

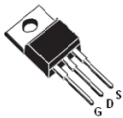
600VN-Channel Super Junction powerMOSFET

DESCRIPTION

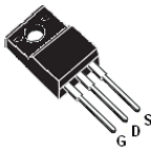
SJ MOSFET is an advanced technology for high voltage powerMOSFETs, designed according to the superjunction principle by P&S. The offered devices provide all benefits of a fast switching and low on resistance, making it especially suitable for applications which require more efficient, more compact, lighter, High Performance Adapter etc.

V_{DS}	600	V
$R_{DS(ON)}$	90	mΩ
I_D	40	A

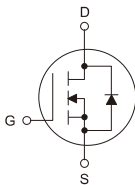
TO-220



TO-220F



TO-247



Features

- Extremely low losses due to very low $R_{dson} \cdot Q_g$
- Superior Avalanche Rugged Technology
- Fast switching capability
- 100% Avalanche Tested
- Pb-free lead plating; ROHS compliant

APPLICATIONS

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- High Performance Adapter
- LED Lighting Power

ORDERING INFORMATION

Temperature Range	Package		Orderable Device	Package Qty.
-55°C ~ +125°C	TO-220	Pb-Free	CWS60R90AC	50 PCS/Tube
	TO-220F		CWS60R90AF	50 PCS/Tube
	TO-247		CWS60R90AZ	30 PCS/Tube



ABSOLUTE MAXIMUM RATINGS(T_j=25°C, unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V _{GS} =0V)	V _{DSS}	600	V
Gate-Source Voltage (V _{DS} =0V, static)	V _{GS}	±30	V
Continuous Drain Current(T _C =25 °C)(Note1)	I _{D(DC)}	40	A
Continuous Drain Current(T _C =100 °C)(Note1)	I _{D(DC)}	25	A
Pulsed Drain Current(Note2)	I _{DM}	110	A
MOSFET dv/dt ruggedness, V _{DS} ≤480 V	dv/dt	50	V/nS
Single Pulsed Avalanche Energy(Note3)	E _{AS}	1200	mJ
Avalanche Energy, Repetitive(Note1)	E _{AR}	2.8	mJ
Avalanche Current, Repetitive(Note1)	I _{AS}	16	A
Maximum Power Dissipation (T _C =25 °C)	P _D	TO-220: 219 TO-220F: 34 TO-247: 219	W
Operating, Storage Temperature Range	T _J , T _{STG}	-55~150	°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Units
Thermal Resistance, Junction-to-Case	R _{thJC}	-	-	TO-220: 0.57 TO-220F: 3.65 TO-247: 0.57	°C /W
Thermal Resistance, Junction-to-Ambient	R _{thJA}	-	-	TO-220: 62 TO-220F: 80 TO-247: 62	°C /W

ELECTRICAL CHARACTERISTICS(T_j =25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	TYP.	Max.	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	600	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V	-	-	1	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} , I _D =250μA	2.5	3.0	3.5	V
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A	-	0.075	0.09	Ω
Gate Resistance	R _g	F=1MHZ, open drain	-	5.6	-	Ω



Dynamic Characteristics(T_j = 25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input capacitance	C _{iss}	V _{DS} =100V, V _{GS} =0V, f=1MHz	-	2700	-	pF
Output capacitance	C _{oss}		-	115	-	
Reverse transfer capacitance	C _{rss}		-	4.3	-	
Turn-on delay Time	t _{d(on)}	V _{DD} =400V, I _D =20A R _G =3.3Ω, V _{GS} =10V	-	29	-	ns
Rise time	t _r		-	68		
Turn-off delay time	t _{d(off)}		-	97		
Fall time	t _f		-	58		

Gate charge characteristics(T_j = 25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Gate to Source Charge	Q _{gs}	V _{DD} =480V, I _D =20A V _{GS} =0 to 10V	-	14.3	-	nC
Gate to Drain Charge	Q _{gd}		-	21.4	-	
Gate Charge Total	Q _g		-	60.0	-	
Gate Plateau Voltage	V _{plateau}		-	6.4	-	V

