

### 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.

### 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

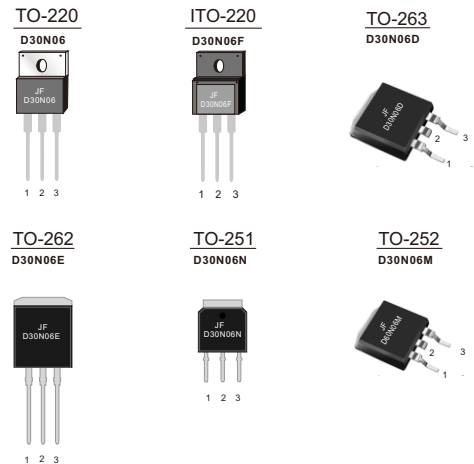
### Application

- Switching applications

### Ordering Information

Part No.	Package Type	Package	Quality(box)
D30N06	TO-220	Tube	1000
D30N06F	ITO-220	Tube	1000
D30N06D	TO-263	Tape & Reel	800
D30N06E	TO-262	Tube	1000
D30N06N	TO-251	Tube	1000
D30N06M	TO-252	Tape & Reel	3000

Product Summary			
$V_{DS}$	$R_{ds(on)}$ (m $\Omega$ ) Typ	$I_D$ (A)	$Q_g$ (Typ)
60V	24 @ 10V	30	22.4nc



### Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

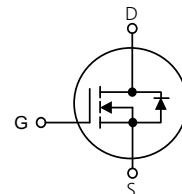


Table1 Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	D30N06/D30N06D/D30N06E D30N06M/D30N06N	D30N06F	Unit
Drain-Source Voltage	$V_{DS}$	60		V
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	30	A
		$T_C=100^\circ\text{C}$	20	
Pulsed Drain Current (Note 1)	$I_{DM}$	74		A
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	120		mJ
Avalanche Current (Note 1)	$I_{AR}$	22		A
Power Dissipation $T_C=25^\circ\text{C}$	$P_D$	50	20	W
Operating Junction and Storage Temperature	$T_J/T_{STG}$	-55~+175		$^\circ\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	D30N06/D30N06D/ D30N06M/D30N06N D30N06E	D30N06F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	3.0	7.5	$^{\circ}C/W$

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	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	68	-	-	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu A$
Gate- Source Leakage Current	Forward	$I_{GSS}$	-	-	100	nA
	Reverse				-100	nA
On Characteristics(Note 4)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	-	3.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=15A$	-	24	35	m $\Omega$
Dynamic Characteristics(Note 5)						
Input Capacitance	$C_{ISS}$	$V_{DS}=35V, V_{GS}=0V, f=1MHz$	-	1000	-	pF
Output Capacitance	$C_{OSS}$		-	85	-	pF
Reverse Transfer Capacitance	$C_{RSS}$		-	68	-	pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=30V, I_D=30A,$ $V_{GS}=4.5V, R_G=6\Omega$	-	25.5	-	ns
Turn-On Rise Time	$t_R$		-	92.9	-	ns
Turn-Off Delay Time	$t_d(off)$		-	74.3	-	ns
Turn-Off Fall Time	$t_f$		-	70.4	-	ns
Total Gate Charge	$Q_G$	$V_{DD}=30V, I_D=10A,$ $V_{GS}=10V$	-	22.4	-	nC
Gate-Source Charge	$Q_{GS}$		-	7.1	-	nC
Gate-Drain Charge	$Q_{GD}$		-	6.9	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=30A$	-	0.95	1.2	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		-	-	30	A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=10A$ $di_F/dt=100A/\mu s$ (Note 1)	-	22.5	-	ns
Reverse Recovery Charge	$Q_{RR}$		-	10.6	-	nC

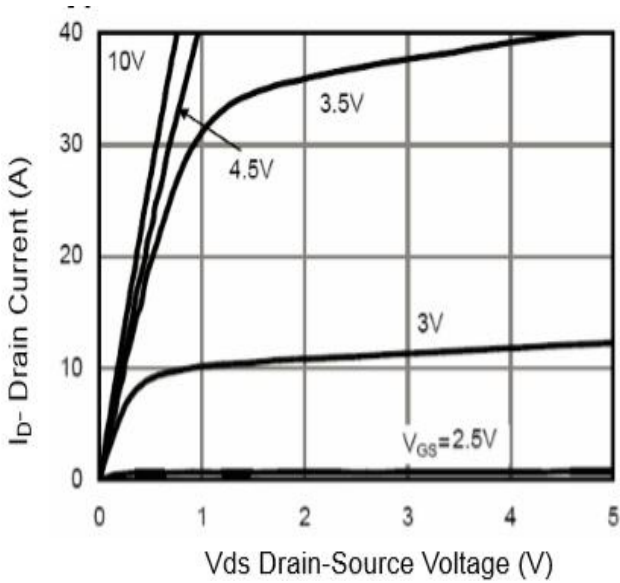
Notes : 1 Repetitive Rating: Pulse width limited by maximum junction temperature

