

General Description

12N70 the silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. which accords with the RoHS standard.



Product Summary			
V _{DS}	R _{DS(on)} (Ω)Typ	I _D (A)	Q _g (Typ)
700V	0.71 @ 10V,6A	12	32nc

Features

- Low on-resistance
- Low gate charge and Fast Switching
- 100% avalanche tested
- Rohs compliant

Mechanical Data

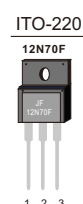
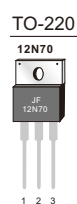
- Case:TO-220, ITO-220,TO-263 Package

Application

- Power switch circuit of adaptor and charger

Ordering Information

Part No.	Package Type	Package	Quality(box)
12N70	TO-220	Tube	1000
12N70F	ITO-220	Tube	1000
12N70D	TO-263	Tape & Reel	800



Block Diagram

Pin Definition:

- 1.Gate
- 2.Drain
- 3.Source

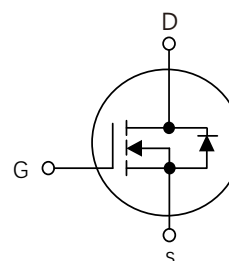


Table1 Absolute Maximum Ratings (T_c=25°C, unless otherwise specified)

Parameters	Symbol	12N70 12N70D	12N70F	Unit
Drain-Source Voltage	V _{DS}	700		V
Gate-Source Voltage	V _{GS}	±30		V
Contionous Drain Current	T _C =25°C	12	12 *	A
	T _C =100°C	10	10 *	
Pulsed Drain Current (Note 1)	I _{DM}	48		A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	806		mJ
Reverse Diode Recovery dv/dt(Note 3)	dv/dt	5.0		V/ns
Power Dissipation T _C =25°C	P _D	250	55	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +150		°C

* limited by maximum junction temperature

Table 2. Thermal Characteristics

Parameters	Symbol	12N70/12N70D	12N70F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62.5	100	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.50	2.27	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

Parameters		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250μA	700			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =700V,V _{GS} =0V			1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _{DS} =0V			100	nA
	Reverse		V _{GS} = -30V,V _{DS} =0V			-100	nA
On Characteristics(Note 4)							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =6A		0.71	0.75	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1MHz		2200		pF
Output Capacitance		C _{OSS}			151		pF
Reverse Transfer Capacitance		C _{RSS}			4.5		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		td(on)	V _{DD} =350V,I _D =12A, V _{GS} =10V,R _G =9.1Ω		18		ns
Turn-On Rise Time		tr			33		ns
Turn-Off Delay Time		td(off)			58		ns
Turn-Off Fall Time		tf			44		ns
Total Gate Charge		Q _G	V _{DD} =350V,I _D =12A, V _{GS} =10V		32		nC
Gate-Source Charge		Q _{GS}			11		nC
Gate-Drain Charge		Q _{GD}			8.4		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V,I _S =12A			1.5	V
Maximum Continuous Drain-Source Diode Forward Current(Note 4)		I _S				12	A
Reverse Recovery Time		trr	V _{GS} =0V,I _S =12A		332		ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs(Note 4)		2803		nC

Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature

2 $L=10\text{mH}, I_D=12.7A$, Starting $T_J=25^{\circ}\text{C}$

3 $I_{SD}=12A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DSS}$, starting $T_J=175^{\circ}\text{C}$

