

### General Description

These N-channel enhanced VDMOSFETS Used advanced trench technology design, provided excellent  $R_{DS(on)}$  and low gate charge. Which accords with the RoHS standard.

Product Summary			
$V_{DS}$	$R_{DS(on)}$ (m $\Omega$ ) Typ	$I_D$ (A)	$Q_g$ (Typ)
80V	4.5 @ 10V	120	65.7nc

### Features

- Fast switching
- Low on-resistance
- Low gate charge and input capacitance
- 100% avalanche tested

### Mechanical Data

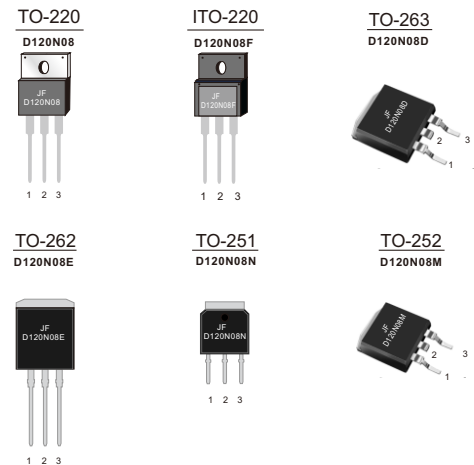
- Case: TO-220, ITO-220, TO-263, TO-262, TO-251, TO-252 Package

### Application

- Switching applications

### Ordering Information

Part No.	Package Type	Package	Quality(box)
D120N08	TO-220	Tube	1000
D120N08F	ITO-220	Tube	1000
D120N08D	TO-263	Tape & Reel	800
D120N08E	TO-262	Tube	1000
D120N08N	TO-251	Tube	1000
D120N08M	TO-252	Tape & Reel	3000



### Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

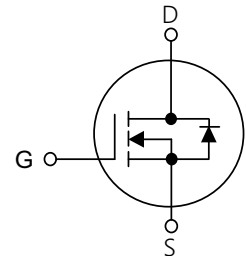


Table1 Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	D120N08/D120N08D/D120N08E	D120N08F	Unit
		D120N08M/D120N08N		
Drain-Source Voltage	$V_{DS}$	80		V
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	120	A
		$T_C=100^\circ\text{C}$	100	
Pulsed Drain Current (Note 1)	$I_{DM}$	480		A
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	560		mJ
Power Dissipation $T_C=25^\circ\text{C}$	$P_D$	220	30	W
Operating Junction and Storage Temperature	$T_J/T_{STG}$	-55~+175		$^\circ\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	D120N08/D120N08D/ D120N08M/D120N08N D120N08E	D120N08F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	60	60	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.70	5	$^{\circ}C/W$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	80	-	-	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=80V, V_{GS}=0V$	-	-	1	$\mu A$
Gate- Source Leakage Current	Forward	$V_{GS}=20V, V_{DS}=0V$	-	-	100	nA
	Reverse	$V_{GS}=-20V, V_{DS}=0V$	-	-	-100	nA
On Characteristics(Note 4)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.0	4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=50A$	-	4.5	5.5	m $\Omega$
Dynamic Characteristics(Note 5)						
Input Capacitance	$C_{ISS}$	$V_{DS}=40V, V_{GS}=0V, f=1MHz$	-	4032	-	pF
Output Capacitance	$C_{OSS}$		-	546	-	pF
Reverse Transfer Capacitance	$C_{RSS}$		-	35	-	pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DS}=40V, R_L=3\Omega,$ $V_{GS}=10V$	-	20.1	-	ns
Turn-On Rise Time	$t_r$		-	38	-	ns
Turn-Off Delay Time	$t_d(off)$		-	45.1	-	ns
Turn-Off Fall Time	$t_f$		-	21	-	ns
Total Gate Charge	$Q_G$	$V_{DD}=30V, I_D=25A,$ $V_{GS}=10V$	-	65.7	-	nC
Gate-Source Charge	$Q_{GS}$		-	24.9	-	nC
Gate-Drain Charge	$Q_{GD}$		-	13.9	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=50A$	-	0.95	1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		-	-	120	A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=20A$	-	61	-	ns
Reverse Recovery Charge	$Q_{RR}$	$dI_F/dt=500A/\mu s$ (Note 1)	-	340	-	nC

