SEMICONDUCTOR

SJ9N80 Series
800V N-Channel Super Junction Power MOSFET

Genaral Description

This series of power MOSFET use N channel Multi-EPI Super-Junction technology and design to provide better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics,making it especially suitable for applications which require superior power density and outstanding efficiency.

Product Summary			
V_{DS}	$R_{DS(on)}$(Ω)Typ	I_D(A)	Qg(Typ)
800V	0.68@ 10V,4.5A	9.0	38nc

Features

- Low on-resistance
- Ultra low gate charge and input capacitance
- 100% avalanche tested
- Rohs compliant

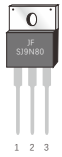
Mechanical Data

- Case:TO-220,ITO-220,TO-263,TO-262,TO-251,TO-252 Package

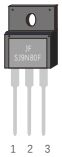
Application

- Switching applications

TO-220 SJ9N80



ITO-220 SJ9N80F



TO-263 SJ9N80D

TO-262 SJ9N80E

TO-251 SJ9N80N

TO-252 SJ9N80M

Ordering Information

Part No.	Package Type	Package	Quality(box)
SJ9N80	TO-220	Tube	1000
SJ9N80F	ITO-220	Tube	1000
SJ9N80D	TO-263	Tape & Reel	800
SJ9N80E	TO-262	Tube	1000
SJ9N80N	TO-251	Tube	1000
SJ9N80M	TO-252	Tape & Reel	3000

Pin Definition:

1.Gate
2.Drain
3.Source

Block Diagram

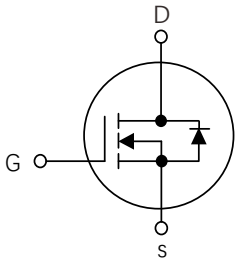


Table1 Absolute Maximum Ratings (T_C=25° C, unless otherwise specified)

Parameters		Symbol	SJ9N80 SJ9N80D SJ9N80E SJ9N80M SJ9N80N	SJ9N80F	Unit
Drain-Source Voltage		V_{DS}	800		V
Gate-Source Voltage		V_{GS}	±30		V
Contionous Drain Current	T_C=25°C	I_D	9	9 ※	A
	T_C=100°C		6	6 ※	
Pulsed Drain Current (Note 1)		I_{DM}	36		A
Single Pulse Avalanche Energy(Note 2)		EAS	290		mJ
Avalanche Current(Note 1)		I_{AR}	2.8		A
Repetitive Avalanche Energy(Note 1)		EAR	1.4		mJ
Reverse Diode Recovery dv/dt(Note 3)		dv/dt	15		V/ns
Drain Source Voltage Slope (V_{DS}=720V)		dv/dt	50		V/ns
Power Dissipation T_C=25°C		P_D	131	34	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +150		℃

※ limited by maximum junction temperature

Table 2.Thermal Characteristics

Parameters	Symbol	SJ9N80 SJ9N80M SJ9N80D SJ9N80E SJ9N80N	SJ9N80F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62.5	80.0	℃/W
Thermal resistance Junction to Case	$R_{\theta JC}$	0.95	3.70	℃/W

Table 3. Electrical Chatacteristics (T_J=25℃, 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	800			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=800V,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	2.5		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=4.5A		0.68	0.80	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V,f=1MHz		680		pF
Output Capacitance		C_{OSS}			60		pF
Reverse Transfer Capacitance		C_{RSS}			15		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		td(on)	V_{DD}=400V,I_D=5A, V_{GS}=10V,R_G=20Ω		15		ns
Turn-On Rise Time		tr			10		ns
Turn-Off Delay Time		td(off)			110		ns
Turn-Off Fall Time		tf			10		ns
Total Gate Charge		Q_G	V_{DS}=480V,I_D=5A, V_{GS}=10V		38		nC
Gate-Source Charge		Q_{GS}			4		nC
Gate-Drain Charge		Q_{GD}			4.5		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V,I_S=5A		1.0	1.5	V
Maximum Continuous Drain-Source Diode Forward Current(Note 4)		I_S				36	A
Reverse Recovery Time		trr	V_R=400V,I_S=5.0A dI$_F$/dt=100A/μs(Note 4)		475		ns
Reverse Recovery Charge		Q_{RR}			5800		nC

Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature
2 R_G=25Ω,V_G=10V,V_{DD}=50V,Starting T_J=25°C
3 I_{SD}≤I_D,di/dt≤200A/μS,V_{DD}≤BV_{DSS},starting T_J=25℃
4 Pulse Test: Pulse width ≤300μS,Duty cycle≤2%
5 Guaranteed by design,not subject to production