4 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

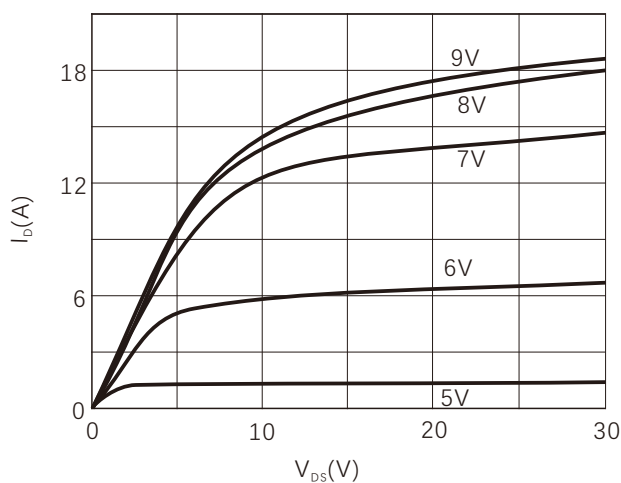


Figure 2. $R_{DS(ON)}$ vs Junction Temperature

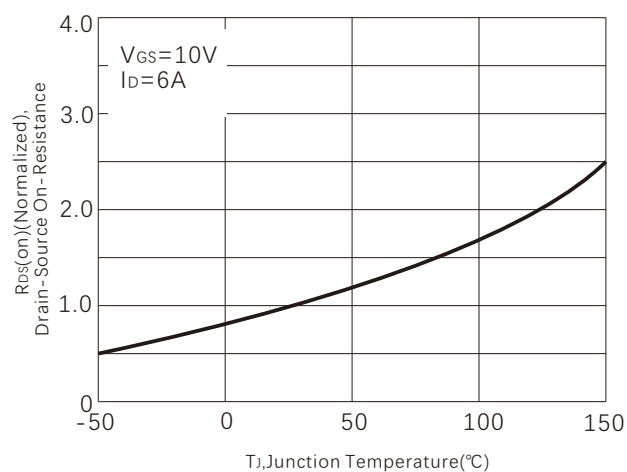


Figure 3. Typical Drain to Source ON Resistance vs. Drain Current

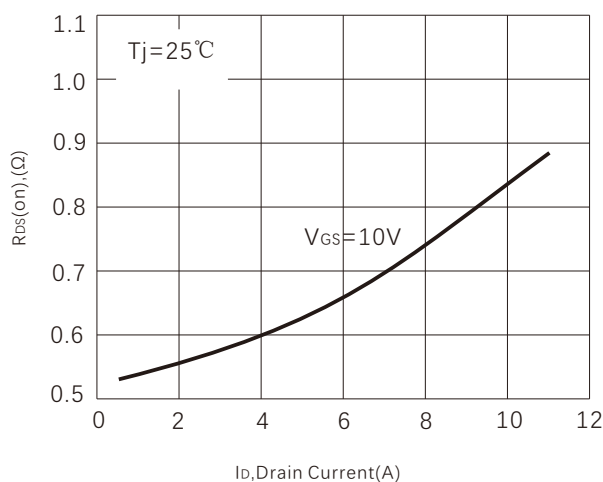