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

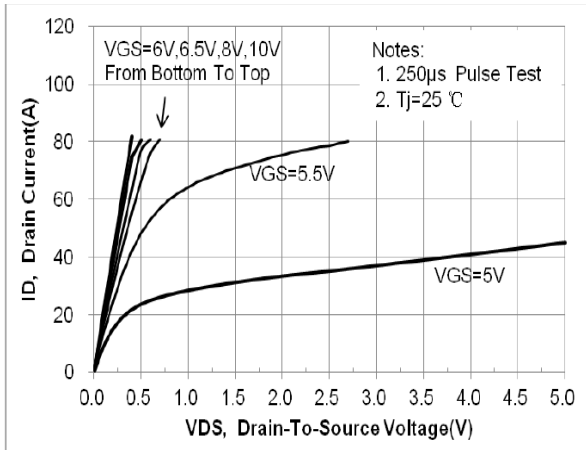
2  $L=0.5mH, R_g=25\Omega$ , Starting  $T_J=25^{\circ}C$

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

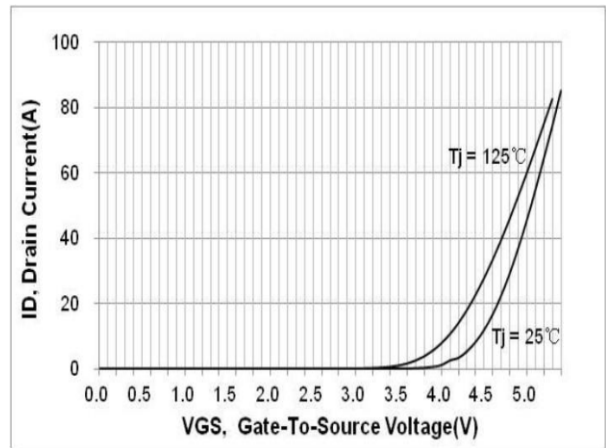
5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

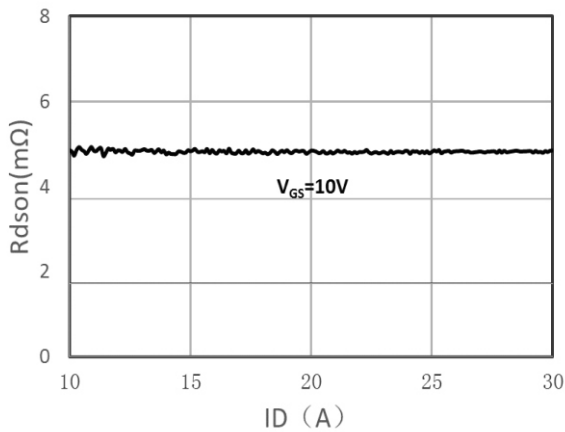
**Figure 1. Typ. Output Characteristics ( $T_j=25^\circ\text{C}$ )**



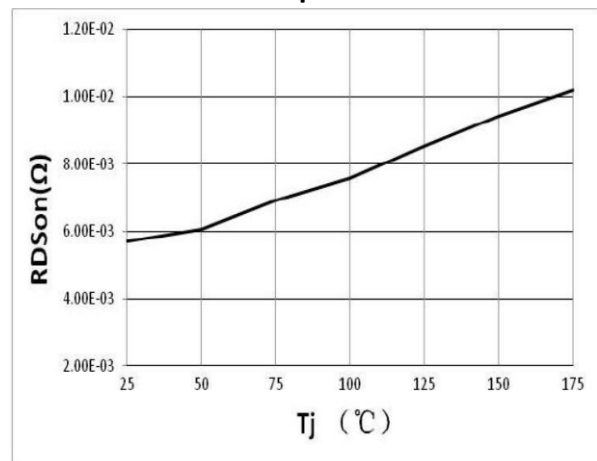
**Figure 2. Transfer Characteristics**  
(Junction Temperature)