2  $L=0.5mH, I_D=22A, V_{DD}=50V$ , Starting  $T_J=25^{\circ}C$

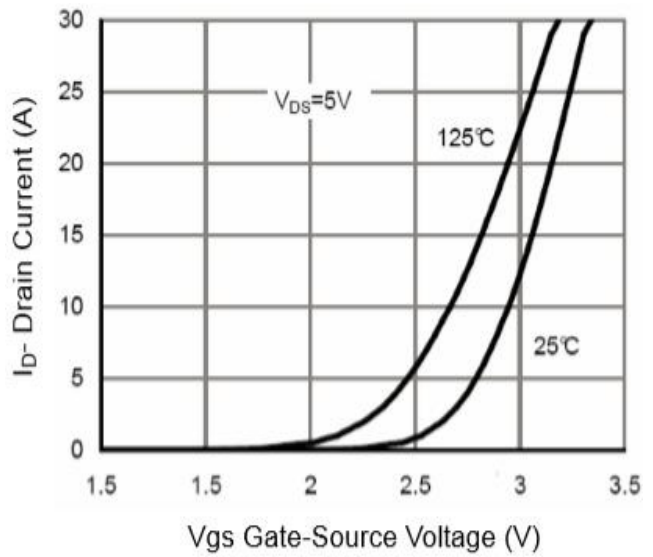
4 Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

