

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 Ω) Typ	I_D (A)	Q_g (Typ)
100V	18 @ 10V	60	17nc

Features

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

Mechanical Data

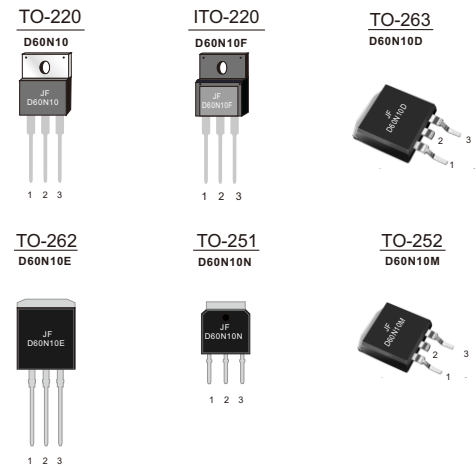
- Case: TO-220, ITO-220, TO-263, TO-262, TO-251, TO-252 Package

Application

- Switching applications

Ordering Information

Part No.	Package Type	Package	Quality(box)
D60N10	TO-220	Tube	1000
D60N10F	ITO-220	Tube	1000
D60N10D	TO-263	Tape & Reel	800
D60N10E	TO-262	Tube	1000
D60N10N	TO-251	Tube	1000
D60N10M	TO-252	Tape & Reel	3000



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

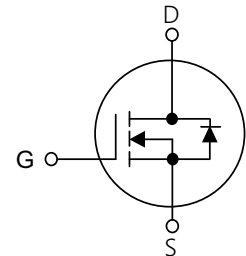


Table1 Absolute Maximum Ratings ($T_C=25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	D60N10/D60N10D/D60N10E D60N10M/D60N10N		Unit	
			D60N10F		
Drain-Source Voltage	V_{DS}	100		V	
Gate-Source Voltage	V_{GS}	± 20		V	
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	60		A
Pulsed Drain Current (Note 1)			150		A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	150		mJ	
Avalanche Current (Note 1)	I_{AR}	25		A	
Power Dissipation	P_D	$T_C=25^\circ\text{C}$	115	35	W
Operating Junction and Storage Temperature			T_J/T_{STG}	-55~+175	

Table 2. Thermal Characteristics

Parameter	Symbol	D60N10/D60N10D/ D60N10M/D60N10N D60N10E	D60N10F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	1.30	4.29	$^{\circ}C/W$

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}	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	1	μA
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	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.5	4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	-	18	22	m Ω
Dynamic Characteristics(Note 5)						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1322	-	pF
Output Capacitance	C_{OSS}		-	358	-	pF
Reverse Transfer Capacitance	C_{RSS}		-	46	-	pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=50V, I_D=47A,$ $V_{GS}=10V, R_G=25\Omega$	-	24	-	ns
Turn-On Rise Time	t_R		-	13	-	ns
Turn-Off Delay Time	$t_d(off)$		-	27	-	ns
Turn-Off Fall Time	t_f	$V_{DD}=80V, I_D=47A,$ $V_{GS}=10V$	-	10	-	ns
Total Gate Charge	Q_G		-	17	-	nC
Gate-Source Charge	Q_{GS}		-	8.1	-	nC
Gate-Drain Charge	Q_{GD}	-	2.3	-	nC	
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	1.3	V
Maximum Continuous Drain-Source Diode Forward Current	I_S		-	-	47	A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_F=47A$	-	62	-	ns
Reverse Recovery Charge	Q_{RR}	$di_F/dt=100A/\mu s$ (Note 1)	-	84	-	nC

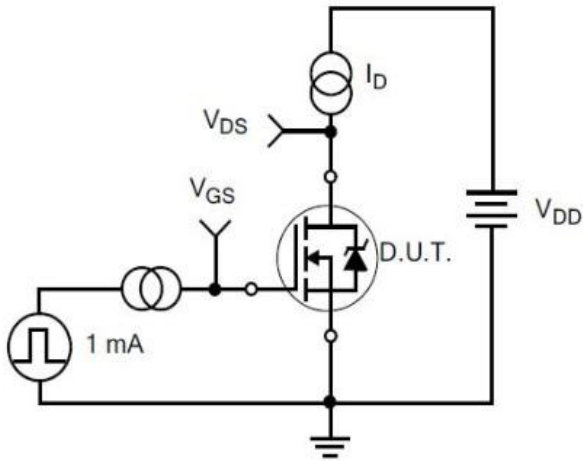
Notes : 1 Repetitive Rating: Pulse width limited by maximum junction temperature