Typical Characteristics Diagrams

Figure 1.Output Characteristics

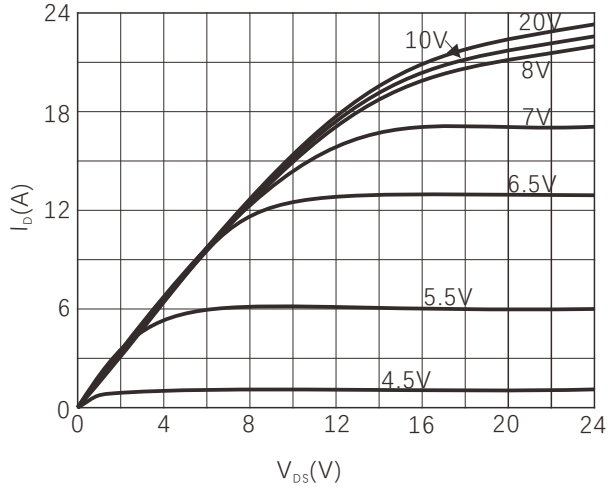


Figure 2. Transfer Characteristics

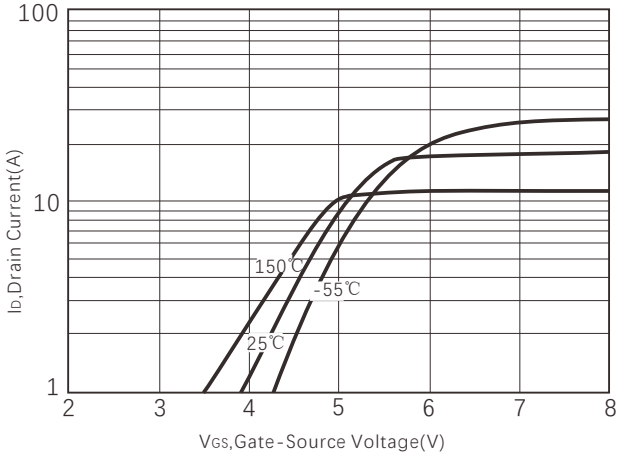


Figure 3.On-Resistance vs.Drain Current

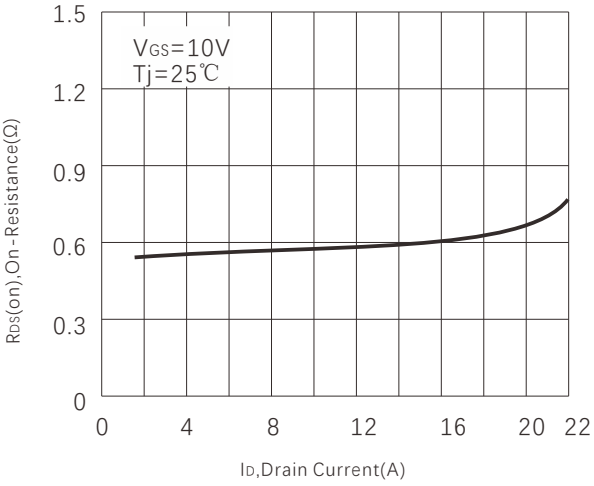


Figure 4. Capacitance