5 Guaranteed by design, not subject to production

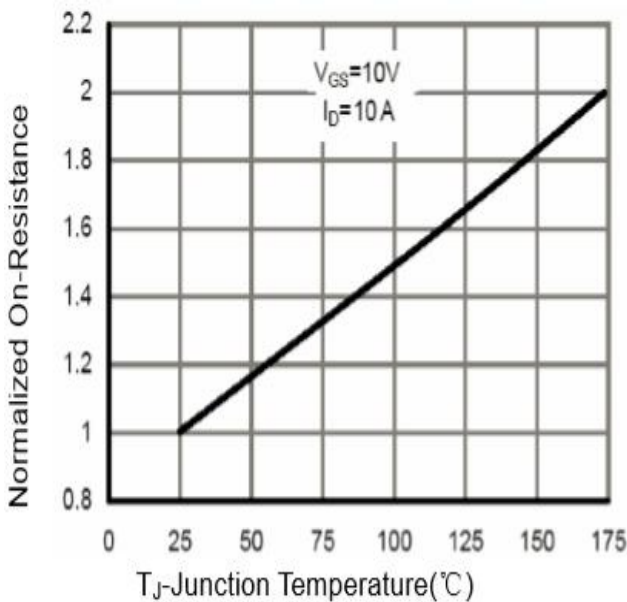
Typical Characteristics Diagrams



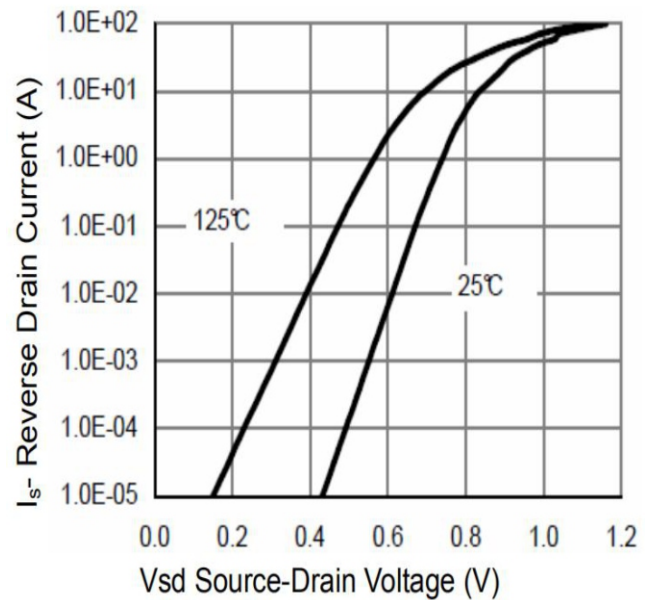
**Fig 1 Output Characteristics**



**Fig 2 Transfer Characteristics**

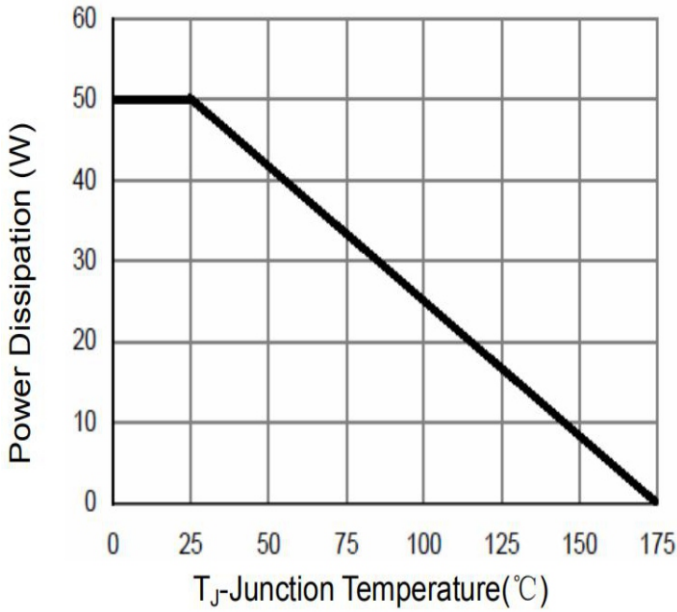