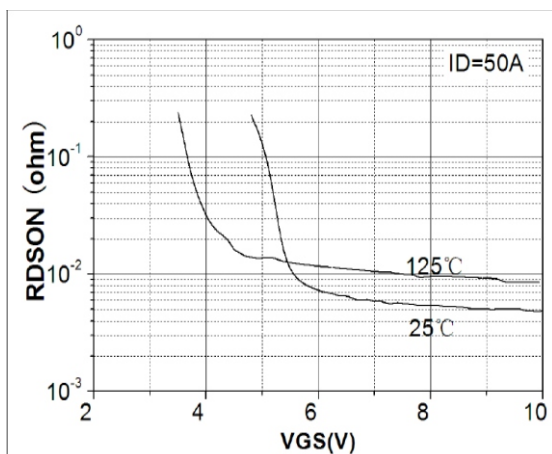
**Figure 3. On-Resistance vs. Drain Current and Gate Voltage Figure**



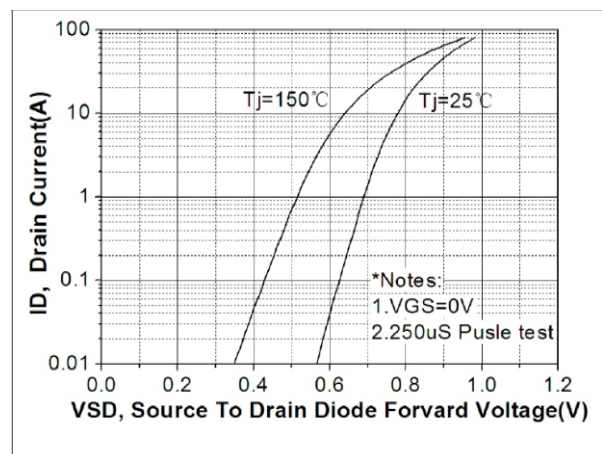
**Figure 4. On-Resistance vs. Junction Temperature**