Reverse diode characteristics(T_j = 25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Body Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _{SD} =20A	-	0.9	-	V
Reverse Recovery Time	t _{rr}	V _R =400V, I _F =20A dI _F /dt=100A/μs	-	495	-	nS
Reverse Recovery Charge	Q _{rr}		-	10.2	-	μC
Peak Reverse Recovery Current	I _{rrm}		-	29.9	-	A

Notes:

1. Limited by maximum junction temperature;
2. Pulse width limited by maximum junction temperature;
3. I_{AS} = 16A, V_{DD} = 50 V, R_G = 25 Ω, Starting T_j = 25°C.

Electrical Characteristics Diagrams

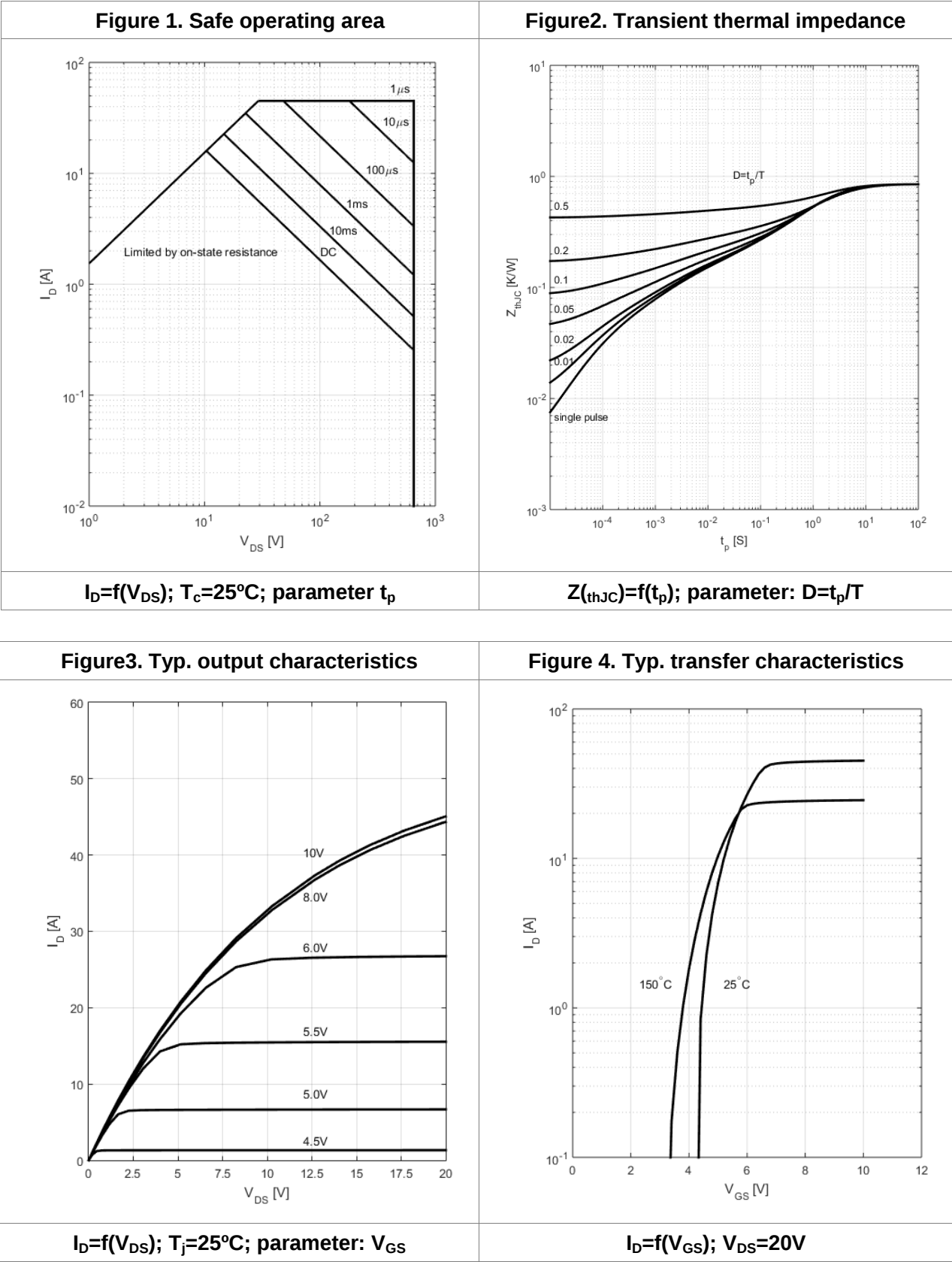
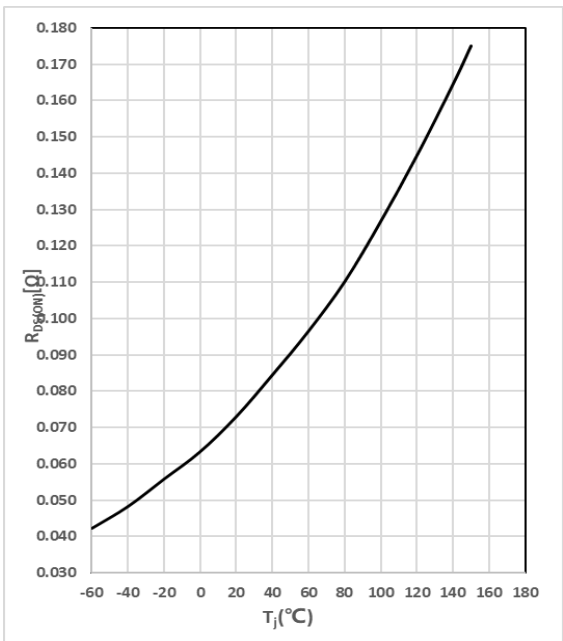
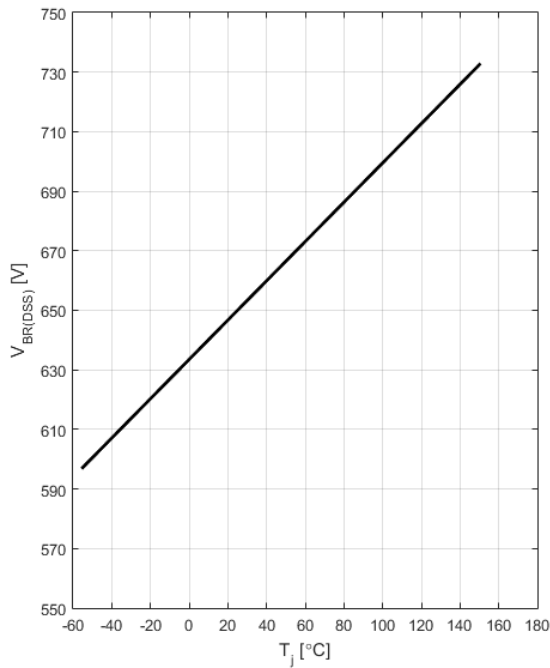