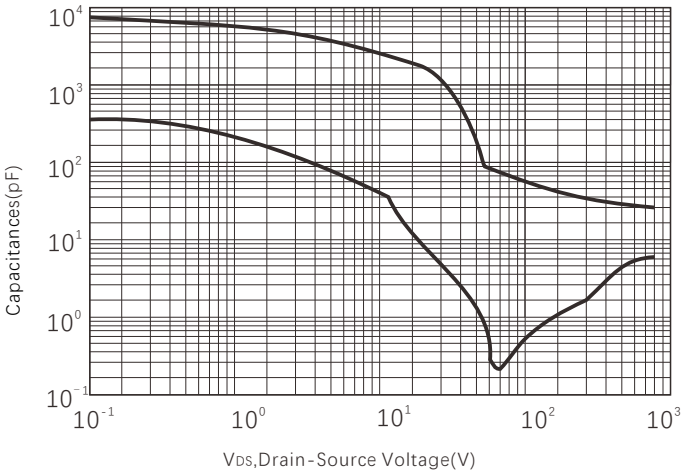


Figure 5.Gate charge

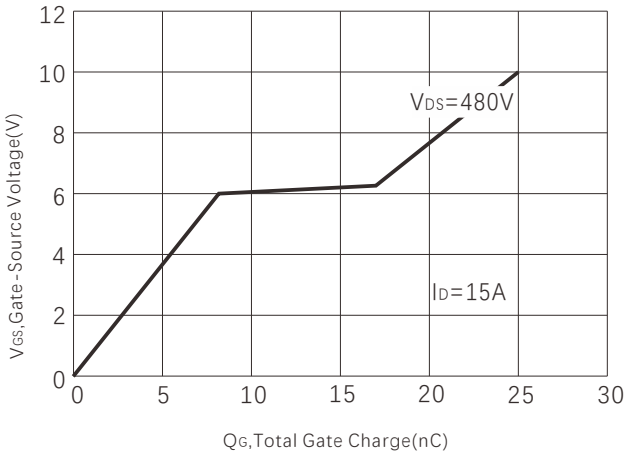


Figure 6.Source-Drain Diode Forward Voltage

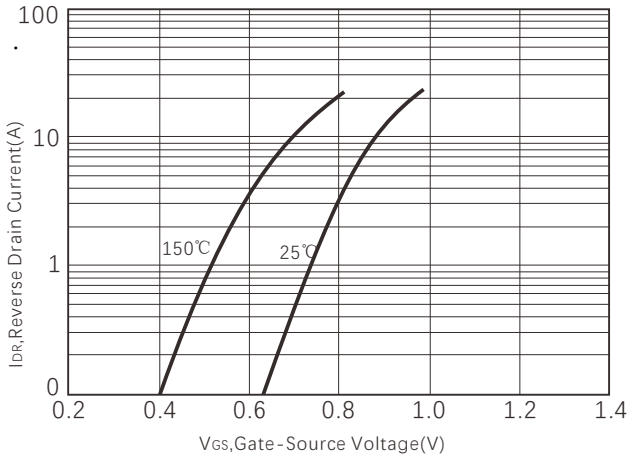


Figure7.$R_{DS(ON)}$ vs Junction Temperature

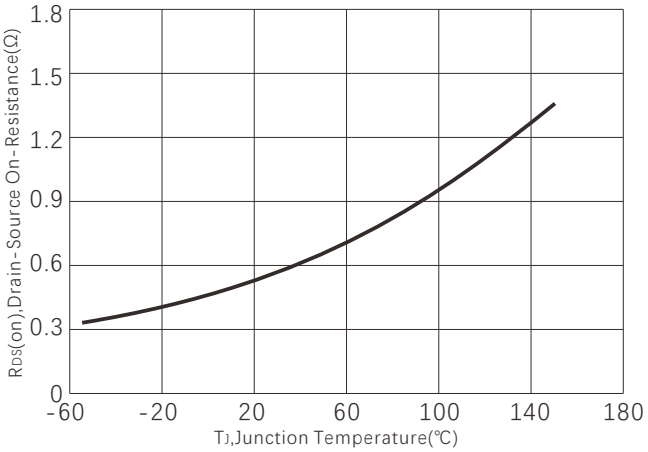


Figure 8.BV_{DSS} vs Junction Temperature

