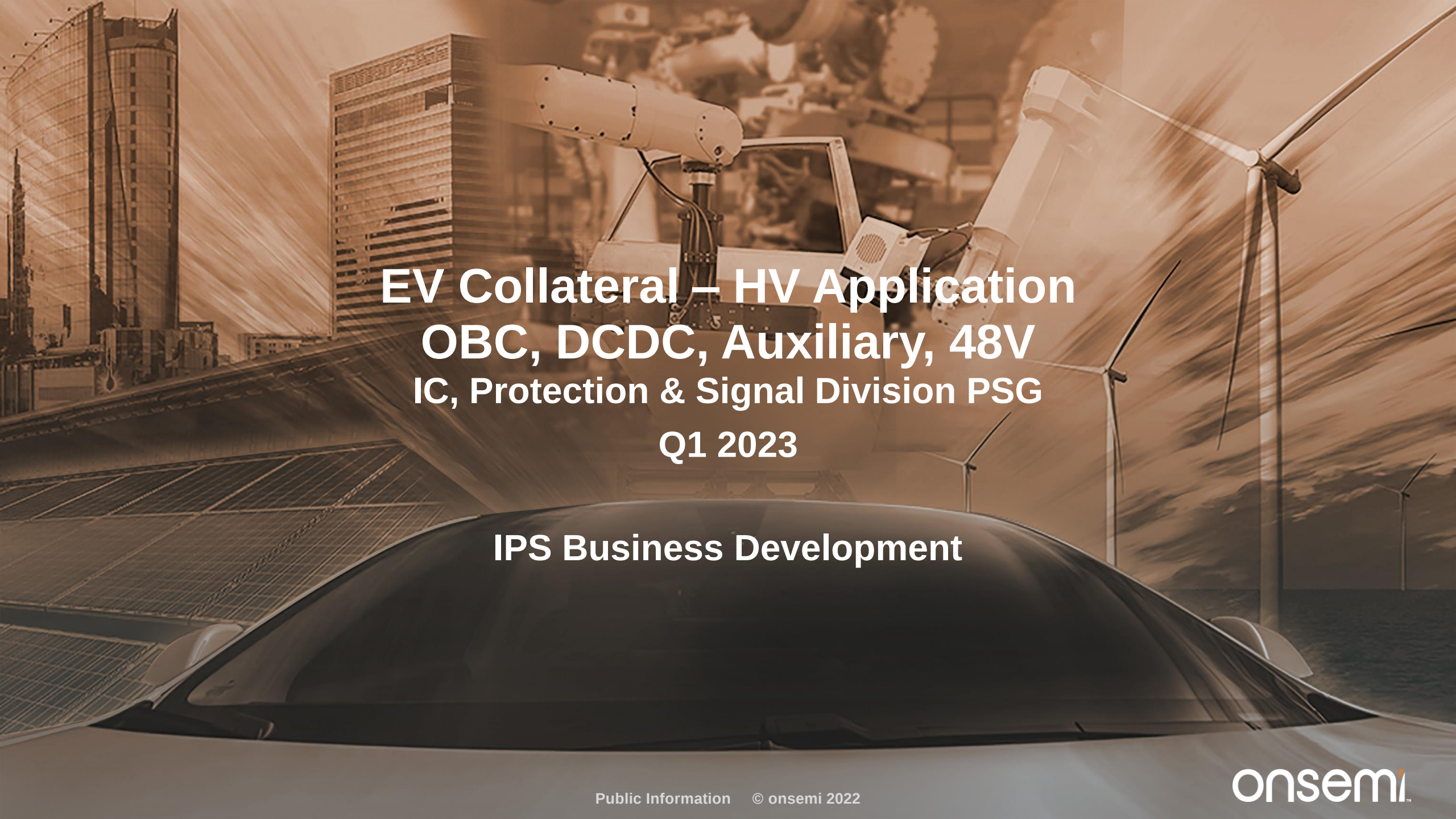
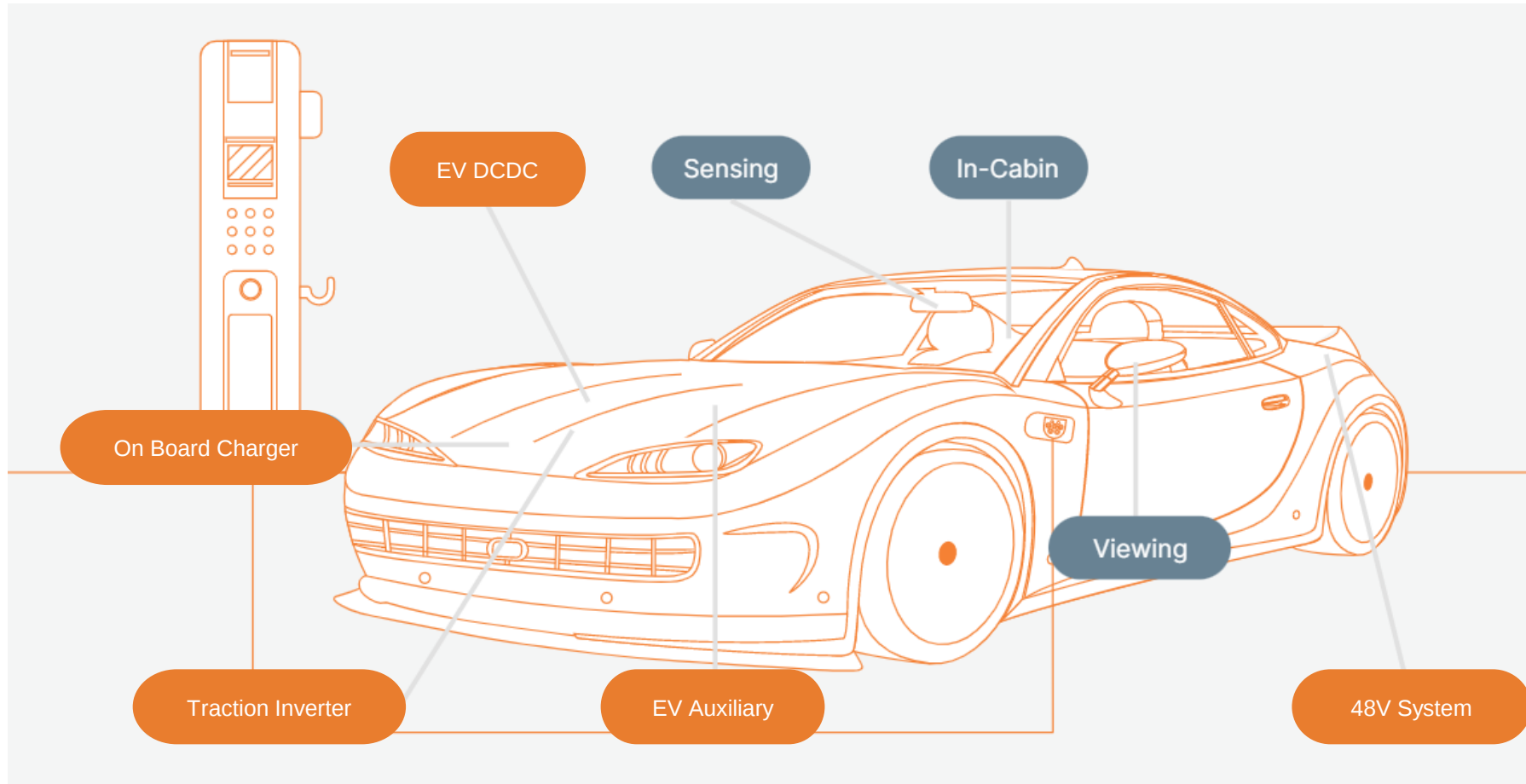




EV Collateral – HV Application **OBC, DCDC, Auxiliary, 48V** **IC, Protection & Signal Division PSG** **Q1 2023**

IPS Business Development

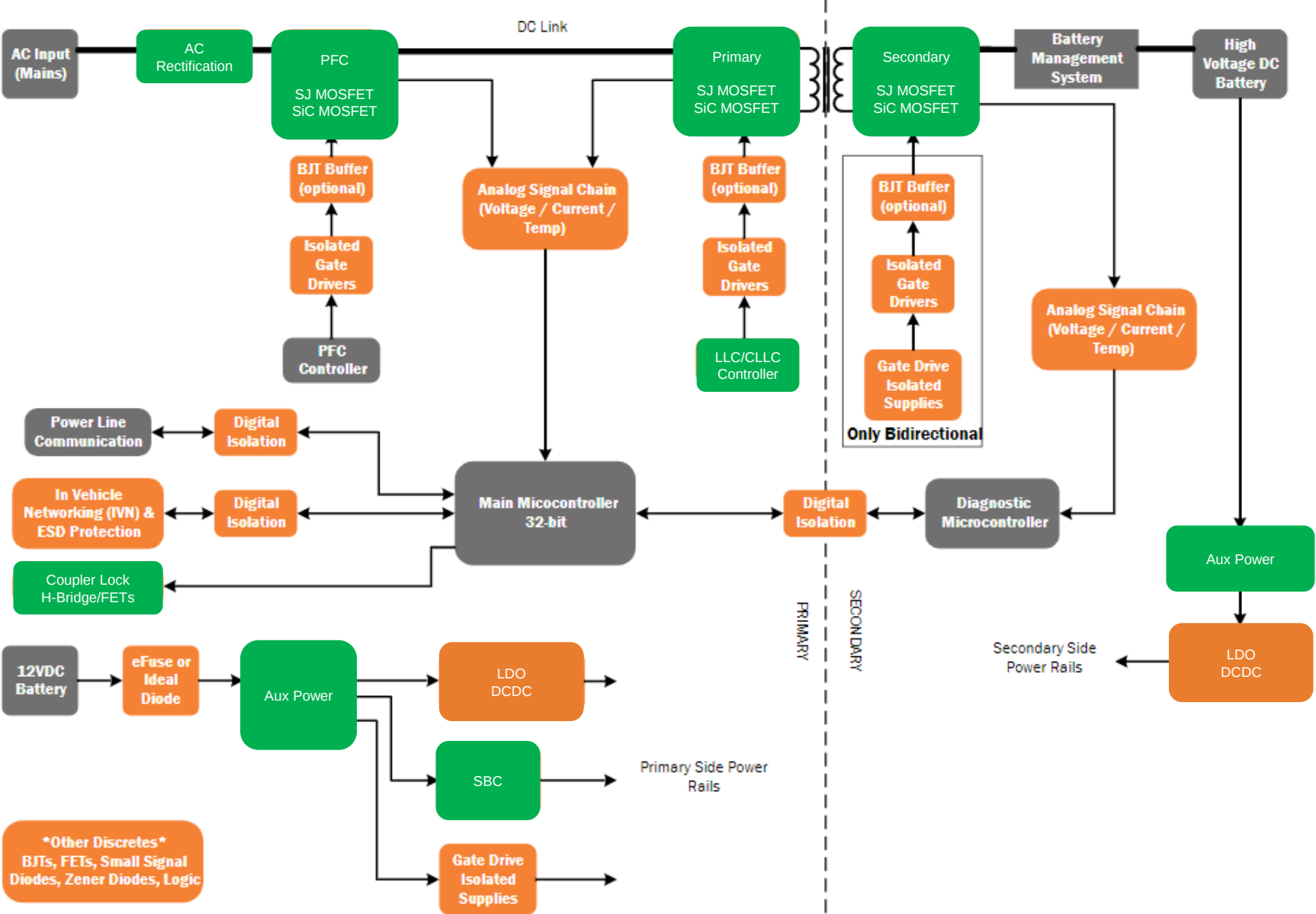
A Leader in Vehicle Electrification



ON Semiconductor Technologies Enabler

- 650 – 1200 V SiC MOSFET
- 650 – 1200 V SiC Diode
- 650 – 1200 V IGBT
- Low – Mid – High Voltage Si FET
- Rectifier
- Module
- High Voltage Gate Driver
- Current sense OpAmp
- LDO
- eFuse
- EEPROM
- ESD Protection

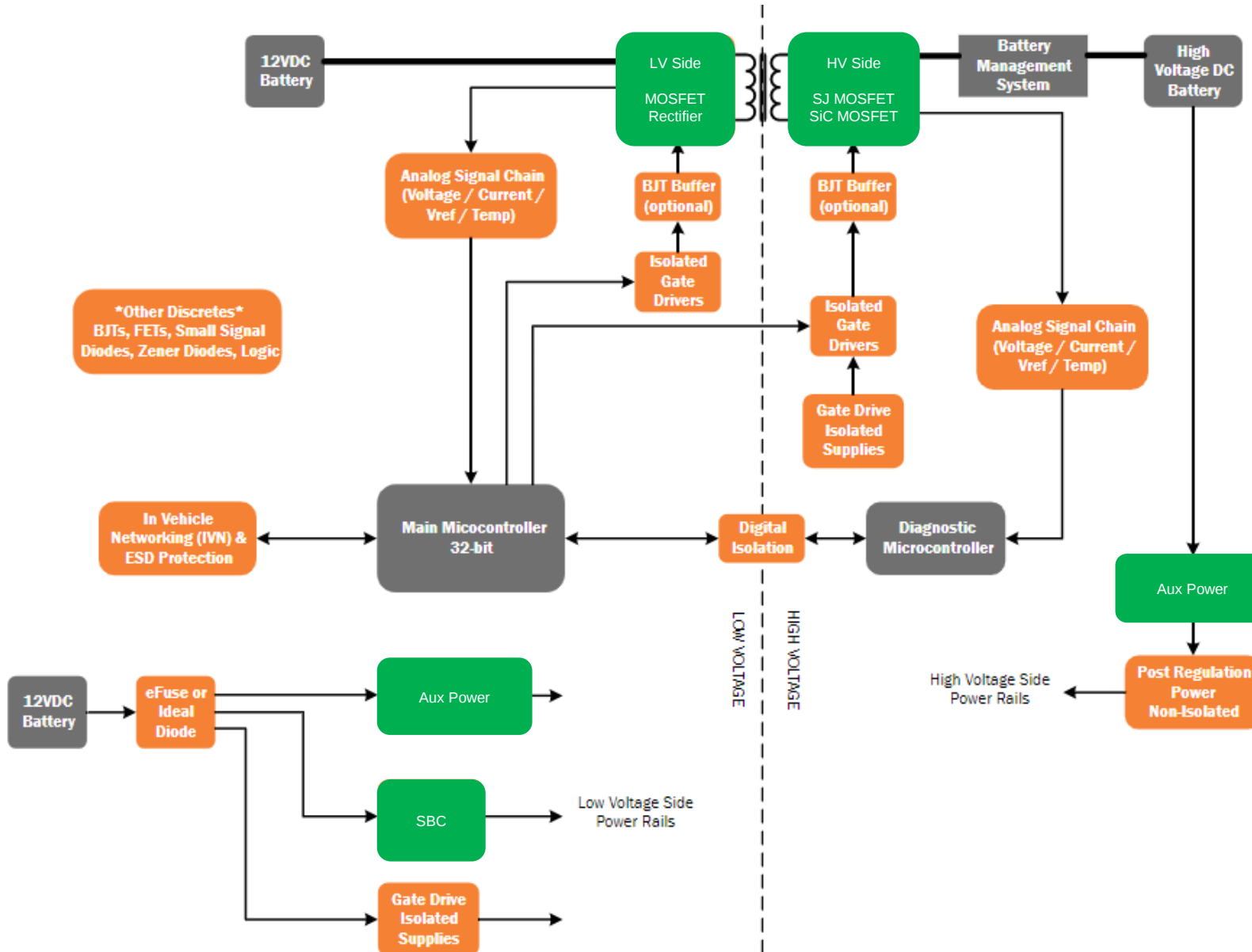
Typical HEV/EV High-Voltage Applications – OBC



Typical HEV/EV High-Voltage Applications – DCDC

IPS Solution

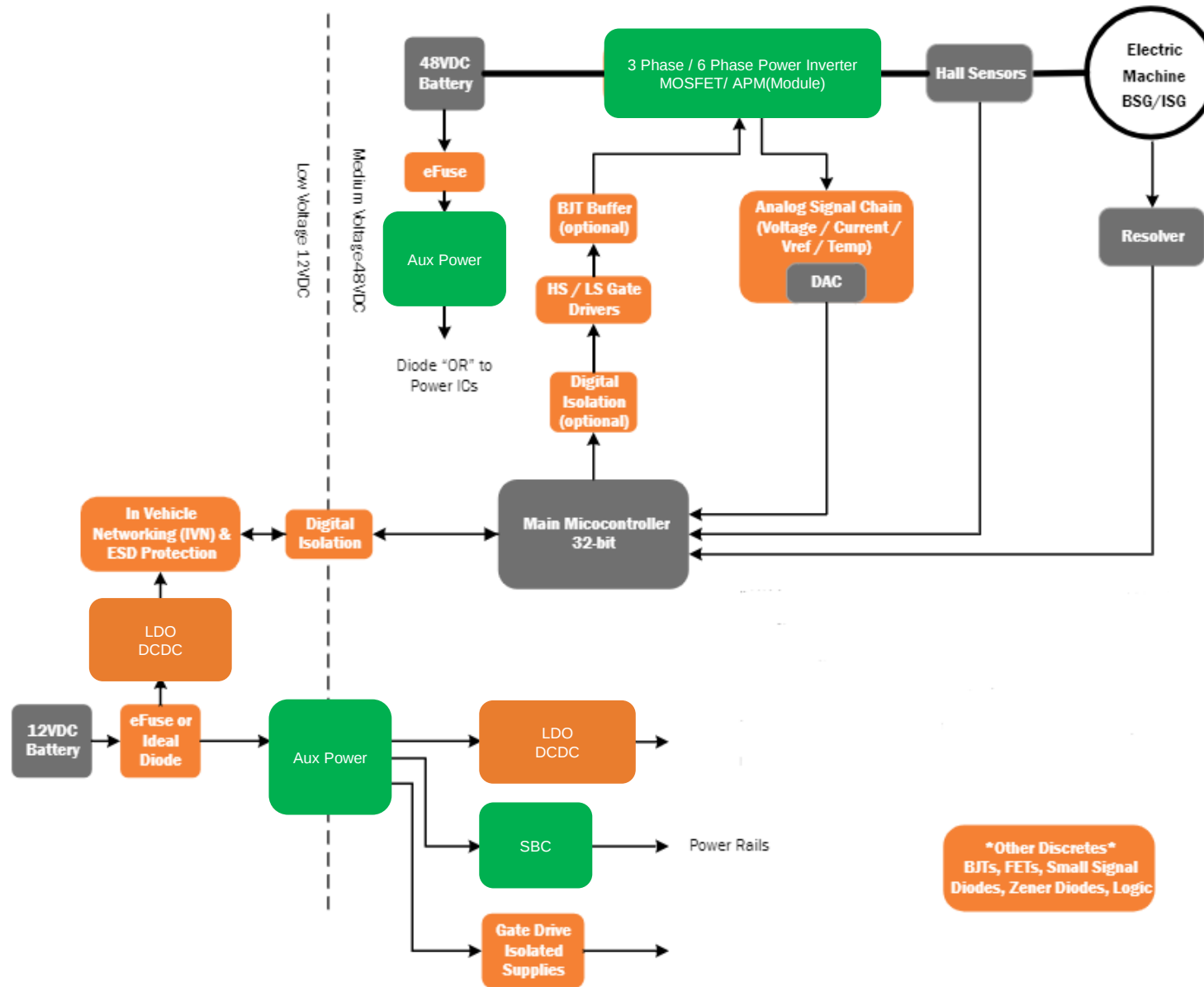
onsemi Solution



Typical 48V Applications – BSG,ISG

IPS Solution

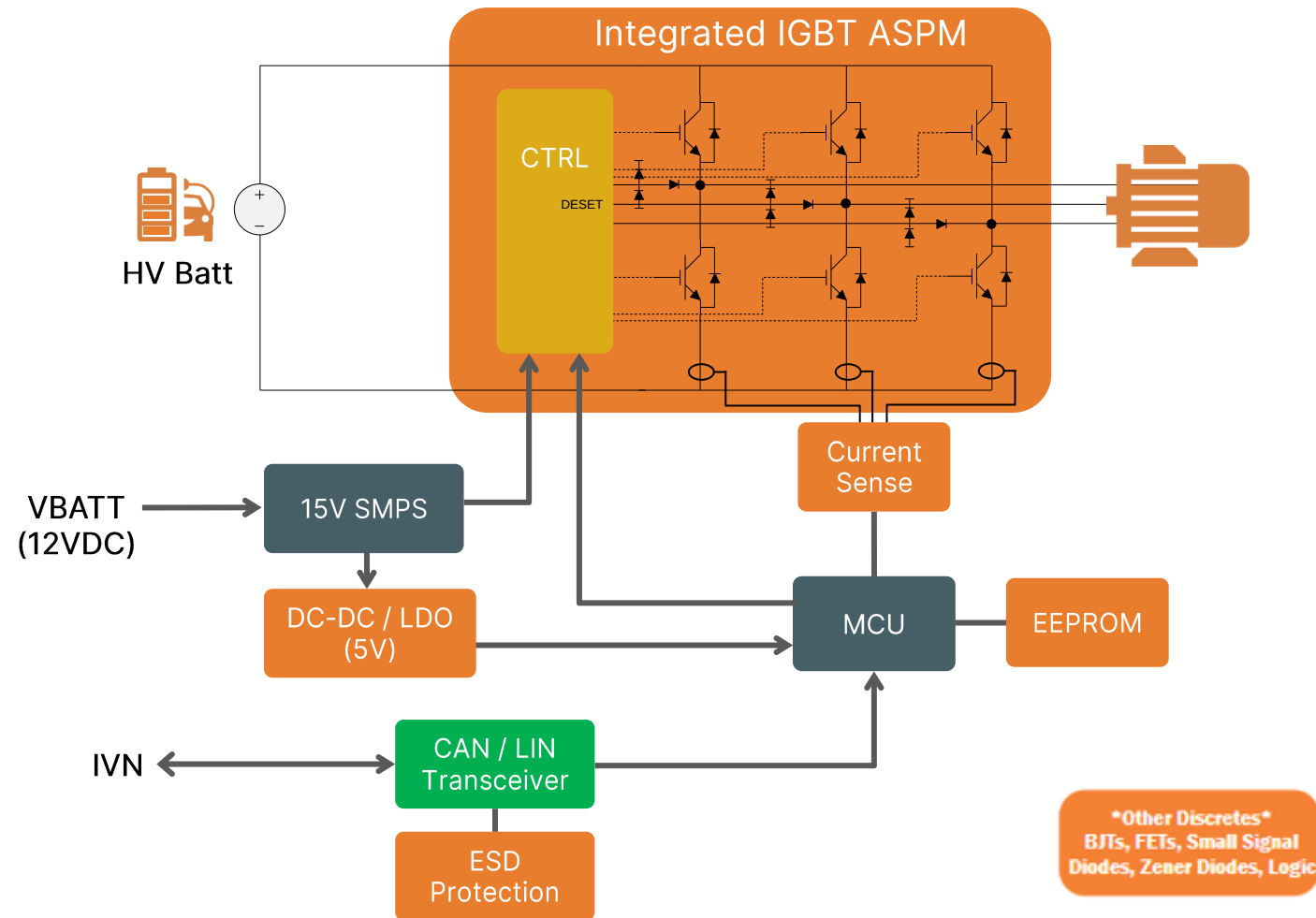
onsemi Solution



Typical HEV/EV High-Voltage Applications – E-comp

IPS Solution

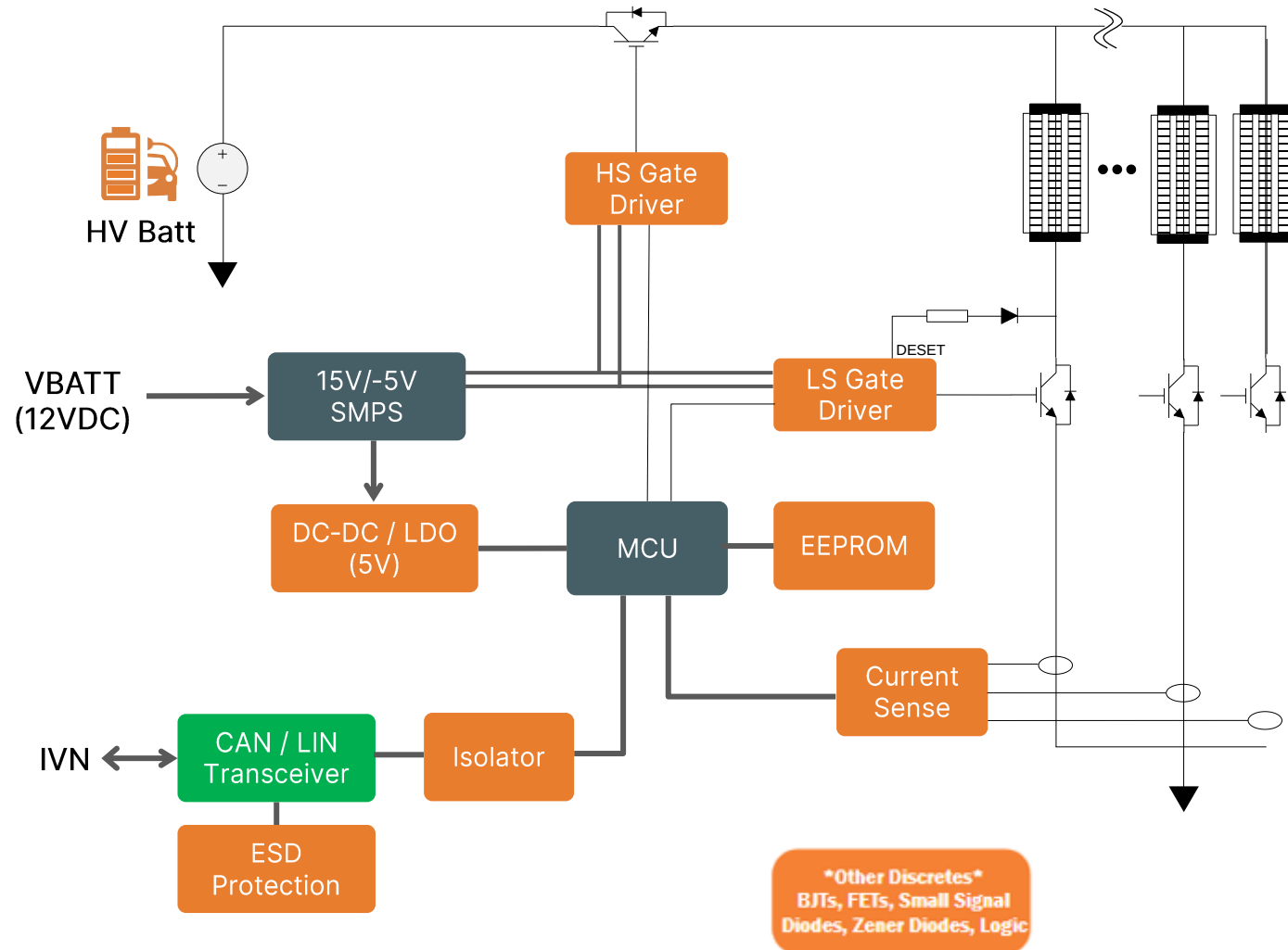
onsemi Solution



Typical HEV/EV High-Voltage Applications – PTC

IPS Solution

onsemi Solution



Single-ended PTC heater

- Simple structure
- Low cost
- Risk on system reliability

Series Connection PTC heater

- Higher cost
- Good system reliability

Products Line up – Protection & Small Signal



eCompressor

ONPN	Function	Package	Count
SMUN5211	Level Switching BRT	SOT-23	</ 9
SMUN5311DW	Dual Level Switching BRT	SC-88	1
SBCP53-16	Pull Down BJT	SOT-223	</ 6
SZMMBZ27/47	Zener Protection	SOT-23	1
SESDONCAN1 SZNUP1105	CAN Protection LIN Protection	SOT-23	1 1



eTurbocharger

ONPN	Function	Package	Count
SBCP68T1G	Pull Down BJT	SOT-223	</ 8
SZMMBZ27VAL	Zener Protection	SOT-23	1
SZNUP2105	IVN Protection	SOT-23	</ 8



PTC Heater

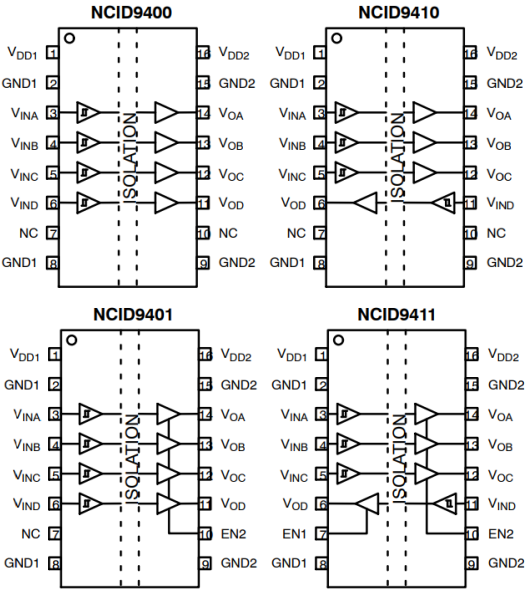
ONPN	Function	Package	Count
SMUN2211	Level Switching BRT	SOT-23	1
SZ1SMA5929/31	Zener Protection	SOT-23	2
SZESD9X3.3	ESD Protection	SOD-923	</ 4
SZNUP2105	IVN Protection	SOT-23	1

ESD Protection for IVN	VBR (V)	C MAX (pF)	Tech	PKG
SZNUP2105L	26.2	30	Bidirectional, Dual	SOT23
SZNUP2125	28.5	10	Bidirectional, Dual	SC70
SZNUP2124	27	10	Bidirectional, Dual	XDFNW3
SZMMBZ27VAL	27	-	Bidirectional, Dual	SOT23

Products Line up – HV GDs, Digital Isolators

HV Gate Driver	# of Ch	Isolation	Output	UVLO	Package
NCV57084/85	1	Y	+7A/-7A	11.5 to 12.5	SOIC8 Narrow
NCV57080/90	1	Y	+6.5A/-6.5A	11.5 to 12.5	SOIC8 Wide/Narrow
NCV57252/53	2	Y	+6.5A/-6.5A	11.5 to 12.5	SOIC16 Wide
NCV57255/56	2	Y	+3.5A/-3.5A	11.5 to 12.5	SOIC16 Narrow
NCV5700/02	1	N	+4A/-6A	12.2 to 12.8	SOIC16
NCV5701/03	1	N	+4A/-6A	12.2 to 12.8	SOIC8

Digital Isolator	# of Ch	Output Enable	VISO Min. (kV)	VIOTM Mim. (kV)	CMTI Min. (kV/us)	Data Rate (Mbps)	Package
NCIV9210R2 ^{Dev}	2	N	5	8	150	50	SOIC16W
NCIV9211R2 ^{Dev}	2	Y	5	8	100	50	SOIC16W
New NCIV9301R2	3	Y	5	8	100	15	SOIC16W
New NCIV9311R2	3	Y	5	8	100	15	SOIC16W
New NCIV9400R2	4	N	5	8	100	10	SOIC16W
New NCIV9401R2	4	Y	5	8	100	10	SOIC16W
New NCIV9410R2	4	N	5	8	100	10	SOIC16W
New NCIV9411R2	4	Y	5	8	100	10	SOIC16W



Products Line up – LDOs

LDO	I Load (mA)	Vin (V)	Vo (V)	PSRR @ 1kHz (dB)	Noise (µVrms)	Iq Max (µA)	Package
NCV8711	100	18	3.0, 3.3, 5.0, ADJ	75	240	2.5	TSOP-5, WDFNW6_2x2
NCV8715	50	24	1.2, 1.8, 3.0, 3.3, 5.0	60@100kHz	65	5.8	SC70-5, XDFN6
NCV8716	80	24	1.5, 1.8, 2.5, 2.8, 3.0, 3.3, 5.0	60@100kHz	120	5.8	WDFN6_2x2
NCV8718	300	24	3.3, 5.0, ADJ	60	36	8.0	WDFN6_2x2
NCV8730	150	38	1.8, 3.3, 5, 15, ADJ	70@10kHz	195	2.5	TSOP-5, WDFNW6_2x2
NCV8734 ^{Dev}	500	38	3.3, 5.0, ADJ	-	-	15	WDFNW8
SCV2951	100	30	5.0	-	56	-	SOIC-8
NCV8537	500	12	1.8, 2.5, 5.0, ADJ	-	33	-	DFNW-10, DFN-10
NCV1117	1,000	20	1.2, 1.5, 1.8, 2.0, 2.5, 3.3, 5.0, ADJ	-	-	-	SOT223-4, DPAK
NCV51460SN33	20	28	3.3	-	-	200	SOT23-3
NCV8170	150	5.5	1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.1, 3.3, 3.6	63	85	0.9	XDFN-4, SOT563-6
NCV8163	250	5.5	1.2, 1.5,1.8, 2.5, 2.7, 2.8, 3.0, 3.3, 5.0	92	6.5	20	XDFN-4, TSOP-5
NCV8177	500	5.5	0.75, 0.85, 0.9, 1.1, 1.2, 1.5, 1.8, 2.8, 3.3	75	54	90	XDFN-4, WDFNW8_2x2
NCV8187	1,200	5.5	0.8, 0.9, 1.1, 1.2, 1.8, 2.8, 3.3, ADJ	75	15	45	XDFN-4, WDFNW8_2x2
NCV8164 (150°C)	300	5.5	1.1, 1.2, 1.5, 1.8, 2.5, 2.8, 2.9, 3.0, 3.3, ADJ	85	9	40	DFNW-8_3x3, WDFNW-6_2x2, TSOP-5
New NCV8189 (150°C)	500	5.5	0.75, 1.2, 1.8, 2.8,3.3, ADJ	85	10	35	WDFNW-6_2x2, DFNW-8_3x3
New NCV59801	1,000	5.5	1.2, 1.8, 3.3, ADJ	85	10	55	WDFNW6_2x2, DFNW8 3x3

Products Line up – OpAmps

OP AMP	# of Ch	VS Max (V)	VOS Max (mV)	GBW Typ (MHz)	SR Typ (V/us)	Package
NCV2187x	1/2/4	5.5	0.045	0.35	0.1	TSOP5, SC70, UDFN8, Micro8, SOIC14
NCV2180x	1/2/4	5.5	0.01	1.5	0.7	SC70, SOT23, Micro8™ UDFN8, TSSOP14
NCV2191x	1/2/4	36	0.025	2	1.6	SOT23, Micro8™, SOIC8, SOIC14, TSSOP14
NCV2023x	1/2/4	36	1.50	3	2.7	SC70, SOT23, SOT553 SOIC8, UDFN8, SOIC14 TSSOP14
NCV20166	1	5.5	1.05	10	0.5	SOT23
NCV2006x	1/2/4	5.5	3.5	3	1.2	TSOP5, SC70, Micro8, SOIC8, TSSOP8, SOIC14, TSSOP14
NCV2007x	1/2/4	36	3.5	3	2.7	TSOP5, SOT553, Micro8, SOIC8, TSSOP8, SOIC14, TSSOP14
NCV2008x	1/2/4	5.5	3.5	1.2	0.4	TSOP5, SC70, Micro8, SOIC8, TSSOP8, SOIC14, TSSOP14
NCVx333	1/2/4	5.5	0.01	0.35	0.15	TSOP5, SC70, Micro8, SOIC8, SOIC14, TSSOP14

Current Sense	VCM (V)	VS Max (V)	VOS Max (mV)	GBW Typ (kHz)	SR Typ (V/us)	Package
NCV21xR	26	26	0.035	90	1	SC70-6, UQFN10
NCV2167x	40	5.5	0.5	350	2	TSOP5, Micro8™, TSSOP14
NCV703x	80	5.5	0.3	100	1	SOIC8, Micro8™
NCV704x	80	5.5	0.3	100	1	SOIC8, Micro8™

Products Line up – EEPROMs

EEPROM	Interface	Density	Vcc	AEC Grade	Package Type
NV25320DxHF	SPI	32 kb	2.5V to 5.5V	0 (150°C)	SOIC8,TSSOP8
NV25640DxHF	SPI	64 kb	2.5V to 5.5V	0 (150°C)	SOIC8,TSSOP8
NV25128DxHF	SPI	128 kb	2.5V to 5.5V	0 (150°C)	SOIC8,TSSOP8
NV25256DxHF	SPI	256 kb	2.5V to 5.5V	0 (150°C)	SOIC8,TSSOP8
NV25320LV	SPI	32 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, US8
NV25640LV	SPI	64 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, US8
NV25128LV	SPI	128 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, WDFNW8
NV25256LV	SPI	256 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, WDFNW8
NV25320MUW	SPI	32 kb	2.5V to 5.5V	1 (125°C)	UDFN-8
NV25640MUW	SPI	64 kb	2.5V to 5.5V	1 (125°C)	UDFN-8
NV25128MUW	SPI	128 kb	2.5V to 5.5V	1 (125°C)	UDFN-8
NV25256MUW	SPI	256 kb	2.5V to 5.5V	1 (125°C)	UDFN-8
NV25512MUW	SPI	512 kb	1.8V to 5.5V	1 (125°C)	UDFN-8
NV25M01D	SPI	1 Mb	1.8V to 5.5V	1 (125°C)	SOIC8,TSSOP8

EEPROM	Interface	Density	Vcc	AEC Grade	Package Type
N24C02	I2C	2 kb	1.7V to 5.5V	1 (125°C)	US8
NV24C04	I2C	4 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, UDFN8, US8
NV24C08	I2C	8 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, UDFN8, US8, TSOP5
NV24C16	I2C	16 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, UDFN8, US8, TSOP5
NV24C32	I2C	32 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, UDFN8, US8
NV24C64	I2C	64 kb	1.7V to 5.5V	1 (125°C)	SOIC8,TSSOP8, UDFN8, US8
NV24C128MUW	I2C	128 kb	2.5V to 5.5V	1 (125°C)	UDFN8
NV24C256MUW	I2C	256 kb	2.5V to 5.5V	1 (125°C)	UDFN8
NV24C512MUW	I2C	512 kb	2.5V to 5.5V	1 (125°C)	UDFN8
NV24M01MUW	I2C	1 Mb	1.8V to 5.5V	1 (125°C)	UDFN8



Products Line up – BJTs, ESD Protections

Buffer BJT	VCEO (V)	IC (A)	ICpeak (A)	VCESAT (mV)	PKG
NJVMJK45H11	-80	-8	-16	-1,000	LFPAK56
NJVMJK44H11	80	8	16	1,000	
NSVS50030SB	-50	-3A	-6A	-185/-500	CPH3 (SOT23)
NSVS50031SB	50	3A	6A	140/210	

ESD Protection	VBR (V)	C MAX (pF)	Tech	PKG
SZNUP2105L	26.2	30	Bidirectional, Dual	SOT23
SZNUP2125	28.5	10	Bidirectional, Dual	SC70
SZNUP2128	31	13	Bidirectional, Dual	SC70
SZMMBZ27VAL	27	-	Bidirectional, Dual	SOT23

Protection & Small Signal

Protection and Signal Product Portfolio

> 3,000 AEC-Q Part Numbers > 170 different Packages

Zener Diodes



- 1.8 V to 200 V
- 0.2 W to 5 W
- Large Variety of Packages
- Devices as small as 0.62 x 0.32 mm²

ESD & Surge Protection



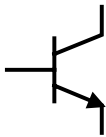
- Highest Power Density in the Industry
- Low Clamping Voltage
- 1 V to 70 V
- Singles, Duals and Arrays
- Optimized response for each interface: High Speed, Power Line, GPIO, Battery Line
- Guaranteed Max Insertion Loss on selected devices

Schottky Diodes



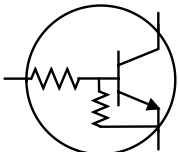
- Optimized V_F & I_R specs → Increase Power Efficiency, Reduce Footprint
- Low Recovery Times
- Singles, Duals and Bridge configurations available
- Wide selection of packages
- First 500 mA, 30 V Schottky in 01005 in the Industry

BJTs



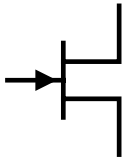
- 10 V to 800 V
- Packages as small as 1.0 x 0.6 mm²
- Audio and Power devices handle > 10 A
- Low V_{CE} Sat devices available
 - Cost effective alternative to MOSFETS
 - $R_{DS(on)}$ Eq of 30 m Ω
 - High ESD Tolerance

BRTs



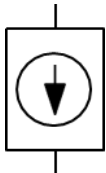
- BJT with Integrated Biasing Resistors
- Save cost and board space
- 17 different resistor combinations
- Singles & Duals
- Over 350 options available!