Figure5.Drain-source on-state resistance



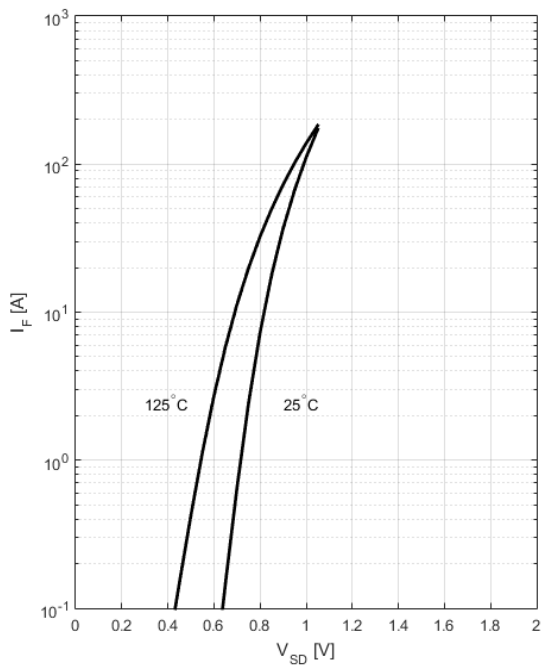
$R_{DS(ON)}=f(T_j); I_D=20A; V_{GS}=10V$