Figure 4. Capacitance

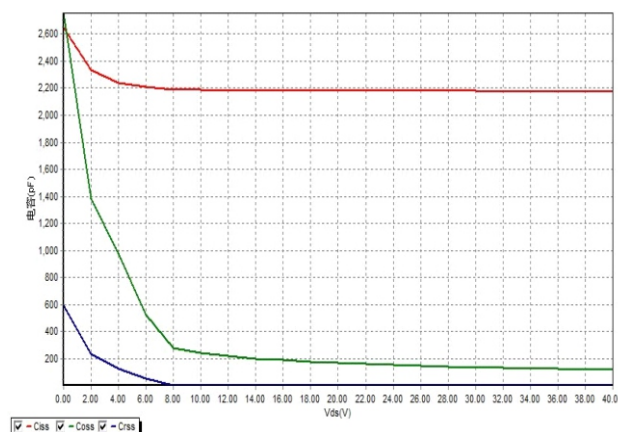


Figure 5. Gate charge

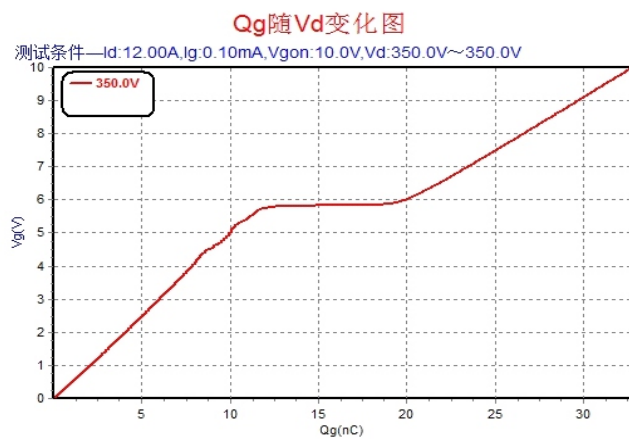


Figure 6. Transfer Characteristics

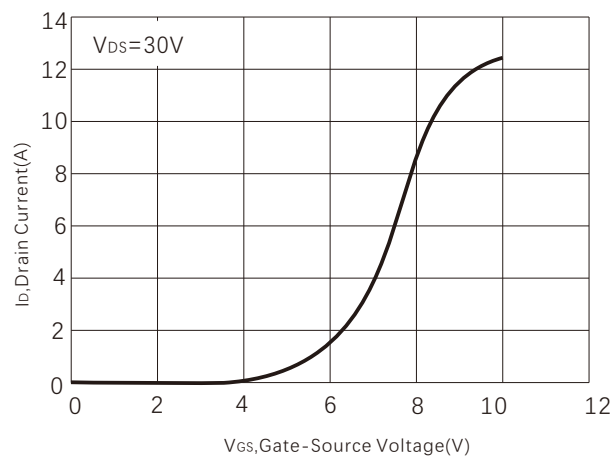


Figure 7. Typical Breakdown Voltage vs Temperature

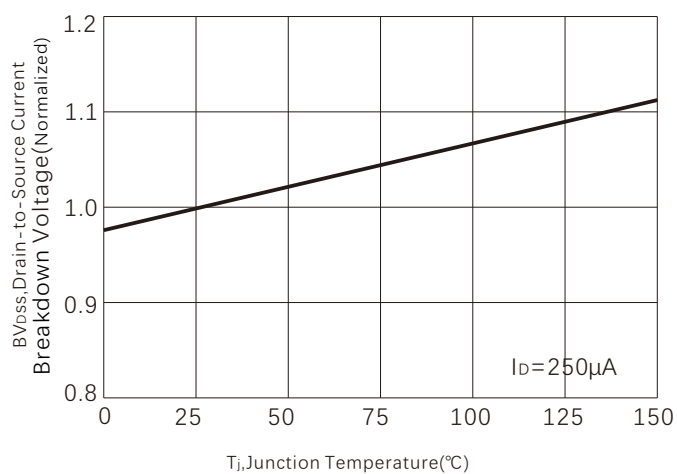