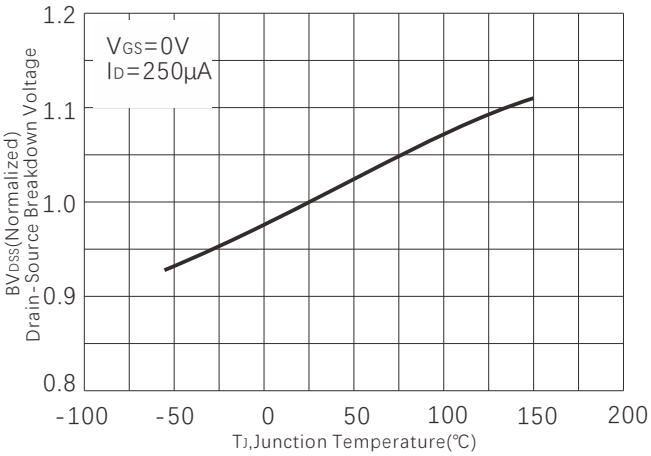


Figure 9. Safe operating area

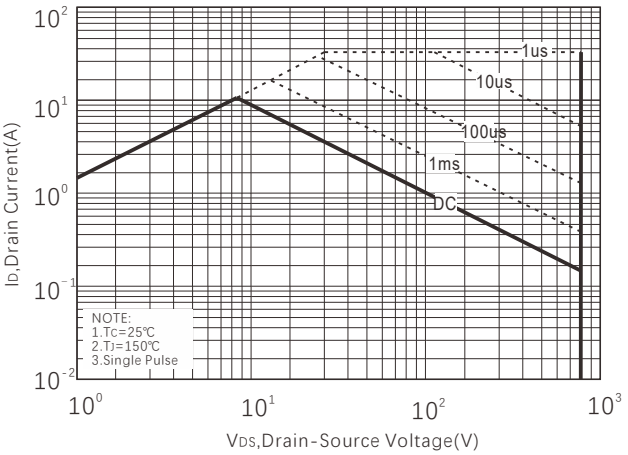


Figure 10. Safe operating area for ITO-220

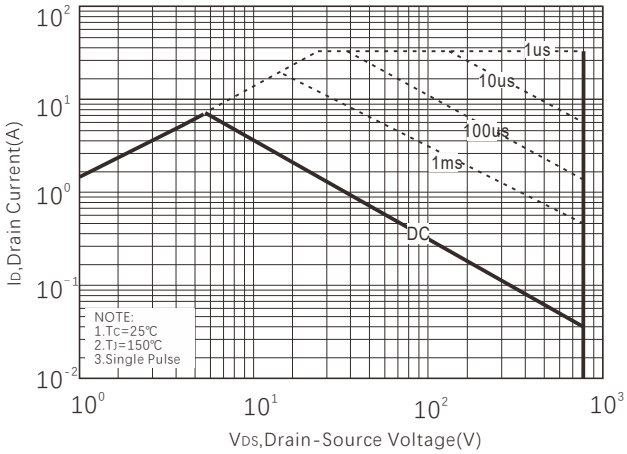
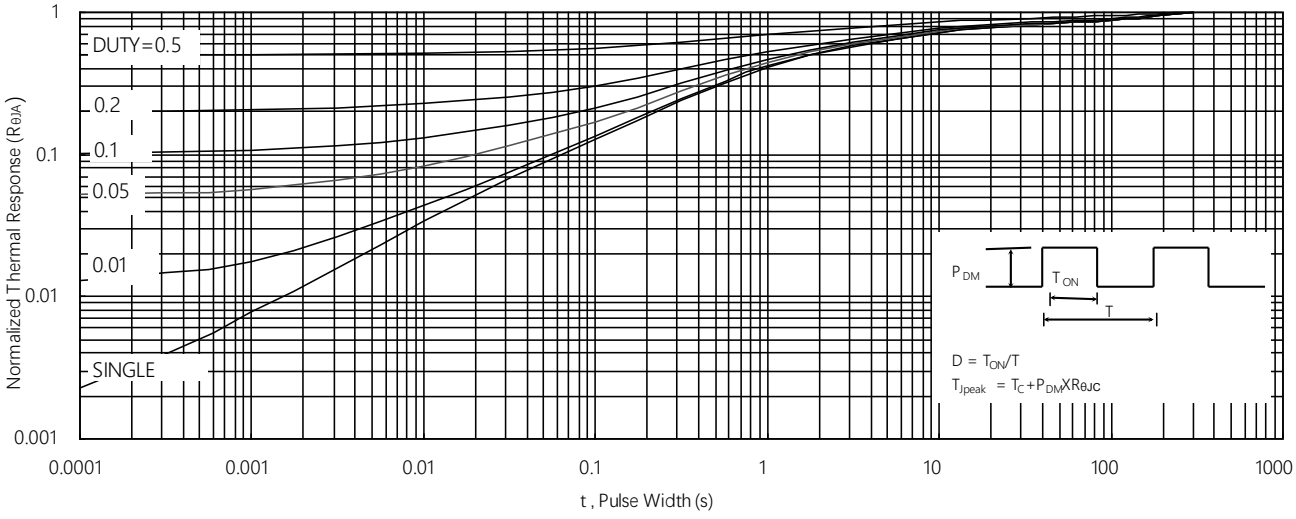
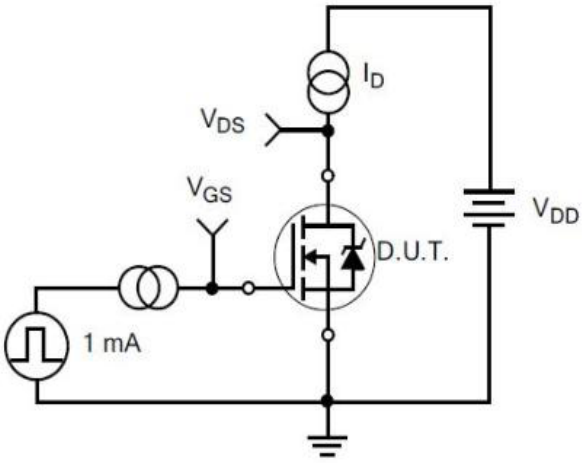