Figure6. Drain-source breakdown voltage



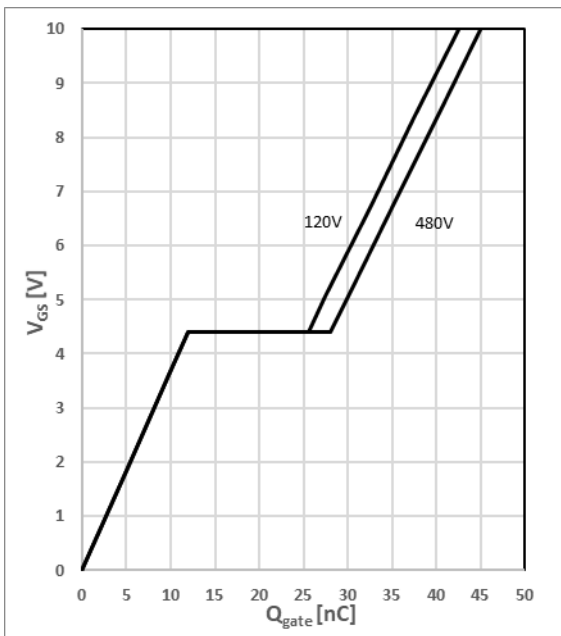
$V_{BR(DSS)}=f(T_j); I_D=10mA$

Figure7. Forward characteristics of reverse diode



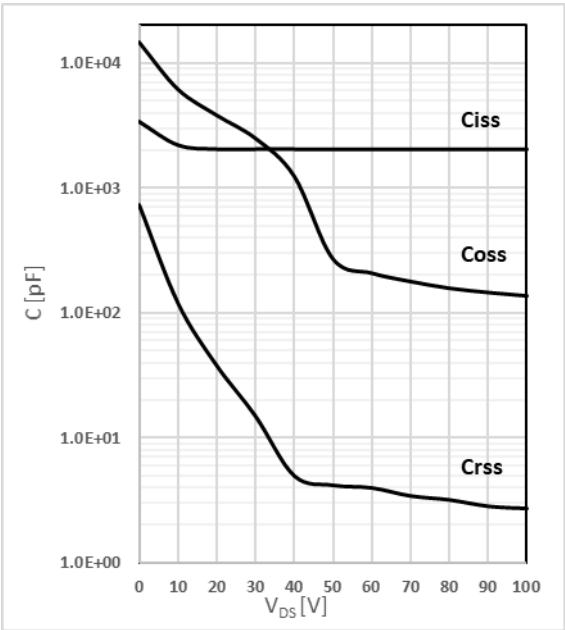
$I_F=f(V_{SD}); \text{parameter: } T_j$

Figure 8. Typ. gate charge



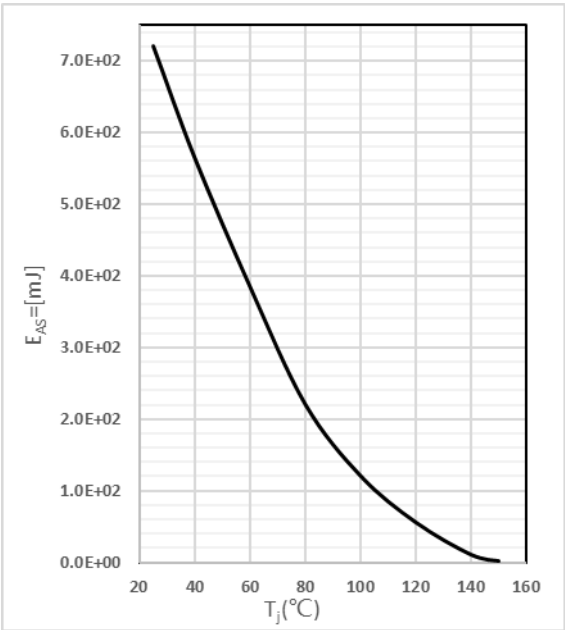
$V_{GS}=f(Q_{gate}), I_D=40A \text{ pulsed}$