JFETs



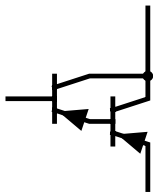
- 10 V to 40 V
- Packages as small as 1.0 x 0.6 mm²
- Low Miller Capacitance
- Selected devices optimized for usage on RF Amplifiers
- More than 50 devices to choose from

CCRs



- Drivers that provide fixed current to LEDs
- Very cost efficient when compared to Switching Regulators
- No EMI Generation
- 45 to 120 V Operation
- 2 Terminal Fixed Output, 3 Terminal Config Output

Darlington Transistors



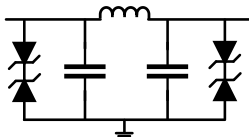
- 30 V to 400 V
- I_C of 0.3 A to 50 A
- Current Gains up to 30,000
- NPN & PNP Configurations available
- More than 80 devices to choose from

RF Discretes



- Specialized:
- RF BJTs and JFETs for Amplifier Circuits
 - PIN diodes for Attenuators
 - Schottky diodes for Envelope Detectors
 - 8.5 GHz SPDT Switches
 - ESD Protection for Antennas

EMI Filters



- Filters with Integrated ESD & Surge Protection
- Common Mode & Single Ended LC, RC
- High Attenuation on bands of interest
- Excellent Clamping Voltage
- Singles & Arrays, > 50 devices available

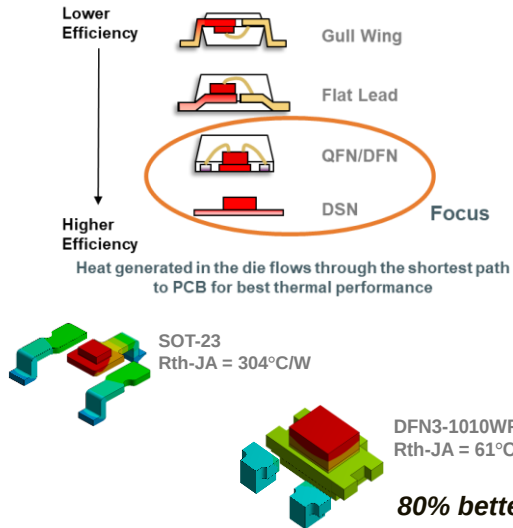
Small Signal Package Migration

Value Proposition

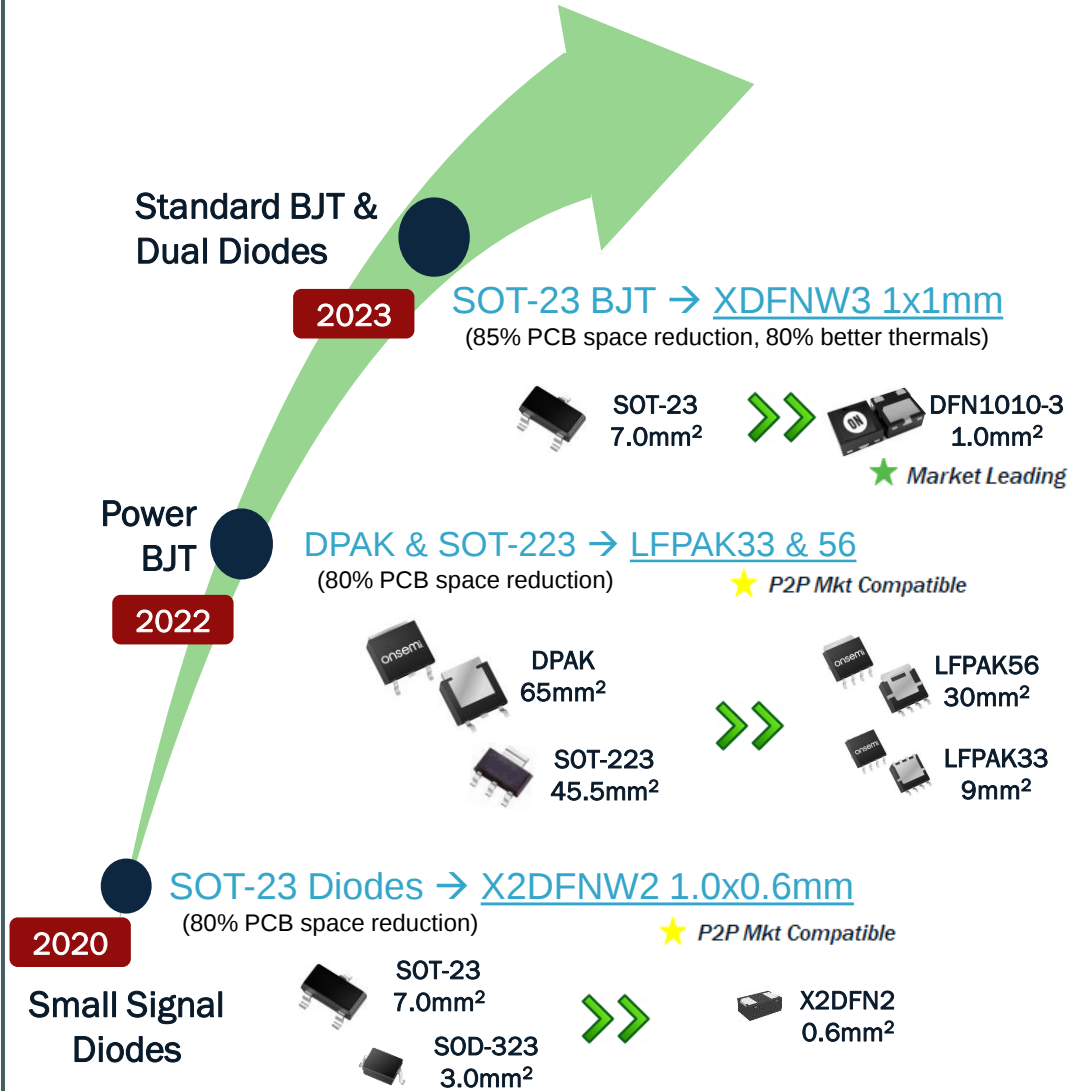
- ✓ Positioned for Automotive Board Shrink Trend
 - Thinner & smaller ECUs to challenge cost reductions
 - Smaller/efficient package adoption vs. legacy SOSM
- ✓ Packages Designed for Automotive Needs
 - DFN w/ Wettable Flanks – inspectable solder joints
 - AOI – Automated Optical Inspection best practices



Thermal Efficiency



Driving Packages & Migration Roadmap



Success Stories/D-WIN



Body Control Module
PN: [NSVBAS16MX2W](#)



Electronic Mirror
Reverse Batt Protection
PN: [NSVR02HL40MX2](#)



Gateway, CAN-FD
Protection , +175°C rated
PN: [SZNUP2124MTW](#)



Park Assist
OVP/Switching
PN: [NSV1C300CTWG](#)



Head Unit
HDBaseT IVN Protection
PN: [SZNSP8814L](#)



Diesel/Gas ECU
+175°C rated
PN: [SZNZ8FxxxMX2W](#)

Small Signal Bipolar Transistors

Increasingly **smaller footprints** and lower profiles with **highest possible power density** to provide **compact, high efficiency solutions**.



	Polarity	SOT-23	SC-70	SC-75	SOT-723	SOT-1123
160 V, 60 mA	NPN	SMMBT5551L	-	-	NSVMMBT5551M	-
80 V, 500 mA	NPN	SMMBTA06L	SMMBTA06W	-	-	-
	PNP	SMMBTA56L	SMMBTA56W	-	-	-
65 V, 100 mA	NPN	SBC846BL	SBC846BW	-	NSVBC846BM	NST846BF
	PNP	SBC856BL	SBC856BW	-	NSVBC856BM	NST856BF
60 V, 600 mA	PNP	SMMBT2907AL	NSVMMBT2907AW	-	NSVMMBT2907AM	-
50 V, 100 mA	NPN	-	-	S2SC4617	NSV2SC5658M	-
	PNP	-	-	S2SA1774	NSV2SA2029M	-
45 V, 100 mA	NPN	BC847AL	SBC847AW	-	-	-
		SBC847BL	SBC847BW	NSVBC847BT	BC847BM	NST847BF
		SBC847CL	SBC847CW	BC847CT	-	-
	PNP	SBC857BL	SBC857BW	NSVBC857BT	-	NST857BF
40 V, 600 mA	NPN	SMMBT2222AL	SMMBT2222AW	NSVMMBT2222AT	NSVMMBT2222AM	-
		SMMBT4401L	NSVMMBT4401W	-	MMBT4401M	-
		SMMBT4403L	MMBT4403W	-	MMBT4403M	-
40 V, 200 mA	NPN	SMMBT3904L	SMMBT3904W	SMMBT3904T	-	NST3904F
	PNP	SMMBT3906L	SMMBT3906W	NSVMMBT3906T	-	NST3906F
30 V, 100 mA	NPN	SBC848BL	NSVBC848BW	-	-	NST848BF
		NSVBC848CL	BC848CW	-	-	-
	PNP	BC858AL	NSVBC858AW	-	-	-
		NSVBC858BL	BC858BW	-	-	-

*Copper traces of 25 mm²

91% smaller, 21% more power

Complete Portfolio

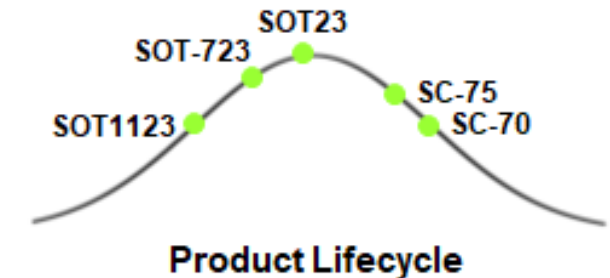
- One of largest portfolios of parts in the industry
- Single, Dual, Complementary and Darlington configurations available

High Levels of Quality

- Very low (<35 ppb) product failure rate
- Extensive AEC-Q101 Qualified portfolio

Reliable Supply

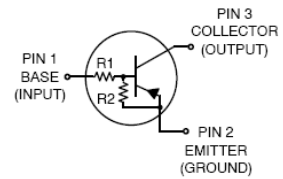
- Global supply chain with one of largest production footprints in the industry.



Digital Transistors (BRTs)

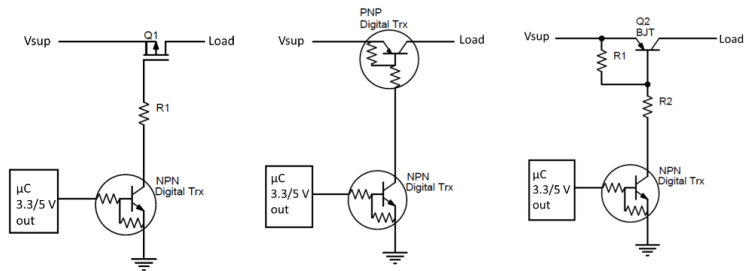
Over 350 part numbers

Digital transistor: BJT with built-in resistor(s)
• Also known as Bias Resistor Transistors (BRTs)

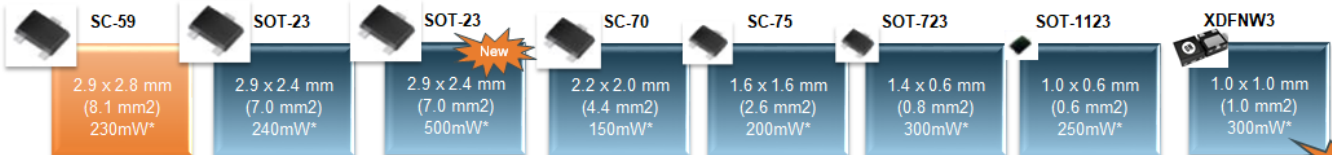


Complete Portfolio

- 17 different resistor combinations
- 6 package options
- AEC-Q101 Qualified parts
- Also available in co-packaged duals
 - SOT-363, SOT-563, SOT-963



Typical Applications



R1	R2	Polarity	SC-59	SOT-23	SOT-23 (500mA)	SC-70	SC-75	SOT-723	SOT-1123	XDFNW3
4.7K	47K	NPN	SMUN2233	NSVMMUN2233L	NVMMUN6233L	SMUN5233	DTC143ZE	NSVDTC143ZM	NSBC143ZF	NSVMMUN2233MXW
		PNP	SMUN2133	NSVMMUN2133L	NVMMUN6133L	SMUN5133	DTA143ZE	NSVDTA143ZM	NSBA143ZF	NSVMMUN2133MXW
10K	47K	NPN	SMUN2214	NSVMMUN2214L	NVMMUN6214L	SMUN5214	DTC114YE	NSVDTC114YM	NSBC114YF	NSVMMUN2214MXW
		PNP	SMUN2114	NSVMMUN2114L	NVMMUN6114L	SMUN5114	DTA114YE	NSVDTA114YM	NSBA114YF	NSVMMUN2114MXW
22K	47K	NPN	SMUN2234	NSVMMUN2234L	NVMMUN6234L	SMUN5234	DTC124XE	NSVDTC124XM	NSBC124XM	NSVMMUN2234MXW
		PNP	SMUN2134	NSVMMUN2134L	NVMMUN6134L	SMUN5134	DTA124XE	NSVDTA124XM	NSBA124XM	NSVMMUN2134MXW
47K	22K	NPN	SMUN2237	NSVMMUN2237L	NVMMUN6237L	SMUN5237	SDTC144WE	DTC144WM	NSBC144WF	NSVMMUN2237MXW
		PNP	SMUN2137	NSVMMUN2137L	NVMMUN6137L	SMUN5137	NSVDTA144WE	NSVDTA144WM	NSBA144WF	NSVMMUN2137MXW
2.2K	∞	NPN	SMUN2238	NSVMMUN2238L	NVMMUN6238L	SMUN5238	SDTC123TE	DTC123TM	NSBC123TF	NSVMMUN2238MXW
		PNP	SMUN2138	NSVMMUN2138L	NVMMUN6138L	SMUN5138	DTA123TE	DTA123TM	NSBA123TF	NSVMMUN2138MXW
4.7K	∞	NPN	SMUN2216	NSVMMUN2216L	NVMMUN6216L	SMUN5216	DTC143TE	NSVDTC143TM	NSBC143TF	NSVMMUN2216MXW
		PNP	SMUN2116	NSVMMUN2116L	NVMMUN6116L	SMUN5116	SDTA143TE	DTA143TM	NSBA143TF	NSVMMUN2116MXW
10K	∞	NPN	SMUN2215	NSVMMUN2215L	NVMMUN6215L	SMUN5215	DTC114TE	DTC114TM	NSBC114TF	NSVMMUN2215MXW
		PNP	SMUN2115	NSVMMUN2115L	NVMMUN6115L	SMUN5115	NSVDTA114TE	DTA114TM	NSBA114TF	NSVMMUN2115MXW
47K	∞	NPN	SMUN2240	NSVMMUN2240L	NVMMUN6240L	SMUN5240	NSVDTC144TE	NSVDTC144TM	NSBC144TF	NSVMMUN2240MXW
		PNP	SMUN2140	NSVMMUN2140L	NVMMUN6140L	SMUN5140	DTA144TE	DTA144TM	NSBA144TF	NSVMMUN2140MXW
100K	∞	NPN	SMUN2241	NSVMMUN2241L	NVMMUN6241L	SMUN5241	DTC115TE	DTC115TM	NSBC115TF	NSVMMUN2241MXW
		PNP	SMUN2141	NSVMMUN2141L	NVMMUN6141L	SMUN5141	DTA115TE	DTA115TM	NSBA115TF	NSVMMUN2141MXW

*Copper traces of 25 mm²

500mA
Samples 1Q22
RTM 4Q22

Wettable Flank
Planning

95% smaller, similar power

Zener Diodes

Over 700 part numbers

Complete Portfolio of Products

Family	P Max (W)	Package
1N53	5.0	Surmetic
1PMT	3.2	Powermite
1N59	3.0	Axial Leded
1SMB	3.0	SMB
1SMA	1.5	SMA
1N47	1.0	Axial Leded
BZX85	1.0	Axial Leded
MMSZ	0.500, 1.0	SOD-123
BZX7	0.500	Axial Leded
MM5Z	0.500	SOD-523
MM3Z	0.300	SOD-323
BZX84	0.250	SOT-23
NZ8F	0.500	X2DFNW2
NZ9F	0.250	SOD-923
NZD	0.200	X3DFN2
MMBZ5	0.225	SOT-23



2.9 x 2.4 mm
(7.0 mm²)
225mW*



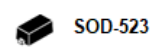
2.9 x 2.4 mm
(7.0 mm²)
250mW*



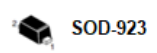
3.7 x 1.6 mm
(5.9 mm²)
500mW*



2.5 x 1.3 mm
(3.2 mm²)
300mW*



2.5 x 1.5 mm
(3.8 mm²)
800mW*



1.0 x 0.6 mm
(0.6 mm²)
200mW*

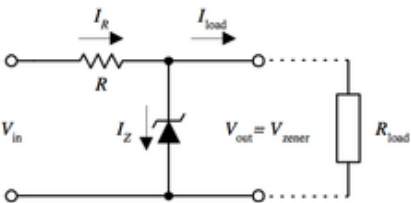


1.0 x 0.6 mm
(0.6 mm²)
250mW**

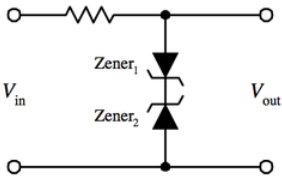
New

Voltage	SOT-23	SOT-23 (**Tight)	SOD-123 (**Low Iz)	SOD-323 (**Tight)	SOD-523 (**Tight)	SOD-923 (**Tight)	X2DFNW2 (**Tight)
2.4V	SZMMBZ5221BLT1G	SZBZX84C2V4LT1G	SZMMSZ2V4T1G	SZMM3Z2V4T1G	SZMM5Z2V4T5G	SZMZ9F2V4T5G	SZMZ8F2V4MX2WT5G
2.7V	SZMMBZ5222BLT1G	SZBZX84C2V7LT1G	SZMMSZ2V7T1G	SZMM3Z2V7T1G	SZMM5Z2V7T5G	SZMZ9F2V7T5G	SZMZ8F2V7MX2WT5G
3.0V	SZMMBZ5225BLT1G	SZBZX84C3V0LT1G	SZMMSZ3V0T1G	SZMM3Z3V0T1G	SZMM5Z3V0T5G	SZMZ9F3V0T5G	SZMZ8F3V0MX2WT5G
.	.	.	.	.	.	.	.
12V	SZMMBZ5242BLT1G	SZBZX84C12LT1G	SZMMSZ12T1G	SZMM3Z12VT1G	SZMM5Z12VT5G	SZMZ9F12VT5G	SZMZ8F12VMX2WT5G
15V	SZMMBZ5245BLT1G	SZBZX84C15LT1G	SZMMSZ15T1G	SZMM3Z15VT1G	SZMM5Z15VT5G	SZMZ9F15VT5G	SZMZ8F15VMX2WT5G
16V	SZMMBZ5246BLT1G	SZBZX84C16LT1G	SZMMSZ16T1G	SZMM3Z16VT1G	SZMM5Z16VT5G	SZMZ9F16VT5G	SZMZ8F16VMX2WT5G
18V	SZMMBZ5248BLT1G	SZBZX84C18LT1G	SZMMSZ18T1G	SZMM3Z18VT1G	SZMM5Z18VT5G	SZMZ9F18VT5G	SZMZ8F18VMX2WT5G
.	.	.	.	.	.	.	.
27V	SZMMBZ5254BLT1G	SZBZX84C27LT1G	SZMMSZ27T1G	SZMM3Z27VT1G	SZMM5Z27VT5G	—	SZMZ8F27VMX2WT5G
36V	SZMMBZ5258BLT1G	SZBZX84C36LT1G	SZMMSZ36T1G	SZMM3Z36VT1G	SZMM5Z36VT5G	—	SZMZ8F36VMX2WT5G
47V	SZMMBZ5261BLT1G	SZBZX84C47LT1G	SZMMSZ47T1G	SZMM3Z47VT1G	SZMM5Z47VT5G	—	SZMZ8F47VMX2WT5G
.	.	.	.	.	.	—	—
.	.	.	.	.	.	—	—
56V	SZMMBZ5263BLT1G	SZBZX84C56LT1G	SZMMSZ56T1G	SZMM3Z56VT1G	SZMM5Z56VT5G	—	—
75V	SZMMBZ5267BLT1G	SZBZX84C75LT1G	—	SZMM3Z75VT1G	SZMM5Z75VT5G	—	—
91V	SZMMBZ5270BLT1G	—	—	—	—	—	—

*Copper traces of 25 mm² **Tight Tolerance = 2% offered, Standard Tolerance = 5% ***Low Iz = 50uA offered

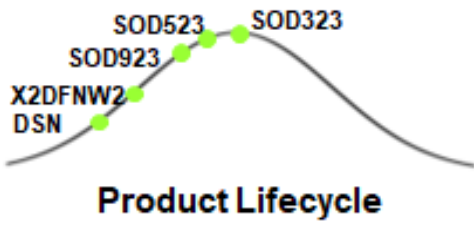


Voltage Regulator



Waveform Clipper

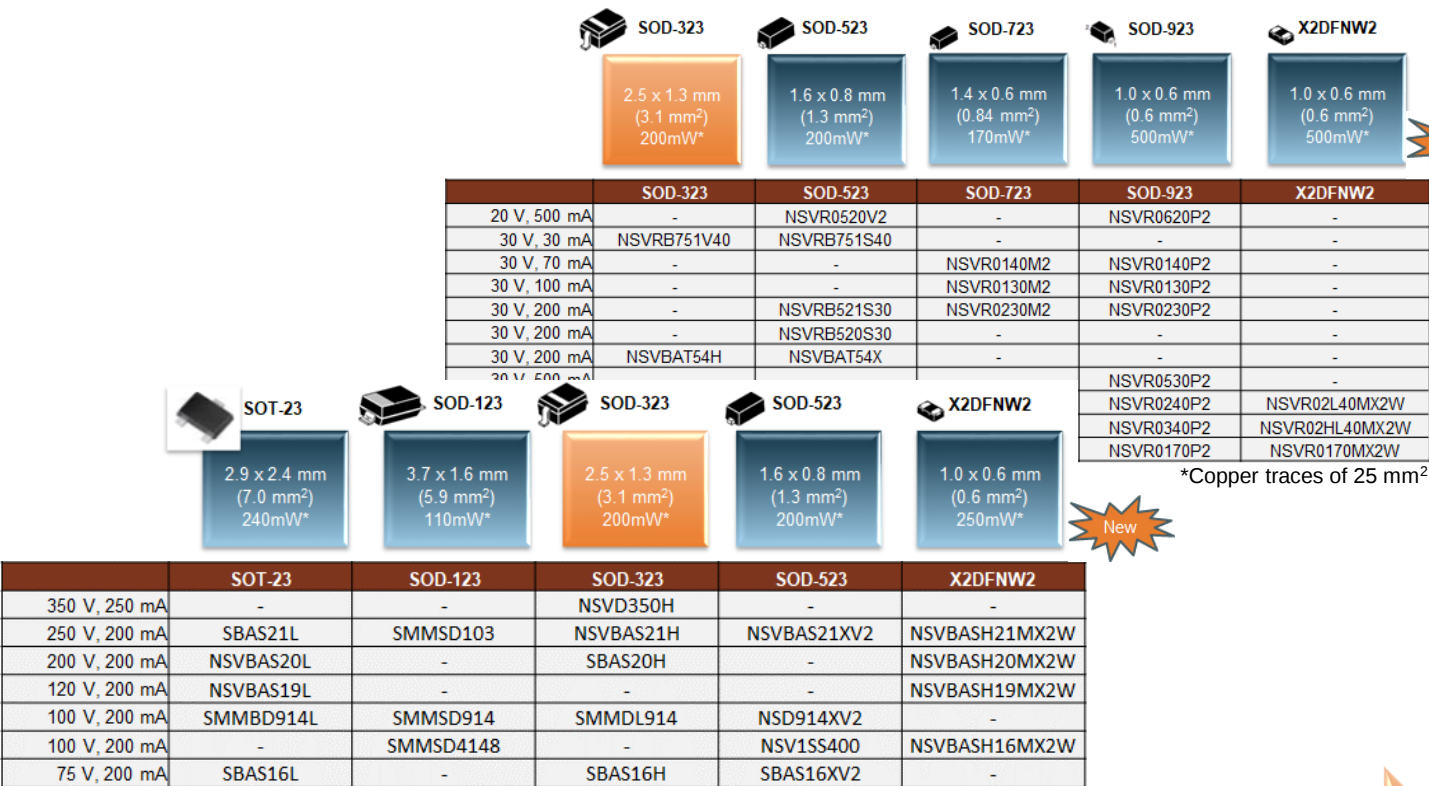
Typical Applications



95% smaller, similar power

Small Signal Schottky & Switching Diodes

Over 250 part numbers



*Copper traces of 25 mm²

94% smaller, 50% more power

Increasingly **smaller footprints** and lower profiles with **highest possible power density** to provide **compact, high efficiency solutions**.

Complete Portfolio

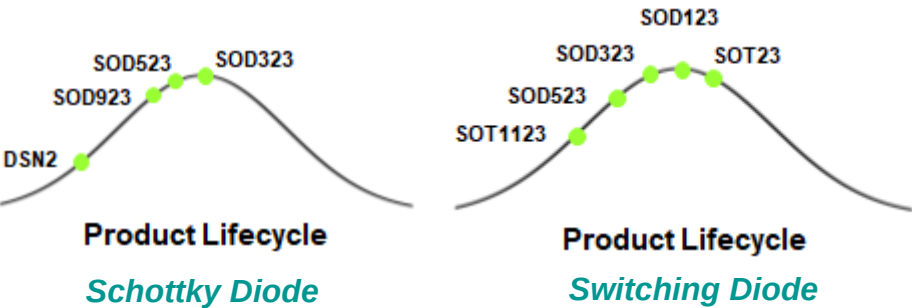
- One of largest portfolios of parts in the industry
- Single, Dual and Triple diode configurations available

High Levels of Quality

- Very low (<10 ppb) product failure rate
- Extensive AEC-Q101 Qualified portfolio

Reliable Supply

- Global supply chain with one of largest production footprints in the industry.



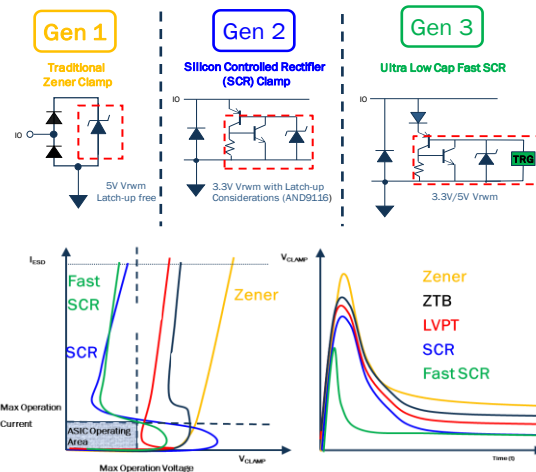
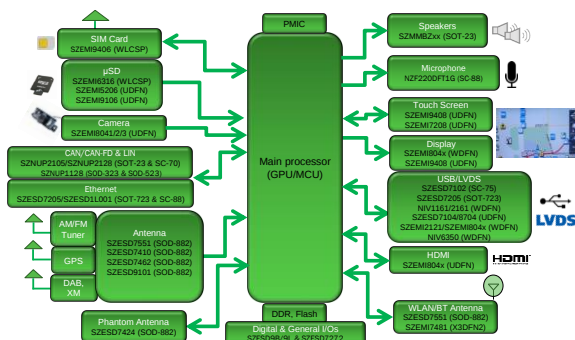
New Technology Focus

Advanced ESD Protection

15% CAGR

Industry Leading Performance

- ✓ **Lowest Vclamp & Capacitance**
 - Ensures highest system level survival & SI
- ✓ **High Growth Application Focus**
 - ADAS, USB-C/PD, Antennas



Small Signal RF >1GHz

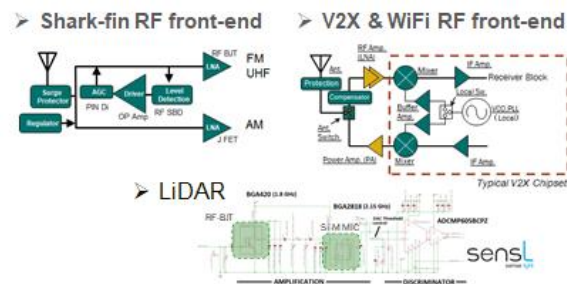
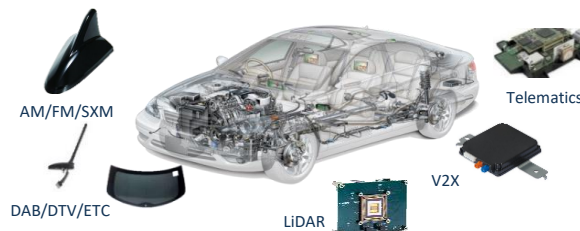
20% CAGR

Broad Portfolio

RF BJTs	JFETs
RF-Schottky	RF-MMICs
PIN Diodes	RF-Switches

Leading Technology

- ✓ High gain, low distortion, robust ESD
- ✓ High Growth Application Focus
 - Wideband >1GHz: 5G, V2X, WiF6

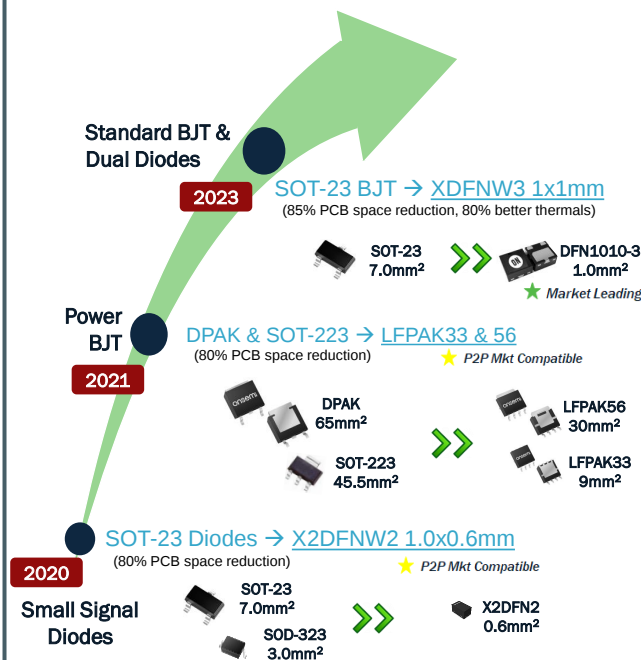
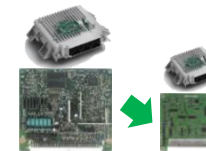


μPackaging Migration

9% CAGR

Supporting Today's ECU Trends

- ✓ Higher power density packaging with industry leading electrical performance
- ✓ Optimized for Automated Optical Inspection (AOI)



Targeted Migration: Tier 1 Case Study

Single Zener, Switching & Schottky Diodes



SOD-323/523

SZMM3ZxxxVT1G

- 4.7/5.1/6.2/7.5/8.2/10/11/16/24 volts

SZMM5ZxxxT1G

- 3.3/5.1/6.2 volts

NSVBAT54HT1G

SBAS20HT1G



X2DFNW2 (SOD-882)

SZNZ8FxxxMX2WT5G

SZNZ8FxxxMX2WT5G

NSVR0240MX2WT5G

NSVBAS20MX2WT5G*

Dual Zener, Single Switching & Schottky Diodes



SOT-23

SZMMBZ52xxBLT1G

SZMMBZxxVDLT1G

SMMBDxxxLT1G

SBAV99LT1G

SESDONCAN1LT3G



X2DFNW2 (SOD-882)