**Figure 5. On-Resistance vs. Gate-Source Voltage (Junction Temperature)**



**Figure 6. Body-Diode Characteristics (Junction Temperature)**



Typical Characteristics Diagrams

Figure 7. Gate-Charge Characteristics

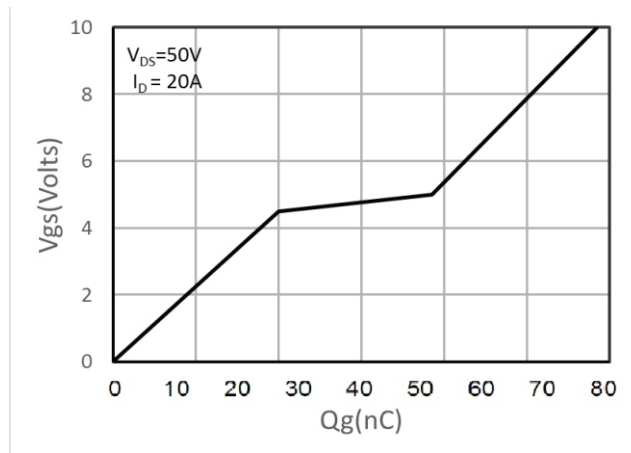


Figure 8. Capacitance Characteristics

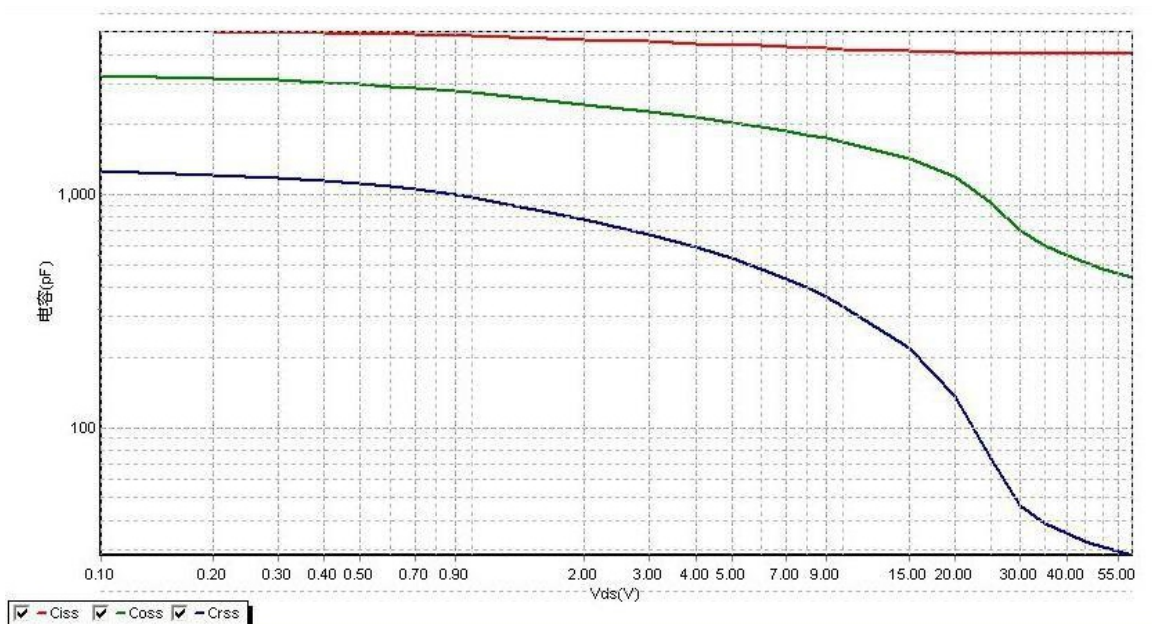
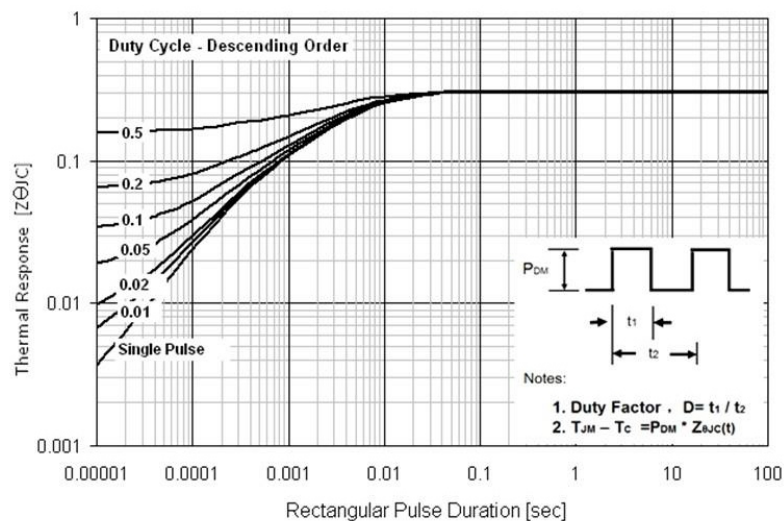
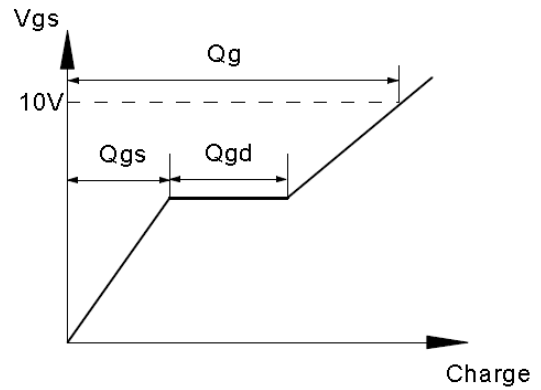
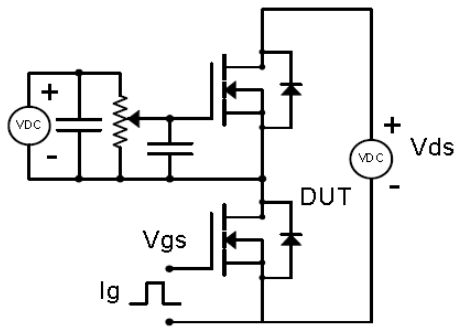