Figure 8. Power dissipation

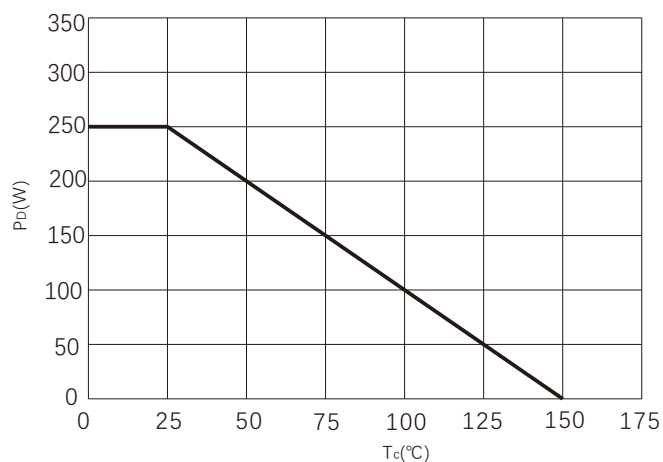


Figure 9. Safe operating area

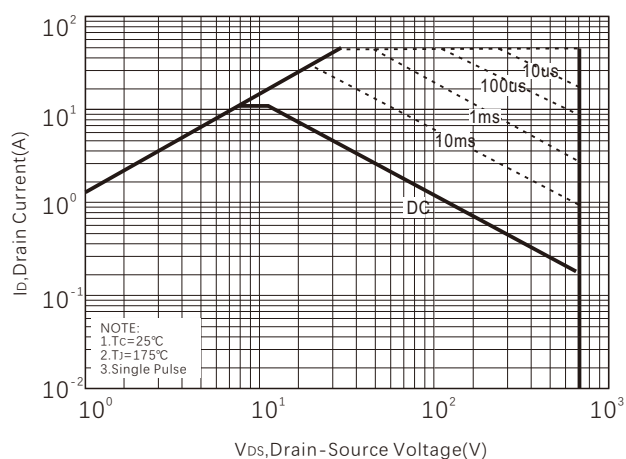


Figure 10. Maximum Drain Current vs Case Temperature

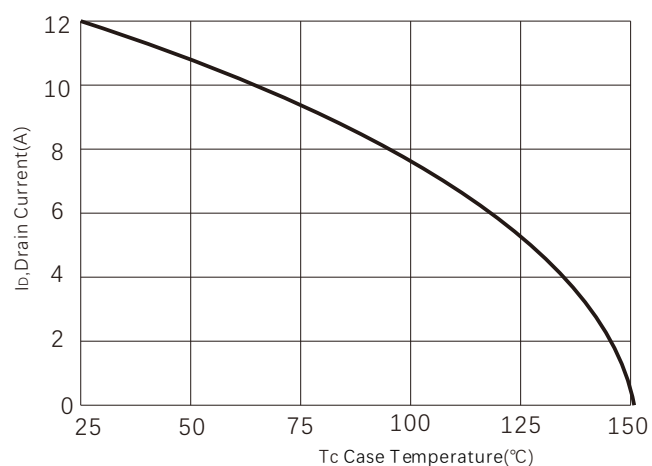
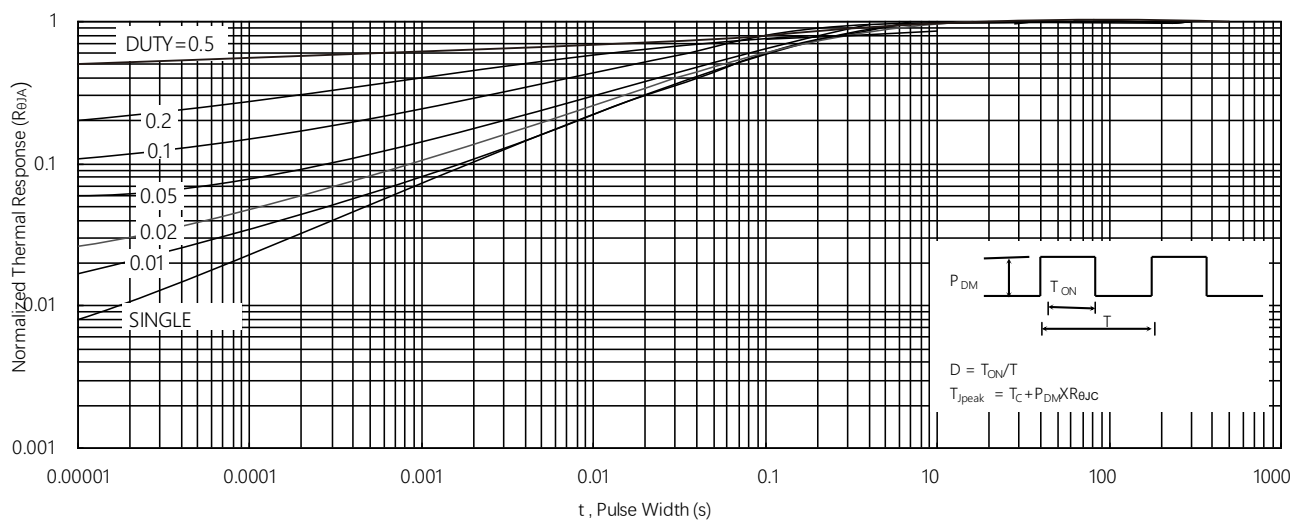
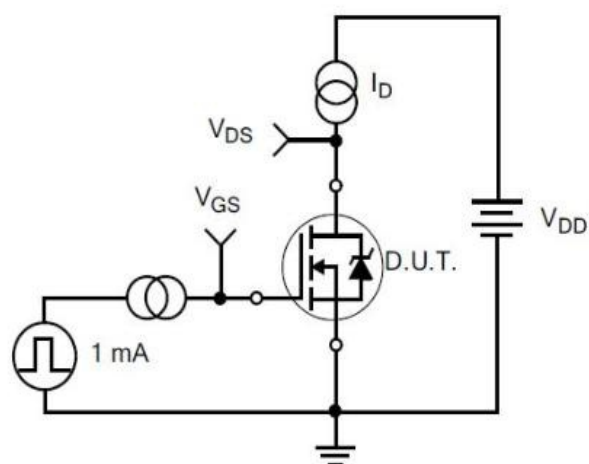