**Fig 3 RDSON vs Junction Temperature**

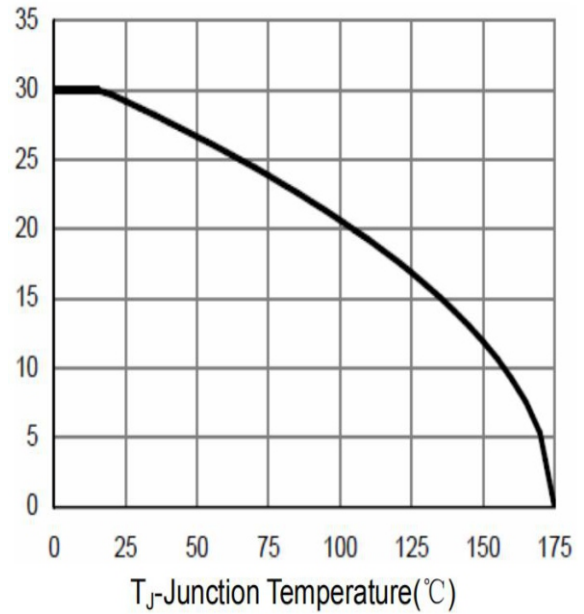


**Fig 4 Source-Drain Diode Forward**

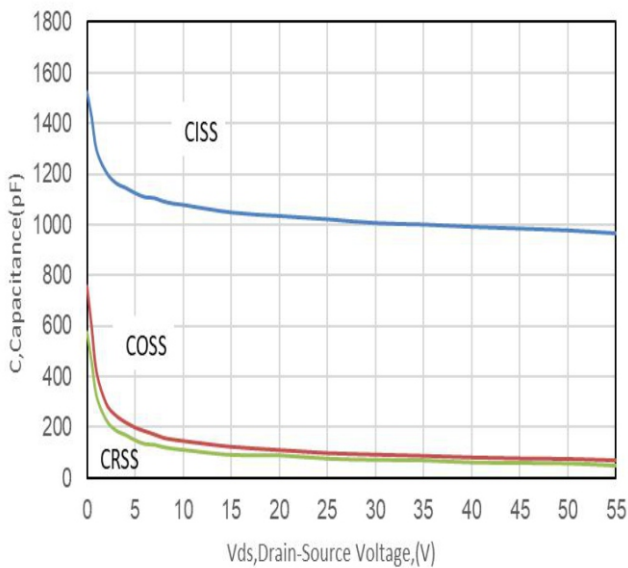
Typical Characteristics Diagrams



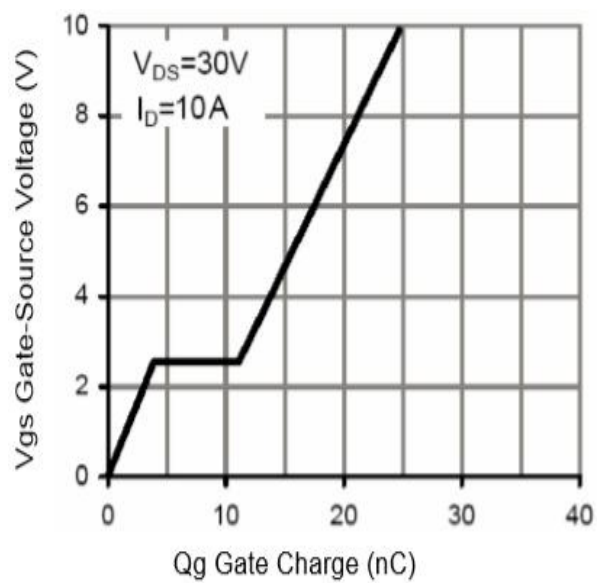
**Fig 5 Power De-rating**



**Fig 6 Current De-rating**