SZNZ8FxxxMX2WT5G

SZNZ8DHxxVMX2WT5G*

NSVBASxxMX2WT5G



XDFNW3-1x1mm (SOT-8015)

SZMMBZxxxMXWTBG*

NSVBASxxMXWTBG*

NSVBASxxMXWTBG*

SZNUP2124MXWTBG

*In Development

Bipolar Transistor



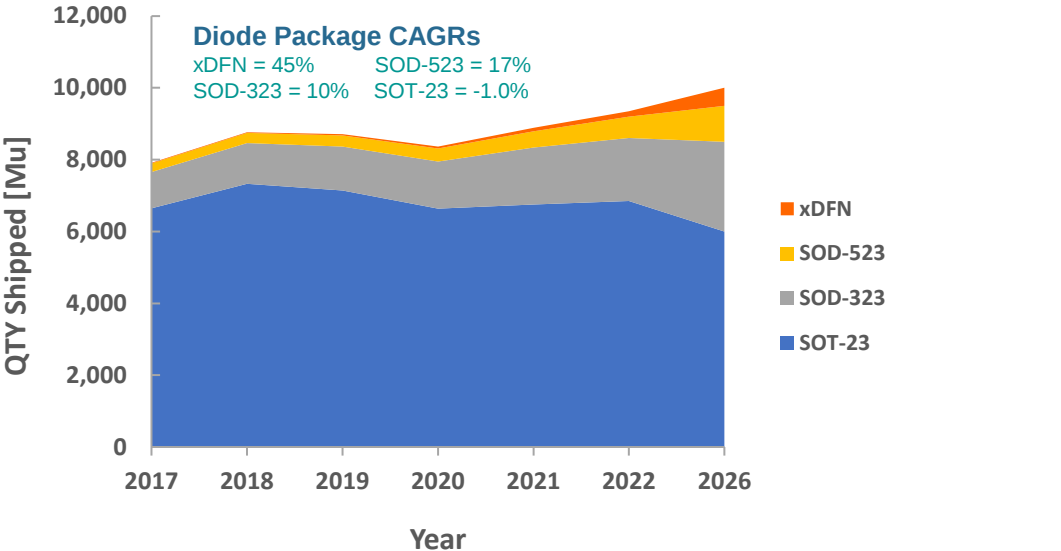
DPAK

- NJVMJD31CT4G



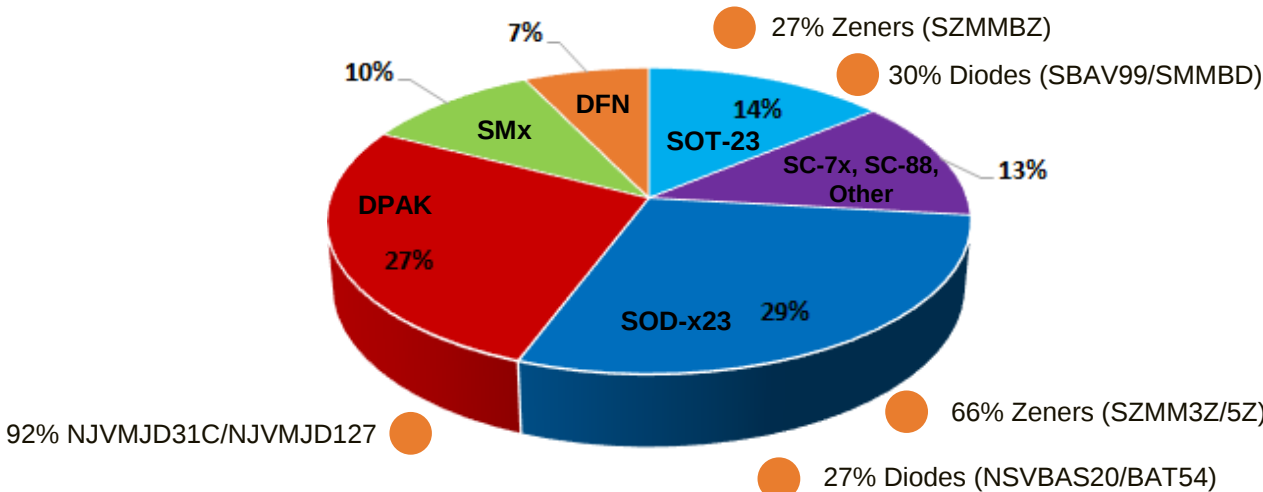
LFPAK56

- NJVMJK31CTWG*



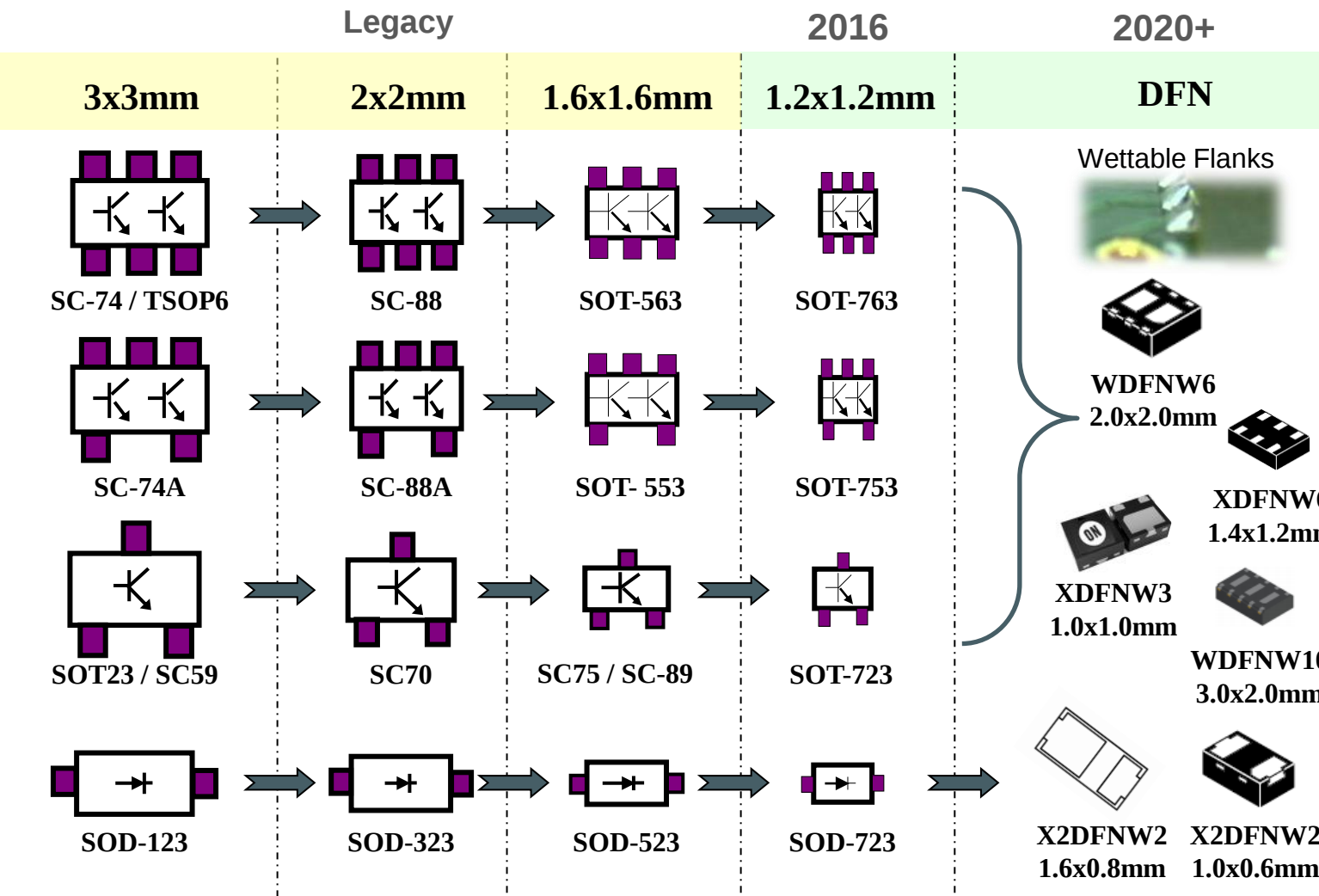
Tier 1 Package Usage

*By rev. per 2022 onsemi award

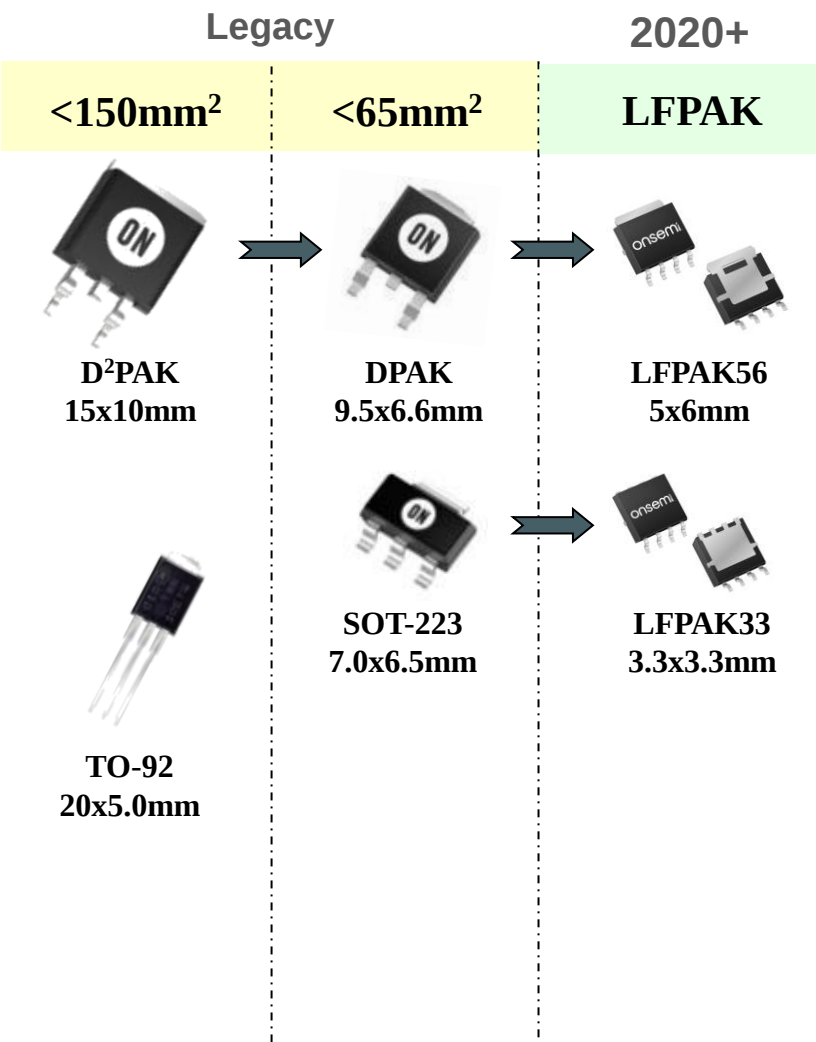


Small Signal Package Roadmap

Small Signal Products

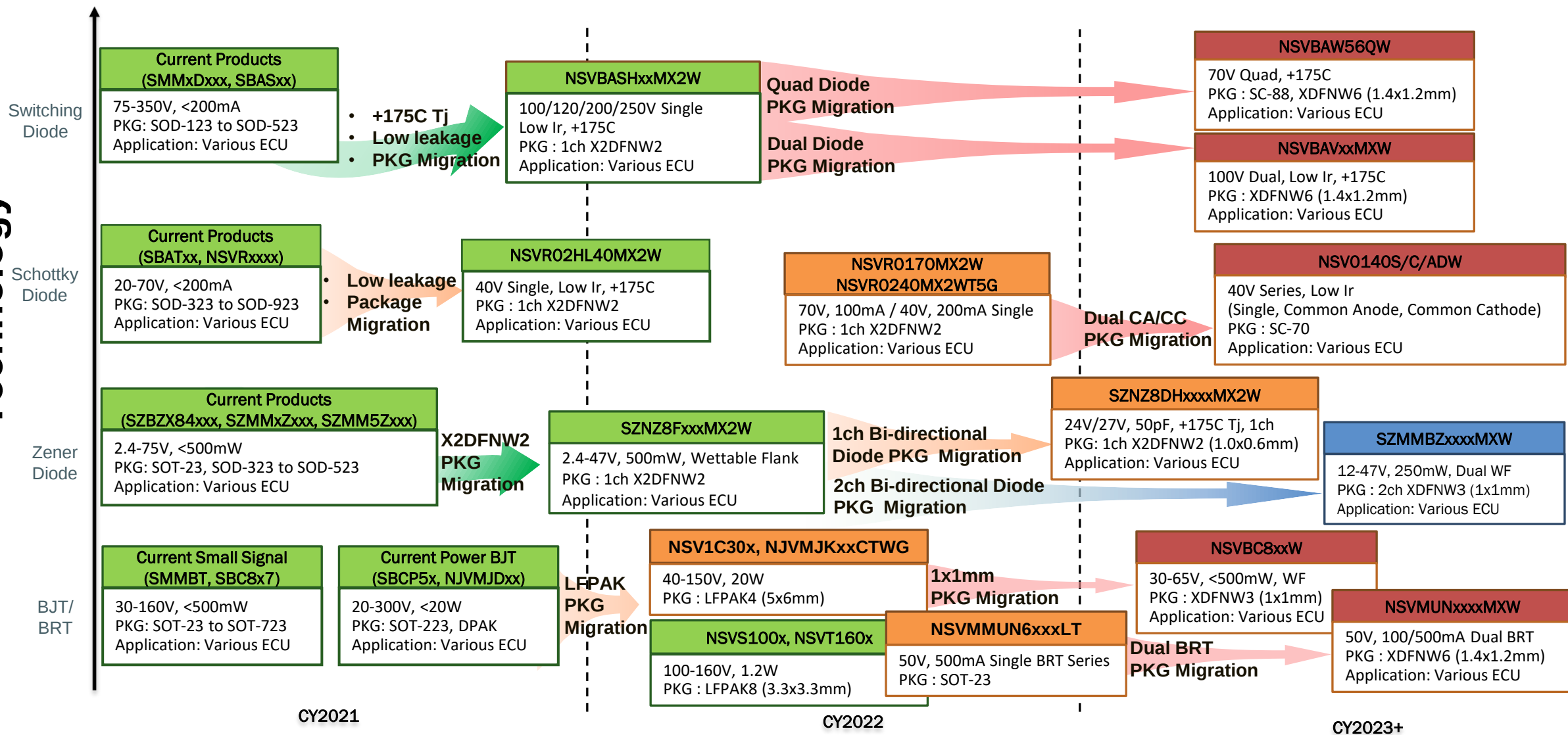


Power Products



Automotive Small Signal Discrete Product Roadmap

Technology



Automotive ESD Protection

ESD Protection

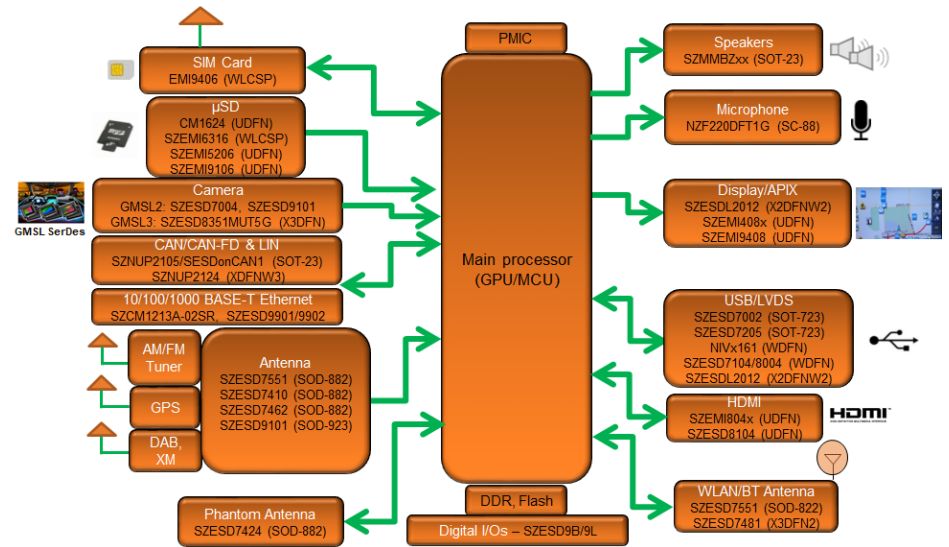


- **#1 Market Share**
- Uni/bi-directional, 1-4x channel solutions
- 30kV & Short-to-battery capability
- Wide Voltage and Capacitance Range
 - <1pF, 3.3 – 27V
- Wetable Flank DFN packaging
- ✓ Wide IVN Protection Portfolio
 - CAN-FD/1000BASE-T/HDBase-T
 - USB 4.0

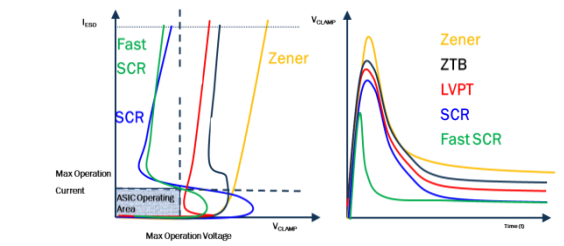
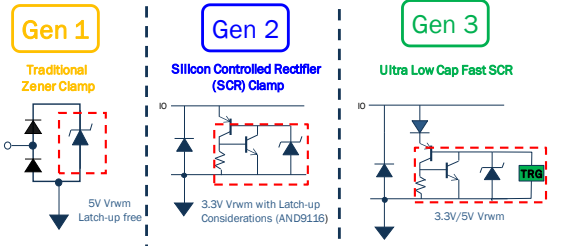


Focus
Sustain

Application Focus & IVN Leadership



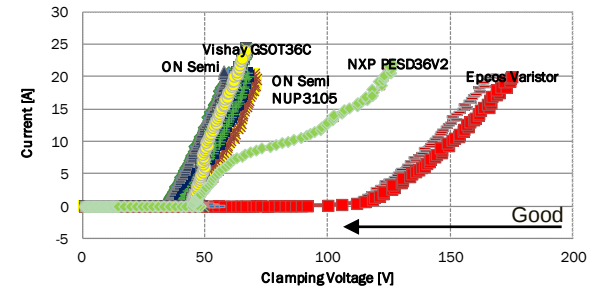
Advanced ESD Structures



High Speed Data Line Protection Performance			
Capacitance	onsemi	Comp 1	Comp 2
ESD Rating	onsemi	Comp 1	Comp 2
Clamping Voltage	onsemi	Comp 1	Comp 2
Peak Pulse Current	onsemi	Comp 1	Comp 2

- ✓ **Lowest Clamping Voltage**
 - Ensures highest system level survival
- ✓ **Lowest parasitic Capacitance**
 - Best in class signal integrity

ON Semi	Network	Nexperia
SZNUP1128	LIN	PESD1LIN PESD1IVN-U
SESDonCAN1	CAN	PESD1CAN
SZNUP2105	CAN	PESD2CAN
SZNUP2125	CAN/CAN FD	PESD1CAN-U PESD2IVN-U
SZNUP3105	24V CAN	2x PESD36VS2UT
SZNUP3125		
SZNUP2115	Flexray	PESD1FLEX PESD2IVN24-T
SZCM1213A-02SR	10/100BASE-T Ethernet	PESD2ETH-AX
SZESD9901	10/100/1000 BASE-T Ethernet	PESD2ETH1G-T
SZESD9902		



- ✓ P2P solutions that offer better protection via lower Rdyn and Clamping Voltage

Automotive USB Protection

VBUS
OCP, OVP, RCP,
ESD

Over-current Protection,
Over-voltage Protection, Reverse Current
Protection, ESD

GND
OCP, STG

Over-current Protection,
Short-to-GND from VBUS



eFuse: NIV6150, NIV6350



Low Side Switch: NCV8411



1ch ESD (X2DFNW2 1.0x0.6mm)
-5V: SZESDM3551
-24V: SZESD7241

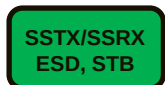
**D+/D-
ESD, STB, STG**

ESD + Short-to-Battery + Short-to-GND

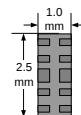


16V
-1ch / 2ch ESD: SZESD7462 / SZESD7002
-2ch ESD+STB: NIV1161
-2ch ESD+STB+STG: NIV2161

24V
-1ch / 2ch ESD: SZESD7241 / SZESD7272
-2ch ESD+STB: NIV1241



ESD + Short-to-Battery (SSTX/RX AC CAP)



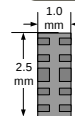
4ch ESD: SZESD8704



1ch ESD: SZESDL2012
(X2DFNW2 1.6x0.8mm)



ESD



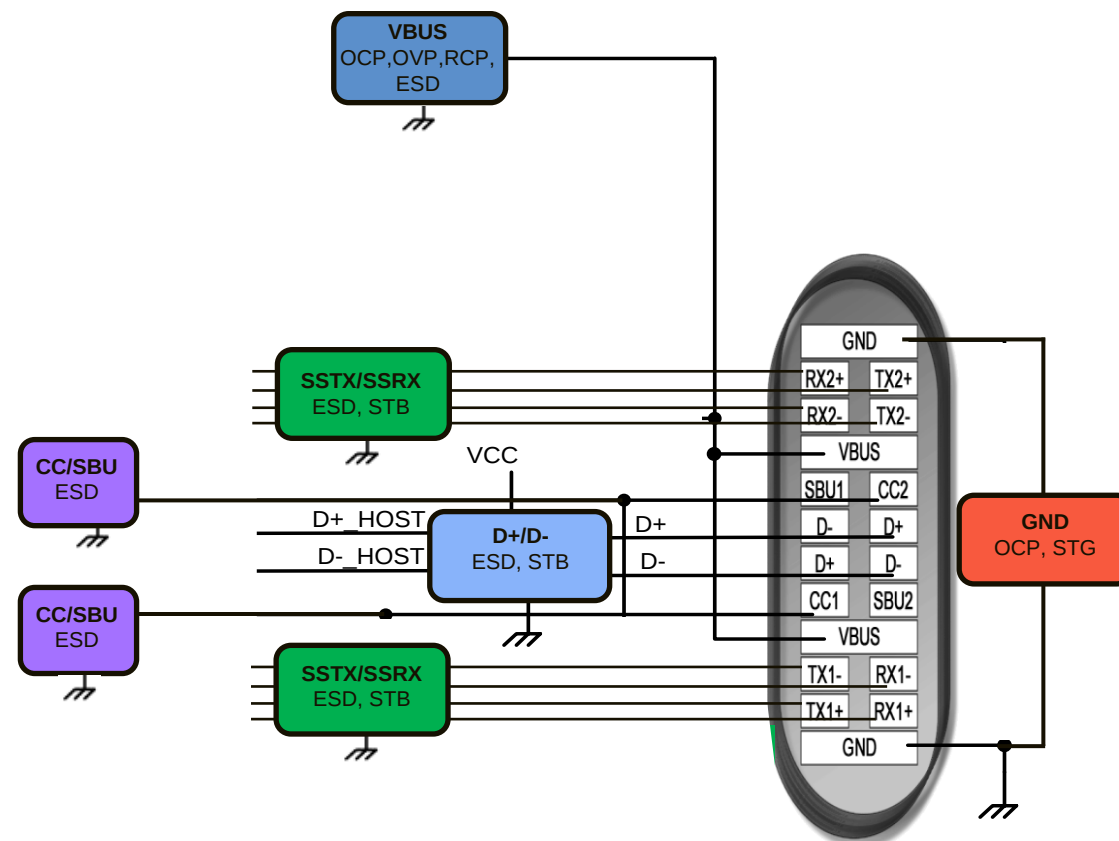
4ch ESD, 5V: SZESD7104



1ch ESD (X2DFNW2 1.0x0.6mm)
-5V: SZESDM3551
-24V: SZESD7241

Automotive Special Protection Needs:

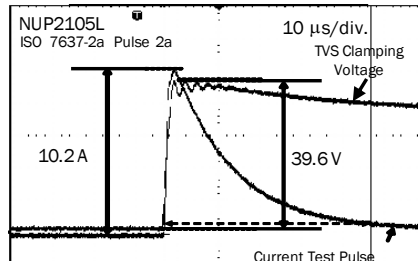
- Short-to-Battery (STB) 16-24V
- Short-to-GND (STG)



IVN ESD Protection

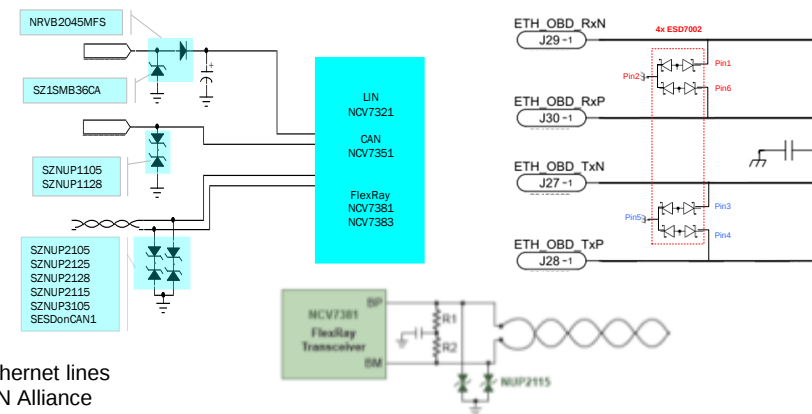
Interface Protocol and Key Requirements

- LIN** – Local Interconnect Network
 - IEC61000-4-2 protection up to $\pm 30\text{kV}$
 - Compliant to LIN v2.1 and J2602 Standard
- CAN** – Controller Area Network
 - IEC61000-4-2 protection up to $\pm 30\text{kV}$
 - Compliant with ISO11858-5 Standard for LS and HS CAN
 - CAN HS (ISO11898-2,5) and CAN low speed fault tolerant (ISO11898-3)
 - Compliant with J2411 Single Wire CAN specification
- FlexRay™**
 - IEC61000-4-2 protection up to $\pm 23\text{kV}$
 - Compliance with FlexRay™ V3.0.1 Specification



- Ethernet**
 - IEC61000-4-2 protection up to $\pm 8\text{kV}$
 - Excellent protection for single pair unshielded Ethernet lines
 - ON Semiconductor is member (adopter) of OPEN Alliance

Typical Application Diagram



Recommended Devices

	Device	V _{BR} Min (V)	V _{RWM} Max (V)	I _R Max (μA)	I _{pp} Max (A)	V _C Max (V)	C Max (pF)	# CH	Topology	ESD IEC61000 4-2 (Contact/Air)	Package	Applications
12V Systems	SZNUP1105	25.7	24.0	0.1	8	44	30.0	1	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-23	LIN/SW CAN
	SZNUPH1128	28.0	26.5	0.1	3	70	15.0	1	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOD-323	LIN/SW CAN - 175C Tj
	SZNUP2128	28.0	26.5	0.1	3	70	15.0	2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-323	HS CAN, CANFD - 175C Tj
	SZNUP2105	26.2	24.0	0.1	8	44	30.0	2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-23	HS CAN
	SZNUP2124	26.0	24.0	0.1	3	66	6.0	2	Bidirectional	$\pm 15\text{kV}/\pm 15\text{kV}$	WDFNW3	CANFD – 175 Tj, Low Vc
	SZNUP2125	26.2	24.0	0.1	3	50	10.0	2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-323	HS CAN, CANFD
	SESDonCAN1	26.2	24.0	0.1	3	50	10.0	2	Bidirectional	$\pm 23\text{kV}/\pm 23\text{kV}$	SOT-23	HSCAN, CANFD
24V Systems	SZNUP3105	35.6	32.0	0.1	8	66	30.0	2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-23	24V System CAN
	SZNUP3125	35.6	32.0	0.1	2	60	10.0	2	Bidirectional	$\pm 21\text{kV}/\pm 21\text{kV}$	SOT-323	24V System CAN
Ethernet 5V & STB Systems	SZNUP2115	26.2	24.0	0.1	3	50	10.0	2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-23	FlexRay
	SZESD9901	100	35	0.2	3.7	28	3.5	2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	X2DFNW2	1Gb Ethernet
	SZESD9902							2	Bidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	SOT-23	175C, Wettable Flank
	SZNSP8814L	3.2	3.0	0.5	35	15	5.0	4	Unidirectional	$\pm 30\text{kV}/\pm 30\text{kV}$	WDFNW10	10/100Mb Ethernet, HDBase-T
	SZCM1213A-02SR	6.0	5.0	1.0	-	-	1.2	2	Unidirectional	$\pm 12\text{kV}/\pm 12\text{kV}$	SOT-143	BroadR-Reach Ethernet
	SZESD1L001	16.5	16.0	1.0	-	-	0.5	4	Unidirectional	$\pm 8\text{kV}/\pm 15\text{kV}$	SC-88	STB OABR + 1Gb Ethernet

Protection Solutions for 10/100/1000BASE-T1 Ethernet: New Product One Pager

SZESD9901/9902

Automotive Ethernet,
Bi-Directional ESD Protection

SZESD9901M

X2DFNW2 - Single
1.0 x 0.6 mm

SZESD9902M

SOT23 - Dual

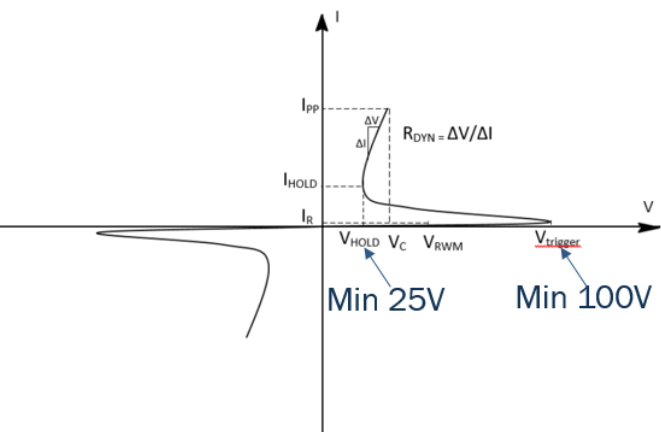
Features

- High Trigger Voltage $\geq 100\text{V}$
- Working Voltage 25V
- Low Capacitance: 2.3pF
- High ESD Rating: $> 30\text{kV}$, ISO-10605
- Rated Surge Current IPP = 2.2A , $8/20\text{ }\mu\text{s}$
- Available in Std SOT-23 dual, or X2DFNW2 single with Wetable flanks

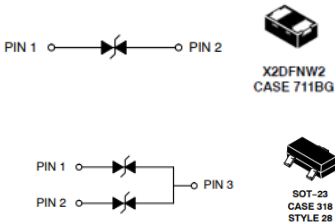
Benefits

- 100V trigger voltage eliminates differential signal distortion clamping during BCI(Bulk Current Injection) and other RF immunity tests
- Low ESD clamping voltage protects CMC, RC network and PHY from damage
- Meets OPEN Alliance ESD suppression device parameters

I-V Curve



Pinout & Packages



Application Information

Tested and Approved for EMC compliance by FTZ Zwickau:
OPEN Alliance: IEEE 1000BASE-T1 EMC Test Specification
for ESD Suppression Devices

2.1 Arrangement of ESD Suppression Device within 100BASE-T1 MDI network

This measurement specification shall be used for an arrangement of ESD suppression device within the 100BASE-T1 MDI interface network as given in Figure 2-1.

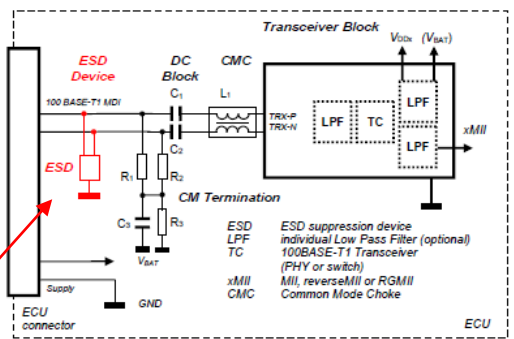


Figure 2-1: Arrangement of ESD suppression device within the 100BASE-T1 MDI interface

2.2 Evaluation of Datasheet Parameters

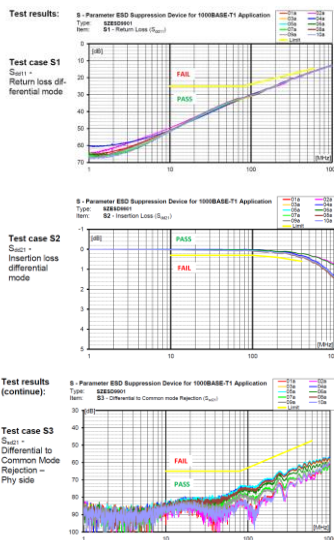
The following parameters for ESD suppression device shall be ensured and documented in the datasheet.