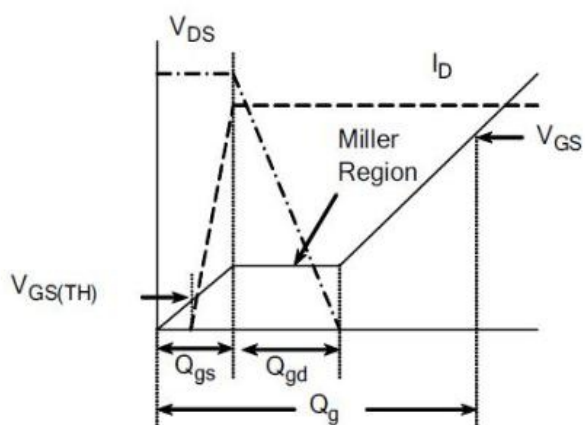
Figure 11. Normalized Maximum Transient Thermal Impedance



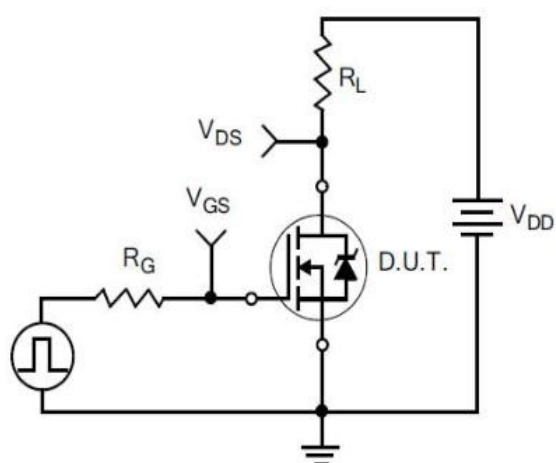
Typical Test Circuit



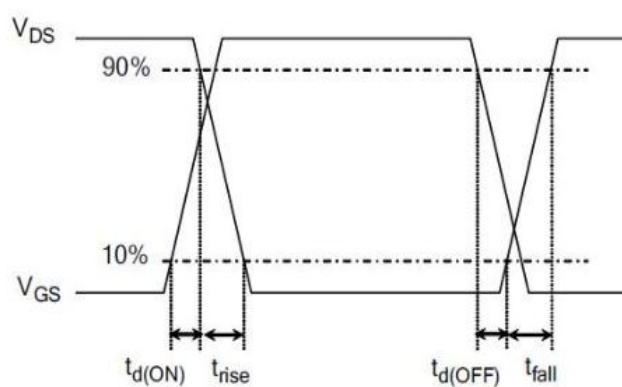
1) Gate Charge Test Circuit



2) Gate Charge Waveform

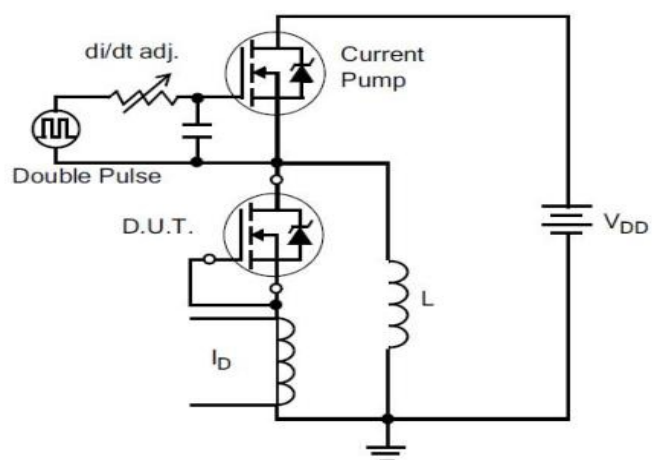