Figure9: Typ. capacitances



$C=f(V_{DS}); V_{GS}=0; f=1\text{MHz}$

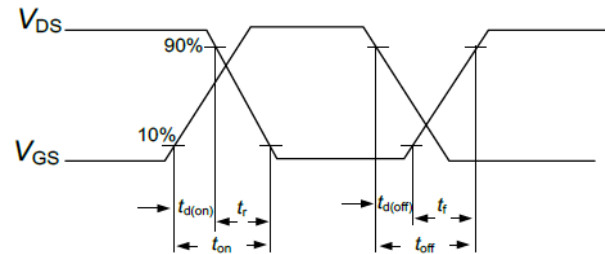
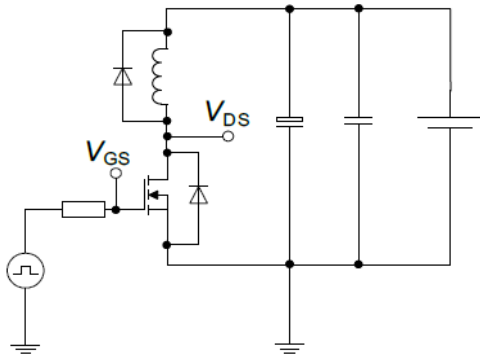
Figure10: Avalanche energy



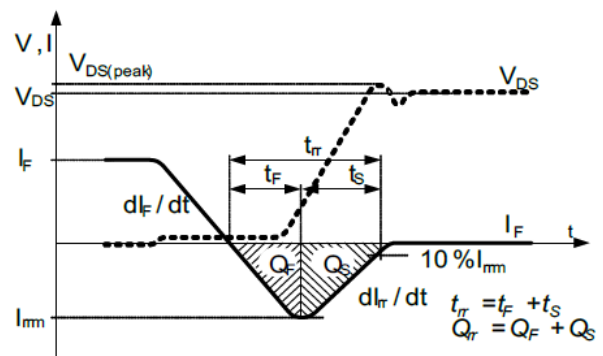
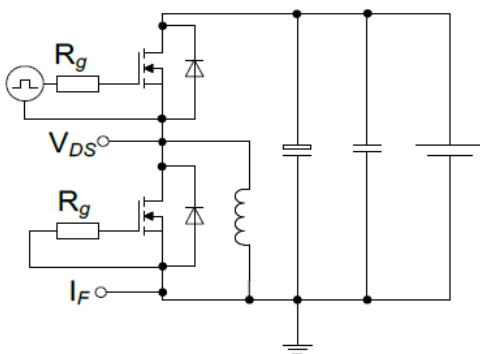
$E_{AS}=f(T_j); I_D=16\text{A}; V_{DD}=50\text{V}$

Test Circuits

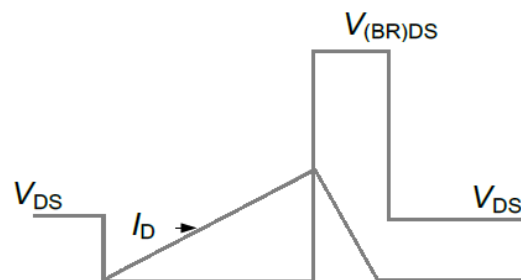
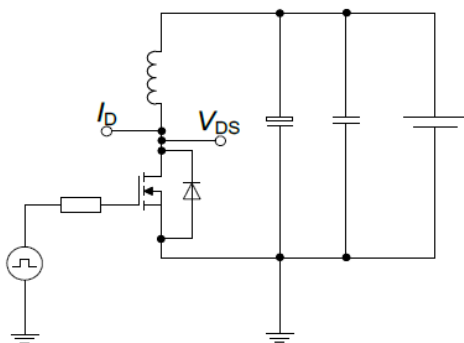
Switch time test circuit