Parameter	Target Value
Working direction	bi-directional
Operation voltage (V_{Dmax})	$\geq 24\text{ V}$
ESD trigger voltage	$\geq 100\text{ V}$
ESD robustness	IEC [1] level 4
Minimum number of discharges	> 1000

Table 2-1: Target values for ESD suppression device



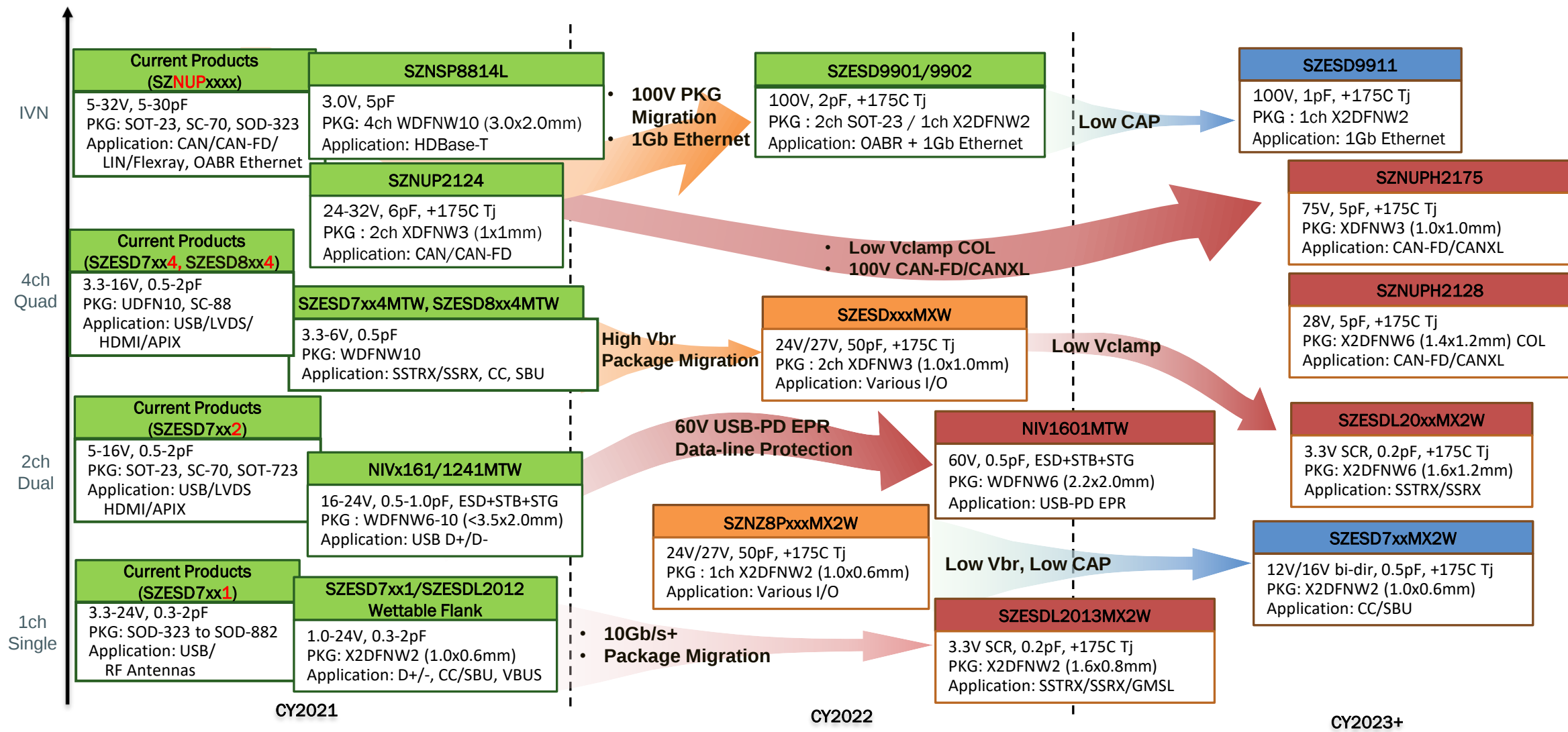
EMC Tests



Samples: Available
RTM: In Production

Automotive ESD Protection Product Roadmap

Technology



ESD Protection: Portfolio

IVN Protection

IVN Protection	V _{BR} Min (V)	V _{RWM} Max (V)	I _R Max (uA)	I _{PP} Max (A)	V _C Max (V)	C Max (pF)	# CH	Topology	ESD IEC61000 4-2 (Contact/Air)	Package	Applications
SZNUP1105	25.7	24.0	0.1	8	44	30	1	Bidirectional	±30kV/±30kV	SOT-23	LIN/SW CAN
SZNUP H1128	28.0	26.5	0.1	3	70	15	1	Bidirectional	±8kV/±15kV	SOD-323	LIN/SW CAN - 175C TJ
SZNUP1128	28.0	26.5	0.1	3	70	15	1	Bidirectional	±8kV/±15kV	SOD-323	LIN/SW CAN
SZNUP2128	28.0	26.5	0.1	3	70	15	2	Bidirectional	±8kV/±15kV	SOT-323	HS CAN, CANFD - 175C TJ
SZNUP2124*	26.0	24.0	0.1	3	66	6	2	Bidirectional	±15kV/±15kV	WDFNW3	CANFD - 175 TJ, Low Vc
SZNUP2105	26.2	24.0	0.1	8	44	30	2	Bidirectional	±30kV/±30kV	SOT-23	HS CAN
SZNUP2242	26.2	24.0	0.1	3	50	10	2	Bidirectional	±30kV/±30kV	SOT-323	HS CAN, CANFD
SESDonCAN1	26.2	24.0	0.1	3	50	10	2	Bidirectional	±23kV/±23kV	SOT-23	HS CAN, CANFD
SZNUP3105	35.6	32.0	0.1	8	66	30	2	Bidirectional	±30kV/±30kV	SOT-23	24V System CAN
SZNUP3125	35.6	32.0	0.1	2	60	10	2	Bidirectional	±21kV/±21kV	SOT-323	24V System CAN
SZNUP2115	26.2	24.0	0.1	3	50	10	2	Bidirectional	±30kV/±30kV	SOT-23	FlexRay
SZCM1213A-02SR	6.0	3.3	1	-	-	1.2	2	Unidirectional	±12kV/±15kV	SOT-143	OABR Ethernet
SESDM9901**	100.0	35.0	0.2	3.7	28	3.5	1	Bidirectional	±30kV/±30kV	X2DFNW2	OABR + 1G Ethernet
SESDM9902**							2			SOT-23	

Antenna Line/RF Protection

Antenna Protection	V _{BR} Min(V)	V _{RWM} Max (V)	R _{dyn} Typ (Ω)	I _{PP} (A)	V _C @ I _{PP} Max (V)	C Max (pF)	# CH	Topology	ESD IEC61000 4-2 (Contact/Air)	Package	Applications
SESD8551	5.5	3.3	0.85	-	-	0.30	1	Bidirectional	±15kV/±15kV	SOD882	Low Clamping SCR
SESD7551	5.0	3.3	0.55	-	-	0.35	1	Bidirectional	±25kV/±25kV	SOD882	High ESD
SESD7561	16.5	16.0	1.05	-	-	0.55	1	Bidirectional	±18kV/±18kV	SOD882	Short to battery
SESD7421	16.5/10.5	16/10	0.95	-	-	0.60	1	Bidirectional	±12kV/±15kV	SOD882	Asymmetrical
SESD7410	10.0	8.0	1.00	-	-	1.00	1	Bidirectional	±30kV/±30kV	X2DFN	High ESD
SESD7424	27.0	24.0	1.05	-	-	1.00	1	Bidirectional	±30kV/±30kV	UDFN2	High voltage/High ESD
SESD9101	5.3	5.0	0.30	-	-	0.50	1	Unidirectional	±25kV/±25kV	SOD923	Lowest Clamping SCR

High Speed Serial Protection

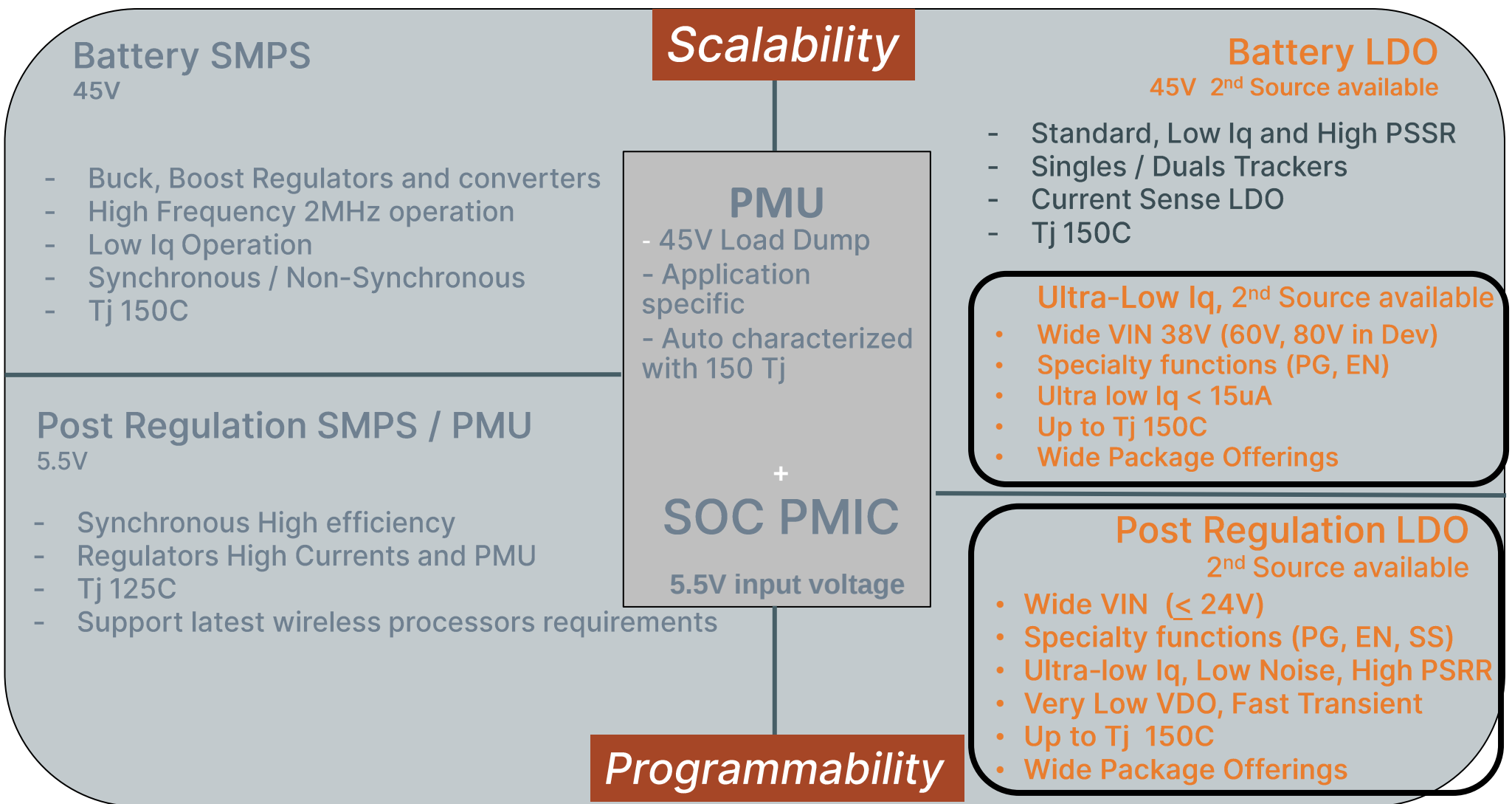
USB 2.0, LVDS, HDMI, APIX	V _{BR} Min(V)	V _{RWM} Max (V)	I _R Max (uA)	C Max (pF)	# CH	Topology	ESD IEC61000 4-2 (Contact/Air)	Package	Applications
SESD7004	5.5	5.0	0.1	0.5	4	Unidirectional	±15kV/±15kV	uDFN10	USB, LVDS, HDMI, APIX
SESD8704	5.0	3.3	1.0	0.5	4	Unidirectional	±30kV/±30kV	uDFN10	USB, LVDS, HDMI, APIX Lowest Clamping
SESD7205	5.2	5.0	1.0	0.5	2	Unidirectional	±20kV/±20kV	SOT-723	USB, LVDS, HDMI, APIX
SESD7002	16.5	16.0	1.0	0.5	2	Unidirectional	±8kV/±15kV	SOT-323	USB, LVDS, HDMI, APIX
NIV1161	16.5	16.0	1.0	0.5	2	Unidirectional	±8kV/±15kV	WDFNW6	USB, LVDS, HDMI, APIX STB
NIV1241	24.3	24.0	1.0	1.0	2	Unidirectional	±8kV/±15kV	WDFNW6	USB, LVDS, HDMI, APIX STB
NIV2161	16.5	16.0	1.0	0.5	2	Unidirectional	±8kV/±15kV	WDFN10	USB, LVDS, HDMI STB+STG
SESDM3551	5.6	5.5	0.1	21.0	1	Unidirectional	±30kV/±30kV	X2DFNW2	1ch VBUS ESD
SESDL2012*	1.4	1.0	0.5	0.3	1	Bidirectional	±15kV/±15kV	X2DFNW2	1ch Dataline ESD

USB Type-C Protection

USB 3.1	V _{BR} Min(V)	V _{RWM} Max (V)	I _R Max (uA)	C Max (pF)	# CH	Topology	ESD IEC61000 4-2 (Contact/Air)	Package	Applications
SESD8704	5.0	3.3	1.0	0.5	4	Unidirectional	±30kV/±30kV	uDFN10	Tx/Rx +/- Lowest Clamping
SESD7104	5.5	5.0	0.1	0.5	4	Unidirectional	±15kV/±15kV	uDFN10	SBU, CC, D+/D-
SESDM3551	5.6	5.5	0.1	21.0	1	Unidirectional	±30kV/±30kV	X2DFN	1ch VBUS ESD
SESDL2012*	1.4	1.0	0.5	0.3	1	Bidirectional	±15kV/±15kV	X2DFNW2	1ch Dataline ESD

LDOs

Automotive Power Supply - Focus Areas



Products meeting next generation size and efficiency requirements

Why Drop the Vregs?

OPN	Iout (mA)	VIN_ABS max (V)	VOUT_max (V)	Iq max (μA)	Ignd (μA)	Min Load (μA)	Accuracy (%)	Dropout (V)	Enable/ PowerGood
NCV8730	150	40	24	1.5	450	N/A	1	0.48	Y/Y
NCV317L	100	40	37	100*	105	2500	4**	1.5	N/N
NCV317M	500	40	37	100*	105	10000	4**	1.5	N/N
NCV317	1500	40	37	100*	105	10000	4**	1.5	N/N
NCV78M	500	35	15	3200	6000	N/A	4	2	N/N
NCV78L	100	40	24	4400	6500	N/A	5	1.7	N/N
*In addition to minimum load requirements									
**Voltage reference accuracy									

Power Savings

- Low self consumption with and without load: 5x – 20x reduction
 - Fun math: Install base of 1MU means savings of 100 to 400 kW!
- True Idle/Sleep implementation
 - No minimum load requirement means new chipsets with ultra low power consumption can be used
- Single device covers all conversion needs, minimizing BOM
 - Wide Vin with low dropout allows usage for all rails from 3V to 24V+
- Enables use of modern MCUs, ADCs and sensors without risk of brownout
 - High accuracy combined with exceptional load/line transient regulation provides stable output voltage
- Allow complex power supplies with sequencing and improved brownout protection with fewer components
 - On-chip Enable and Power Good functions

Automotive Key Performance Evolution

High Temperature

Low VDO & Iq

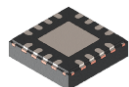
High PSRR

Wide-Vin + Low Iq

Higher Operating Junction Temperature



- Transistors specifically designed for these higher temperatures of operation
- Operating $T_j = 150^{\circ}\text{C}$
- $T_j = T_a + 25^{\circ}\text{C}$ for high P_d
 - $T_j = T_a + P_d * R_{\theta ja}$



Improved Efficiency



Energy saving



- Providing lower voltage dropout and tighter accuracy
- Quiescent Currents down to 500nA
- Reduce standby current in system for always on applications

High PSRR, Low Noise



- Slew rate control to meet sensor power up sequence specification
- $\text{PSRR} \geq 85\text{dB}$ & low noise interference with Ultra-low noise $\leq 10\mu\text{V}_{\text{rms}}$, reducing the number of external components

Wide-Vin + Ultra-Low Iq

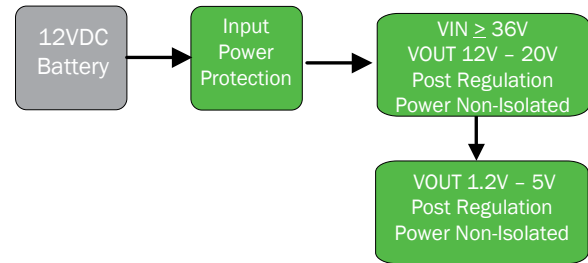


- **Ultra-Low $I_q \leq 5\mu\text{A}$** to support module quiescent current requirements
- **A Wide Voltage input for battery connected applications**

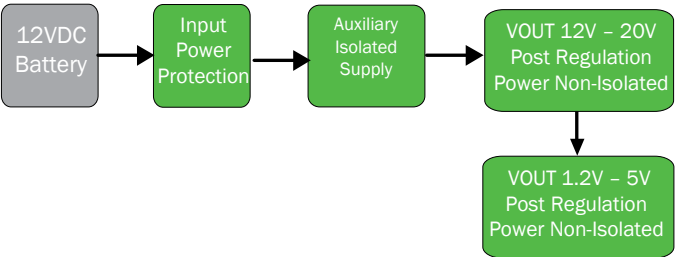
xEV LDO Options for OBC, DC-DC, Auxiliary

PRIMARY SIDE, POWER RAILS

Non-Isolated, LV to LV

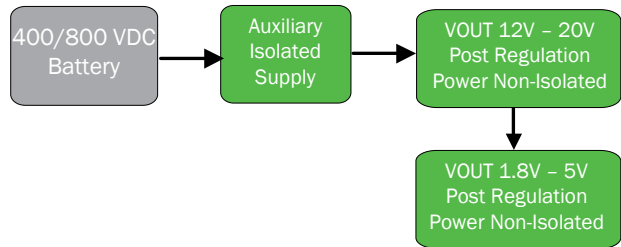


Isolated, HV to HV



SECONDARY SIDE, POST REGULATION POWER RAILS

Isolated, HV to LV



Application	P/N	V _{IN} (max) (V)	I _{LOAD} (mA)	V _{OUT} (V)	Noise (μVrms)	PSRR @ 1kHz (dB)	I _Q (μA)	Package(s)
Wide-Input, Wide-Output	NCV2931 (Load Dump & Reverse Transient)	40	100	5, ADJ	700	60	5800	SOIC-8, DPAK, D2PAK
	NCV8730 <i>New</i>	40	150	1.2 - 24, ADJ	240	75	1.3	WDFNW-6, TSOP-5
	NCV78MxxABD	40	350	5, 8, 9, 12, 15	-	49	3200	DPAK-3
	NCV8734 <i>Development</i>	40	500	3.3, 5, ADJ to 35	70	80	13	DFNW-8, SOIC8_EP
	NCV/SCV2951 (150°C) <i>New</i>	30	100	ADJ	56	40	93	SOIC-8
	NCV51460 (Vref)	28	20	3.3			140	SOT23-3
	NCV8716, NCV8718	24	80, 300	1.2 - 5, ADJ	200, 36	55	4	WDFN6
	NCV8711 <i>New</i>	18	100	1.2 - 17, ADJ	240	75	1.3	WDFNW-6, TSOP-5
Low VIN, High Performance	NCV8170	5.5	150	1.2 - 3.6	0.8 - 3.6	45	0.5	XDFN4, SOT563-6
	NCV8163	5.5	250	1.2 - 5.3	6.5	92	12	XDFN4, TSOP-5
	NCV8164 (150°C) <i>New</i>	5.5	300	1.2 - 5	9	85	30	WDFNW6, TSOP-5

* NOTE: Distribution Architecture, Isolated Auxiliary Power, may come from LV (12V), HV, or both batteries to supply Primary and/or Secondary sides

Wide & High Input Voltage LDO

P/N	I _{Load}	V _{IN}	V _{OUT}	I _Q	V _{drop} (V)	PSRR	Package
NCV502	80mA	12V	1.5 ~ 5.0	40uA	0.6~1.5	55dB	TSOP-5
NCV551	150mA	12V	1.4 ~ 5.0	4uA	0.04	-	TSOP-5
NCV8535	500mA	12V	Fixed: 1.5 ~ 5.0 ADJ: up to 10V	190uA (max)	0.260	55dB	DFN10_3x3 DFNW10_3x3
NCV8711^{New}	100mA	18V	1.2 ~ 17, ADJ	1.3uA	0.215	60dB	TSOP-5, WDFN6_2x2
NCV8715	50mA	24V	1.2 ~ 5.0	3.4uA	0.26	60dB @ 100kHz	SC70-5, XDFN6
NCV8716	80mA	24V	1.5 ~ 5.0	3.4uA	0.40	60dB @ 100kHz	WDFN6_2x2
NCV8718	300mA	24V	1.2 ~ 5.0	4uA	0.285	60dB	WDFN6_2x2
NCV2951	100mA	30V	3.3 ,5.0, ADJ	93uA	0.35	40dB	SOIC-8, Micro-8
SCV2951 (Grade 0)	100mA	30V	3.3 ,5.0, ADJ	93uA	0.35	40dB	SOIC-8
NCV8730^{New}	150mA	38V	1.8, 3.3, 5, 15, ADJ	1.5uA	0.290	75dB	TSOP-5, WDFN6_2x2

Battery Connected

NCV59801 – 1A, Low Noise w/ Power Good & Soft Start

Value Proposition: 1A, Low VIN, 150C operating junction temperature with Power Good

The NCV59801 is 1A LDO Linear Voltage Regulator capable to operate at a junction temperature of 150°C. It is a very stable and accurate device with low quiescent current consumption (typ. 30uA over the full temperature range), low dropout, low output noise and very good PSRR. The regulator incorporates several protection features such as Thermal Shutdown, Controlled Output Voltage Slew Rate from 5 mV / us , Current Limiting and also Power Good Output signal for easy MCU interfacing. It is available in a DFNW8 3x3x0.65 and WDFNW6 2x2x0.65 mm packages.

Unique Features

- 1.6V to 5.5V operating input voltage
- PSRR: 80dB at 1 kHz
- **150C operating junction temperature**
- Slew rate times: 5 / 30 / 100 mV/usec
- Able to operate from a low voltage rail
- High input ripple rejection
- Capable to operate at extended temps
- Sequencing & controlled overshoot

Other Features

- Fixed Voltage Options Available: 0.6 V to 5 V
- Power Good signal for power sequencing
- $\pm 1.5\%$ Accuracy Over Full Load, Line @125C
- 200mV typ dropout @ 1A of output current
- 35uA quiescent current consumption
- Ultra-Low Noise: $10\mu V_{RMS}$ for fixed versions

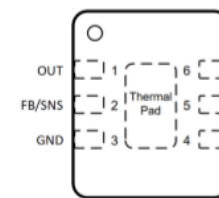
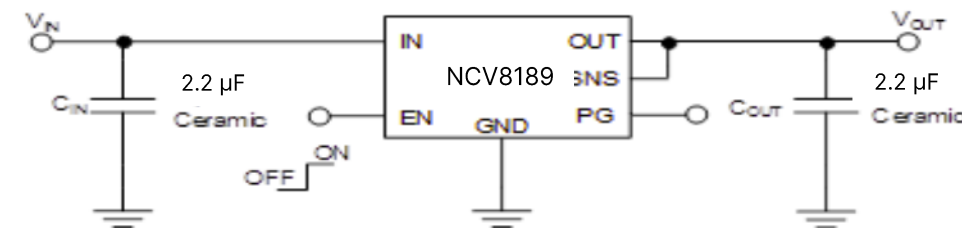


Market & Applications

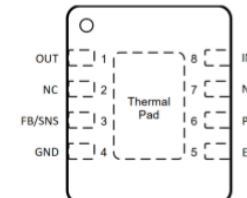
- Infotainment & Cluster
- Modular Platforms for Dashboard Displays
- Internet Connection Sharing (ICS) Gateway Server Applications
- General Purpose Automotive

Benefits

Application Data



WDFNW6 2x2, 0.65P
CASE 511DW



DFNW8 3x3, 0.65P
CASE 507AD

Ordering information

- Samples : Now
- Release to Production: Now

Competitive Comparison 1A Standard

➤ What is the value of the NCV59801?

- ✓ Next generation of onsemi 1A Linear Regulators
- ✓ High accuracy over full temp range
- ✓ Low Vout fixed and adjustable options available
- ✓ High PSRR and low noise
- ✓ Features include enable (EN), power good (PG), and output voltage slew rate
- ✓ Available in WDFN6_2x2 and DFNW8_3x3 that is a direct drop-in, P2P, to TI's TPS746-Q1 with improved performance!

Parameter / Feature	Common Conditions	Units	NCV59801			NCV8187			NCV59800			TPS746-Q1			TPS785-Q1			TPS7A8101-Q1		
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
Junction Temp. Range		°C	-40 to 150			-40 to 150			-40 to 125			-40 to 150			-40 to 150			-40 to 125		
Supply Voltage Max. Rating	Vin	V	6			6			6			6.5			6.5			7		
Operating Supply Voltage		V	1.6 - 5.5			1.5 - 5.5			2.2 - 5.5			1.5 - 6			1.7 - 6			2.2 - 6.5		
Nominal Output Current		mA	1000			1200			1000			1000			1000			1000		
Output Voltage range	Adjustable	V	0.6 - 5			0.8 - 5			0.8 - 5			0.55 - 5.5			0.65 - 5			0.55 - 5.5		
Output Voltage range	Fixed	V	0.6 - 5			0.8 - 5			-			0.65 - 5			1.2 - 5.5			-		
Output Voltage Accuracy	Full temp. range	%	-1		+1	-2		+2	-2.5	+/-0.3	+2	-1.5		+1.5	-1.7		+1.7	-1.5		+1.5
Output Voltage Accuracy	Room temp.	%	-0.7		+0.7	-2		+2	-2.5		+2	-0.85		+0.85	-0.5		+0.5	-0.85		+0.85
Dropout @ 3.3Vout	typ. Io = 1A	mV		300			150	220			500		195	310			315		195	310
Ground Current	@ 0 load	µA		35	50		30	45		60	100		25	36	15	25	40		25	36
Output Current Limit		mA	1300	1500	1700	1300	1750			1600		1220	1500	1830	1040		1650	1220	1500	1830
Disable Current	Ven = 0	µA		0.1	3.5		0.1	5		0.2	2		0.1	1.55		0.01	3		0.1	1.55
PSRR	f = 1kHz	dB	85			75			63			53			60			53		
	f = 100kHz	dB	60			40						38			45			38		
	f = 1MHz	dB	40			35			27			30			30			30		
Noise	10Hz to 100kHz	µVrms	10			15			15x Vout			53			30			23		
Features	Bypass Capacitor		No			No			Yes			No			No			No		
	Enable		Yes			Yes			Yes			Yes			Yes			Yes		
	Power Good		Yes			Yes			No			Yes			No			Yes		
	Output Voltage Slew Rate		Yes			No			Yes			No			No			No		
Cout Range		µF	2.2			4.7	10		4.7		100	0.47	1	220	1		200	0.47	1	220
Package(s)			WDFNW6 2x2			WDFNW6 2x2						WSON6 2x2								
			DFNW8 3x3			DFNW8 3x3			DFN8 3x3			VSON8 3x3			VSON8 3x3			SON8 3x3		
(P2P shaded)						DPAK-5									TO-252 (5)					

NCV8711 – 18V, 100mA, 1uA Iq LDO with Power Good

Value Proposition: Wide-Input Voltage, Low Iq, Low Dropout

The NCV8711 is a next generation CMOS LDO regulator designed for up to 18V input voltage and 100mA output current. Designed to meet the requirements for industrial wide-input voltage circuits. The NCV8711 device provides ultra-low quiescent current of only 1uA up to 125°C, which makes this device ideal solution for battery powered application. Output voltage can be set from 1.2 to 17V. The device also offer excellent load/line transient regulation and output Power Good function to reset MCU. This device is available in TSOP-5 and WDFN6_2x2 packages.

Unique Features

- 2.7V to 18V input voltage
- Ultra-Low Iq : 1μA typ
- Built-in Soft Start Circuit
- Power Good function (Ver B)

Benefits

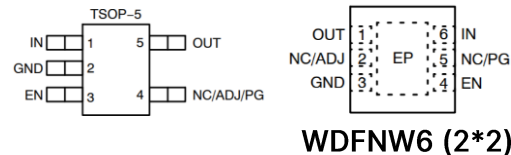
- Can support multi-cell battery application
- Extend battery life / save power
- Can suppress inrush current to protect IC
- Can reset MCU to avoid malfunction

Other Features

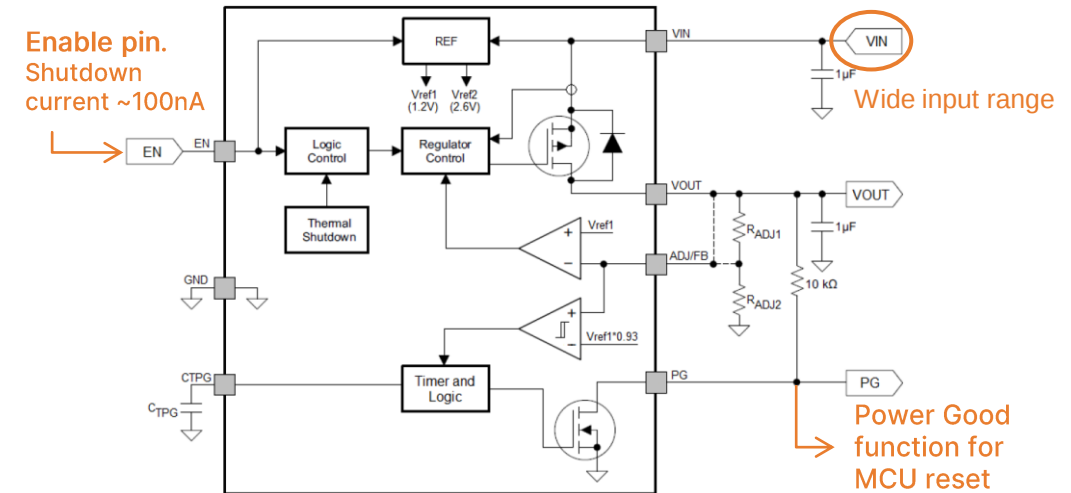
- Fixed & Adjustable Voltage Options Available: 1.2V to 17V
- ±1% Accuracy @ Tj : -40°C ~ +85°C
- 215mV typical dropout @ 100mA of output current, 3.3Vout
- Short Circuit Protection, Thermal Shutdown Protection
- Stable with 1uF ceramic capacitor

Market & Applications

- LED Lighting
- Body Control Modules
- Infotainment and Telematics
- Audio and CAN Power Supply
- General Purpose Automotive



Application Data (DFN-6)



Ordering & Package Information

- Samples : Now
- Release to Production: Now

NCV8718 Wide Input Voltage, 300 mA Adjustable LDO with Enable

Value Proposition: 24V Wide VIN Operating at 300mA

The NCV8718 is 300mA LDO Linear Voltage Regulator. It is a very stable and accurate device with ultra-low quiescent current consumption (typ. 4µA) and a wide input voltage range (up to 24 V). The regulator incorporates several protection features such as Thermal Shutdown and Current Limiting. Available in WDFN6 2x2 mm package.

Unique Features

- Operating VIN: 2.5V to 24V
- Vout : ADJ, 1.2V, 1.8V, 3.3V, 5.0V
- PSRR: 60dB @ 1kHz
- Ultra-low Quiescent Current @ 4µA
- WDFN6 2x2 mm Package
- Wide VIN supports 12V rails
- Supports ADJ & Fixed Vouts
- Good input ripple rejection
- Ideal for always-on, Stdby mode
- Improved thermal resistance

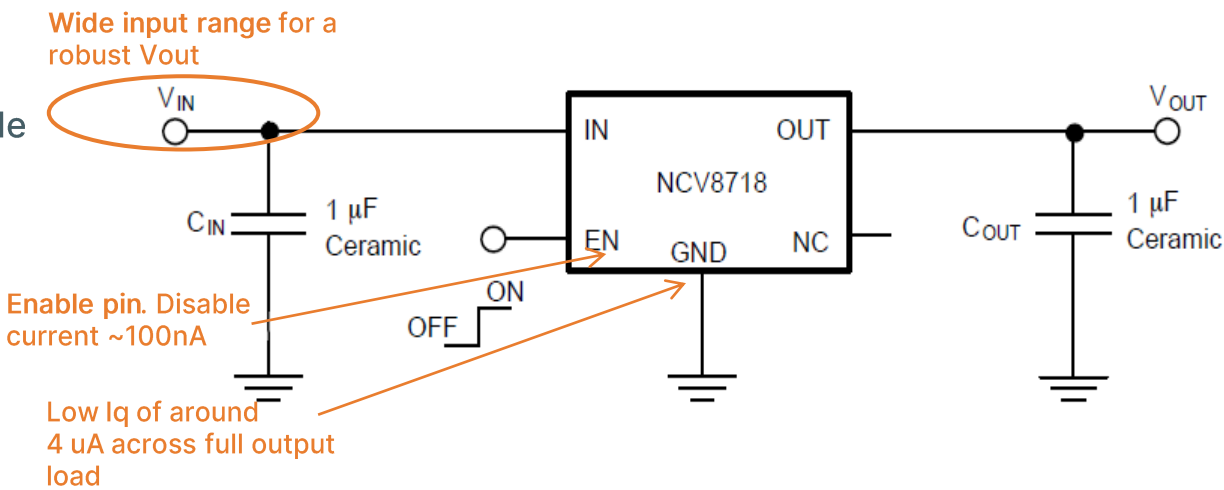
Others Features

- ±2% Accuracy Over Line and Temperature
- Noise 36µVrms
- SOA Limiting for High Vin / High Iout – Static / Dynamic
- Soft-start to Reduce Inrush Current and Overshoots

Market & Applications

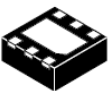
- Infotainment & Cluster, Wireless Charging
- Modular Platforms for Dashboard Displays
- Internet Connection Sharing (ICS) Gateway Server Applications
- General Purpose Automotive

Typical Application diagram

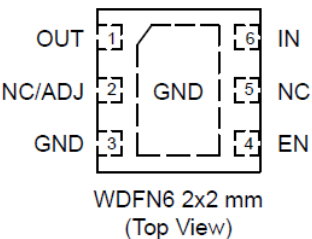


Ordering & Package information

- Samples Available: Now
- Datasheet Available: Now
- Release to Production
 - ADJustable: Now
 - Fixed Voltage Options: Now



WDFN6
MT SUFFIX
CASE 511BR



NCV8730 – 38V, 150mA, 1uA Iq LDO with Power Good

Value Proposition: Wide-Input Voltage, Low Iq, Low Dropout

The NCV8730 is a next generation CMOS LDO regulator designed for up to 38V input voltage and 150mA output current. Designed to meet the requirements for industrial wide-input voltage circuits. The NCV8730 device provides ultra-low quiescent current of only 1uA, which makes this device ideal solution for applications that are always on. Output voltage can be set from 1.2 to 24V. The device also offer excellent load/line transient regulation and output Power Good function to reset MCU. This device is available in TSOP-5 and WDFN-6 packages.

Unique Features

- 2.7V to 38V input voltage
- Ultra-Low Iq : 1uA typ
- Built-in Soft Start Circuit
- Power Good function (Ver B)

Benefits

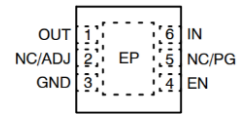
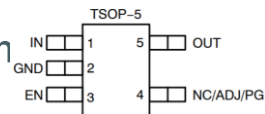
- Support Automotive transients
- Ideal for always on applications
- Can suppress inrush current to protect IC
- Can reset MCU to avoid malfunction

Other Features

- Fixed & Adjustable Voltage Options Available: 1.2V to 24V
- $\pm 1 / 2\%$ Accuracy @ Tj : -40 to +125C
- 290mV typical dropout @ 150mA of output current, 3.3Vout
- Short Circuit Protection, Thermal Shutdown Protection
- Stable with 1uF ceramic capacitor

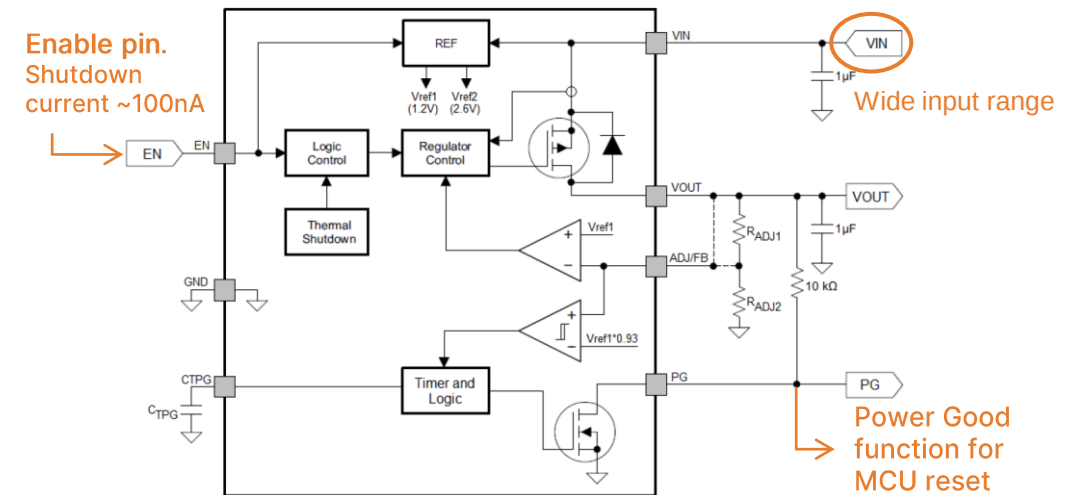
Market & Applications

- Wireless Charging
- Telecommunication and Networking System
- Infotainment and Cluster
- General Purpose Automotive



WDFN-6 (2*2)

Application Data (WDFN-6)



Ordering & Package Information

- Samples : Now
- Release to Production: Now

SCV2951: LDO Regulator, 100 mA, Low Dropout

Value Proposition: 100mA, Wide VIN and Vout, +/-0.5% Accuracy

SCV2951 a low dropout (LDO) linear voltage regulator that is specifically designed to maintain proper regulation with an extremely low input-to-output voltage differential. It features a very low quiescent bias current of 75 μ A and is capable of supplying output currents in excess of 100 mA. Internal current and thermal limiting protection is provided. The maximum input voltage rating is 30V. The 'A' suffix is for an initial output voltage tolerance +/-0.5%. It is available in a SOIC-8 package.