3) Resistive Switching Test Circuit

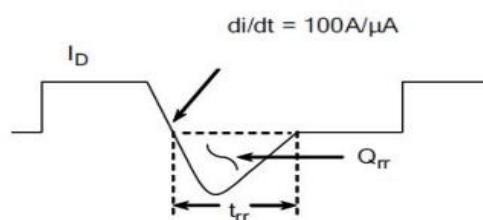


4) Resistive Switching Waveforms

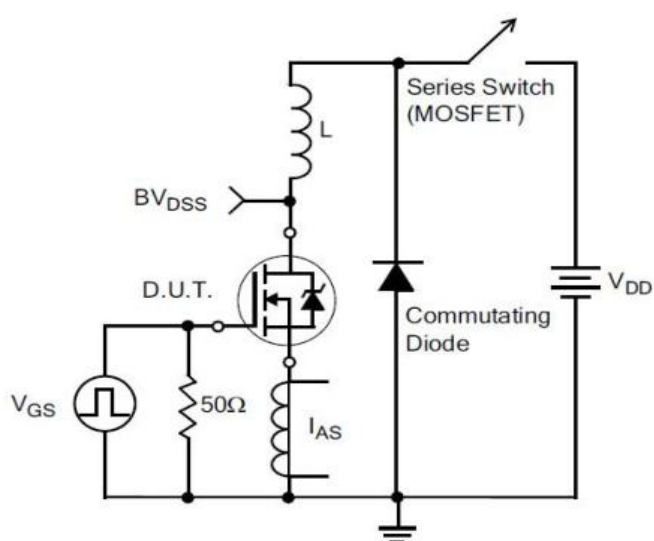
Typical Test Circuit



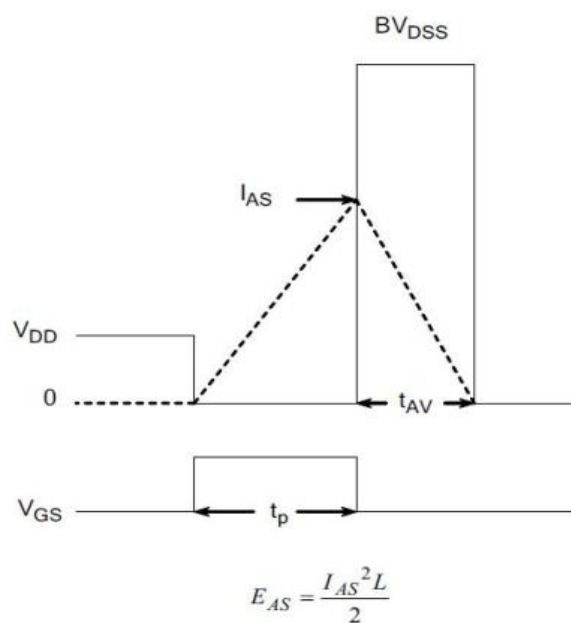
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