2 $L=0.5mH, I_D=20A, V_{DD}=80V$, Starting $T_J=25^{\circ}C$

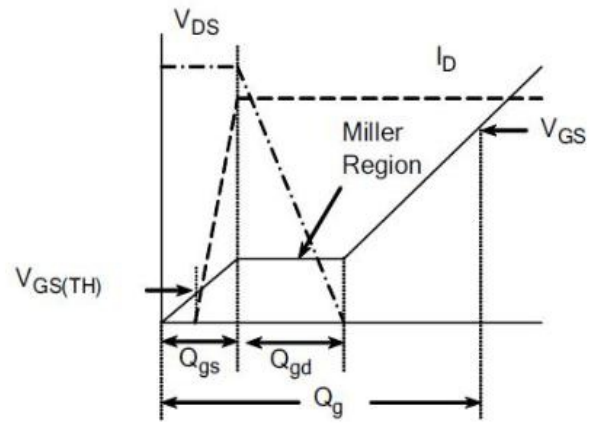
4 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

5 Guaranteed by design, not subject to production

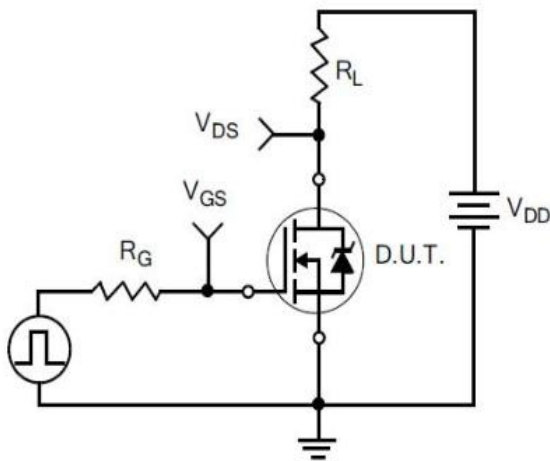
Typical Test Circuit



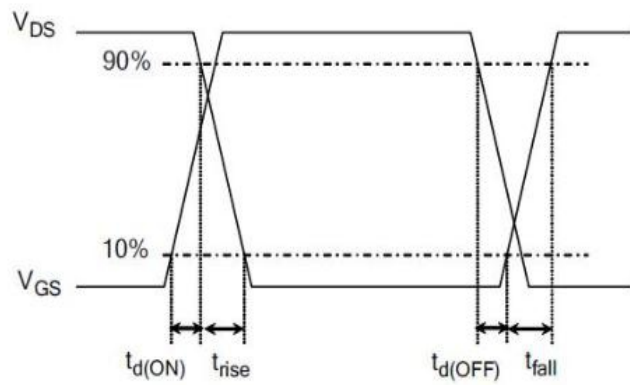
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