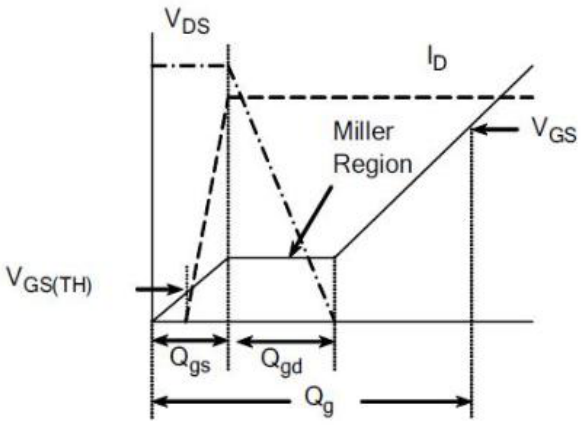
Figure 11.Normalized Maximum Transient Thermal Impedance



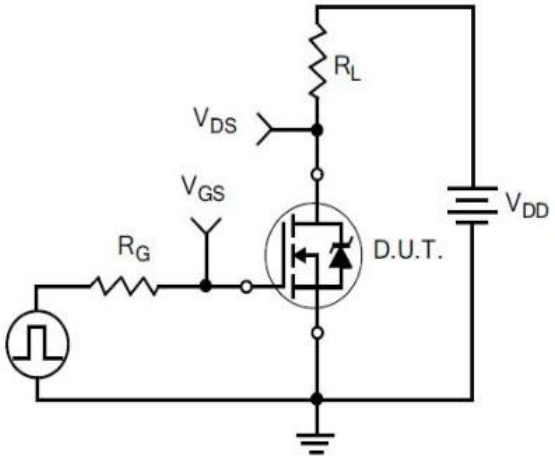
Typical Test Circuit



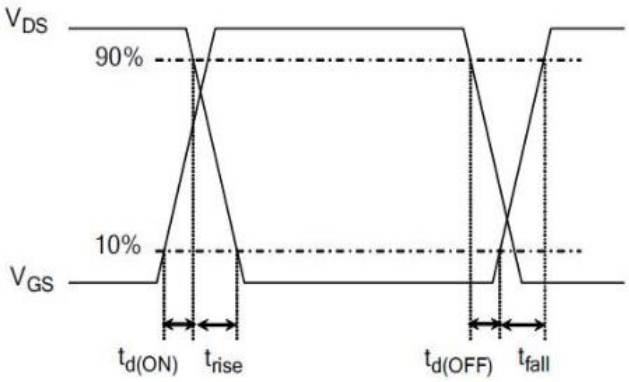
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