Reverse diode characteristics test circuit and waveform

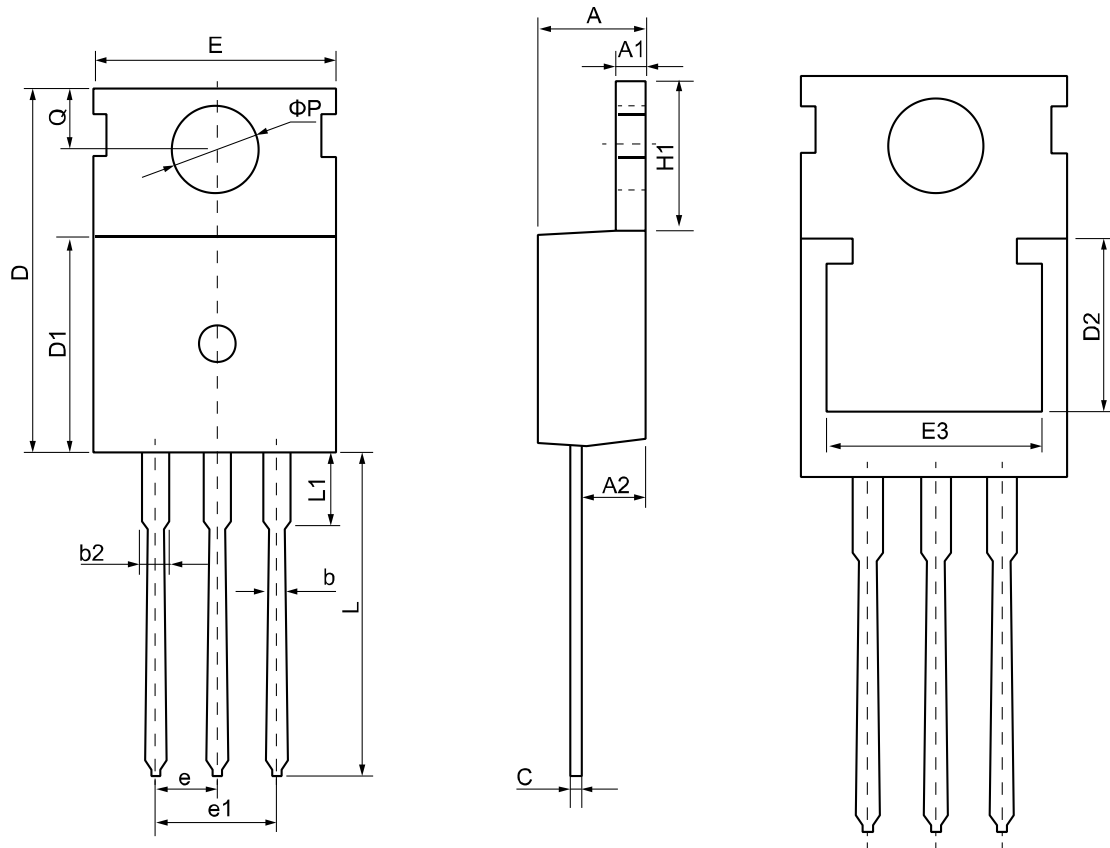


Unclaimed inductive switching test circuit & waveform



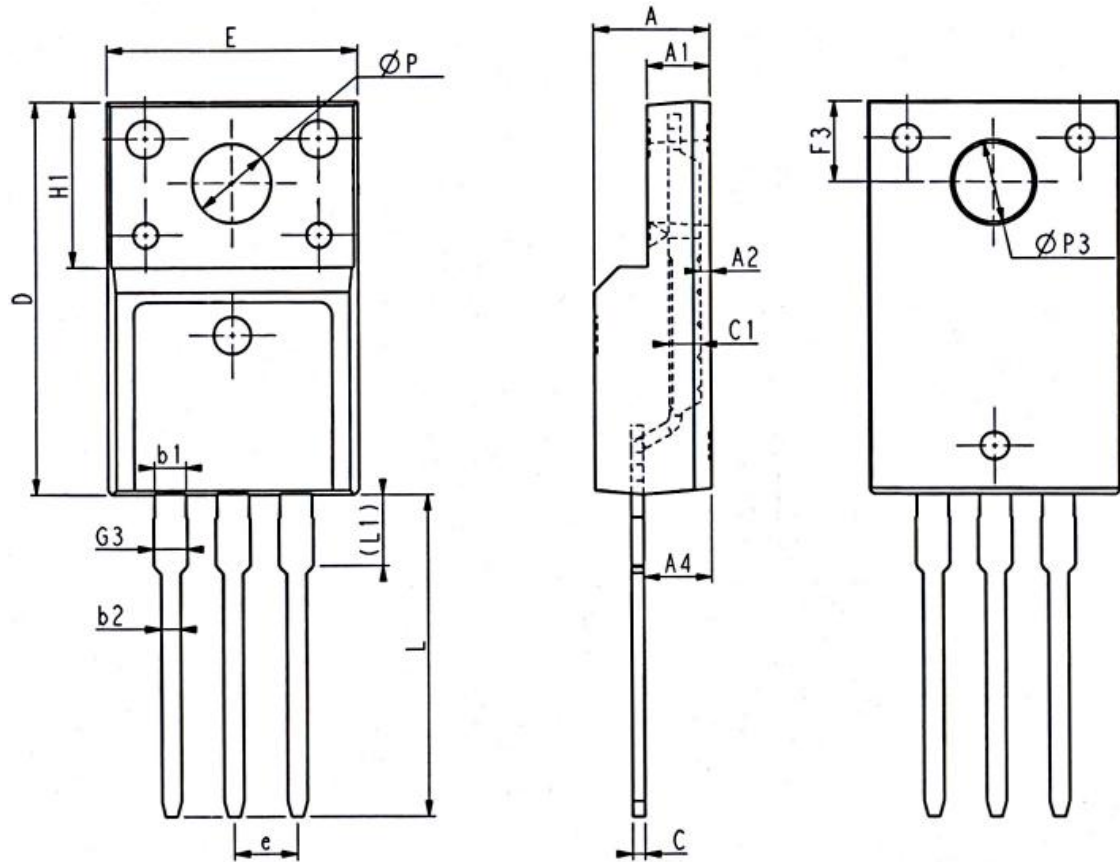
PHYSICAL DIMENSIONS

TO-220

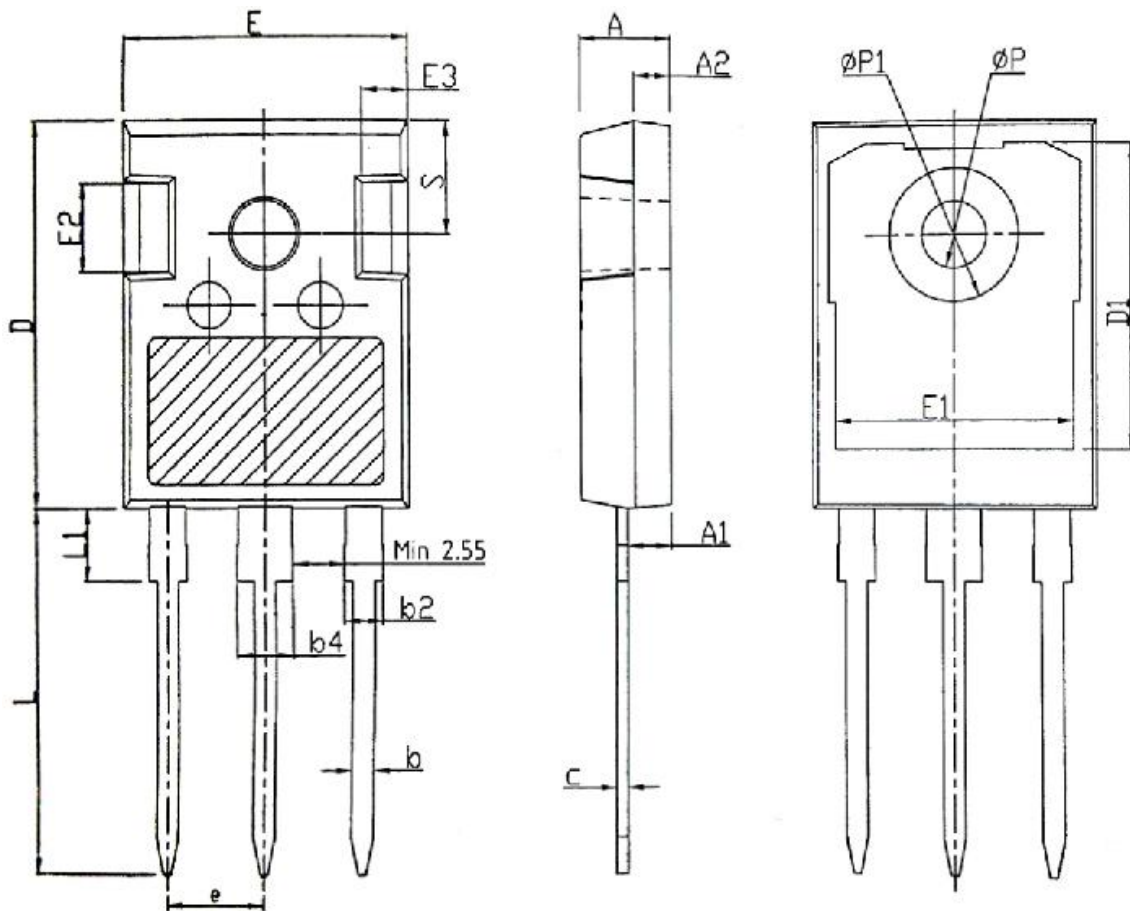


Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
A	4.37	4.57	4.77	E	9.80	10.00	10.20
A1	1.25	1.30	1.45	E3	7.00	-	-
A2	2.20	2.40	2.60	e	2.54(BSC)		
b	0.70	0.80	0.95	e1	5.08(BSC)		
b2	1.17	1.27	1.47	H1	6.30	6.50	6.80
c	0.40	0.50	0.65	L	12.75	13.50	13.80
D	15.30	15.60	15.90	L1	-	3.10	3.40