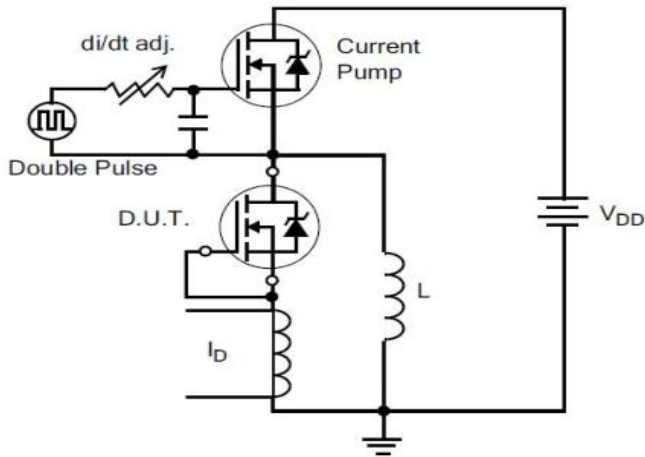


3) Resistive Switching Test Circuit

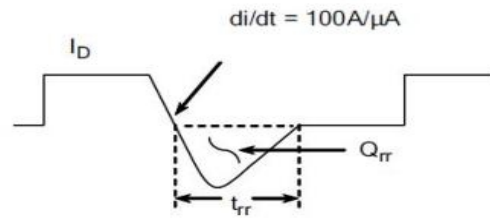


4) Resistive Switching Waveforms

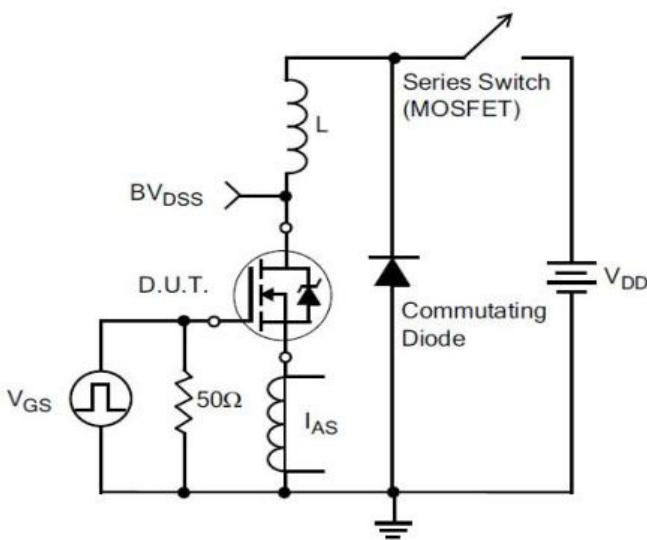
Typical Test Circuit



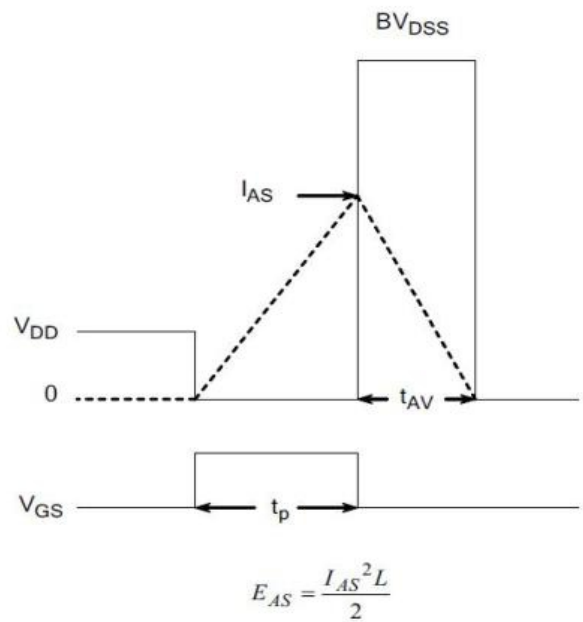
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