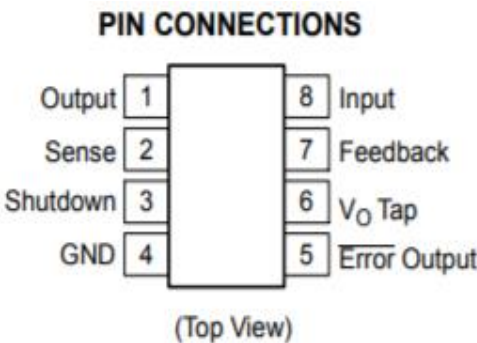
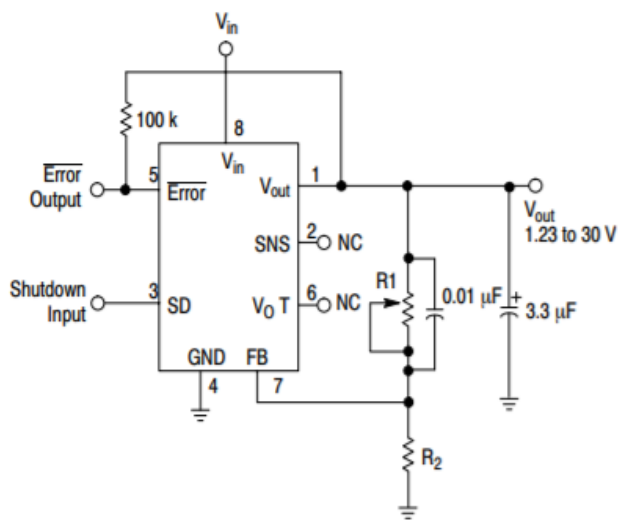
Features

- Low Vin to Vout volt differential - 50mV @ 100 μ A & 380mV @ 100mA
- Low Quiescent Bias Current of 75 μ A
- 5.0 V or ADJ +/- 0.5% allows use as a Regulator or Reference
- Extremely Tight Line and Load Regulation
- Requires Only a 1.0 μ F Output Capacitor for Stability
- Internal Current and Thermal Limiting
- Error(bar) Output Signals an Out of Regulation Condition
- Output programmable from 1.25 V to 29 V
- Maximum input voltage rating is 30V
- AEC-Q100 Qualified and PPAP Capable; -40°C to +150°C Ambient Operating Temperature Range

Market & Applications

- Infotainment & Cluster, Wireless Charging
- Modular Platforms for Dashboard Displays
- Internet Connection Sharing (ICS) Gateway Server Applications
- General Purpose Automotive

Application Data



Ordering information

- Samples Available: Now
- Datasheet Available: Now
- Release to Production
 - SCV2951ACDR2G

SOIC-8



NCV8730 – 38V, 150mA, 1uA Iq LDO with Power Good

Value Proposition: Wide-Input Voltage, Low Iq, Low Dropout

The NCV8730 is a next generation CMOS LDO regulator designed for up to 38V input voltage and 150mA output current. Designed to meet the requirements for industrial wide-input voltage circuits. The NCV8730 device provides ultra-low quiescent current of only 1uA, which makes this device ideal solution for applications that are always on. Output voltage can be set from 1.2 to 24V. The device also offer excellent load/line transient regulation and output Power Good function to reset MCU. This device is available in TSOP-5 and WDFN-6 packages.

Unique Features

- 2.7V to 38V input voltage
- Ultra-Low Iq : 1μA typ
- Built-in Soft Start Circuit
- Power Good function (Ver B)

Benefits

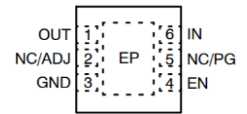
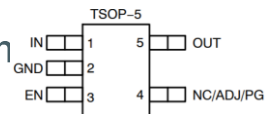
- Support Automotive transients
- Ideal for always on applications
- Can suppress inrush current to protect IC
- Can reset MCU to avoid malfunction

Other Features

- Fixed & Adjustable Voltage Options Available: 1.2V to 24V
- $\pm 1 / 2\%$ Accuracy @ Tj : -40 to +125C
- 290mV typical dropout @ 150mA of output current, 3.3Vout
- Short Circuit Protection, Thermal Shutdown Protection
- Stable with 1uF ceramic capacitor

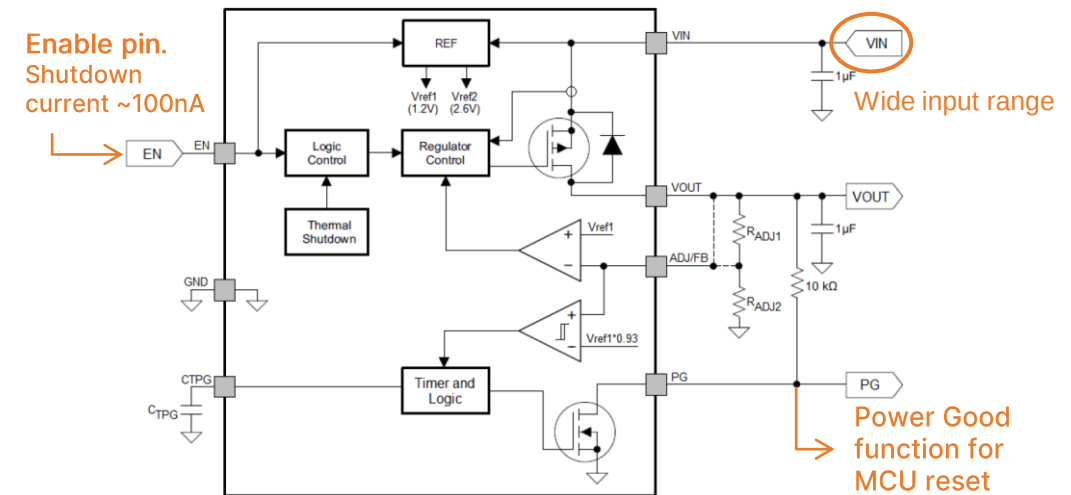
Market & Applications

- Wireless Charging
- Telecommunication and Networking System
- Infotainment and Cluster
- General Purpose Automotive



WDFN-6 (2*2)

Application Data (WDFN-6)



Ordering & Package Information

- Samples : Now
- Release to Production: Now

OpAmps

Automotive Applications

It's still an Analog World !



Strong and growing portfolio of products that provide low power, high performance solutions for all power supply and sensor signal conditioning needs for Automotive markets.

General Purpose Amplifiers Low Power Amplifiers Precision Amplifiers Current Sense Amplifiers Comparators

Active Safety and Semi-Autonomous Driving

ADAS - Exterior, E-Mirror,
Park Assist
Power Supplies
Electronic Power Steering

Body & Convenience

Climate Control
Instrument Clusters
Power Supplies
Steering Wheel Sensors
Electric-Chromic Mirrors
Seat Positioning, Heating & Cooling
Door/Mirror/Window Control



Powertrain

Engine Control (Gas/ Diesel)	Fuel Injection Control
Throttle Control	Position Sensing
Ignition Control	HEV/PHEV/EV
Sensor Interface	Electric Pump & Fan Control
Power Supplies	

Audio & Infotainment

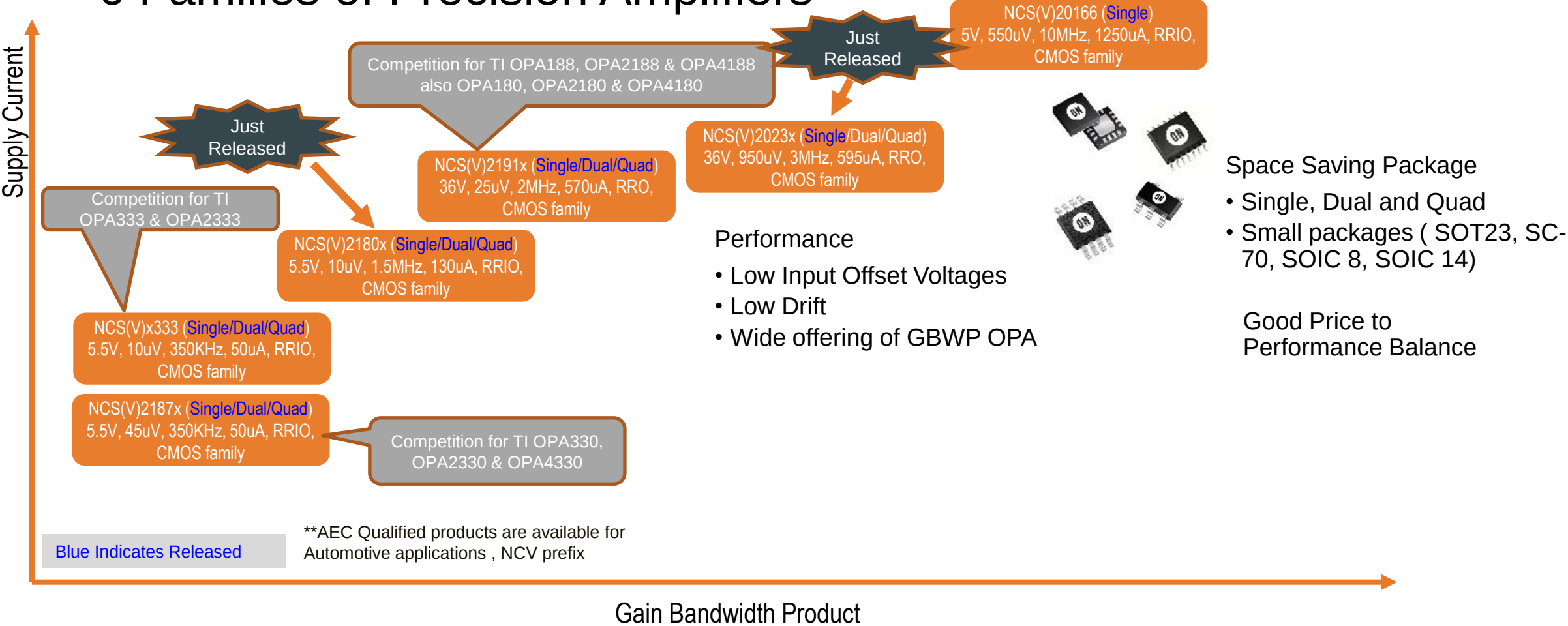
Navigation Systems
Power Supplies

LED lighting

Interior: Door, Dome, RGB Accent, Puddle
Exterior: CHMSLs, RCLs, Accent
Advanced Front Lighting & Motor Control

Precision Op Amp (1mV or lower Offset Voltage)

6 Families of Precision Amplifiers



Sampling: NCS(V)20231/2. In Dev: NCS20234

<http://www.onsemi.com/NCS20232>

Value Proposition

The NCS20231/2/4 family of op amps feature a wide supply range of 2.7 V to 36 V with an input offset voltage as low as ± 0.95 mV max @ 25°C . These op amps are available in single, dual, and quad channel configurations. Automotive qualified options are available under the NCV prefix. Automotive grade 0 versions have an extended operating temperature range from -40 °C to 150 °C. All other versions are specified over the operating temperature range from -40 °C to 125 °C.

Unique Features

- Offset Voltage: ± 0.95 mV max (25°C)
- Offset Drift: ± 2 μ V/°C max
- Supply Voltage Range: 2.7 V to 36 V
- Unity Gain Bandwidth: 3 MHz
- CMRR: VSS to (VDD-1.35)V

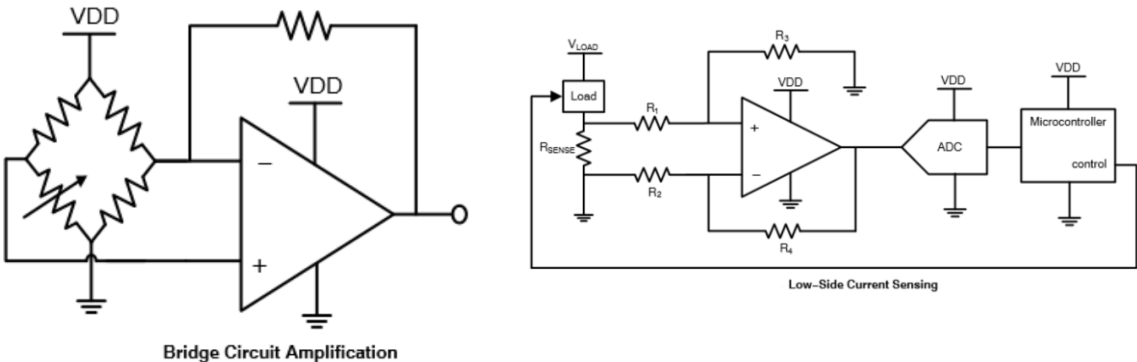
Others Features

- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These devices are Pb-free, Halogen free/BFR free and are RoHS compliant
- Available in Single, Dual, and Quad Packages

Market & Applications

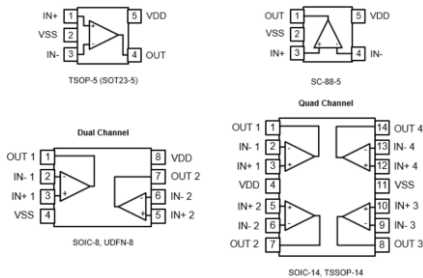
- Telecom Equipment
- Power Supply Designs
- Diesel Injection Control
- Automotive
- Motor Control

Typical Application diagram



Packages/ Pin Outs

Temperature	Channels	Package	Device Part Number
Industrial and Commercial			
-40°C to 125°C	Single	TSOP-5	NCS20231SN2T1G
		SC-88	NCS20231SQ3T2G
		SOT-553	NCS20231
	Dual	SOIC-8	NCS20232DR2G
		UDFN-8	NCS20232
	Quad	SOIC-14	NCS20234DR2G
		TSSOP-14	NCS20234DBR2G
Automotive Qualified, Grade 1			
-40°C to 150°C	Single	TSOP-5	NCV20231SN2T1G
		SC-88	NCV20231SQ3T2G
		SOT-553	NCV20231
	Dual	SOIC-8	NCV20232DR2G
		SOIC-14	NCV20234DR2G
	Quad	TSSOP-14	NCV20234DBR2G



Value Proposition

This family of single, dual and quad zero-drift amplifiers provide excellent precision. This is achieved with continuous calibration of the input offset voltage over time and temperature.

Unique Features

- Gain-Bandwidth Product: 270 to 350 kHz
- Low Supply Current/ Channel: 17 μ A (typ., at 3.3V)
- Low Offset Voltage: 45 μ V max
- Low Offset Drift: 0.4 μ V/°C max
- Wide Supply Range: 1.8V to 5.5 V
- Wide Temperature Range: -40°C to +125°C
- AEC- Q100 Qualified are available

Benefits

- Offset error is inherent to all amplifiers. This error tends to increase with time and temperature. Op amps amplify both the signal and the error. Among the various architectures employed to lower the offset, Zero-Drift is one such, which provides exceptionally low offset and drift, resulting in high accuracy sensor measurements and amplification, especially when the input of the op amp is a small signal.

Market & Applications

- Thermal Management Circuits
- Transducer Applications
- Current Sensing in Motor Control, Lighting etc.
- Power Supplies
- Battery Powered/ Portable Applications
- Electronic Scales, Wheatstone Bridges
- Instrumentation in Medical and Industrial
- Automotive
- Telecom
- Industrial
- Computing
- Medical

Typical Application diagram

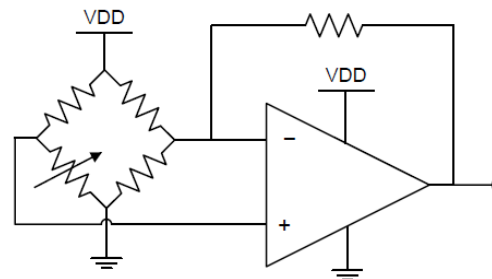
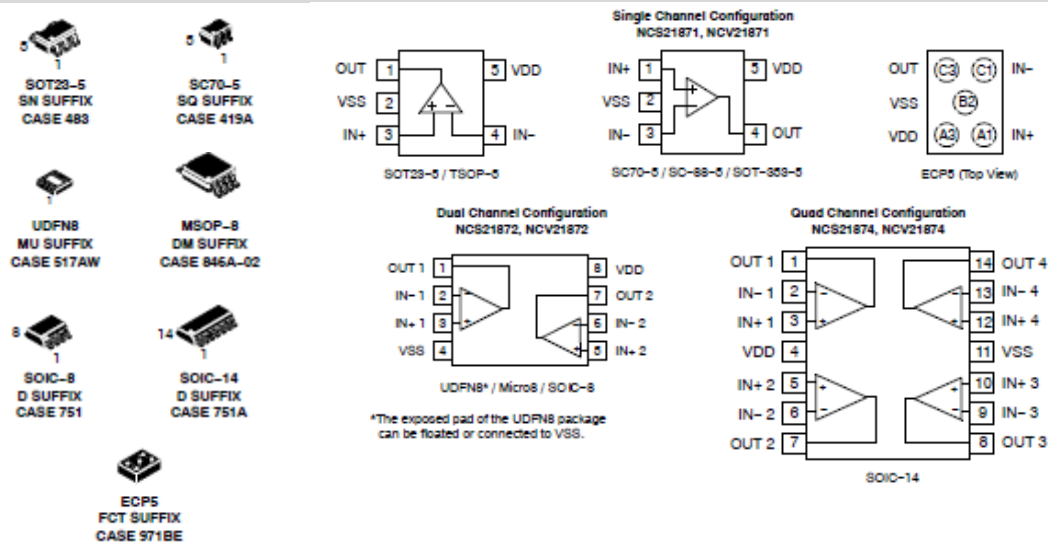


Figure 18. Bridge Circuit Amplification

Packages/ Pin Outs



NCS21801/2/3/4

Value Proposition

The NCS21801/3, NCS21802, and NCS21804 are precision op amps featuring low input offset voltage and low offset drift over time and temperature. The NCS2180x is available in single, dual, and quad channel configurations. All versions are specified for operation from -40°C to +125°C. NCV prefix parts are automotive grade 1 qualified. The single channel option is also available with an enable (/shutdown) pin which powers down the part to a low power state and the output is in high impedance. The part is powered on and functional when this pin is pulled high.

Unique Features

- Gain-Bandwidth: 1.5 MHz
- Quiescent Current: 75 typ, 130 max over temp
- Input Offset Voltage: 10 μ V max @ 25°C
- Offset Drift Over Temperature: 5 nV/°C
- Supply Range: 1.8 to 5.5 (-40 to 125C)
- CMRR: 110 dB min over temp
- PSRR: 110 dB min over temp
- Integrated EMI Filters

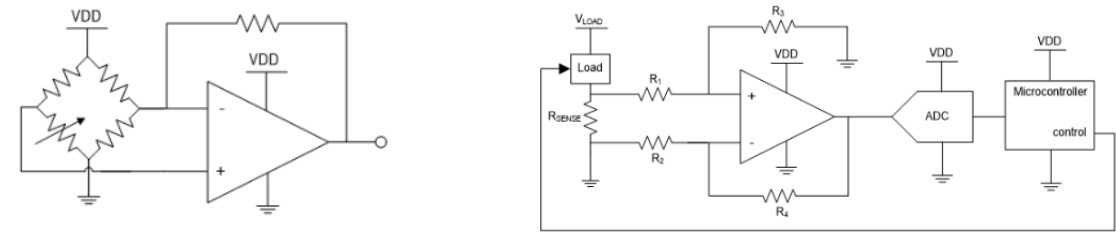
Benefits

- Enable Pin
- Rail-to-Rail Input and Output
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

Market & Applications

- Thermal Management Circuits
- Transducer Applications
- Current Sensing in Motor Control, Lighting etc.
- Power Supplies
- Battery Powered/ Portable Applications
- Electronic Scales, Wheatstone Bridges
- Instrumentation in Medical and Industrial
- Automotive
- Telecom
- Industrial
- Computing
- Medical

Typical Application diagram



Packages/ Pin Outs

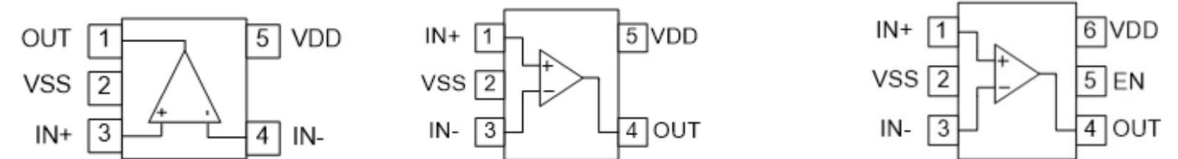


Figure 1. Single Pinout, TSOP-5/SOT23-5 Figure 2. Single Pinout, SC70-5 / SC-88-5 / SOT-353-5 Figure 3. Single Pinout with Enable, SC-88/SC70-6/SOT-363

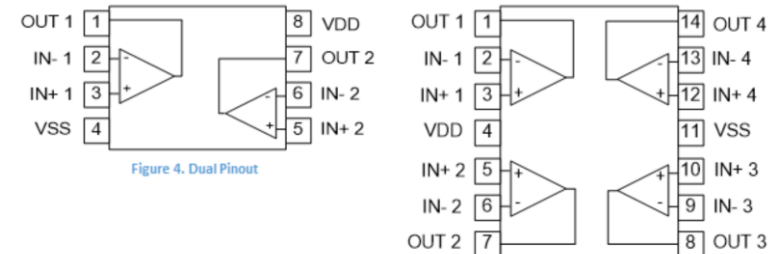


Figure 4. Dual Pinout

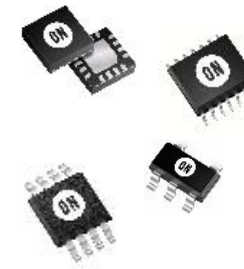
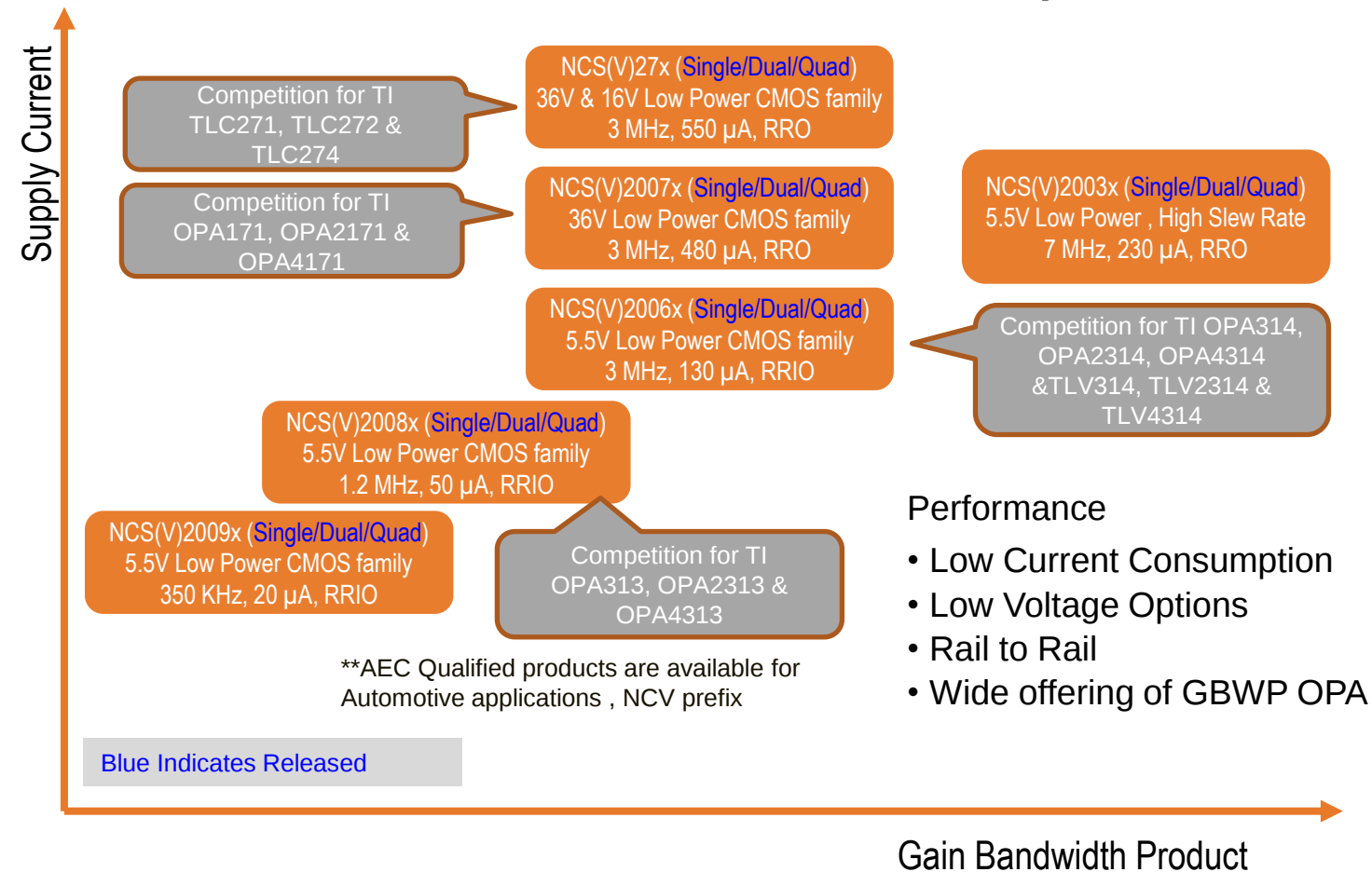
Figure 5. Quad Pinout

Precision Portfolio

Product	# of Ch.	VS Min (V)	VS Max (V)	Iq Typ (mA)	VOS Max (mV)	GBW Typ (MHz)	SR Typ (V/μs)	Temperature Range (°C)	Package Type
<u>NCSx325</u>	1/2/4	1.8	5.5	0.021	0.05	0.27/ 0.35	0.1	-40 to 125	SOT-23-5 Micro8™ SOIC-8 SOIC-14
<u>NCSx333</u>	1/2/4	1.8	5.5	0.017 0.021 0.028	0.01/0.03	0.27/ 0.35	0.1	-40 to 125	SC-70-5 SOT-23-5 Micro8™ SOIC-8 UDFN-8 SOIC-14
<u>NCS/V21871/2/4</u>	1/2/4	1.8	5.5	0.017	0.045	0.35	0.1	-40 to 125	TSOP-5, SC705, UDFN8, Micro8, SOIC-14
<u>NCS21911/2/4</u>	1/2/4	4	36	0.475	0.025	2	1.6	-40 to 125	SOT-23-5, Micro8™ SOIC-8, SOIC14, TSSOP14
<u>NCS20166</u>	1	3	5.5	1.2	1.05	10	0.5	-40 to 125	SOT-23-5
NCS21801/2/3/4	1/2/4	1.8	5.5	0.95	0.01	1.5	0.7	-40 to 125	SC-70-5 SOT-23-5 Micro8™ UDFN-8 TSSOP-14
NCS2023x1/2/4	1/2/4	2.7	36	0.475	1.50	3	2.7	-40 to 150	SC-70-5 SOT-23-5 SOT553-5 SOIC-8 UDFN-8 SOIC-14 TSSOP-14

Low Power Op Amp (Less than 1mA current consumption)

6 Families of Low Power Amplifiers



Space Saving Package

- Single, Dual and Quad
- Small packages (SOT23, SC-70, SOIC 8, SOIC 14)

Good Price to Performance Balance

- Migration Path for next generation designs

Available Now: NCS(V)20071, NCS(V)20072 and NCS(V)20074

Value Proposition

The NCS2007x series operational amplifiers provide rail-to-rail output operation, 3 MHz bandwidth, and are available in single, dual, and quad configurations. Rail-to-Rail operation enables the user to make optimal use of the entire supply voltage range while taking advantage of 3 MHz bandwidth. The NCS2007x can operate on supply voltages as low as 2.7 V over the temperature range of -40°C to 125°C. At a 2.7 V supply, the high bandwidth provides a slew rate of 2.8 V/ μ s while only consuming 405 μ A of quiescent current per channel. The wide supply range allows the NCS2007x to run on supply voltages as high as 36 V, making it ideal for a broad range of applications. Since this is a CMOS device, high input impedance and low bias currents make it ideal for interfacing to a wide variety of signal sensors. The NCS2007x devices are available in a variety of compact packages. Automotive qualified options are available under the NCV prefix. No output phase reversal.

Unique Features

- Wide Supply Range: 2.7 V to 36 V
- Rail-To-Rail Output
- Wide Bandwidth: 3 MHz typical
- Low Supply Current: 405 μ A 2.7V
- Low Input Bias Current: 5 pA typical
- High Slew Rate: 2.8 V/ μ s typical
- NCV parts for Automotive

Benefits

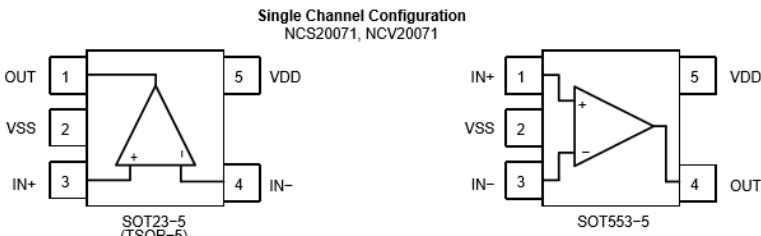
- Wide supply range suitable for a wide variety of applications
- Wide output range
- Compatible with high speed signals 3 MHz
- Low current consumption
- High input impedance
- Meets automotive standards

Market & Applications

- Sensor Signal Conditioning
- Current Sensing
- Air Conditioning Systems
- Filter Circuits
- Unity Gain Buffer
- White Goods

Typical Applications / Pin Outs

- Motor Current Sense
- Current Shunt Monitor
- Sensor Conditioning
- Automotive
- Industrial



Packages



SOT-553
CASE 463B



Micro8™
CASE 846A



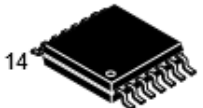
SOIC-8
CASE 751



TSOP-5
CASE 483



TSSOP-8
CASE 948S



TSSOP-14
CASE 948G



SOIC-14 NB
CASE 751A

ON Part Number	Phase
NCS20071	Launched
NCS20072	Launched
NCS20074	Launched

Available Now: NCS(V)20081, 2 & 4

Value Proposition

The NCS20081/2/4 is a family of single, dual and quad Operational Amplifiers (Op Amps) with 1.2 MHz of Gain-Bandwidth Product (GBWP) and draws only 42 μ A of Quiescent current. The NCS2008x has Input Offset Voltage of 4 mV and operates from 1.8 V to 5.5 V supply voltage over a wide temperature range (-40°C to $+125^{\circ}\text{C}$). The Rail-to-Rail In/Out operation allows the use of the entire supply voltage range while taking advantage of the 1.2 MHz GBWP. Thus, this family offers superior performance over many industry standard

parts. These devices are AEC-Q100 qualified which is denoted by the NCV prefix. NCS2008x's low current consumption and low supply voltage performance in space saving packages, makes them ideal for sensor signal conditioning and low voltage current sensing applications in Automotive, Consumer and Industrial markets.

Unique Features

- Wide Bandwidth: 1.2 MHz
- Low Supply Current/ Channel: 42 μ A typ ($V_S = 1.8$ V)
- Low Input Offset Voltage: 4 mV max
- Wide Supply Range: 1.8 V to 5.5 V
- Available in Single, Dual, and Quad Packages

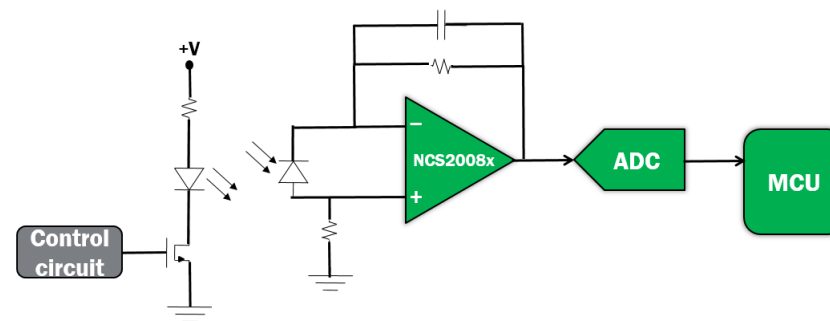
Others Features

- Wide Temperature Range: -40°C to $+125^{\circ}\text{C}$
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP
- Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant
- Unity Gain Stable
- Rail-to-Rail Input and Output

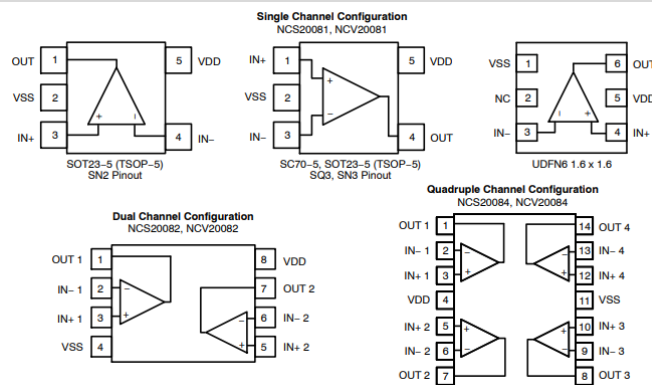
Market & Applications

- Automotive
- Battery Powered/ Portable
- Sensor Signal Conditioning
- Low Voltage Current Sensing
- Filter Circuits
- Unity Gain Buffer

Typical Application diagram



Packages/ Pin Outs



ON Part Number	Phase
NCS20081	Launched
NCS20082	Launched
NCS20084	Launched

In Development: NCS(V)20161/2/4, 8MHz, RRIO Operational Amplifier

Value Proposition

The NCS20161/2/4 is a family of single, dual and quad Operational Amplifiers (Op Amps) featuring 8 MHz Gain-Bandwidth Product (GBWP) while consuming a low 800uA of quiescent current. The NCS2016x has an Input Offset Voltage of 2.0 mV and operates from 1.8 V to 5.5 V supply voltage. They also feature full rail-to-rail input and output.

Unique Features

- High Bandwidth: 8 MHz
- Input Offset Voltage: 2.0 mV
- Supply Voltage: 1.8 V to 5.5 V

Benefits

- The Bandwidth supports fast data acquisition systems.
- The low offset voltage improves precision over general purpose devices.
- The supply voltage allows use from standard 5V supplies and from low 1.8V to conserve energy.