Figure 9: Normalized Maximum Transient Thermal Impedance (R<sub>thJC</sub>)

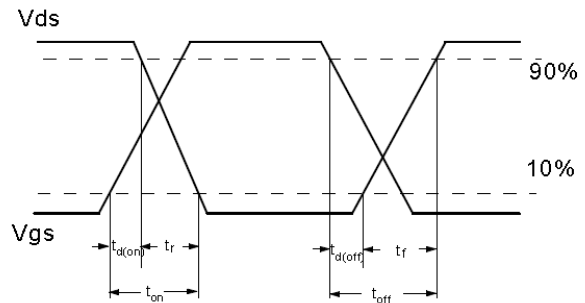
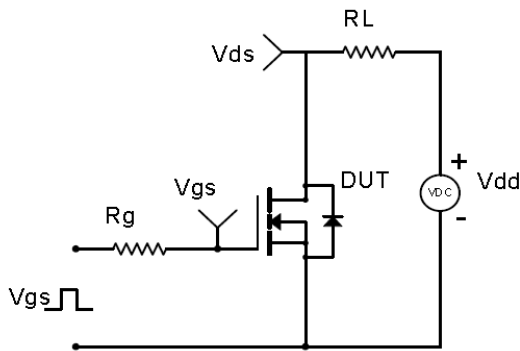


Typical Test Circuit

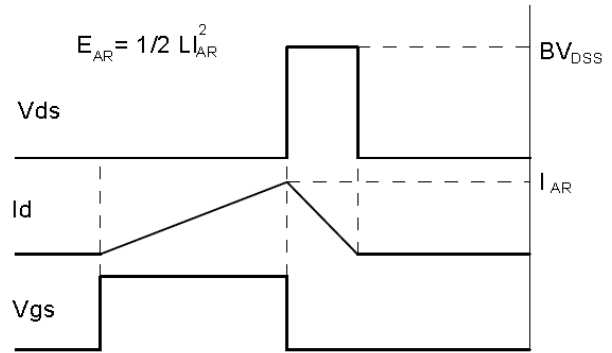
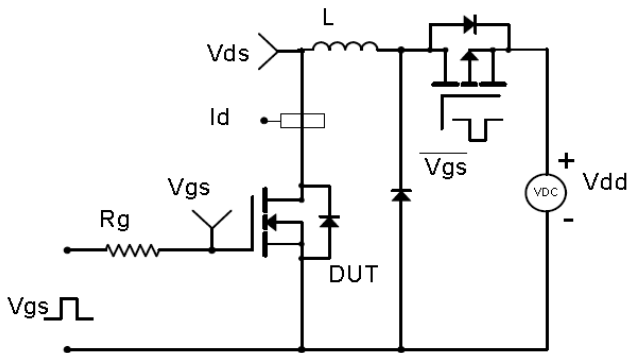
Gate Charge Test Circuit & Waveform



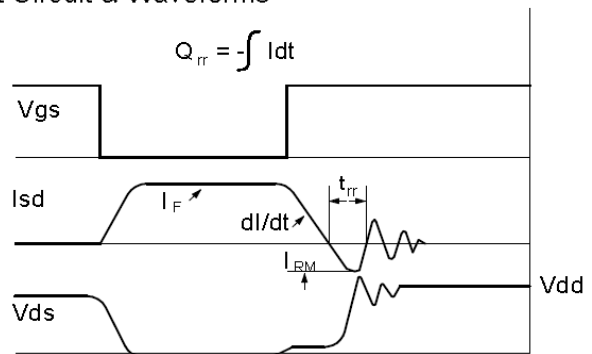
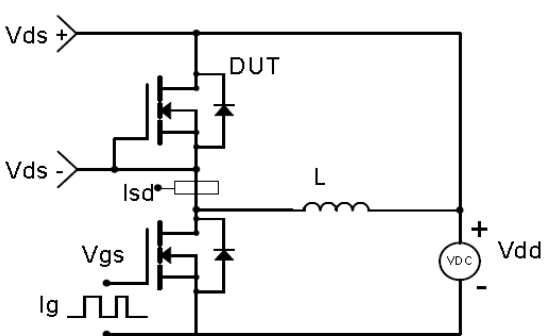
Resistive Switching Test Circuit & Waveforms