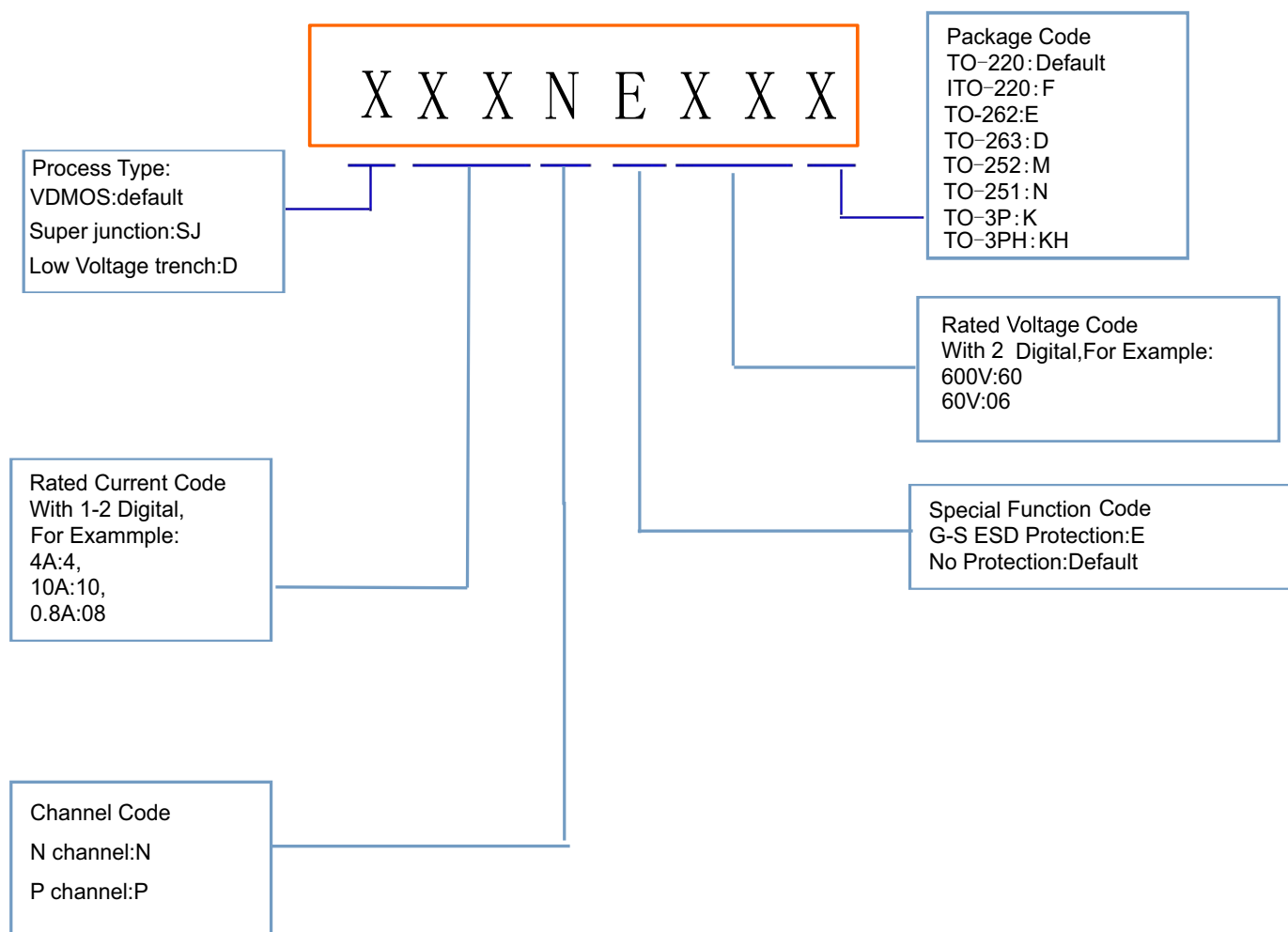


7) . Unclamped Inductive Switching Test Circuit



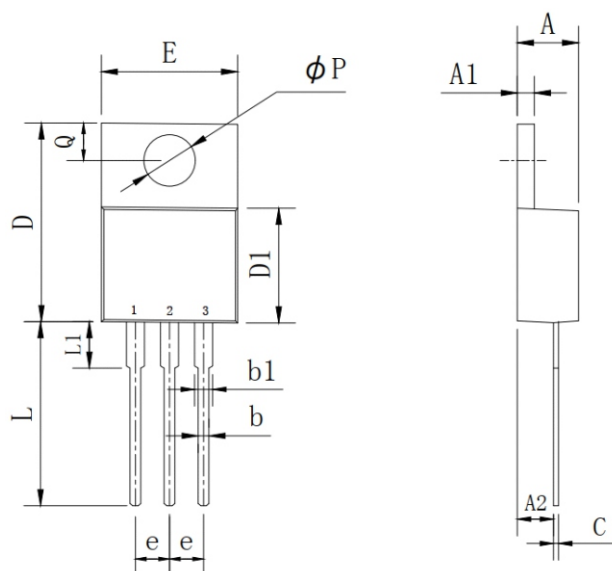
8) Unclamped Inductive Switching Waveforms