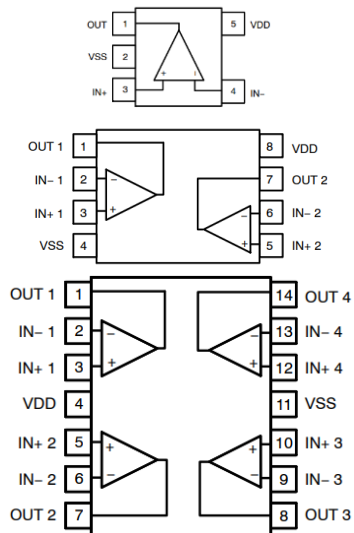
Specifications:

- CMRR : Typically 103dB
- PSRR: Typically 103dB
- Slew Rate: 6.5V/ μ s
- Noise 10kHz: 10nV/rtHz
- Quiescent Current: 800 uA

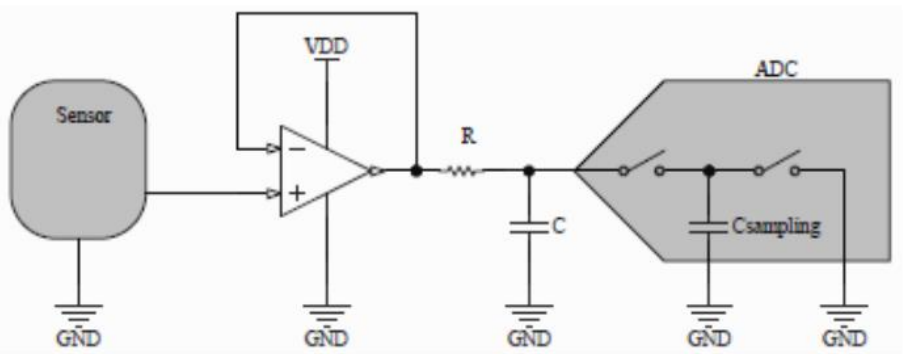
Market & Applications

- Sensor Signal Conditioning
- Active Filter Circuits high-Impedance Buffers
- High-Impedance Buffers
- Automotive Q1 Qualification
- Solenoid applications

Industry Standard Pin Outs



Applications

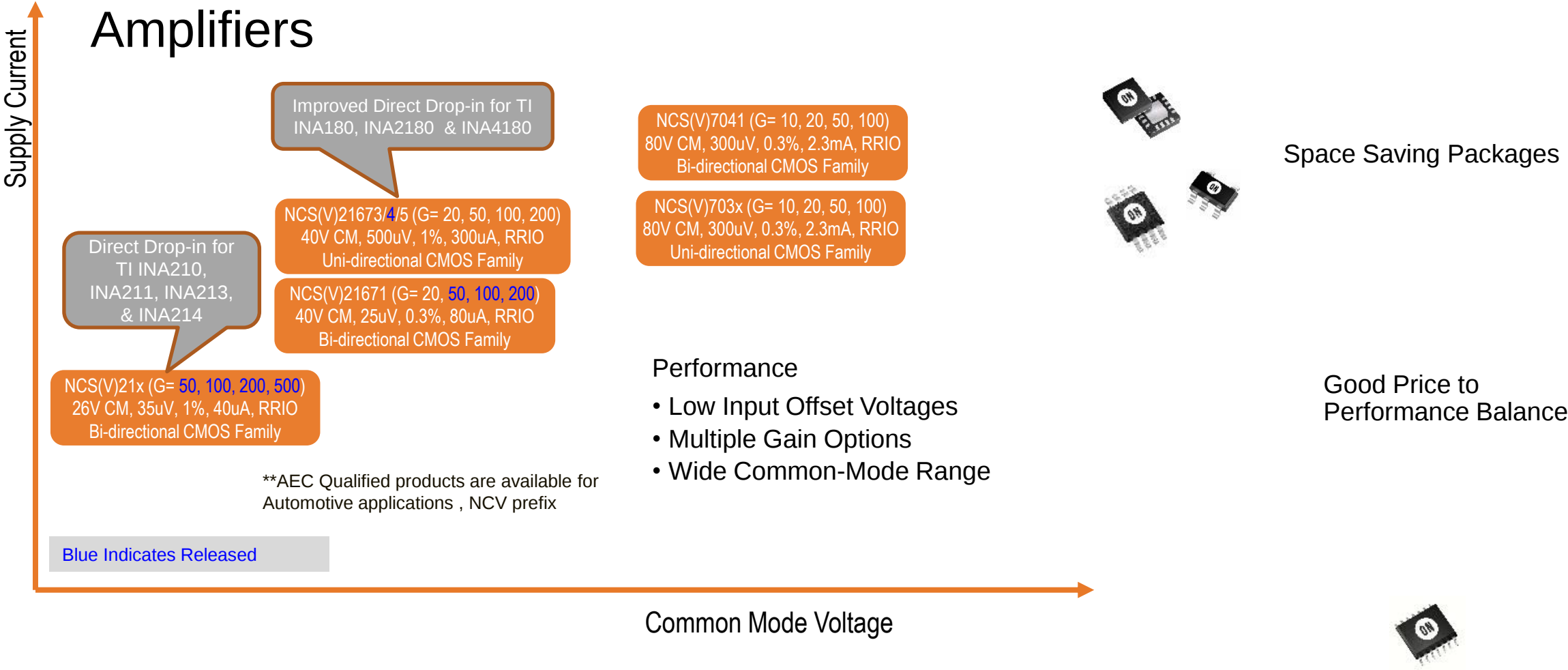


Unity Gain Buffer Stage for ADC Sampling and signal conditioning.

NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

Current Sense Amplifiers (Integrated Resistors)

5 Families of Current Sense Amplifiers



Precision Amplifiers and Current Sense Amplifiers

	Precision Amplifiers	Current Sense Amplifiers
★	Very low input offset voltage (10μV)	Low input offset voltage (35μV)
	Precision, matched resistors must be used to set the gain in order to minimize V_{OS} and gain error	Integrates gain resistors, minimizing V_{OS} and gain error ★
	Larger PCB footprint after adding external resistors	Smaller PCB footprint (e.g. SC70-6) ★
★	Gain can be adjusted with external resistors	Gain is usually fixed

In Development: NCS(V)21673/4 (Multiple Channels)

Value Proposition

The NCS21673/4 are precision current sense amplifiers featuring low input offset voltage and low offset drift over time and temperature. With gains of 20, 50, 100 and 200V/V, these devices can measure voltage across shunts at common mode voltages from -0.1V to 40V. They operate from 2.7V to 5.5V and are available in space saving packages.

Unique Features

- Wide common mode input range: -0.1 V to 40 V
- Supply voltage range: 2.7 V to 5.5 V
- Low offset voltage: $\pm 100 \mu\text{V}$
- Low offset drift: $\pm 1 \mu\text{V}/^\circ\text{C}$ max
- Low gain error: $\pm 1 \%$ max
- Low current consumption: 300 μA max per channel

NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

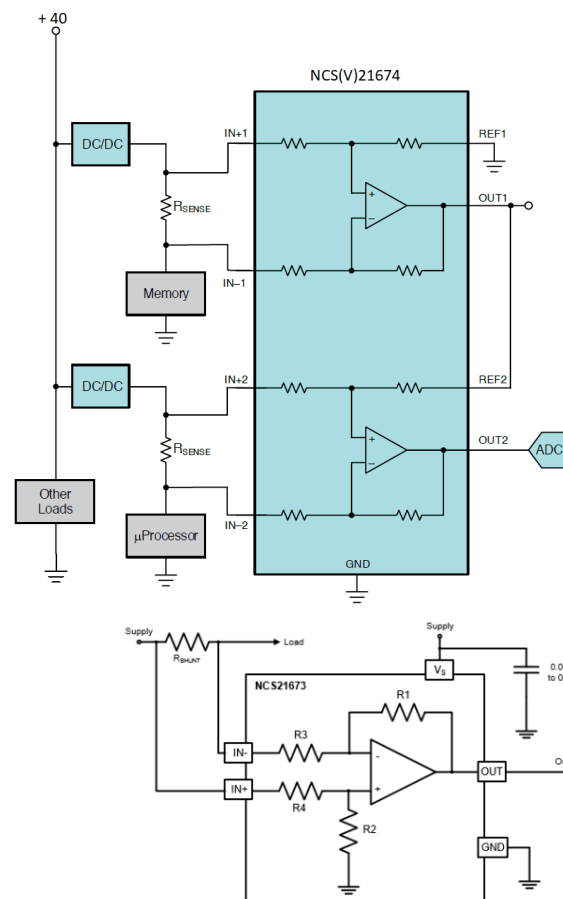
Benefits

- High bandwidth of 350 kHz and slew rate which allows for fast detection in the changes of current
- When current is sensed in multiple points in a system, a multichannel solution offers space and cost savings
- Wide common mode ranges independent of the supply voltage is helpful to measure not only fast transients but also be used for both high side and low side current sensing.

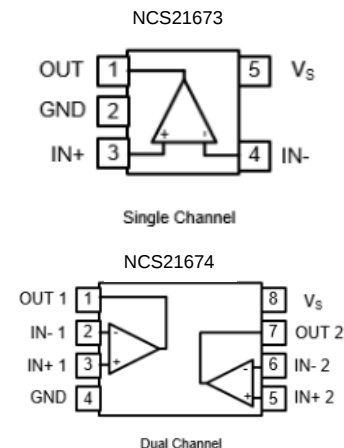
Market & Applications

- Thermal Management Circuits
- Transducer Applications
- Current Sensing in Motor Control, Lighting etc.
- Power Supplies
- Battery Powered/ Portable Applications
- Electronic Scales, Wheatstone Bridges
- Instrumentation in Medical and Industrial
- Automotive
- Telecom
- Industrial
- Computing
- Medical

Typical Application diagram



Packages/ Pin Outs



In Development: NCS(V)21671 (Integrated Filtering)

Value Proposition

The NCS21671 are a series of voltage output current sense amplifiers offered in gains of 25, 50, 100, and 200 V/V. These parts can measure voltage across shunts at common mode voltages from -0.1 V to 40 V, independent of supply voltage. The low offset of the zero-drift architecture enables current sensing with maximum drops across the shunt as low as 10 mV full-scale. These devices can operate from a single +1.7 V to +5.5 V power supply, drawing a maximum of 40 μ A of supply current.

Unique Features

- Wide Common Mode Input Range: - 0.1 V to 40 V
- Supply Voltage Range: 1.7 V to 5.5 V
- Low Offset Voltage: $\pm 25 \mu$ V max
- Low Offset Drift: 0.5μ V/ $^{\circ}$ C
- Low Gain Error: $\pm 0.3\%$ max

Benefits

- An enable function is provided to reduce current drain through the input pins and power supply pins to negligible levels.

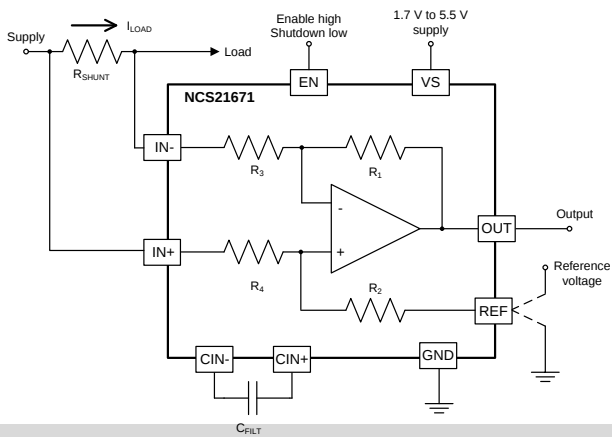
Others Features

- CMRR (DC): 114
- Bandwidth: 20, 30, 40 kHz
- Slew Rate: Typ 0.4 V/ μ s
- Gain Options: 25, 50, 100, and 200 V/V
- Quiescent Current: 50 μ A max
- Optional Input Filtering: Add External Capacitor to Set Cutoff Frequency
- Enable

Market & Applications

- High-Side Current Sensing
- Low-Side Current Sensing
- Difference Amplifier
- Telecom
- Power Management
- Battery Charging and Discharging
- Automotive

Typical Application diagram



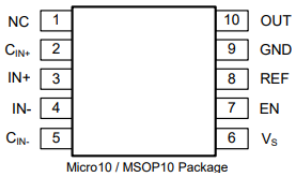
Packages/ Pin Outs

Industrial and Consumer

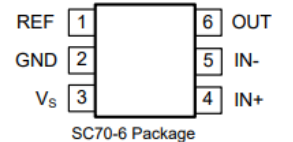
Package	GAIN	Enable	Filter Pins	Part Number
SC70-6	25	No	No	NCS21671SQ025T2G
	50			NCS21671SQ050T2G
	100			NCS21671SQ100T2G
	200			NCS21671SQ200T2G
Micro10	25	Yes	Yes	NCS21671DM025R2G
	50			NCS21671DM050R2G
	100			NCS21671DM100R2G
	200			NCS21671DM200R2G

Automotive Grade1 Qualified

Package	GAIN	Enable	Filter Pins	Part Number
SC70-6	25	No	No	NCV21671SQ025T2G
	50			NCV21671SQ050T2G
	100			NCV21671SQ100T2G
	200			NCV21671SQ200T2G
Micro10	25	Yes	Yes	NCV21671DM025R2G
	50			NCV21671DM050R2G
	100			NCV21671DM100R2G
	200			NCV21671DM200R2G



NC denotes no internal connection. Pins can be left floating/connected to voltage between VS and GND.



In Development: NCS(V)7041 - Bidirectional

Value Proposition

The NCS(V)7041 is a high voltage, high resolution, bidirectional current sense amplifier. It features gain options of 14/20/50/100 V/V, with a max. $\pm 0.3\%$ gain error over -40°C to 125°C . The NCS(V)704x can perform bi- or unidirectional current measurements across a sense resistor with excellent common-mode rejection from -5 V to 80 V . The wide Common-Mode Range which includes ground provides for better transient response.

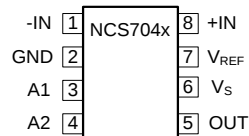
Unique Features

- Common-Mode Range: -5 V to 80 V
- Supply: 4.5 V to 5.5 V
- Offset Voltage: $300\text{ }\mu\text{V}$ (Max.)
- Offset Drift: $3\text{ }\mu\text{V}/^{\circ}\text{C}$
- Gain Error: $\pm 0.3\%$ (Max.)
- CMRR (DC): 90 dB
- Bandwidth: 100 kHz
- Slew Rate: $1\text{ V}/\mu\text{s}$
- Quiescent Current: 3 mA

Market & Applications

- Telecom Equipment
- Power Supply Designs
- Diesel Injection Control
- Automotive
- Motor Control
- Solenoid applications

Packages/ Pin Outs



MICRO-8
SOIC-8

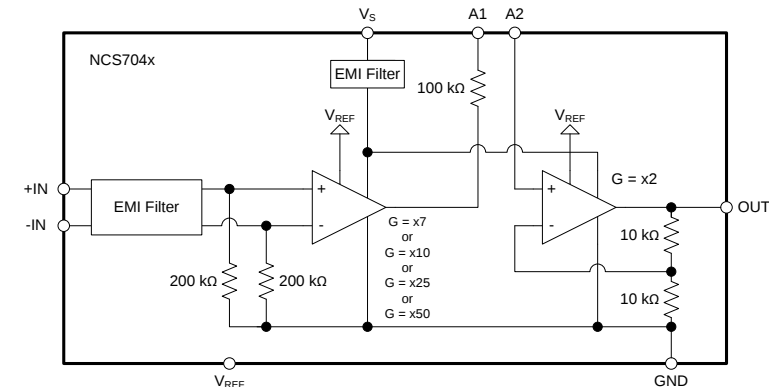
*NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

Benefits

A1 and A2 pins also allow gains to be adjusted between fixed gain options

A1 and A2 pins allow an intermediate filtering network. A single or dual pole filter can be created to eliminate noise from the output gain stage, increasing the overall accuracy of the current measurements

The EMI filtering on the supply rails and the inputs eliminates the noise before it enters the signal chain



The Vref pin allows the output signal to be ground, Vs referenced for bi-directionality

www.onsemi.com/NCS210

The NCS21x and NCV21x are voltage output current shunt monitors that can measure voltage across shunts at common-mode voltages from -0.3 V to 26 V , independent of supply voltage. Four fixed gains are available: 50 V/V , 100 V/V , 200 V/V , 500 V/V . The low offset of the zero-drift architecture enables current sensing with maximum drops across the shunt as low as 10 mV full-scale

Benefits

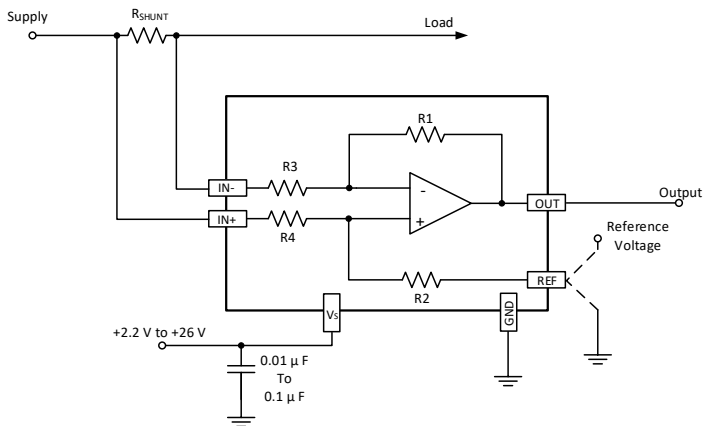
- Wide Common-Mode Input Range: -0.3 V to 26 V
- Supply Voltage Range: 2.2 V to 26 V
- Low Offset Voltage: $\pm 35\text{ }\mu\text{V}$ max
- Low Offset Drift: $0.5\text{ }\mu\text{V}/^\circ\text{C}$
- Low Gain Error: 0.2% typ., 1% max
- Load dump capability up to 30 V
- The wide Common-Mode Range which includes ground provides for better transient response at the inputs.

Others Features

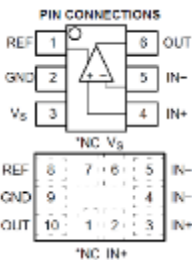
- CMRR (DC): >100 dB, (AC): >90 dB up to 20kHz
- Bandwidth: 90 kHz
- Slew Rate: 1 V/ μ s
- Gain Options: 50 V/V, 100 V/V, 200 V/V and 500 V/V
- Quiescent Current: 80 μ A max

- Telecom Equipment
- Automotive
- Sensors
- Power Management
- Battery Charging and Discharging

Typical Application diagram



Packages/ Pin Outs

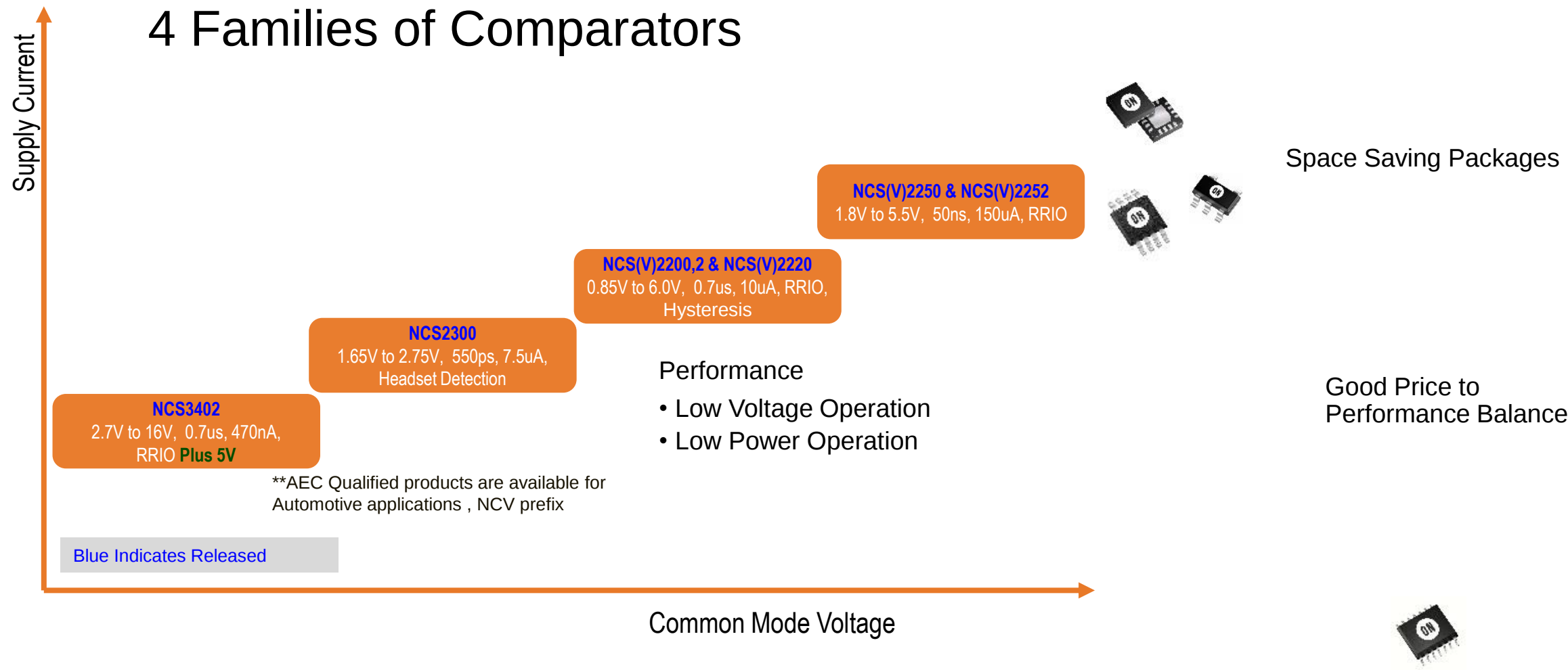


Product	Gain	R3-R4	R1-R2
NCS210	200	5 kΩ	1 MΩ
NCV210	200	5 kΩ	1 MΩ
NCS211	500	2 kΩ	1 MΩ
NCS213	50	20 kΩ	1 MΩ
NCV213	50	20 kΩ	1 MΩ
NCS214	100	10 kΩ	1 MΩ
NCV214	100	10 kΩ	1 MΩ

- *NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

Comparators

4 Families of Comparators



Released: NCS2200 & NCS2202 Low Voltage, Low Power Comparator

Value Proposition

The NCS220x series is a sub-One-volt, low power comparator family. These devices consume only 10 uA of supply current. They are guaranteed to operate at a low voltage of 0.85 V which allows them to be used in systems that require less than 1.0 V and are fully operational up to 6.0 V

Unique Features

- Rail-to-Rail Input/Output Performance
- No Phase Inversion with Overdriven Input Signals.
- Complementary Push-Pull Output
- Open Drain Output
- Internal Hysteresis

Benefits

- Maximizes input and output voltage swing.
- Ensures output doesn't change state if input is overdriven.
- Can source or sink current.
- Pull-up allows mixed voltages.
- Prevents noise or small signal changes from switching the output.

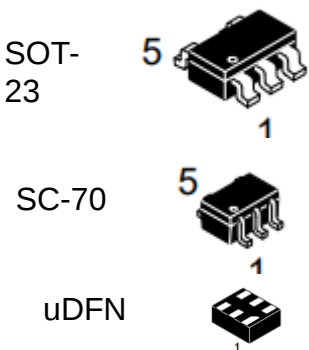
Specifications:

- Power Supply: 0.85 to 6.0 V
- Propagation Delay: 0.7 uS
- Output Fall Time: 20 nS
- Output Rise Time: 16 nS
- Power-up Time: 35 uS
- Quiescent Current: 10 uA

Market & Applications

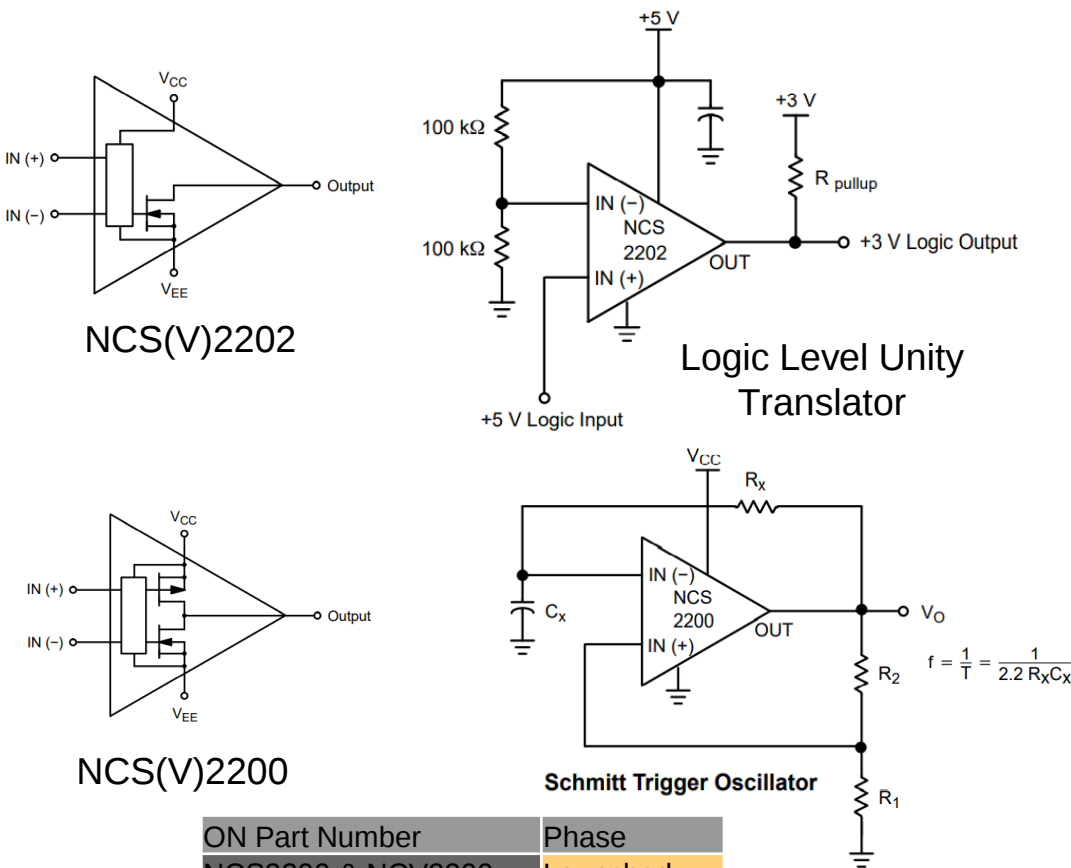
- Handheld Electronics: Smart Phones, Tablets, Electronic Meters.
- Security and Alarm Systems.
- Industrial Sensors.
- Portable Medical.

Industry Standard Pin Outs



NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

Applications



ON Part Number	Phase
NCS2200 & NCV2200	Launched
NCS2202 & NCV2202	Launched



Gate Drivers

High Voltage IGBT Gate Drivers

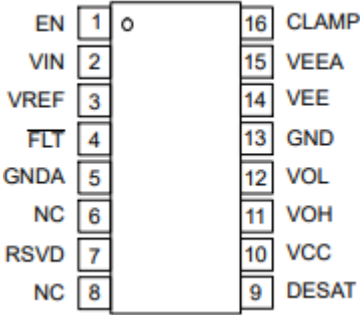
	Non-Isolated	High side & Low side	Internally Isolated		
PRODUCTS	NCD5700/02 NCD5701/03(A/B/C) SO16 & SO8	NCD57200/01 SO8 P2P with IR/IFX & ST	NCD57000/01 Single channel SO16 wide body P2P w/ TI & IFX	NCD57080/84/85/90 Single channel SO8 narrow & wide body P2P w/ TI, IFX, Analog	NCD57252 Dual channel SO16 wide body P2P w/ TI, SiLabs
APPLICATIONS	HVAC PFC UPS Motor Control 1-Switch PTC Heater	IPMs Motor Control White Goods 2-Switch PTC Heater	UPS Solar Inverter Motor control EV Chargers	PTC Heaters BSG Inverter OBC Traction Inverter	
HIGHLIGHTS	High Drive Current Low Propagation Delay Full Features: DESAT, Clamp, UVLO, TSD, Vee	High Drive Current Dead time control Low Propagation Delay	High Drive Current Low Propagation Delay Full Features: DESAT, Clamp, UVLO, Vee, STO Isolation Certification: UL/VDE/IEC		

Gate Drivers OPN Selection Guide

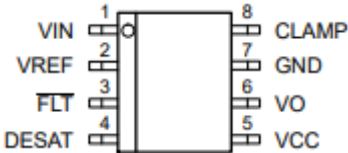
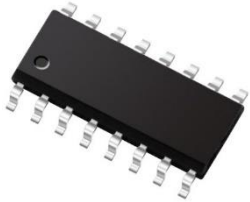
	Specs/Features							Target Applications								
								Automotive				Industrial/Consumer				
	No. of channels	Isolation	Differential Input	DESAT w/ FLT	Miller Clamp	VEE	Split output	Traction	PTC	OBC	HV DC-DC	IH	UPS	Solar	Motor Control	HVAC
NCDV)5700/2	1			V	V	V	V	V	V							
NCD(V)5701/3A	1			V	V			V	V	V	V	V	V		V	
NCD(V)5701/3B	1			V		V		V	V	V	V	V	V		V	
NCD(V)5701/3C	1			V			V	V	V	V	V	V	V		V	
NCD(V)57000/1	1	V	V	V	V			V	V					V	V	V
NCD(V)57080A	1	V	V		V					V	V	V	V			V
NCD(V)57080B	1	V	V			V				V	V	V	V			V
NCD(V)57080C	1	V	V				V			V	V	V	V			V
NCD(V)57090A	1	V	V		V								V	V	V	
NCD(V)57090B	1	V	V			V							V	V	V	
NCD(V)57090C	1	V	V				V						V	V	V	
NCD(V)57084	1	V		V					V				V			
NCD(V)57085	1	V		CS w/FLT					V				V			
NCD(V)57252	2	V								V	V			V		V
NCD(V)57200/1	2									V	V	V	V			V

Non-Isolated 1-Channel Gated Drivers

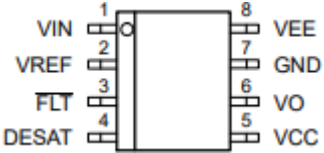
OPN	Versions	Key Feature(s)	Package Type	Samples	Release Date	Datasheet	App Note	Demo Board
NCD(V)5701		High Current IGBT Gate Driver	SOIC 16-Narrow Body	Production	Released	onsemi.com	Released	Available
NCD(V)5701	A / B / C	IGBT 8-pin driver, narrow body	SOIC 8-pin Narrow Body	Production	Released	onsemi.com	Released	Available
NCD(V)5702		5700 with open-drain (vs. active low) FAULT output	SOIC 16-Narrow Body	Production	Released	onsemi.com	Released	Available
NCD(V)5703	A / B / C	5701 with open-drain (vs. active low) FAULT output	SOIC 8-pin Narrow Body	Production	Released	onsemi.com	Released	Available
NCD(V)5703	D	5703C with Enable	SOIC 8-pin Narrow Body	Production	Released	onsemi.com	Released	Available
NCD(V)5705B		5703B with Lower UVLO	SOIC 8-pin Narrow Body	Production	Released	onsemi.com	Released	Available
NCV5706B		IGBT 8V/7V UVLO	SOIC 8-pin Narrow Body	Production	Released	onsemi.com	Released	Available
NC(V)5707	A / B / C	IGBT 8V/7V UVLO	SOIC 8-pin Narrow Body	Production	Released	onsemi.com	Released	Available



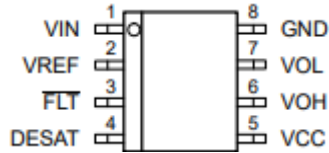
NCD(V)5700 / NCD(V)5702 / NCD(V)5706



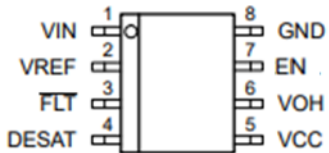
NCD(V)5701 / NCD(V)5703
A: Active Miller Clamp



NCD(V)5701 / NCD(V)5703
B: Negative Output Voltage



NCD(V)5701/NCD(V)5703/NCD(V)5707
C: Separate V_{OL}/V_{OH} Outputs



NCD(V)5703
D: With Enable Pin



NCD(V)5700/02 – Full Featured

Features

- High current (4 A/6 A src/snk) at Miller Plateau Voltage
- Wide (VCC-VEE) range operation with negative voltage capability
- FLT indicator for micro
- DESAT detect with programmable delay
- Miller clamp with high sink current
- Regulated VREF for external use
- Tight UVLO for IGBT safety

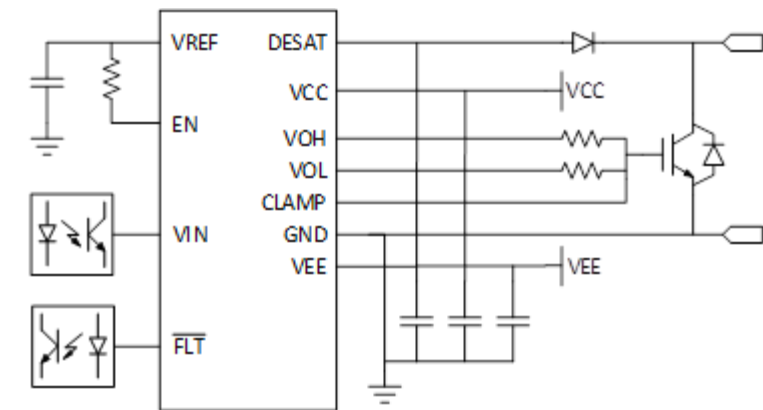
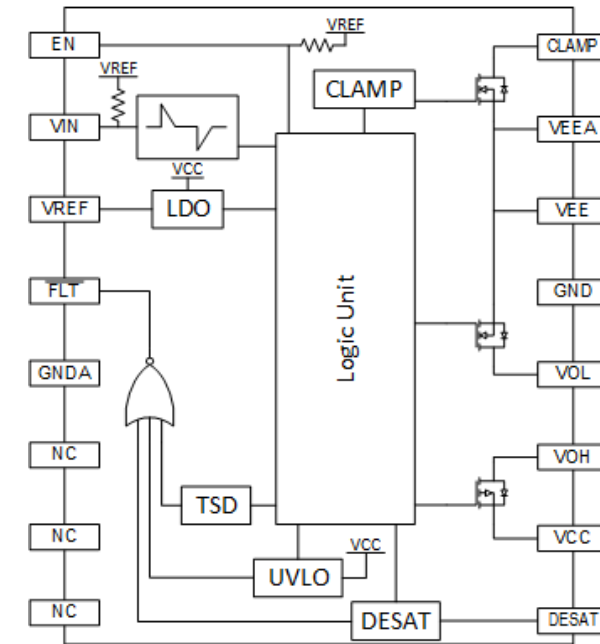
Market & Applications

Inverters, Motor Drive, UPS, Automotive Power Supplies, PTC

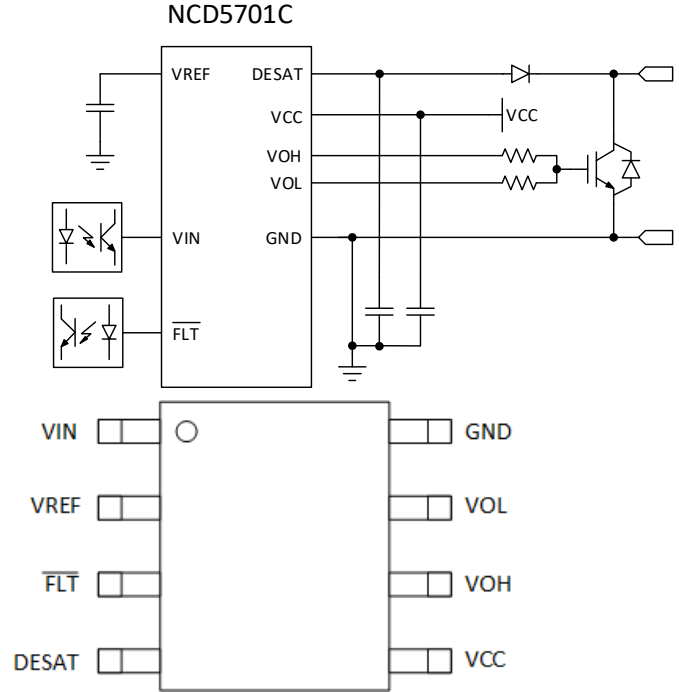
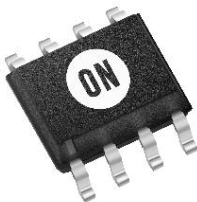
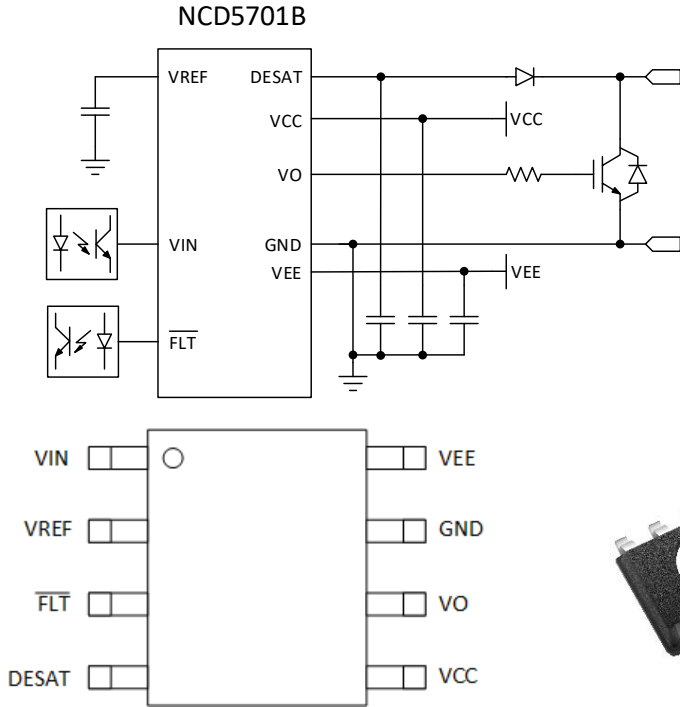
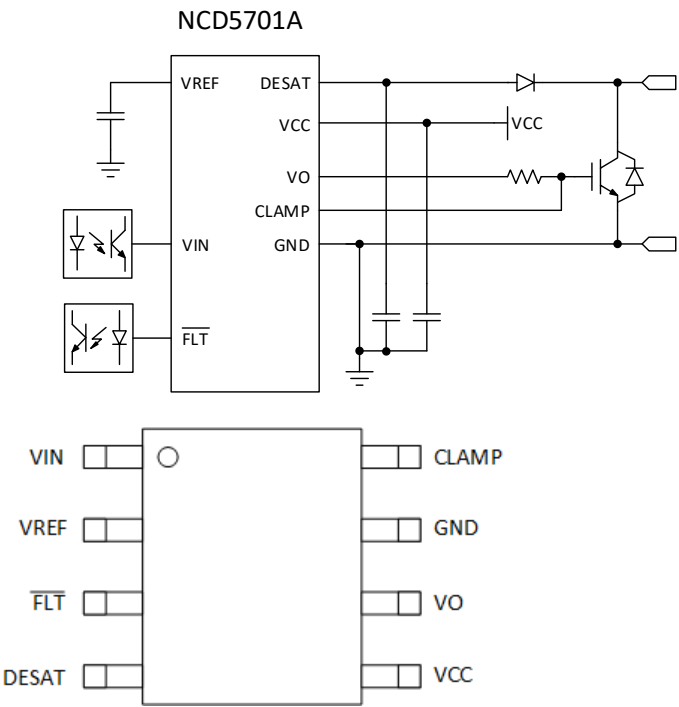
Heater