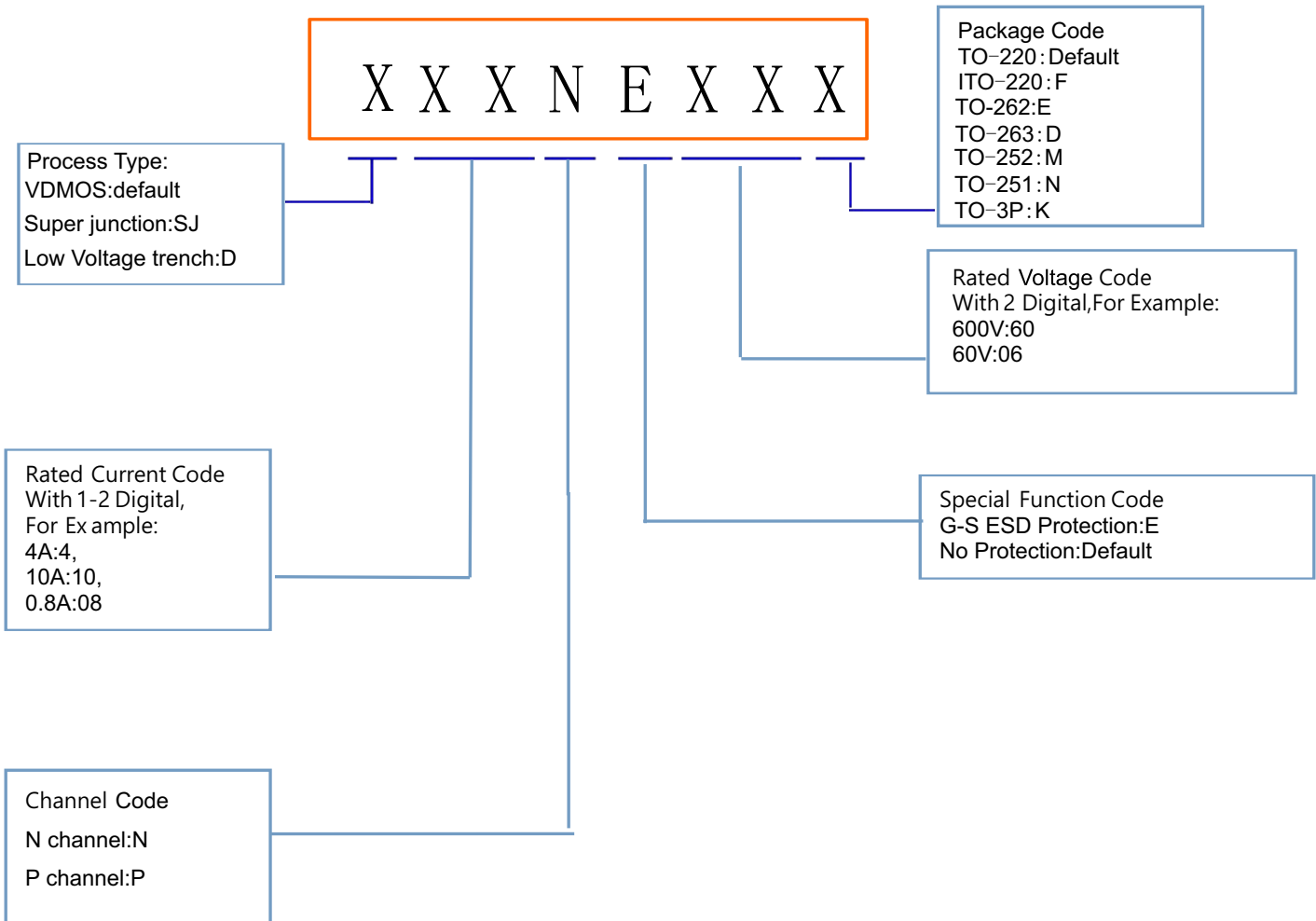
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