Product Names Rules



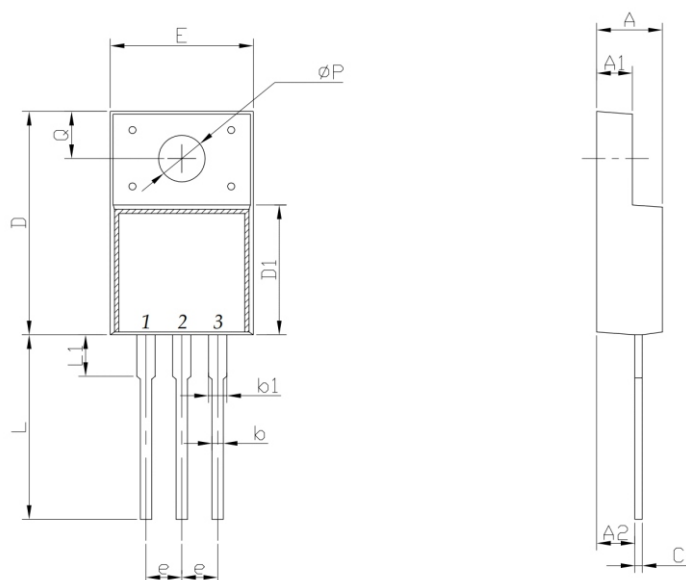
Dimensions

TO-220 PACKAGE OUTLINE DIMENSIONS



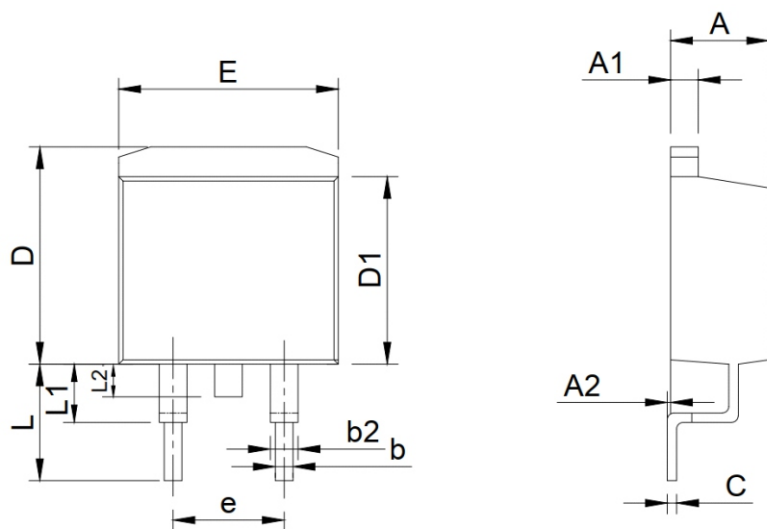
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74	0.092	0.108
L	12.58	14.3	0.495	0.563
L1	2.8	4.2	0.110	0.165
P	3.4	4.14	0.134	0.163
Q	2.45	3	0.096	0.118

ITO-220 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108
L	12.6	14	0.496	0.551
L1	2.45	4.3	0.096	0.169
P	2.9	3.8	0.114	0.150
Q	2.5	3.55	0.098	0.140

TO-263 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	0	0.25	0.000	0.010
b	0.61	1.01	0.024	0.040
b1	1.2	1.34	0.047	0.053
C	0.3	0.6	0.012	0.024
D	9.48	10.84	0.373	0.427
D1	8.49	9.3	0.334	0.366
E	9.7	10.31	0.382	0.406
e	4.88	5.28	0.192	0.208
L	4.46	5.85	0.176	0.230
L1	1.33	2.33	0.052	0.092
L2	0	2.2	0.000	0.087

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