Packages/Options

SOIC-16 Narrow, Full protection features



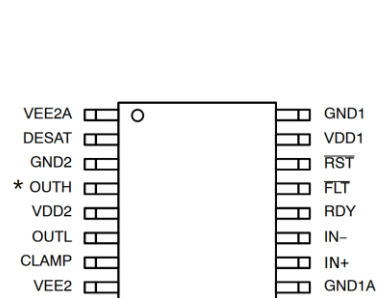
NCD(V)5701/03 – Reduced Feature in SOIC-8



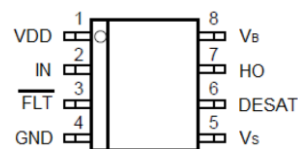
Part #	Pkg	Key Features +Options	Targeted Applications
NCD(V)5701A NCD(V)5703A	SO-8	VREF+FLT+DESAT+ <u>CLAMP</u>	Welding, Low-end UPS/Solar, Automotive power supplies
NCD(V)5701B NCD(V)5703B	SO-8	VREF+FLT+DESAT+ <u>VEE</u>	Welding, Low-end UPS/Solar, Automotive power supplies
NCD(V)5701C NCD(V)5703C	SO-8	VREF+FLT+DESAT+ <u>VOH/VOL</u>	Welding, Low-end UPS/Solar, Automotive power supplies
NEW NCD(V)5703D	SO-8	<u>VREF+FLT+DESAT+VEE</u> + Enable	PTC Heater (Enable pin for shut-off) – Sampling Q4'21

Isolated 1-Channel Gated Drivers

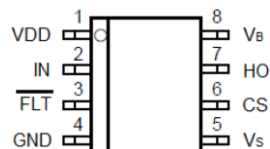
OPN	Key Feature(s)	Package Type	UVLO (V)	T _{PD} (ns)	Samples	RTM Status	Demo Board
IGBT Gate Drivers							
NCD(V)57000	Full Featured Single-Channel IGBT Driver	SOIC-16 Wide	12.2 to 12.8	60	Available	Released	Available
NCD(V)57001	NCD57000 with Single Output	SOIC-16 Wide	12.2 to 12.8	60	Available	Released	Available
NCD(V)57080 A/B/C/D/E/F	Single Channel IGBT Driver (Wide Body)	SOIC-8 Wide	11.5 to 12.5	60	Available	Released	Available
NCD(V)57090 A/B/C/D/E/F	Single Channel IGBT Driver (Narrow Body)	SOIC-8 Narrow	11.5 to 12.5	60	Available	Released	Available
NCD(V)57084	Single Channel IGBT Driver (Narrow Body)	SOIC 8 Narrow	11.5 to 12.5	60	Available	Released	Available
NCD(V)57085	Single Channel IGBT Driver (Narrow Body)	SOIC 8 Narrow	11.5 to 12.5	60	Available	Released	Available
MOSFET Gate Drivers							
NCP(V)51152AA/BA	Single-Channel MOS Driver, Split Output	SOIC-8 Narrow	5.7 or 8.2	36 ns	Available	Q3-2023	Available
NCP(V)51152AB/BB	Single-Channel MOS Driver, True Vcc UVLO	SOIC-8 Narrow	5.7 or 8.2	36 ns	Available	Q3-2023	Available
NCP(V)51153AA/BA	Single-Channel MOS Driver, Split Output	SOIC-8 Wide	5.7 or 8.2	36 ns	Q2-2023	Q3(Q4)-2023	Available
NCP(V)51153AB/BB	Single-Channel MOS Driver, True Vcc UVLO	SOIC-8 Wide	5.7 or 8.2	36 ns	Q2-2023	Q3(Q4)-2023	Available
NCP(V)51752Ax/Bx	Single-Channel MOS Driver, Negative Bias	SOIC-8 Narrow	5.7 or 8.2	36 ns	Available	Q3-2023	Available
SiC Gate Drivers							
NCP(V)51152CA/DA	Single-Channel MOS Driver, Split Output	SOIC-8 Narrow	12 or 17	36 ns	Available	Q3-2023	Available
NCP(V)51152CB/DB	Single-Channel MOS Driver, True Vcc UVLO	SOIC-8 Narrow	12 or 17	36 ns	Available	Q3-2023	Available
NCP(V)51153DA	Single-Channel MOS Driver, Split Output	SOIC-8 Wide	17	36 ns	Q2-2023	Q3(Q4)-2023	Available
NCP(V)51153DB	Single-Channel MOS Driver, True Vcc UVLO	SOIC-8 Wide	17	36 ns	Q2-2023	Q3(Q4)-2023	Available
NCP(V)51752Cx/Dx	Single-Channel MOS Driver, Negative Bias	SOIC-8 Narrow	12 or 17	36 ns	Available	Q3-2023	Available



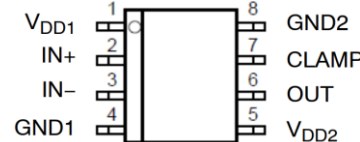
NCD(V)57000/01
*NCD(V)57000 only



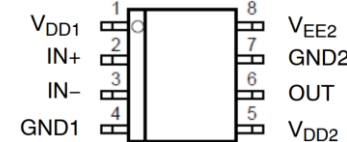
NCD(V)57084



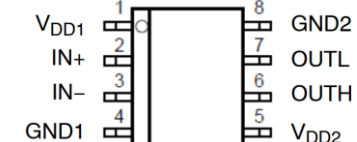
NCD(V)57085



Active Miller Clamp

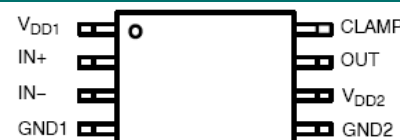


Negative Output Supply



Separate V_{OL}/V_{OH} Outputs

Alternate Pinouts



Active Miller Clamp



Separate V_{OL}/V_{OH} Outputs



Active Miller Clamp

NCD(V)57080A/B/C 8-pin Narrow Body Isolated Gate Driver

Features

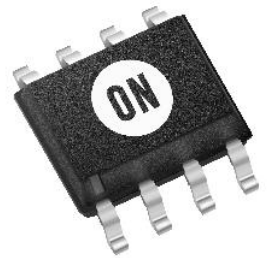
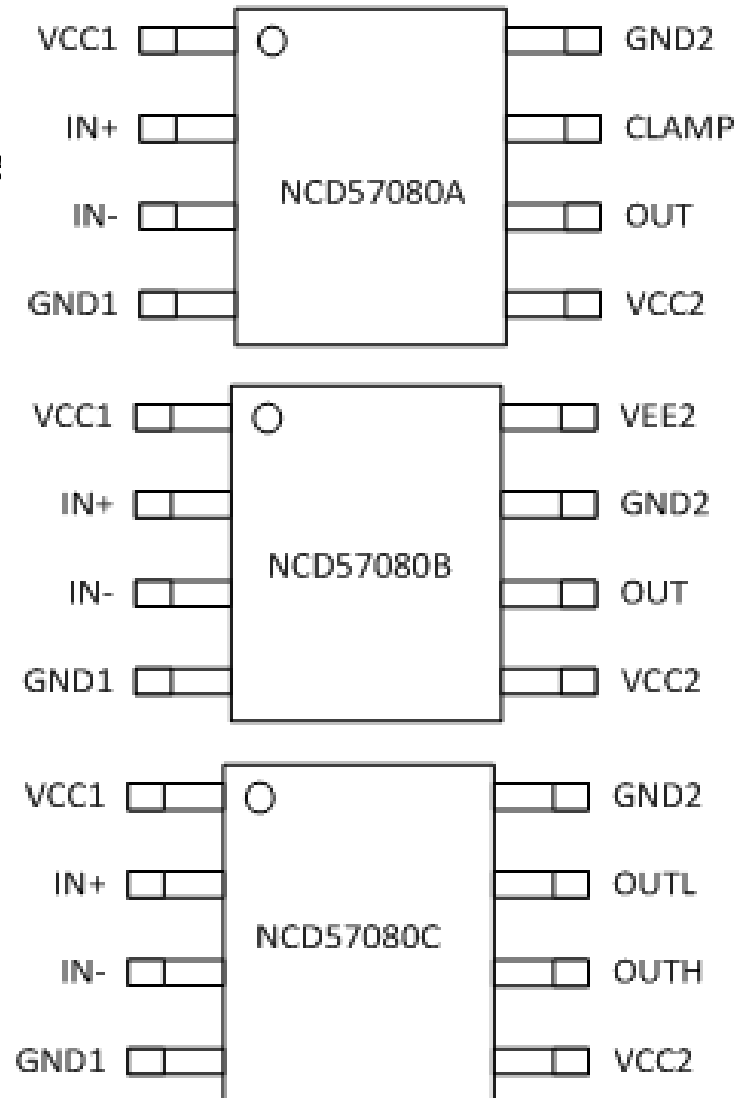
- High current (4.0 A/6.0 A src/snk) at Miller Plateau Voltage
- Galvanic Isolation up to 3.75 kV
- CMTI > 100kV/us @ 1500V
- Typical 60ns propagation delays
- Miller clamp, Negative gate voltage, Split output options
- Tight UVLO for IGBT safety

Market & Applications

Solar Inverters, Motor Drive, UPS
EV Chargers, Automotive Power Supplies

Packages/Options

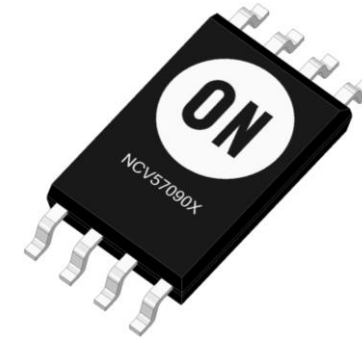
SOIC-8 Narrow Body



NCD(V)57090 8-pin Wide Body Isolated Gate Driver

Features

- High current (4.0 A/6.0 A src/snk) at Miller Plateau Voltage
- Galvanic Isolation up to 5 kV
- CMTI > 100kV/us @ 1500V
- Typical 60ns propagation delays
- Miller clamp, Negative gate voltage, Split output options
- Tight UVLO for IGBT safety

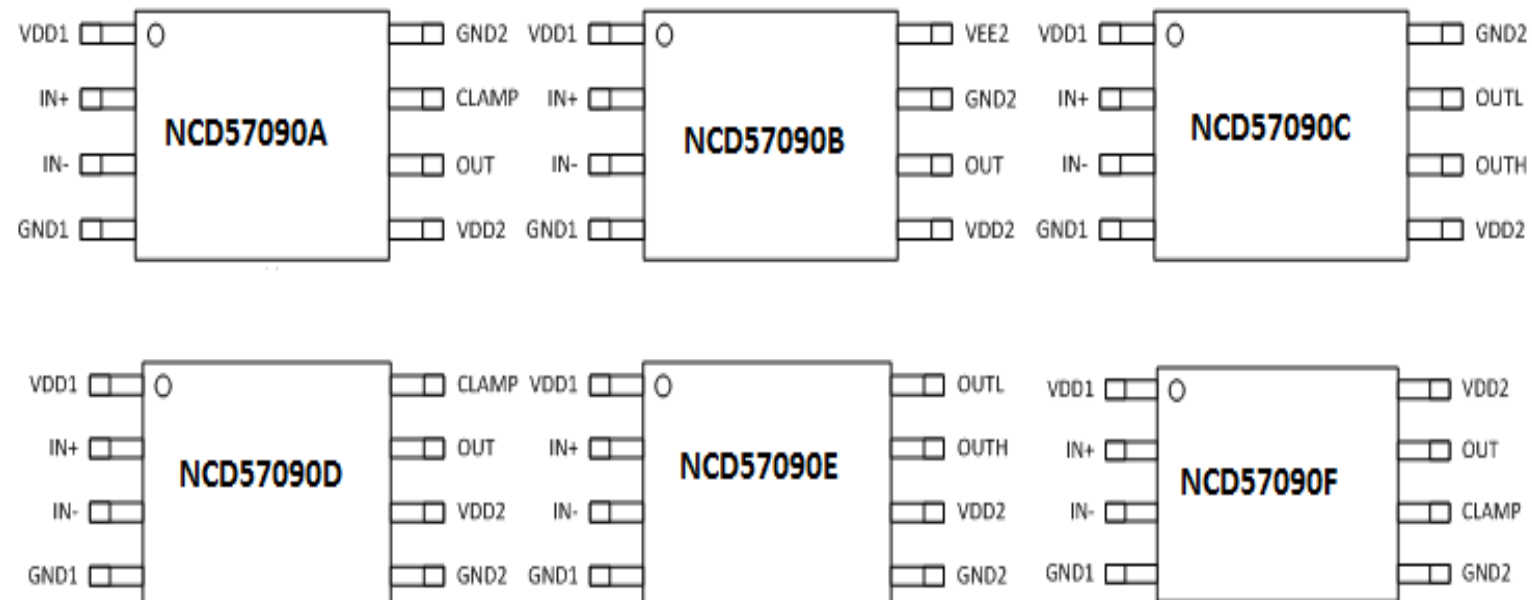


Market & Applications

Solar Inverters, Motor Drives, UPS
Automotive power supplies, EV Chargers

Packages/Options

SOIC-8 Wide Body



NCD(V)57084/57085 8-pin Narrow Body Isolated Gate Driver

Features

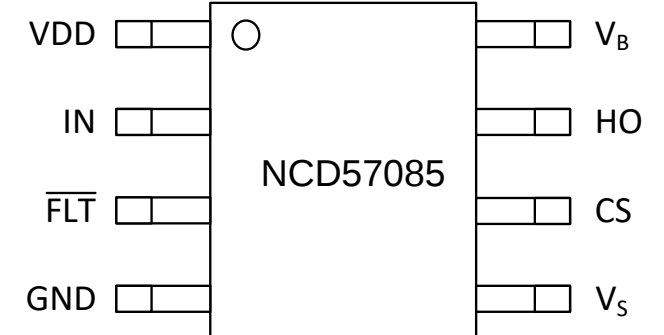
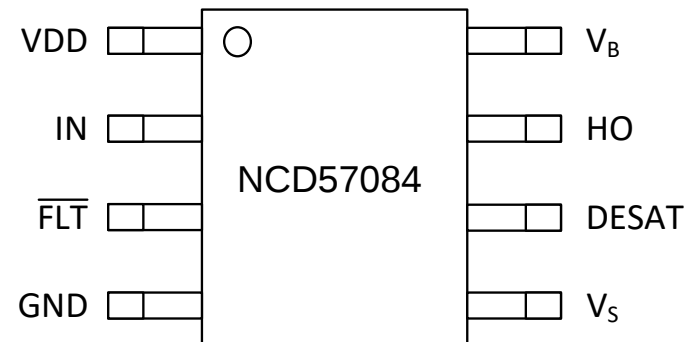
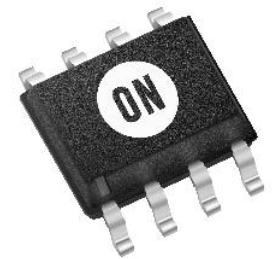
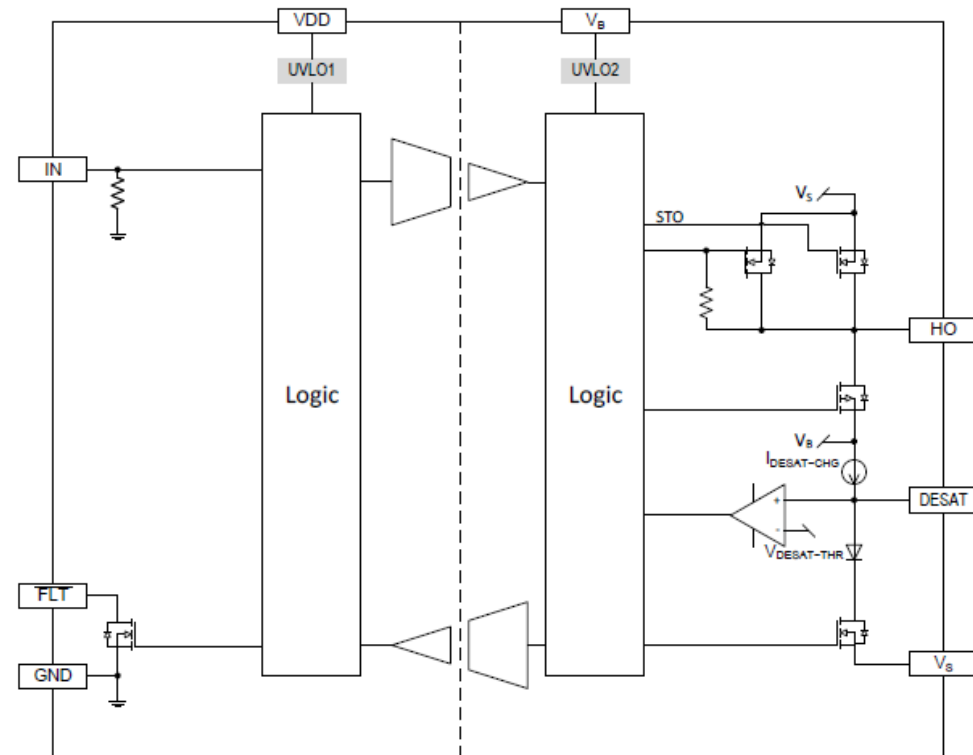
- High current (4.0 A/6.0 A src/snk) at Miller Plateau Voltage
- Galvanic Isolation up to 2.5 kV
- CMTI > 100kV/us @ 1500V
- Typical 60ns propagation delays
- DESAT/CS with FLT
- Tight UVLO for IGBT safety

Market & Applications

HVAC, IH, Motor Drives, UPS
EV chargers, Automotive Power Supplies

Packages/Options

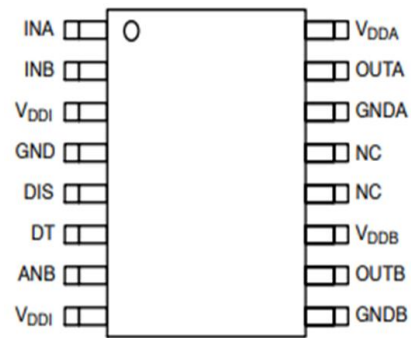
SOIC-8 Narrow Body



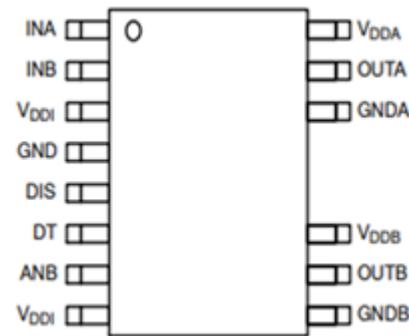
Isolated 2-Channel Gated Drivers

OPN	Key Feature(s)	Package Type	UVLO (V)	T _{PD} (ns)	Samples	RTM Status	Demo Board
IGBT Gate Drivers							
NCD(V)57200	Half-Bridge with deadtime & interlocks	SOIC-8 Narrow	11.0 to 12.0	90 ns	Available	Production	Available
NCD(V)57201	Half-Bridge with two independent inputs	SOIC-8 Narrow	11.0 to 12.0	90 ns	Available	Production	Available
NCD(V)57252	Two-Channel Output IGBT Driver	SOIC-16 Wide	11.5 to 12.5	60 ns	Available	Production	Available
NCD(V)57255	Two-Channel Output IGBT Driver	SOIC-16 Narrow	11.5 to 12.5	60 ns	Available	Production	Available
MOSFET Gate Drivers							
NCP51561A/B	Two-Channel Output MOS Driver	SOIC-16 Wide	5.7 or 8.2	36 ns	Available	Production	Available
NCV51561A/B	Two-Channel Output MOS Driver	SOIC-16 Wide	5.7 or 8.2	36 ns	Available	Production	Available
NCP(V)51563A/B	Two-Channel MOS Driver with high creepage	SOIC-14 Wide	5.7 or 8.2	36 ns	Available	Q1-2023	Available
NCP51562A/B	Two-Channel Output MOS Driver	SOIC-16NB/LGA13	5.7 or 8.2	36 ns	Q1-2024	Q4-2024	Q1-2024
NCP51560AB/BB	Two-Channel Output MOS Driver pin#7 NC	SOIC-16 Wide	5.7 or 8.2	38 ns	Available	Production	Available
SiC Gate Drivers							
NCP51561C/D	Two-Channel Output SiC Driver	SOIC-16 Wide	13 or 17	36 ns	Available	Production	Available
NCV51561C/D	Two-Channel Output SiC Driver	SOIC-16 Wide	13 or 17	36 ns	Available	Production	Available
NCP(V)51563C/D	Two-Channel SiC Driver with high creepage	SOIC-14 Wide	13 or 17	36 ns	Available	Production	Available
NCP51560CB/DB	Two-Channel Output MOS Driver pin#7 NC	SOIC-16 Wide	13 or 17	38 ns	On Demand	On Demand	Available

*T_{PD} (ns, Out-H Typ @ 25C)

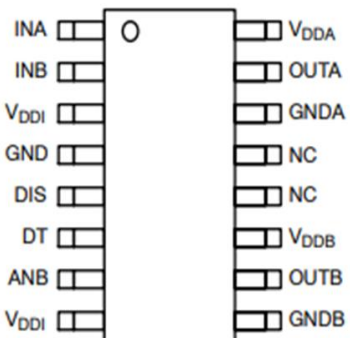


SOIC 16 Wide



SOIC 14 Wide

Length x Width	
10.3 x 7.5 mm	9.9 x 6.0 mm
VIORM (Max Working Insulation Voltage)	
1200 V _{PK}	1200 V _{PK}
VIOTM (Max Allowable Over Voltage)	
8400 V _{PK}	4200 V _{PK}
Creepage & Clearance	
8 mm	4 mm

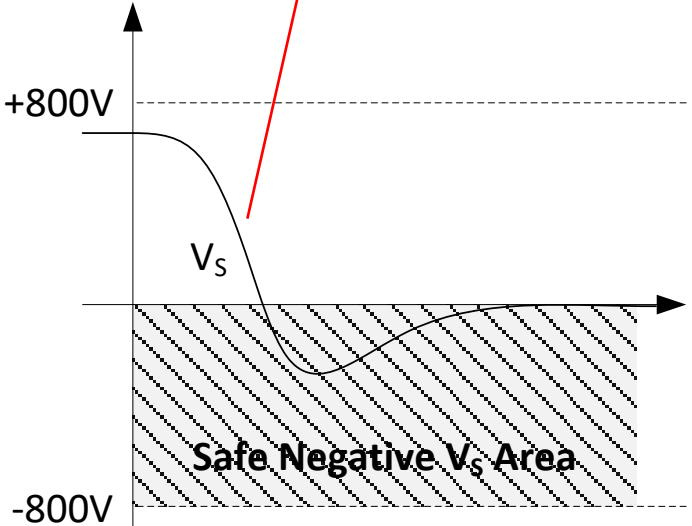
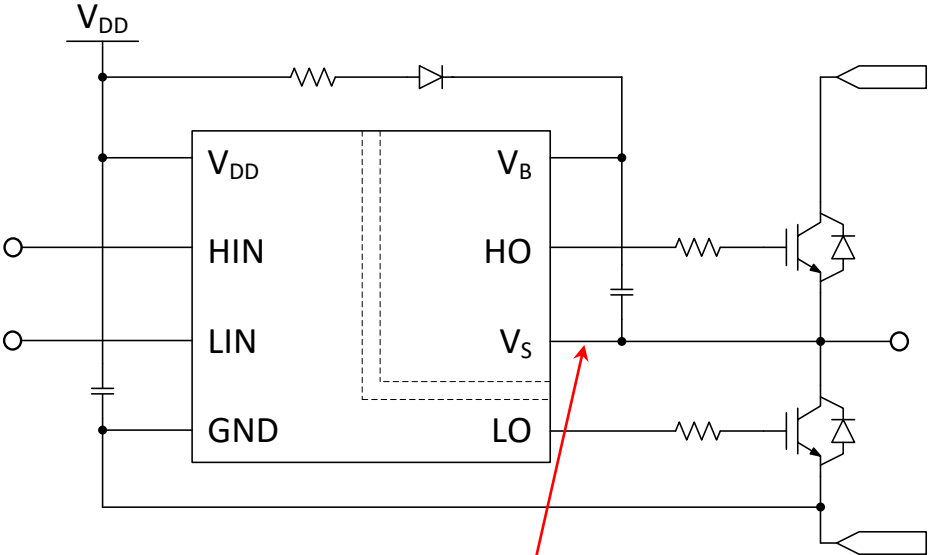


SOIC 16 Narrow

NCD(V)57200/01/02 Half Bridge Gate Driver

Features

- High current +/- 2 APK
- DC bus operation up to +800V
- **Immunity to negative V_s stress**
- 3.3V/5V/15V logic input
- 100kV/us CMTI
- Asymmetric UVLO protection for both channels
- V_{cc}/V_B up to 25V
- Output in phase with input signals



Applied Topologies

- Bi – Directional Boost
- LLC
- Full & Half Bridges

Packages/Options

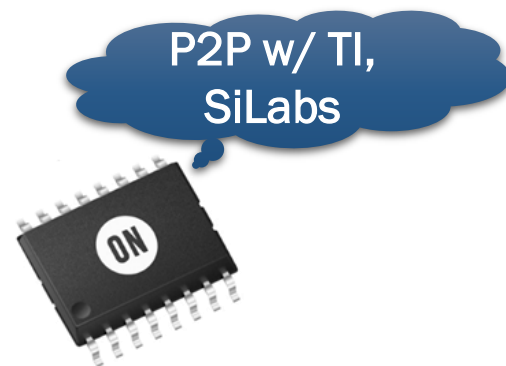
- SOIC-8 Narrow Body or die sale for the IPM version

	Interlock	Dead time	Input Filter Time
NCD(V)57200	Yes	300ns	20ns
NCD(V)57201	No, Independent Channels	No	20ns
NCD(V)W57202	Yes	1000ns	600ns ON & 400ns OFF

NCD(V)57252 Dual Channel Isolated Gate Driver

Features

- High current (4.0 A/6.0 A src/snk) at Miller Plateau Voltage
- Galvanic Isolation up to 5 kV
- CMTI > 100kV/us @ 1500V
- Typical 60ns propagation delays
- Tight UVLO for IGBT safety
- 3.3V, 5V, and 15V Logic inputs
- Configurable for Dual Low-side, Dual high-side or Half-

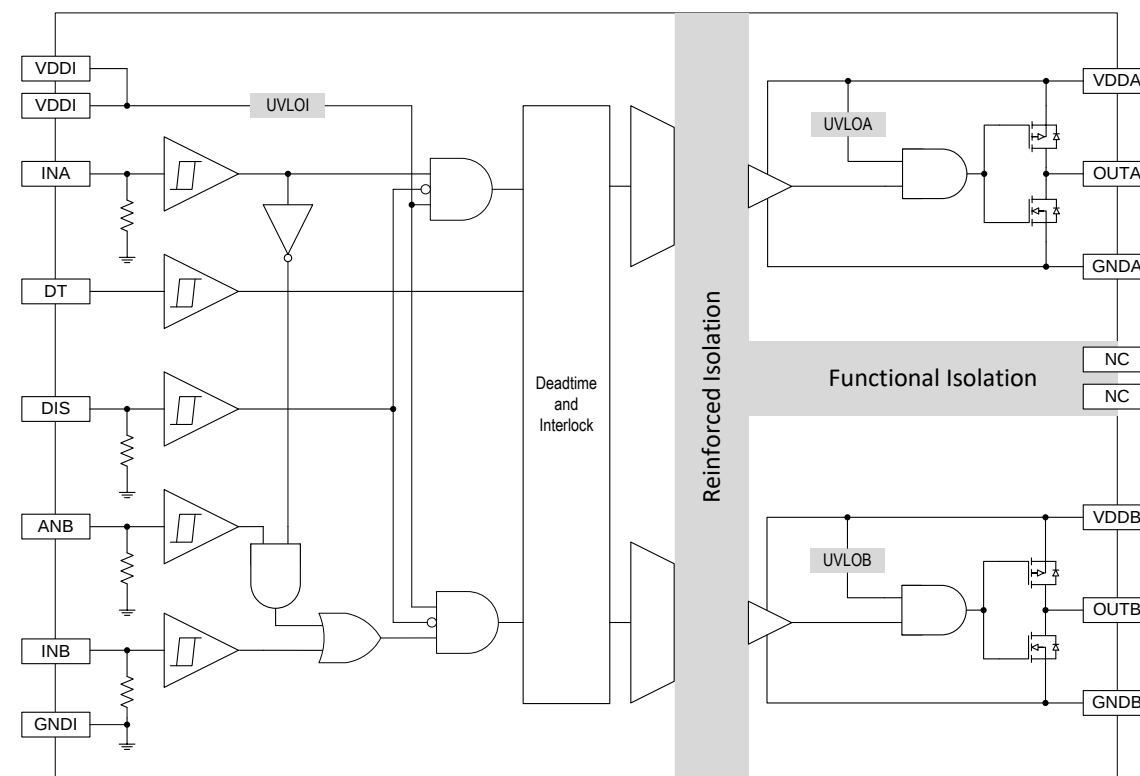
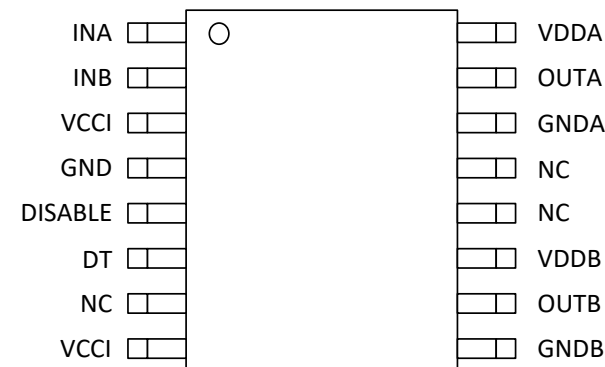


Market & Applications

OBC, EV Chargers, Solar Inverters, Motor Drives, UPS, Automotive power supplies,

Packages/Options

SOIC-16 Wide Body



NCD(V)57255 Dual Channel Isolated Gate Driver

Sampling
Now
RTM
Q2'2021

Features

- High current, +/- 4.0 Apk src/snk
- Galvanic Isolation up to 3 kV
- CMTI 100kV/us @ 1500V
- Typical 60ns propagation delays
- Tight UVLO for IGBT safety
- 3.3V, 5V, and 15V Logic inputs
- Configurable for Dual Low-side, Dual high-side or Half-



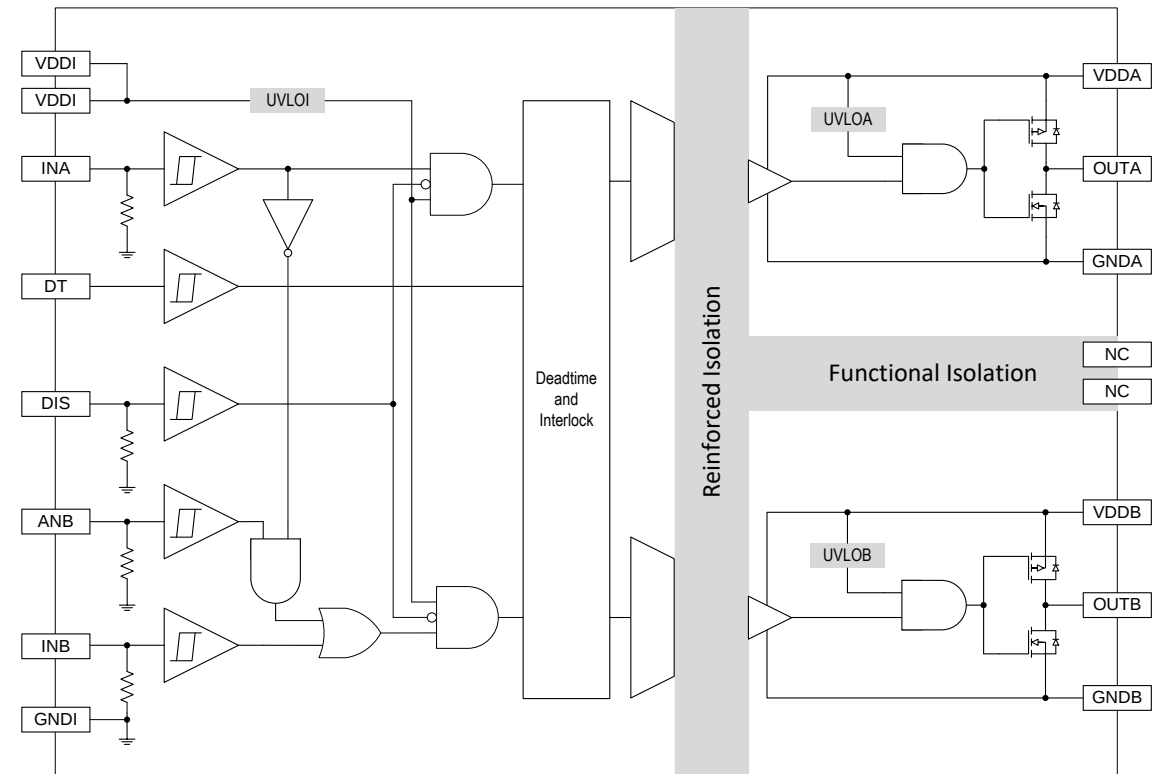
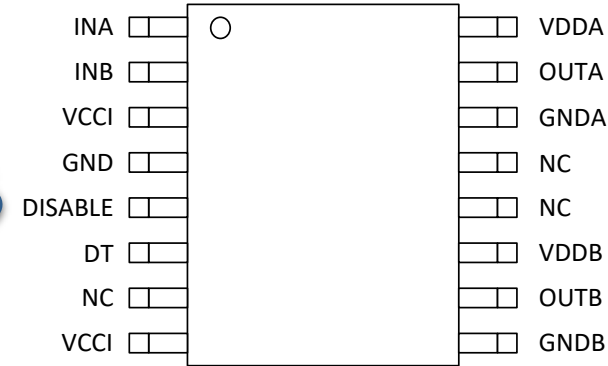
P2P w/ ADI,
TI, SiLabs

Market & Applications

OBC, EV chargers, Automotive power supplies
Motor Drives, UPS

Packages/Options

SOIC-16 Narrow Body

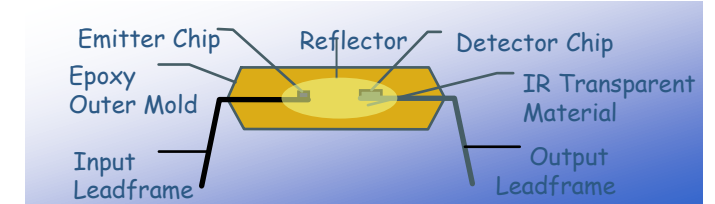
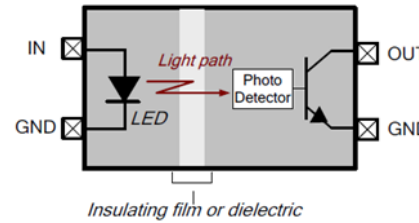