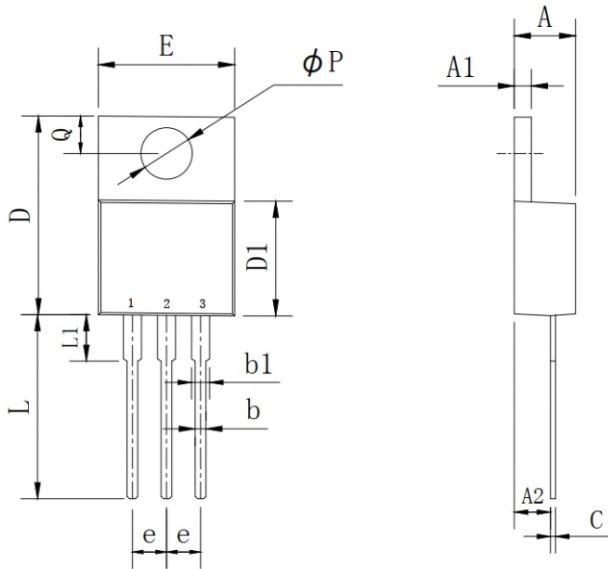


Product Names Rules



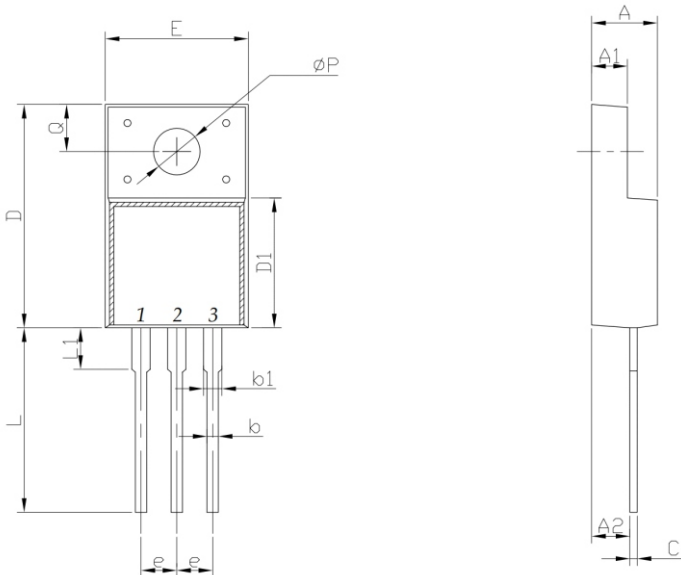
Dimensions

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

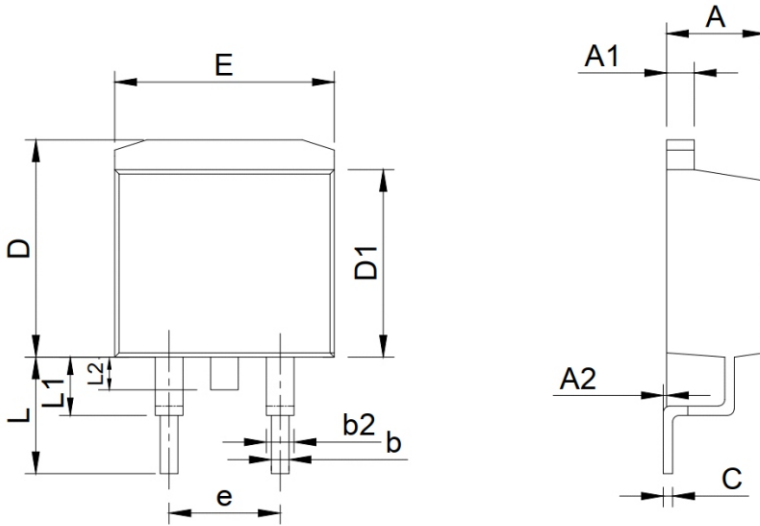
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