**Fig 7 Capacitances vs Vds**



**Fig 8 Gate Charge**

Typical Characteristics Diagrams

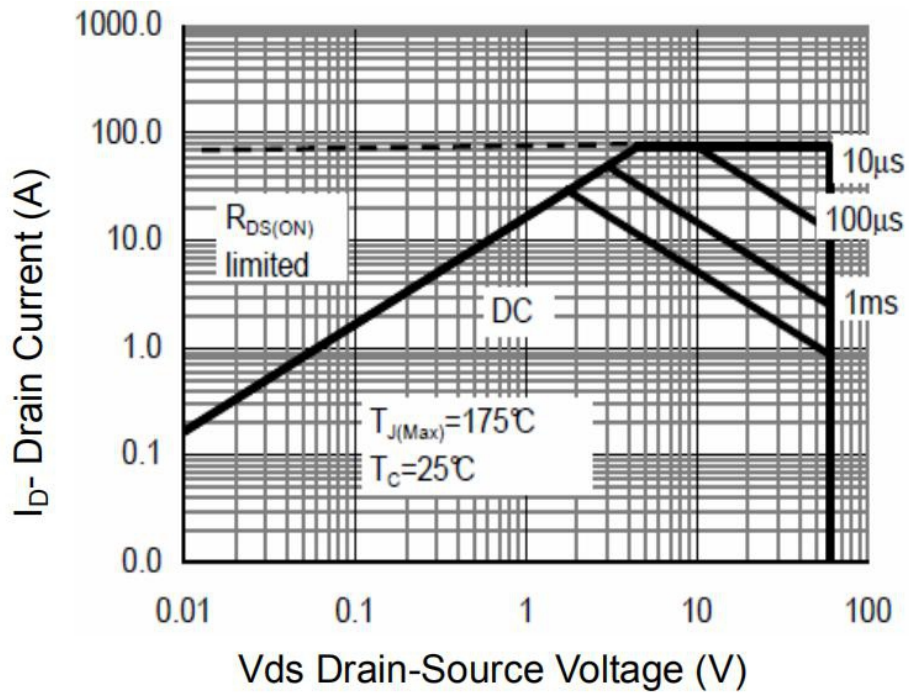


Fig 9 Safe Operation Area

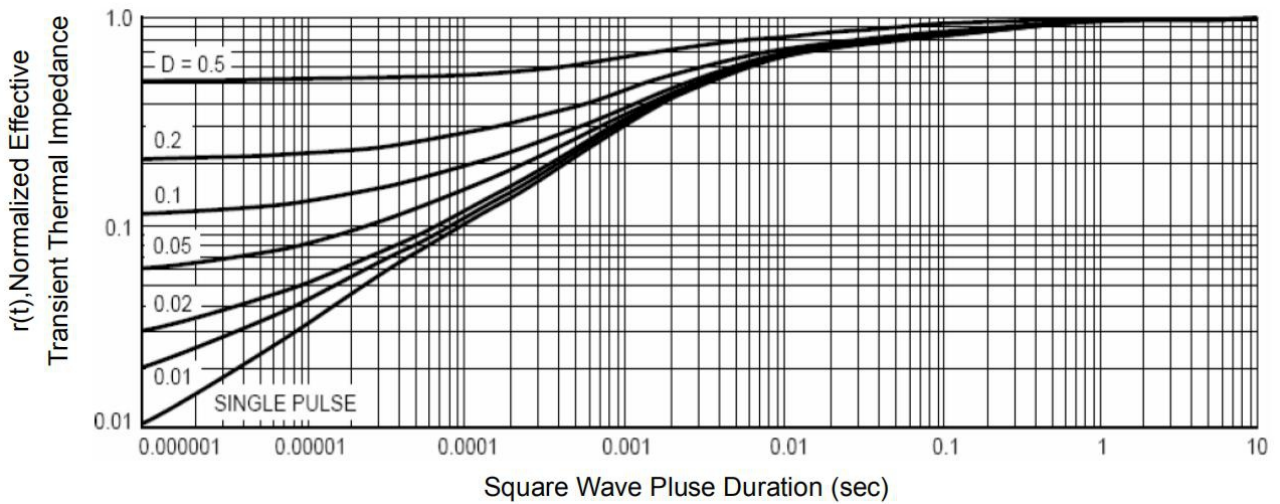
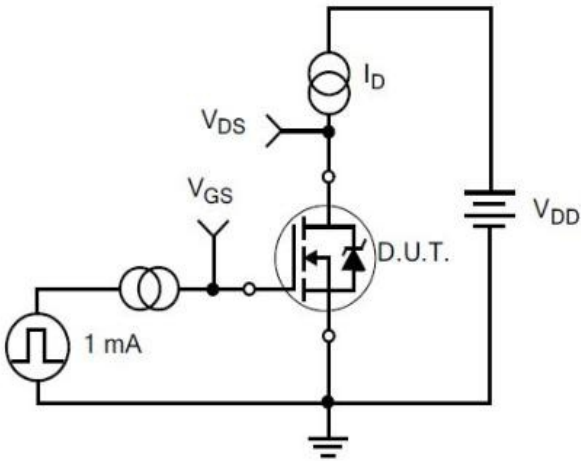
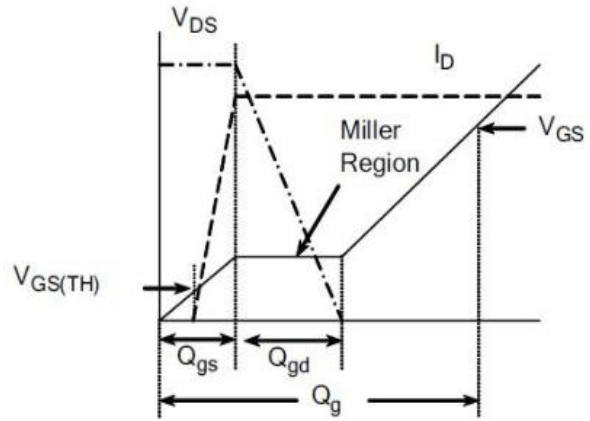