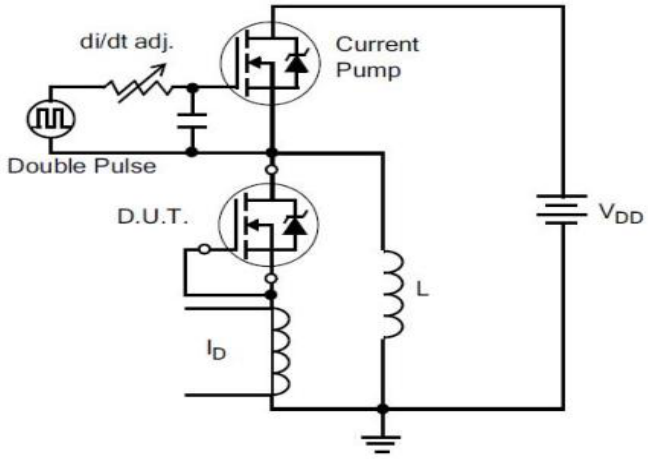


3) Resistive Switching Test Circuit

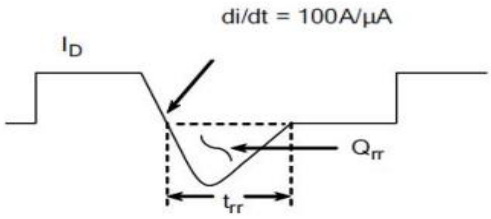


4) Resistive Switching Waveforms

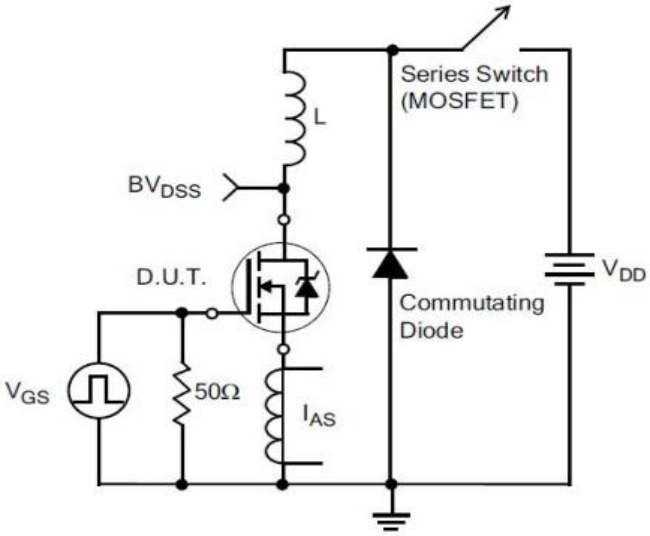
Typical Test Circuit



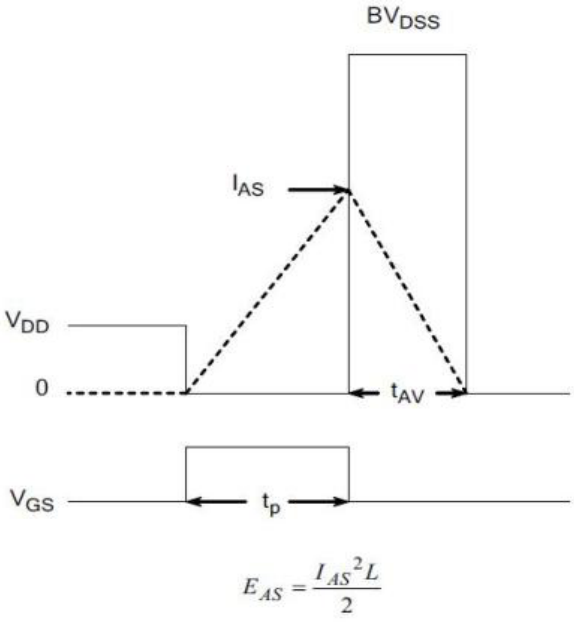
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



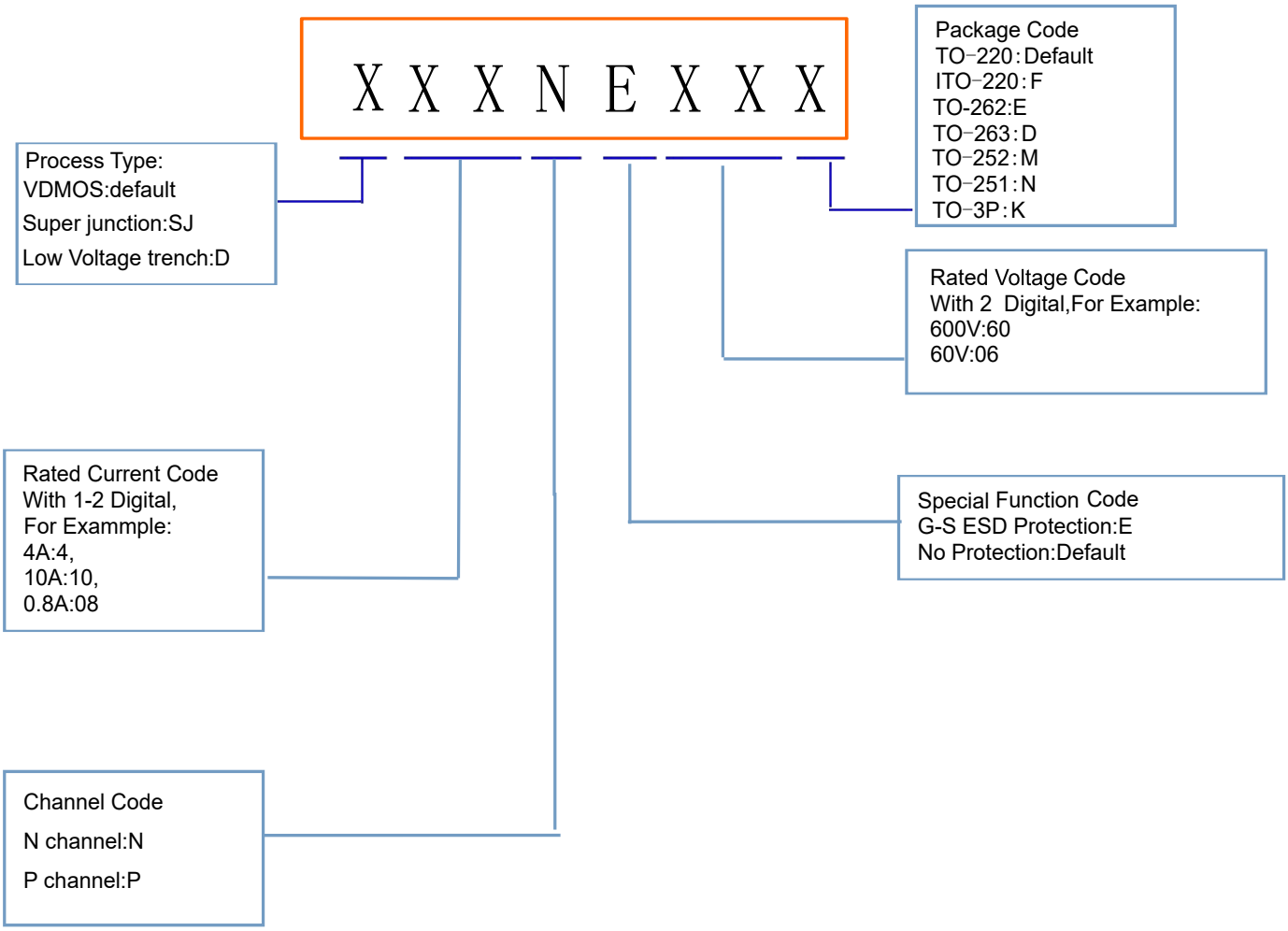
7) . Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