D1	8.90	9.10	9.30	ΦP	3.40	3.60	3.80
D2	5.50	-	-	Q	2.60	2.80	3.00

TO-220F



Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
E	9.96	10.16	10.36	e	2.54(BSC)		
A	4.50	4.70	4.90	L	12.68	12.98	13.28
A1	2.34	2.54	2.74	L1	2.93	3.03	3.13
A2	0.30	0.45	0.60	ØP	3.03	3.18	3.38
A4	2.56	2.76	2.96	ØP3	3.15	3.45	3.65
c	0.40	0.50	0.65	F3	3.15	3.30	3.45
c1	1.20	1.30	1.35	G3	1.25	1.35	1.55
D	15.57	15.87	16.17	b1	1.18	1.28	1.43
H1	6.70(REF)			b2	0.70	0.80	0.95

TO-247

Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	Min	Nom	Max		Min	Nom	Max
A	4.80	5.00	5.20	E1	13.00	13.30	13.60
A1	2.21	2.41	2.59	E2	4.80	5.00	5.20
A2	1.85	2.00	2.15	E3	2.30	2.50	2.70
b	1.11	1.21	1.36	e	5.44(BSC)		
b2	1.91	2.01	2.21	L	19.82	19.92	20.22
b4	2.91	3.01	3.21	L1	-	-	4.30
c	0.51	0.61	0.75	ΦP	3.40	3.60	3.80
D	20.80	21.00	21.30	ΦP1	-	-	7.30
D1	16.25	16.55	16.85	S	6.15(BSC)		
E	15.50	15.80	16.10	-	-	-	-

< Copyright >

All the Patent, Copyright and IP contained in this document belong to P&S, shall not be reproduced, copied, or used in other ways without permission.



Apr. 2018

Rev 1.30

www.icbase.com