Fig 10 Normalized Maximum Transient Thermal Impedance

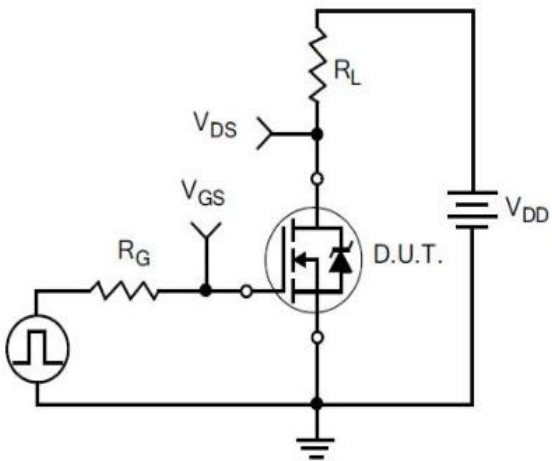
Typical Test Circuit



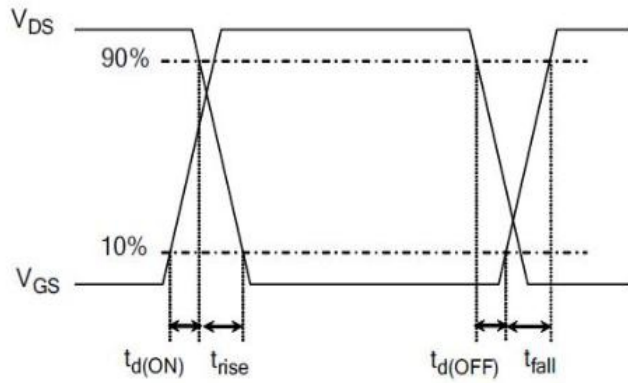
1) Gate Charge Test Circuit



2) Gate Charge Waveform

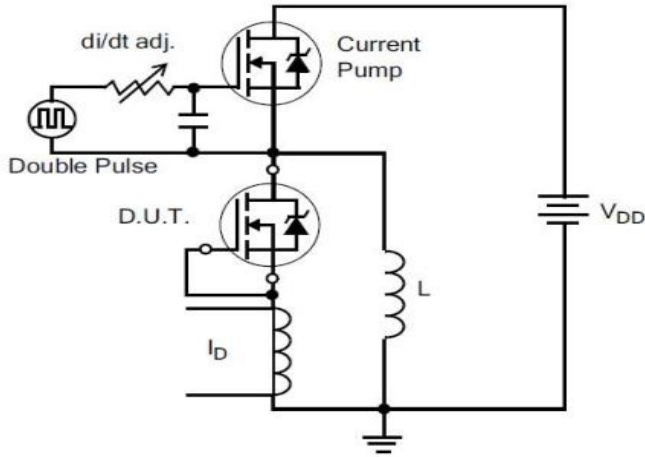


3) Resistive Switching Test Circuit

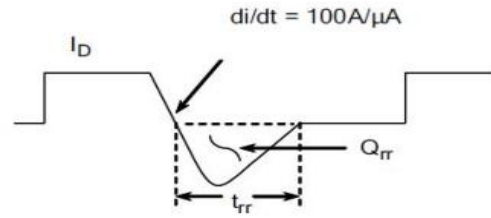


4) Resistive Switching Waveforms

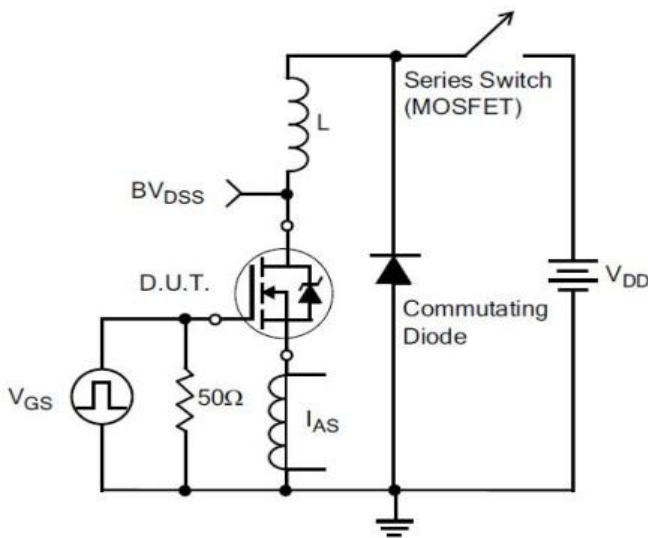
Typical Test Circuit



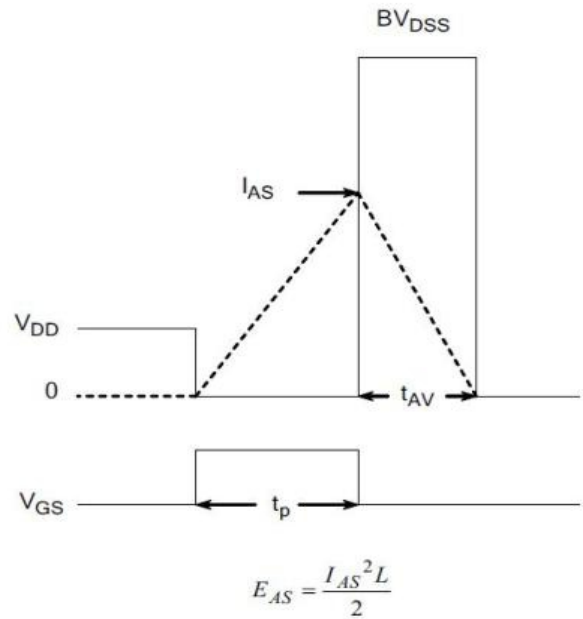
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