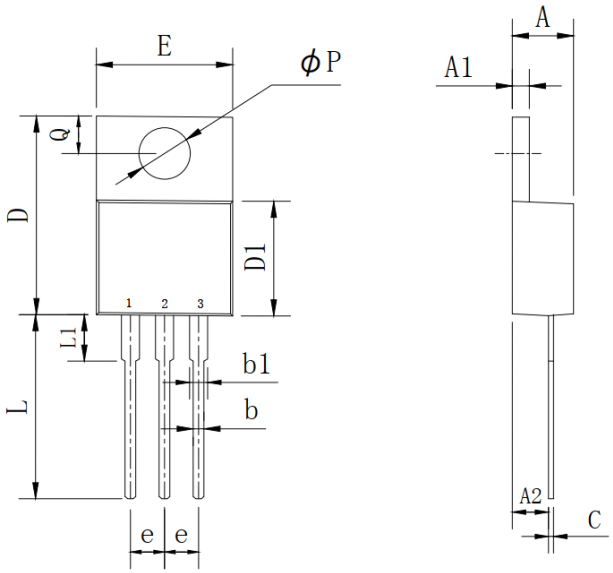
8) Unclamped Inductive Switching Waveforms

Product Names Rules



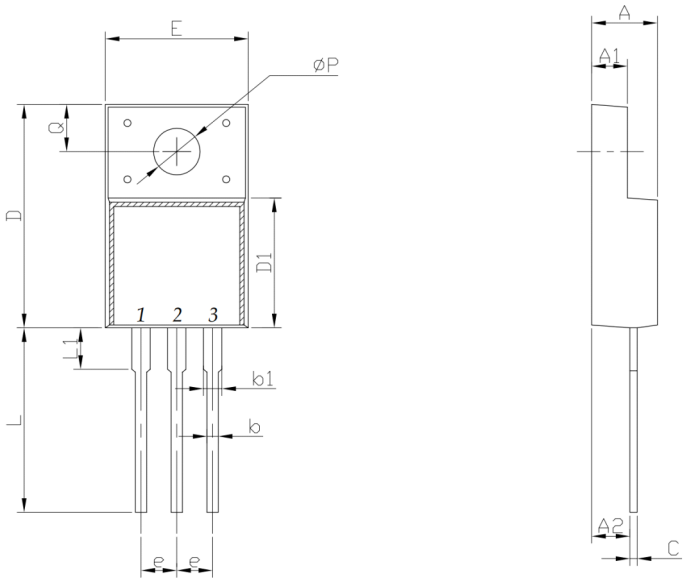
Dimensions

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

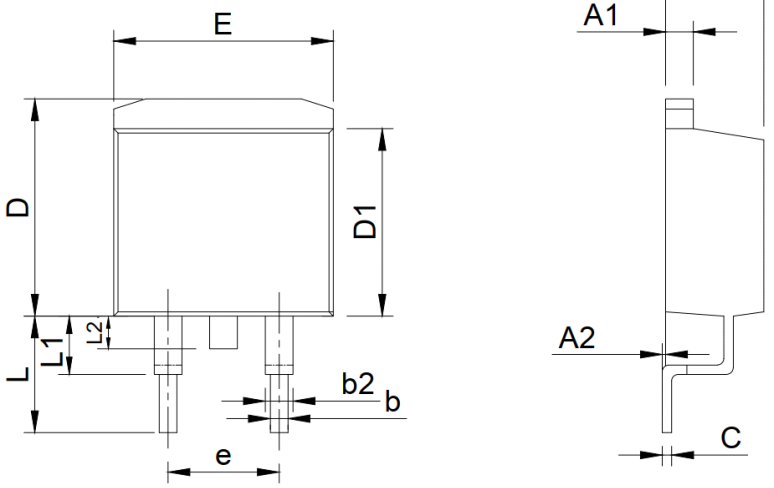
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