Digital Isolators

Common Isolation Techniques and Main Issues

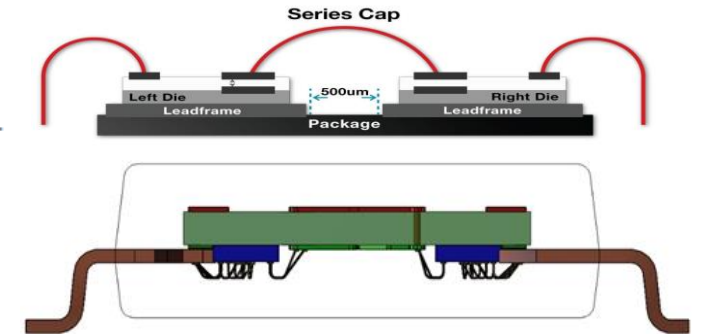
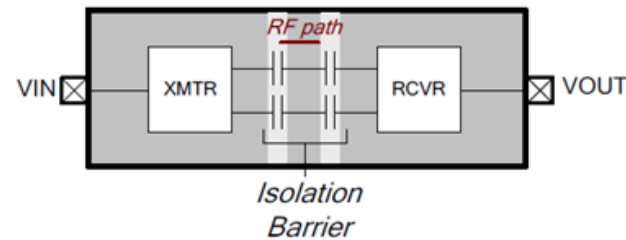
Optical -> Optical transmission (fiber optics), optical coupling (optocoupler)

- LED degradation over time/temperature
- Slow (<25Mbit/s)
- Not economical for high-channel count



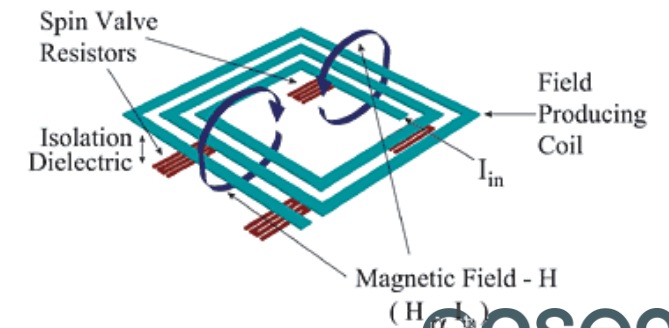
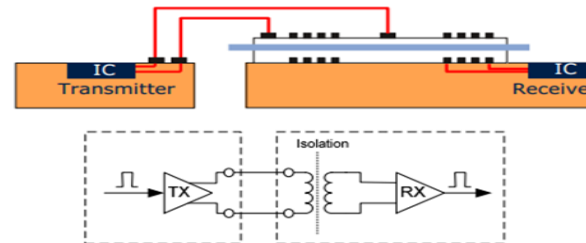
Capacitive (on-chip/off-chip)

- Thin insulation barrier (on-chip)
- Insulating materials susceptible to damage from EOS/ESD (on-chip)
- Higher power consumption (off-chip)
- EMI/EMC challenges



Magnetic -> Coreless transformer, magneto resistive, hall effect

- Magnetic interference
- EMI susceptibility
- Thin insulation barrier



Comparison of Isolation Techniques

Attribute		Opto-Coupler	On-chip Magnetic	On-chip Capacitive	Digi-Max™ Off-chip Capacitive
Isolation Materials		Epoxy/Silicone gel	Polyimide	SiO ₂ or equivalent	Ceramic Substrate/ Epoxy
Signal Coupling		Optical (LED +diode)	Magnetic field	Electric field	Electric field
Performance Across Temp & Time		Varies	Consistent	Consistent	Consistent
Life Expectancy		~10 Yrs	~ 20 Yrs	~ 20 Years	~20 Years
Speed		Slow	Fast	Fast	Fast
Distance Through Insulation (DTI)		> 400 µm	~20 µm	~20 µm	> 500 µm
Meets EN60950 >0.4mm DTI		Yes	No	No	Yes
Common Mode Transient Immunity (CMTI)		~25 kV/µs	> 100 kV/µs	> 100 kV/µs	> 100 kV/µs
EMI EMC	Susceptibility	Non-issue – too slow	Design techniques	Signal level dependent	Signal level dependent
	Radiation	Non-issue (light transmission)	Design techniques	Design techniques	Design techniques
Junction Temperature		Up to 125°C	Wide range (150 °C)	Wide range (150 °C)	Wide range (150 °C)
Standards		UL1577 IEC60747-5-5	UL1577 VDE0884-11	UL1577 VDE0884-11	UL1577 VDE0884-11
Modulation Method for Internal Signal Xfer		No modulation required	On-Off Keying	On-Off Keying	On-Off Keying
AEC Qualified Portfolio		Limited	Yes	Yes	Yes

Description:

- Full Duplex Communications
- Low Power Consumption
- 150 KV/ μ s Minimum Common Mode Rejections
- High Speed:
 - 75 Mbit/s Data Rate (NRZ)
 - 18 ns Maximum Propagation Delay
 - 10 ns Maximum Pulse Width Distortion
 - 4 ns Maximum Propagation Delay Skew
- 2.5 V to 5 V Level Translation
- Extended Industrial Temperature Range: -40°C to 125°C
- Safety and Regulatory Approvals
 - UL1577 (5,000K VRM for 1 Minute)
 - DIN 0884-11 (pending)

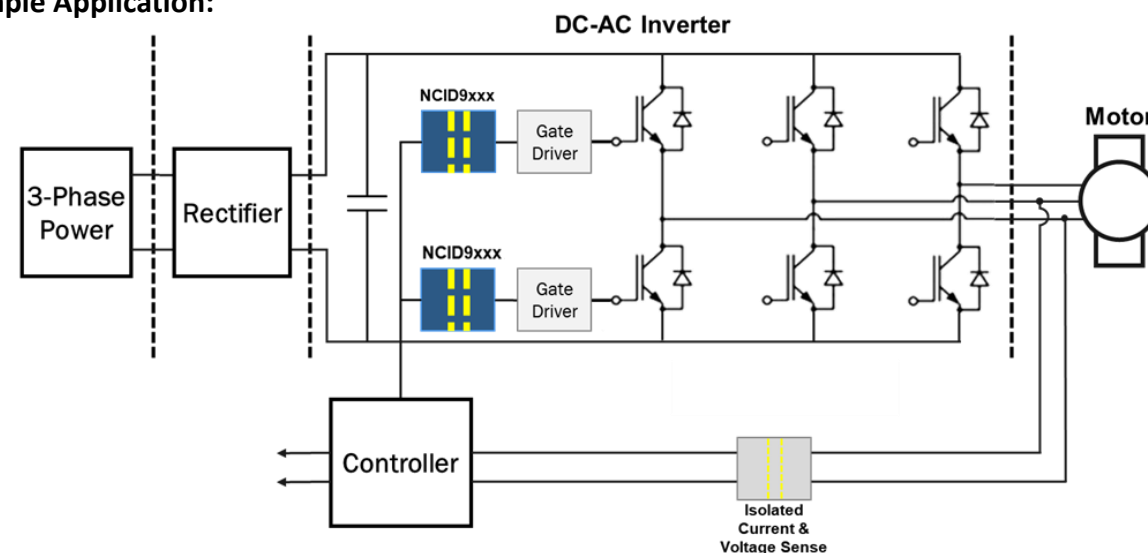
Applications:

- Isolated PWM Control
- Industrial Field-bus Communications
- Microprocessor System Interface
- SPI
- Programmable Logic Control
- Isolated Data Acquisition System
- Voltage Level Translator

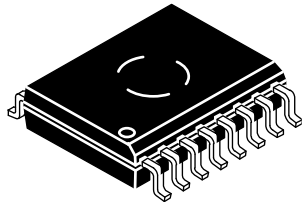
Benefits:

- Off-Chip Capacitive Isolation vs. On-Chip Capacitive or Electro-Magnetic Isolation
 - Distance Through Insulation (DTI): 500um (Off-Chip) vs. 20um (On Chip / Magnetic)
 - Meets EN60950 >0.4mm DTI requirement
 - Double Protection Status for UL1577 Approvals (vs. Basic Protection for On-Chip & Magnetic)
 - Better Long Term Reliability (500 hrs+ on sustained 5.5kVACrms)
- Off-Chip Capacitive Digital Isolation vs. Opto Couplers
 - Higher Data Rates: Up to 100 Mbps vs. 25 Mbps
 - CMTI (Common Mode Transient Immunity): 150 kV/us Minimum vs. 25 kV/us
 - Higher Max Channel Count: Up to 6-Channels per device vs. 1 or 2

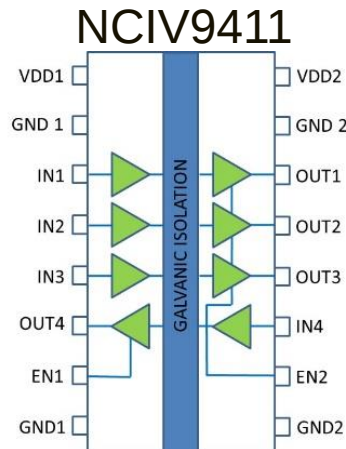
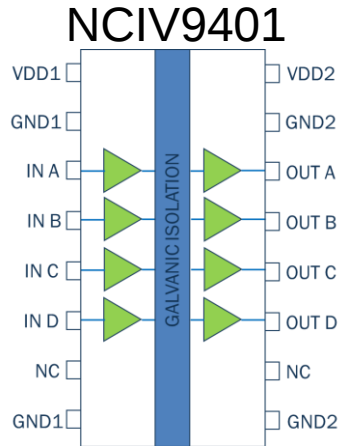
Example Application:



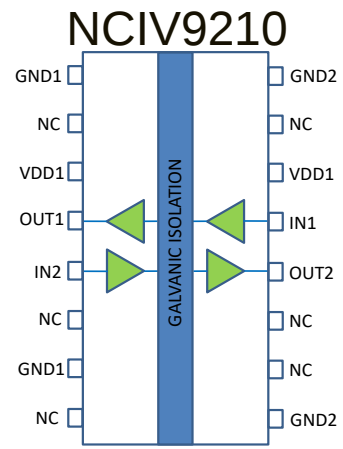
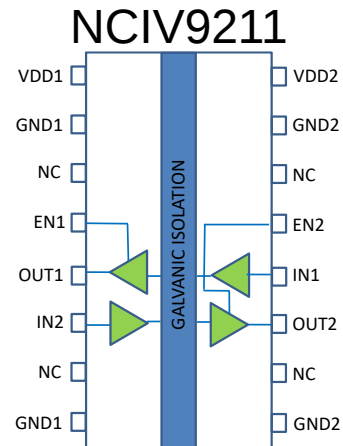
Digi-Max™ Family of Hi-Speed Digital Logic-to-Logic Isolators



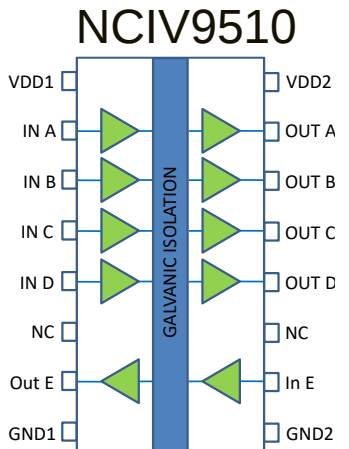
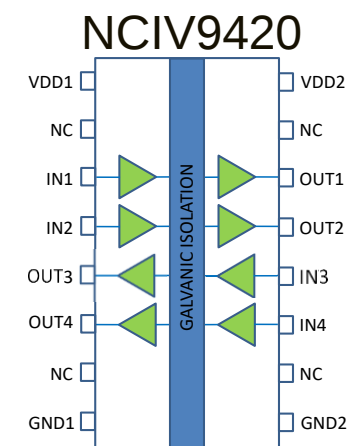
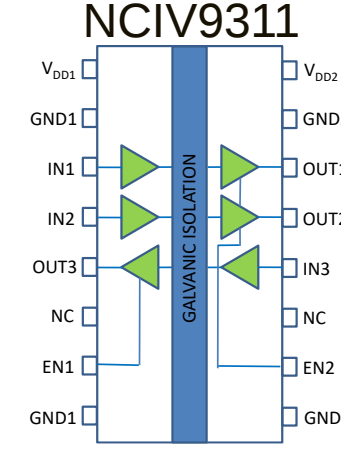
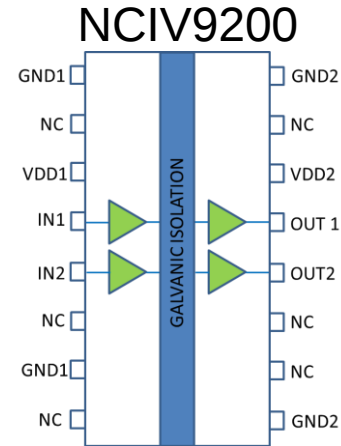
SO-16 WB
Package



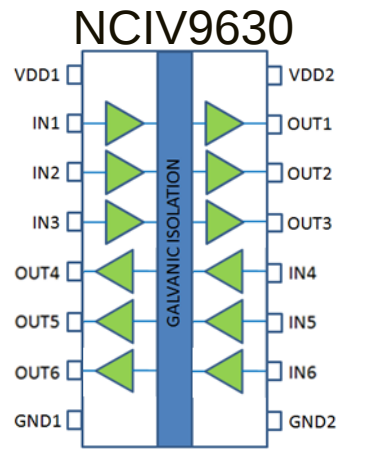
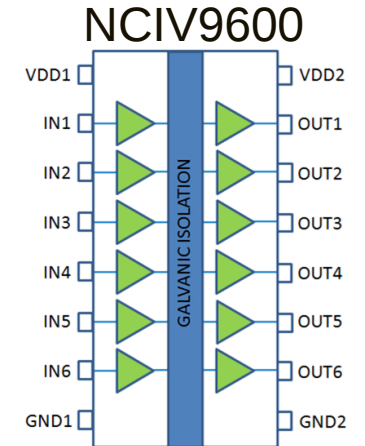
2021



2021 - 2022



2023



- Other Configurations Available

EEPROMs

High Performance EEPROM Overview

Densities

2 Kb

4 Kb

8 Kb

16 Kb

32 Kb

64 Kb

128 Kb

256 Kb

512 Kb

1 Mb

2 Mb*

4 Mb*

Endurance and Retention

- 4 million Write Cycles Endurance
- Up to 200 Years of Data Retention

Operating Temperature



- True Automotive Grade 0 to 150 °C
- Extended Industrial range from -40 °C to 125 °C

Supply Voltage

- 1.1 V to 5.5 V Consumer
- 1.7 V to 5.5 V Industrial & Automotive

Interface

- 2-wire interface saves space on your board
- 4-wire interface provide speeds up to 20 MHz
- RF and NFC interfaces provide wireless access



Packages



SOIC 8



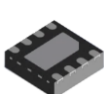
TSSOP 8



US 8



TSOT 23



UDFN 8 (WF)



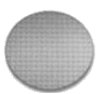
WLCSP 8



WLCSP 6



WLCSP 4/5



Wafer

Automotive EEPROM Focus

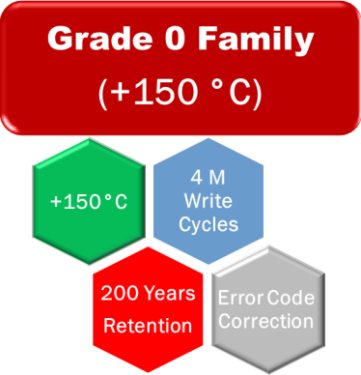
Improved EEPROM Cell

SPI Grade 0 Family

- NV25010 - NV25640

Low Vcc Grade 1 (+125°C)

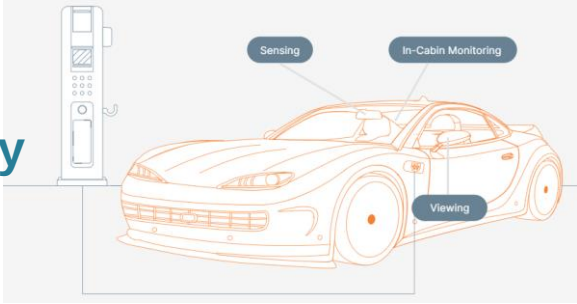
- NV25xxxLV



Lower Vcc EEPROM

Low Vcc Grade 1 Family

- NV24CxxLV, NV25xxxLV



Smaller Footprint

Wettable Flank UDNF-8 Family

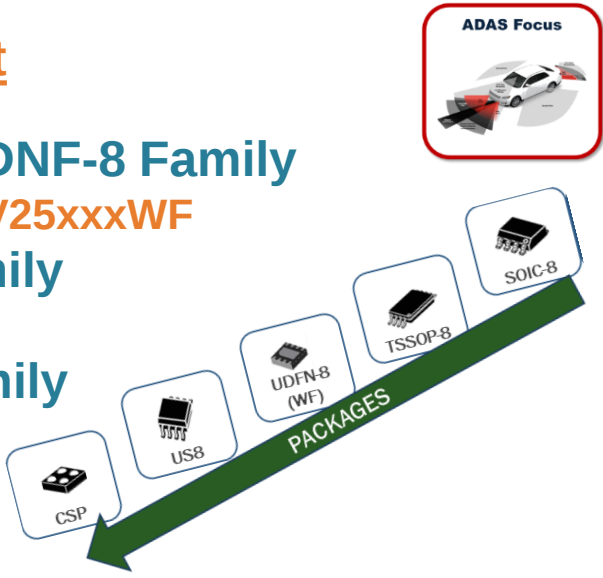
- NV24CxxLWF, NV25xxxWF

US8 Package Family

- N24C02 - N24C64

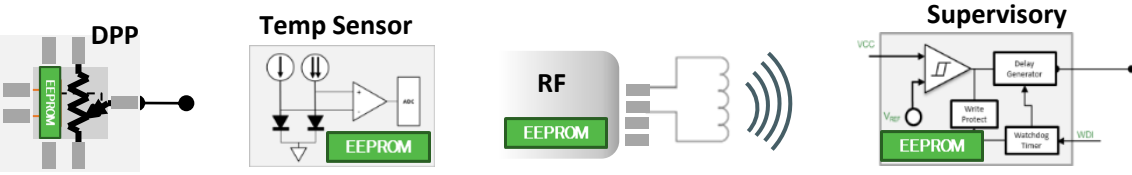
CSP Package Family

- CAV24CxxC4

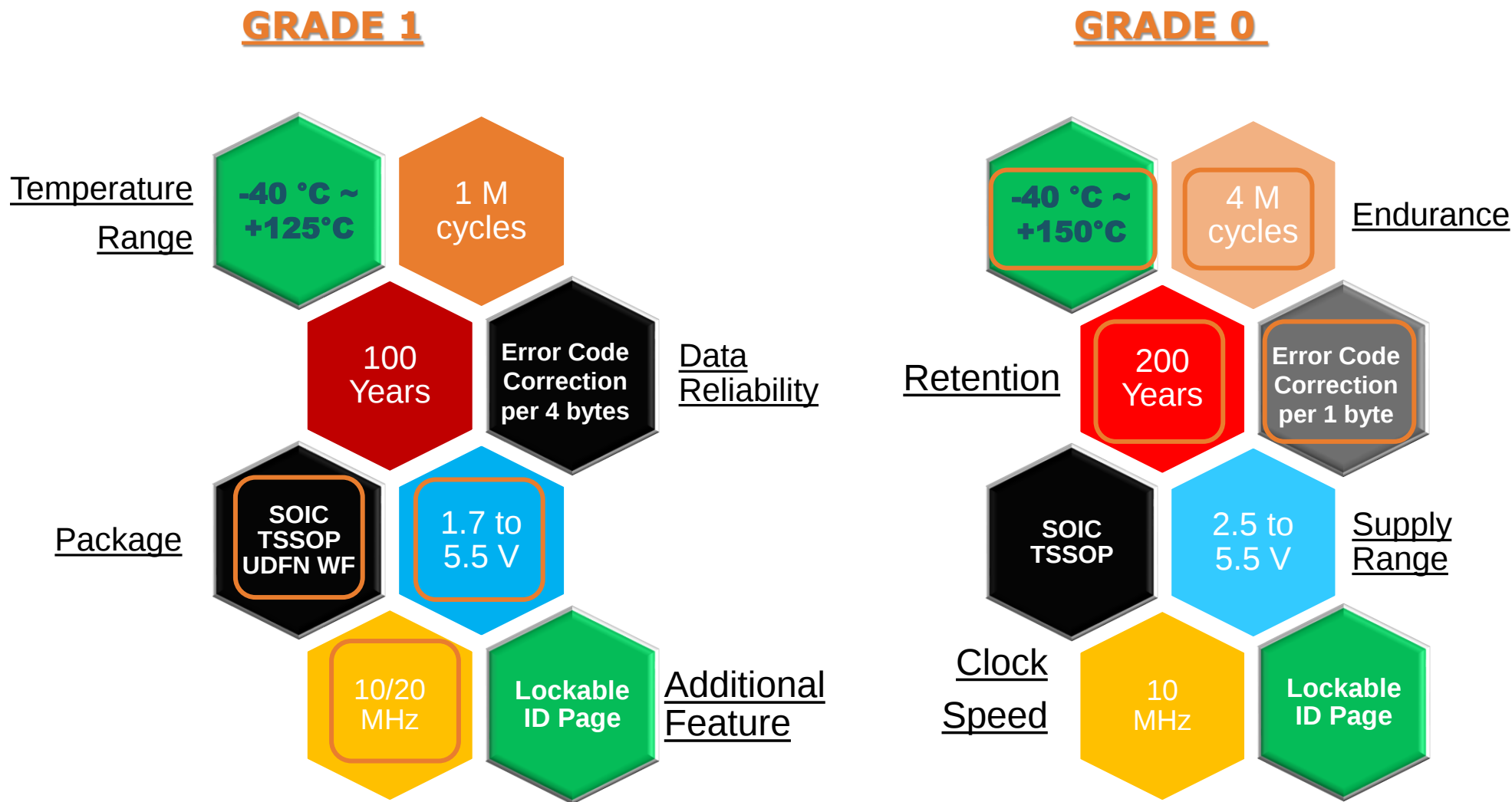


Automotive EEPROM Plus (upcoming)

- EEPROM plus other functionality in same chip
- Exist for Industrial, can qualify for Automotive

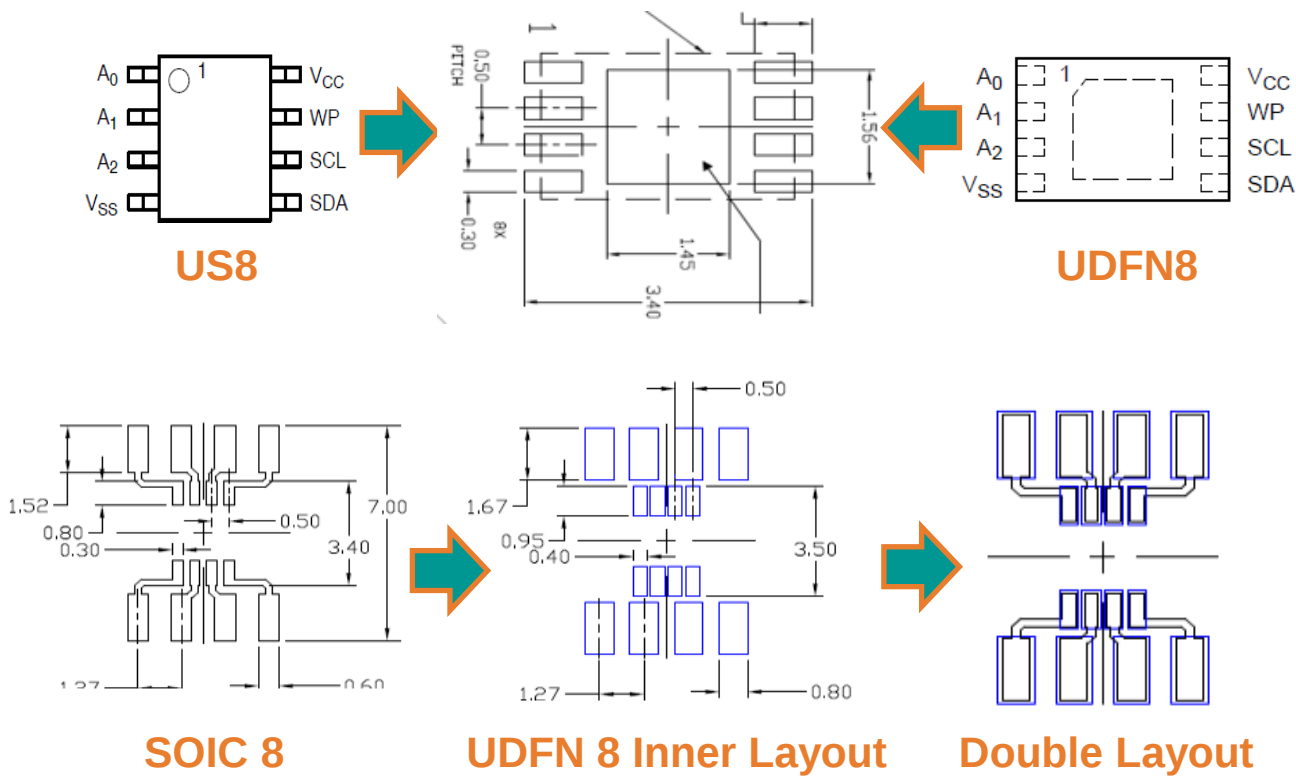


Automotive Grade 0 & 1 EEPROM Comparison



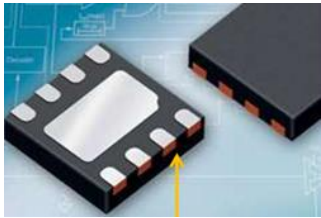
Small – Size Package Advantages

Package	Leaded	Small Size	AOI Support	AEC Q100	Wettable Flank	Footprint Compatibility
US 8	√	√ (2.0x2.3mm)	√	√		√ (uDFN 8, SOIC 8)
TSOP 5	√	√ (1.5 x 3.0mm)	√	√		√ (SOT 23)
UDFN8 WF		√ (2.0x3.0mm)	√	√	√	√ (US 8, SOIC 8)

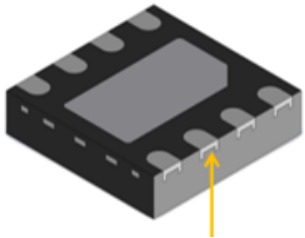


Wettable Flank

- ✓ 100% Sn Plated Leads
- ✓ Better Soldering & Connection
- ✓ Stronger Mold Lock for U-Shape Leads



Copper Sidewall



Wettable Flank

Automotive Grade 1 EEPROM Device List

Density	Interface	SOIC 8		TSSOP 8		uDFN 8		TSOP 5	WLCSP 4	US 8
2kb	I ² C	CAV24C02WE-GT3	—	CAV24C02YE-GT3	—	—	—	—	—	N24C02UVTG
4kb	I ² C	CAV24C04WE-GT3	NV24C04DWVLT3G	CAV24C04YE-GT3	NV24C04DTVLT3G	—	NV24C04MUW3V(L)TBG	—	—	N24C04UVTG
8kb	I ² C	CAV24C08WE-GT3	NV24C08DWVLT3G	CAV24C08YE-GT3	NV24C08DTVLT3G	—	NV24C08MUW3V(L)TBG	NV24C08SNVLT3G	CAV24C08C4CTR	N24C08UVTG
16kb	I ² C	CAV24C16WE-GT3	NV24C16DWVLT3G	CAV24C16YE-GT3	NV24C16DTVLT3G	—	NV24C16MUW3V(L)TBG	NV24C16SNVLT3G	CAV24C16C4CTR	N24C16UVTG
32kb	I ² C	CAV24C32WE-GT3	NV24C32DWVLT3G	CAV24C32YE-GT3	NV24C32DTVLT3G	—	NV24C32MUW3V(L)TBG	—	CAV24C32C4CTR	N24C32UVTG
64kb	I ² C	CAV24C64WE-GT3	NV24C64DWVLT3G	CAV24C64YE-GT3	NV24C64DTVLT3G	—	NV24C64MUW3V(L)TBG	—	CAV24C64C4CTR N24C64A4DXTG*	N24C64UVTG
128kb	I ² C	CAV24C128WE-GT3	—	CAV24C128YE-GT3	—	—	NV24C128MUW3VTBG	—	—	—
256kb	I ² C	CAV24C256WE-GT3	—	CAV24C256YE-GT3	—	—	NV24C256MUW3VTBG	—	—	—
512kb	I ² C	CAV24C512WE-GT3	—	CAV24C512YE-GT3	—	CAV24C512HU5E-GT3	NV24C512MUW3VTBG	—	—	—
1Mb	I ² C	CAV24M01WE-GT3	—	CAV24M01YE-GT3	—	—	NV24M01MUW3VTBG	—	—	—
1kb	SPI	CAV25010VE-GT3	NV25010DWVLT3G	CAV25010YE-GT3	NV25010DTVLT3G	—	NV25010MUW3VTBG	—	—	—
2kb	SPI	CAV25020VE-GT3	NV25020DWVLT3G	CAV25020YE-GT3	NV25020DTVLT3G	—	NV25020MUW3VTBG	—	—	—
4kb	SPI	CAV25040VE-GT3	NV25040DWVLT3G	CAV25040YE-GT3	NV25040DTVLT3G	—	NV25040MUW3VTBG	—	—	—
8kb	SPI	CAV25080VE-GT3	NV25080DWVLT3G	CAV25080YE-GT3	NV25080DTVLT3G	—	NV25080MUW3VTBG	—	—	—
16kb	SPI	CAV25160VE-GT3	NV25160DWVLT3G	CAV25160YE-GT3	NV25160DTVLT3G	—	NV25160MUW3VTBG	—	—	—
32kb	SPI	CAV25320VE-GT3	NV25320DWVLT3G	CAV25320YE-GT3	NV25320DTVLT3G	CAV25320VP2E-GT3	NV25320MUW3VTBG	—	—	—
64kb	SPI	CAV25640VE-GT3	NV25640DWVLT3G	CAV25640YE-GT3	NV25640DTVLT3G	CAV25640VP2E-GT3	NV25640MUW3VTBG	—	—	—
128kb	SPI	CAV25128VE-GT3	NV25128DWVLT3G	CAV25128YE-GT3	NV25128DTVLT3G	—	NV25128MUW3VTBG	—	—	—
256kb	SPI	CAV25256VE-GT3	NV25256DWVLT3G	CAV25256YE-GT3	NV25256DTVLT3G	—	NV25256MUW3VTBG	—	—	—
512kb	SPI	CAV25512VE-GT3	—	CAV25512YE-GT3	—	CAV25512HU5E-GT3	NV25512MUW3VTBG	—	—	—
1Mb	SPI	CAV25M01VE-GT3	NV25M01DWUTG	CAV25M01YE-GT3	NV25M01DTUTG	—	NV93C46BMUW3VTBG	—	—	—
1kb	μWire	CAV93C46VE-GT3	—	CAV93C46YE-GT3	—	—	—	—	—	—
2kb	μWire	CAV93C56VE-GT3	—	CAV93C56YE-GT3	—	—	—	—	—	—
4kb	μWire	CAV93C66VE-GT3	—	CAV93C66YE-GT3	—	—	NV93C76BMUW3VTBG	—	—	—
8kb	μWire	CAV93C76VE-GT3	—	CAV93C76YE-GT3	—	—	NV93C86BMUW3VTBG	—	—	—
16kb	μWire	CAV93C86VE-GT3	—	CAV93C86YE-GT3	—	—	—	—	—	—

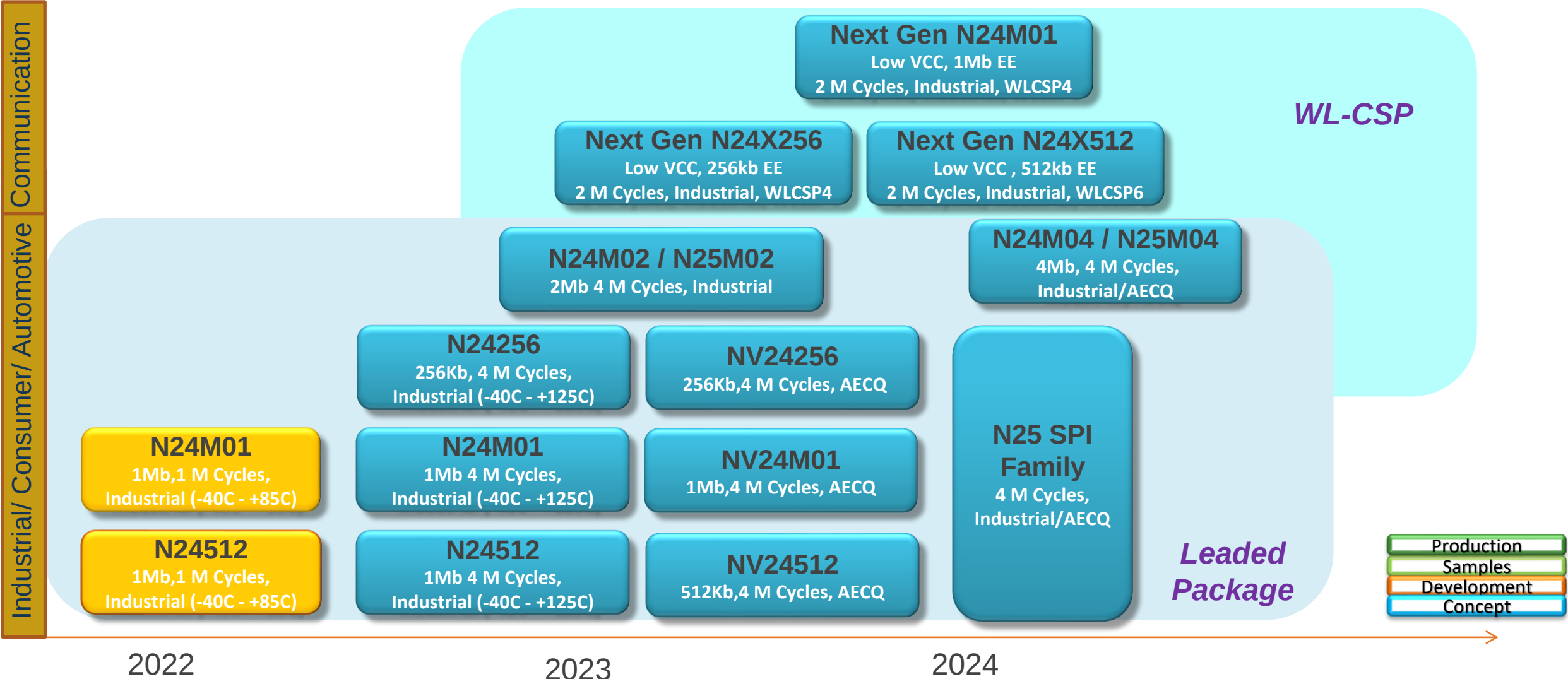
Automotive Grade 0 EEPROM Device List

Density	Interface	SOIC 8	TSSOP 8
1 kb	SPI	NV25010DWHFT3G	NV25010DTHFT3G
2 kb	SPI	NV25020DWHFT3G	NV25020DTHFT3G
4 kb	SPI	NV25040DWHFT3G	NV25040DTHFT3G
8 kb	SPI	NV25080DWHFT3G	NV25080DTHFT3G
16 kb	SPI	NV25160DWHFT3G	NV25160DTHFT3G
32 kb	SPI	NV25320DWHFT3G	NV25320DTHFT3G
64 kb	SPI	NV25640DWHFT3G	NV25640DTHFT3G
128 kb	SPI	NV25128DWHFT3G	NV25128DTHFT3G
256 kb	SPI	NV25256DWHFT3G	NV25256DTHFT3G

Quick Competitive Analysis

Brand	Part Number	Operating Temp.	Supply Voltage	Endurance (cycles)	Retention (years)	Standby Current	Read Current	Write Current
onsemi	NV25640	-40 to +150 °C	2.5 – 5.5 V	4 M	200	10 uA	3 mA	2 mA
Other	M95640	-40 to +145 °C	2.5 – 5.5 V	4 M	100	40 uA	4 mA	2 mA

Serial EEPROM Roadmap





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