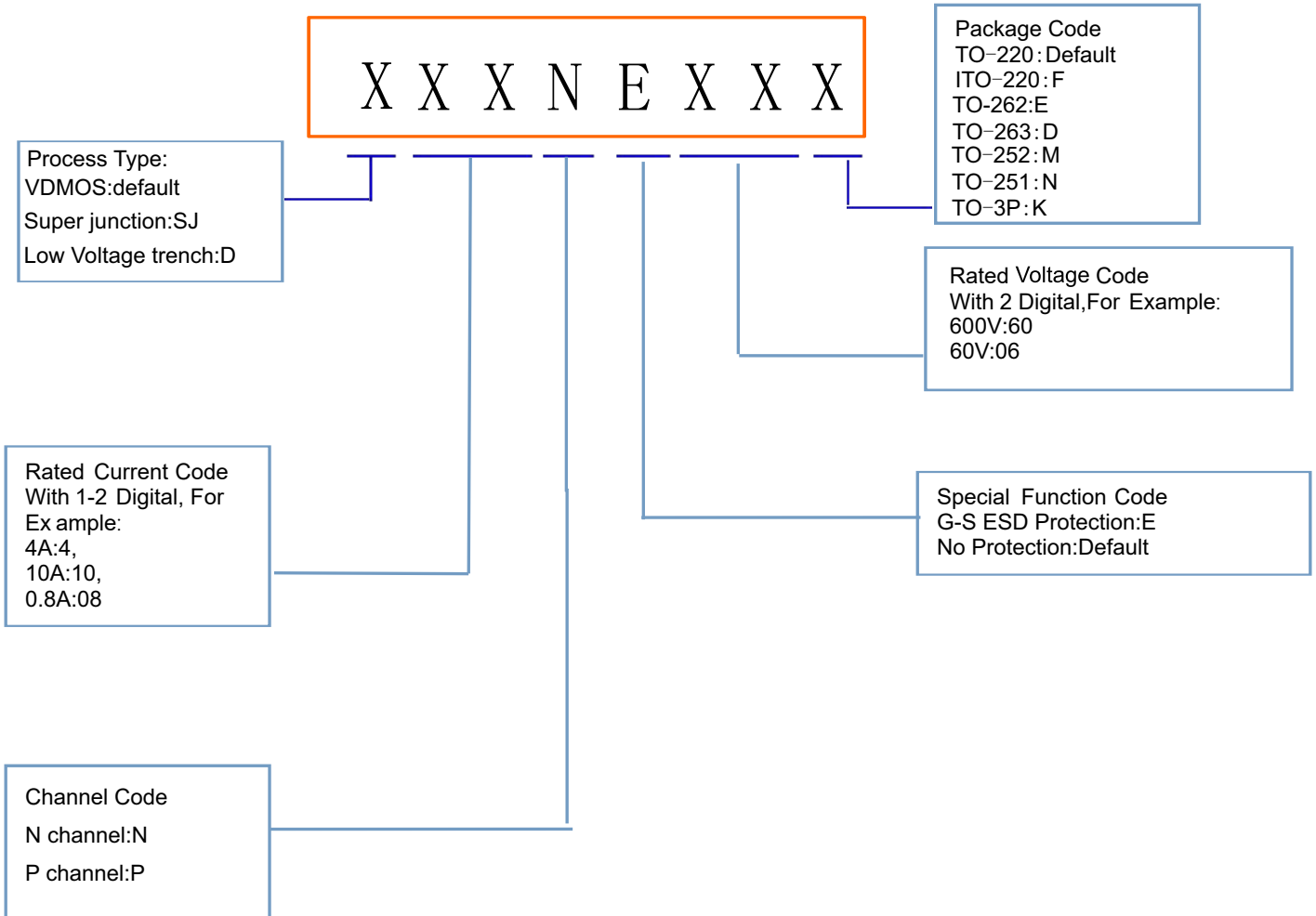


7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

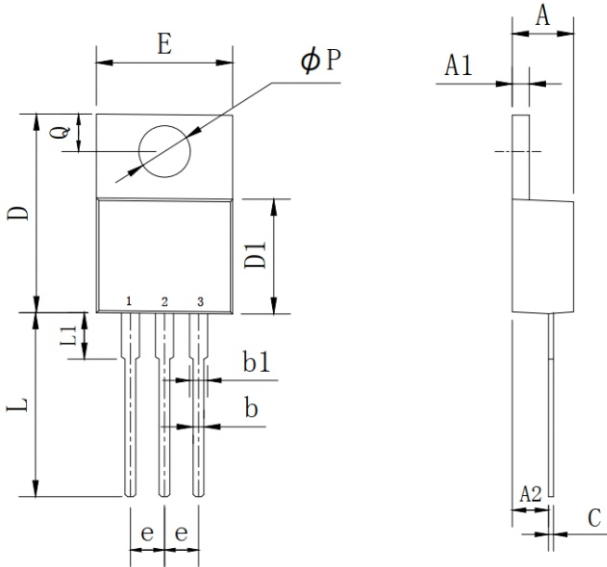
Product Names Rules





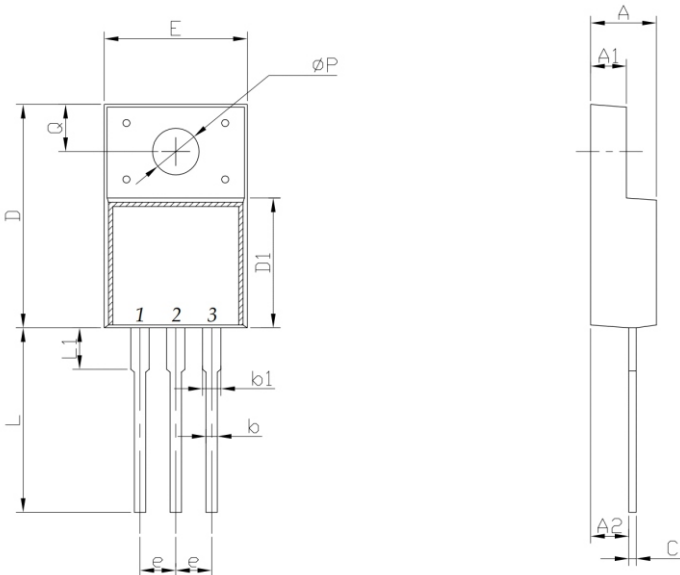
Dimensions

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

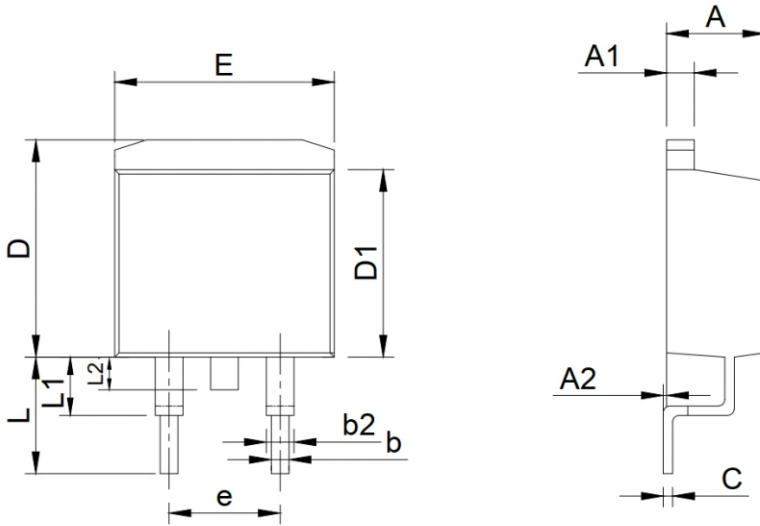
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