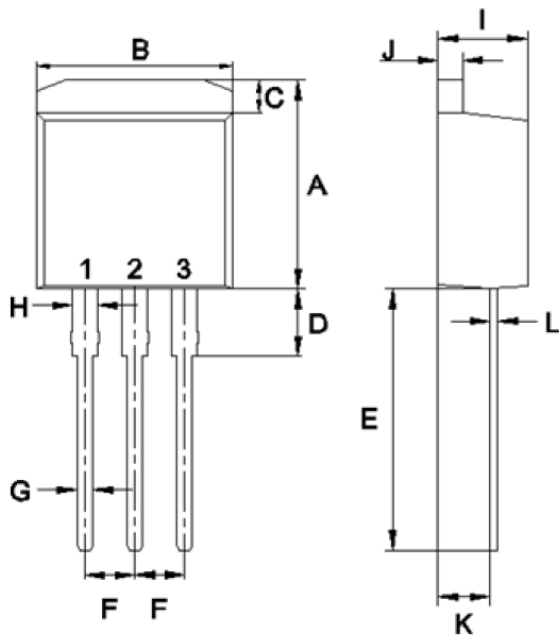
Dimensions

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

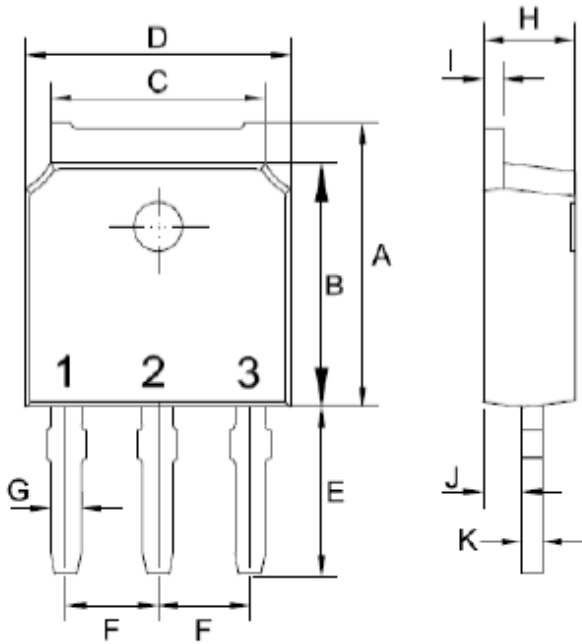


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	10.14	11.14	0.399	0.439
B	9.57	10.57	0.377	0.416
C	1.15	1.84	0.045	0.072
D	2.95	3.95	0.116	0.156
E	12.25	13.75	0.482	0.541
F	2.34	2.74	0.092	0.108
G	0.51	1.11	0.020	0.044
H	0.97	1.57	0.038	0.062
I	4.25	4.87	0.167	0.192
J	1.07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



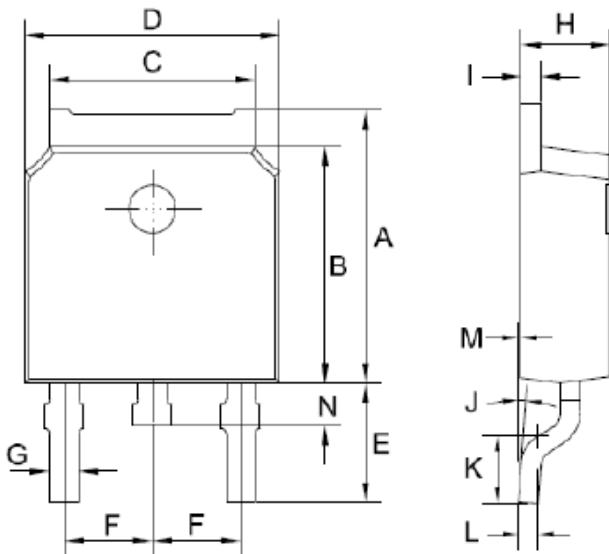
Dimensions

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



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	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	0°	8°	0°	8°
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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