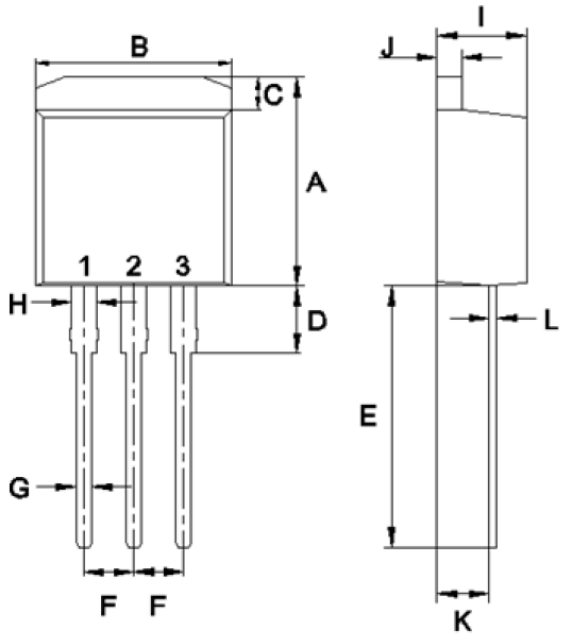
Dimensions

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

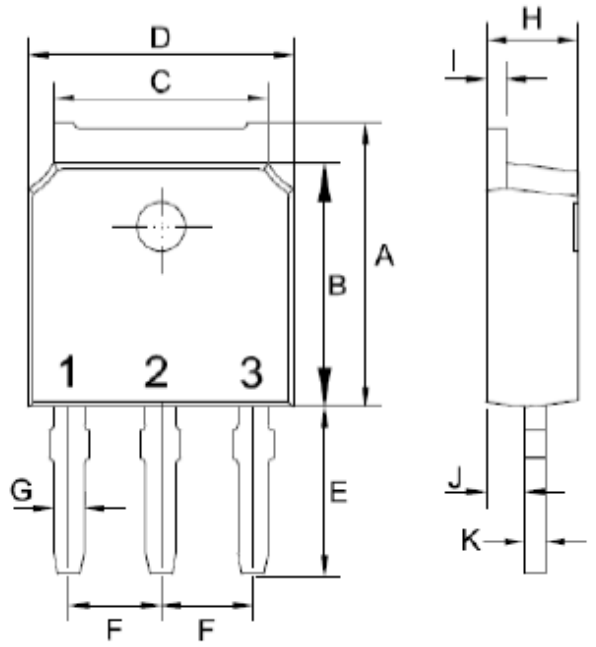
TO-262 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	10.14	11.14	0.399	0.439
B	9.57	10.57	0.377	0.416
C	1.15	1.84	0.045	0.072
D	2.95	3.95	0.116	0.156
E	12.25	13.75	0.482	0.541
F	2.34	2.74	0.092	0.108
G	0.51	1.11	0.020	0.044
H	0.97	1.57	0.038	0.062
I	4.25	4.87	0.167	0.192
J	1.07	1.47	0.042	0.058
K	2.03	2.92	0.080	0.115
L	0.3	0.6	0.012	0.024

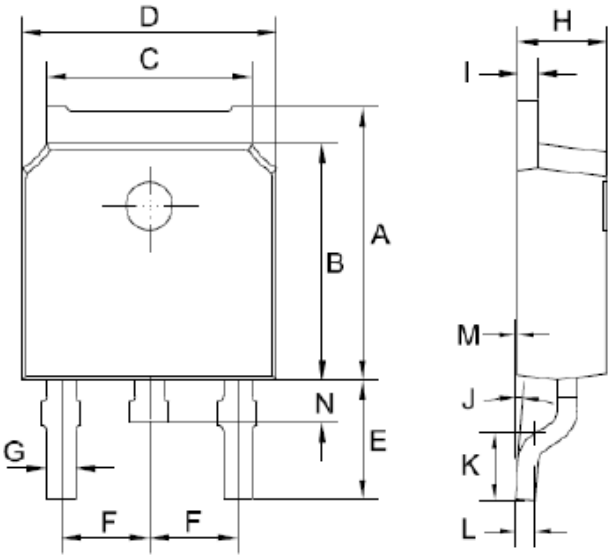
Dimensions

TO-251 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	3.5	4.35	0.138	0.171
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0.71	1.31	0.028	0.052
K	0.41	0.61	0.016	0.024

TO-252 PACKAGE OUTLINE DIMENSIONS



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	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	2.6	3.3	0.102	0.130
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0ú	8ú	0ú	8ú
K	1.45	1.85	0.057	0.073
L	0.41	0.61	0.016	0.024
M	0	0.12	0.000	0.005
P	0.6	1	0.024	0.039

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