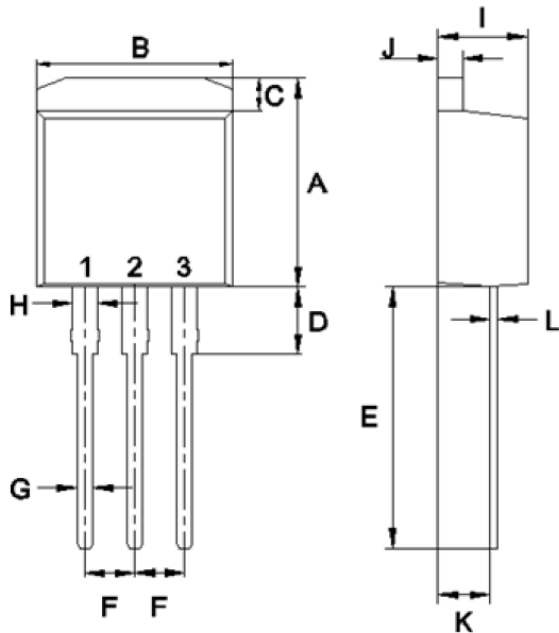
Dimensions

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

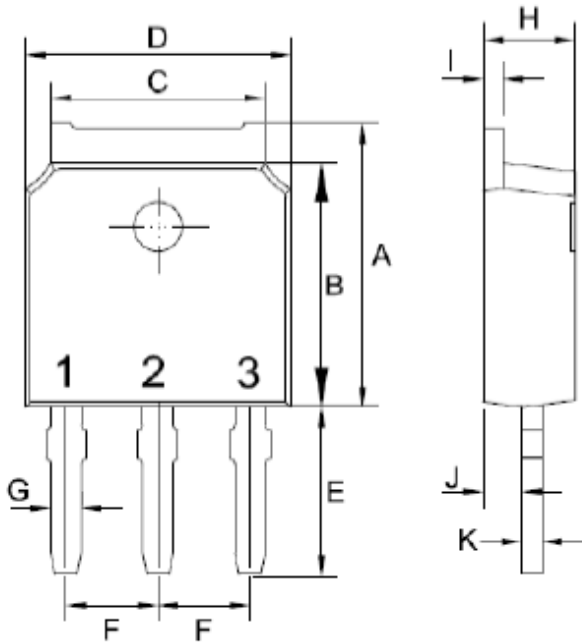
TO-262 PACKAGE OUTLINE DIMENSIONS



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

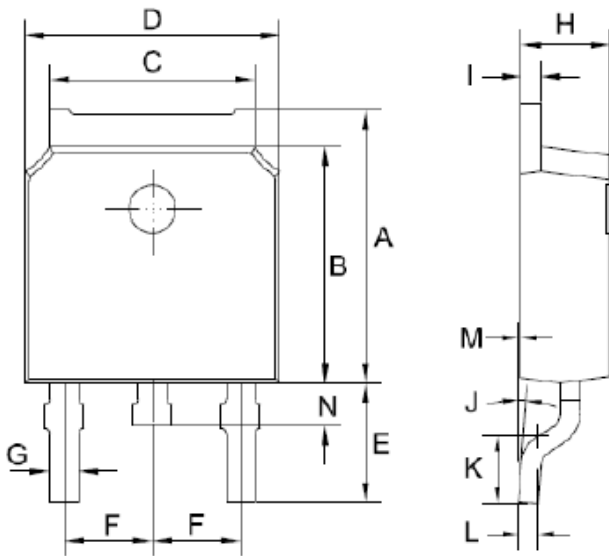
Dimensions

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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