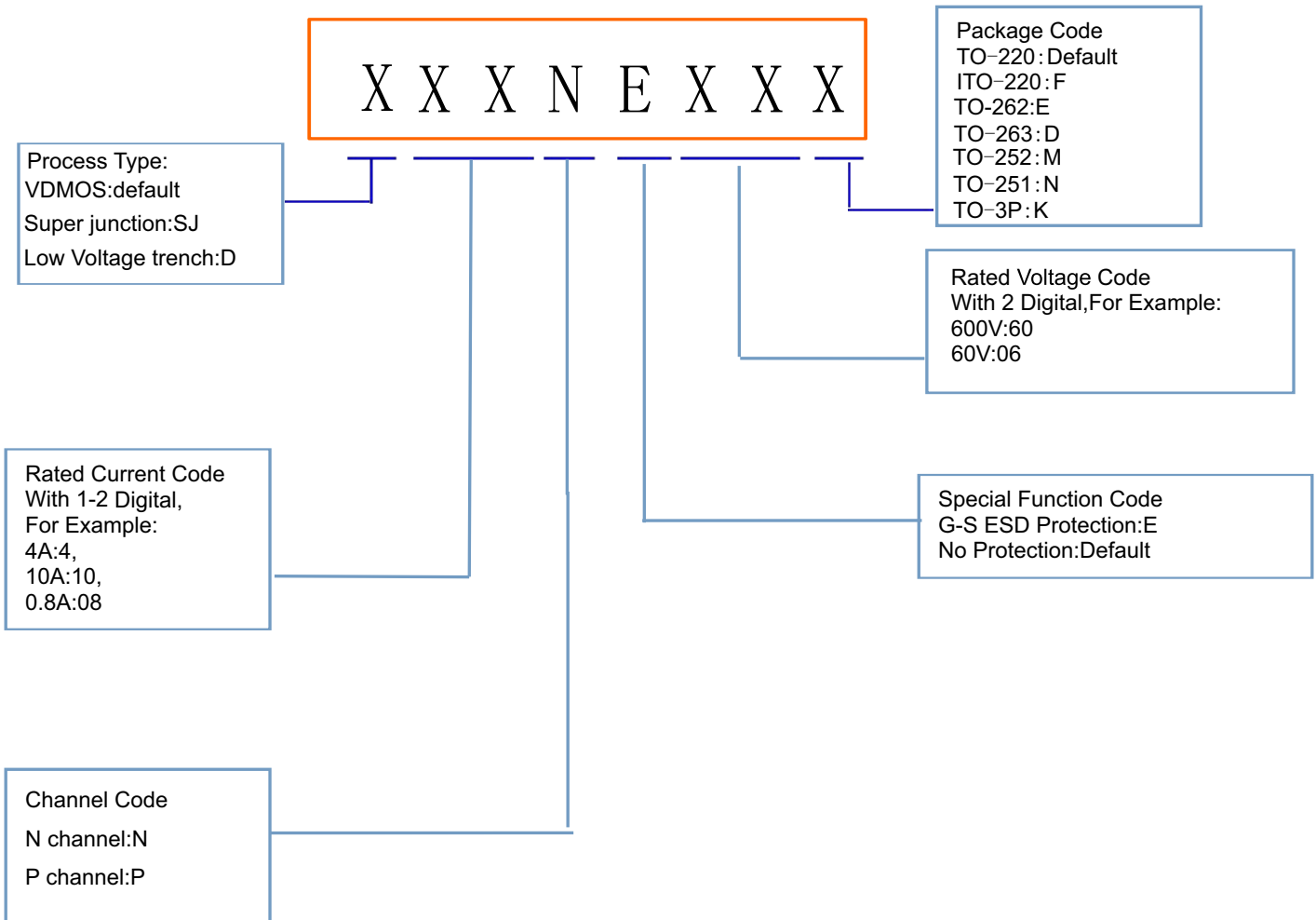


7) . Unclamped Inductive Switching Test Circuit



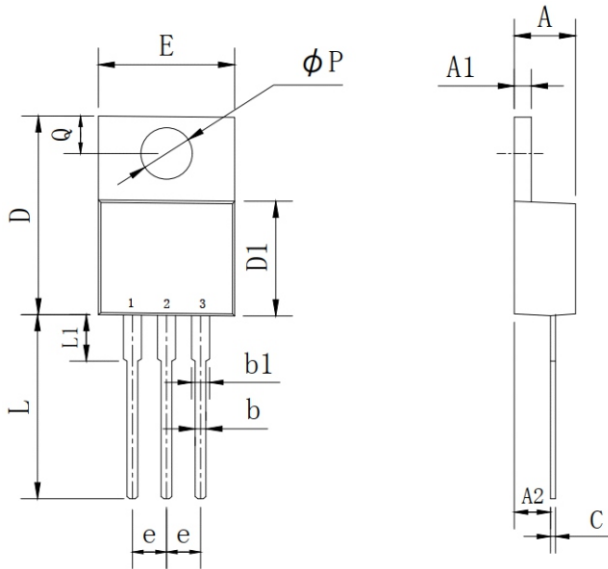
8) Unclamped Inductive Switching Waveforms

Product Names Rules



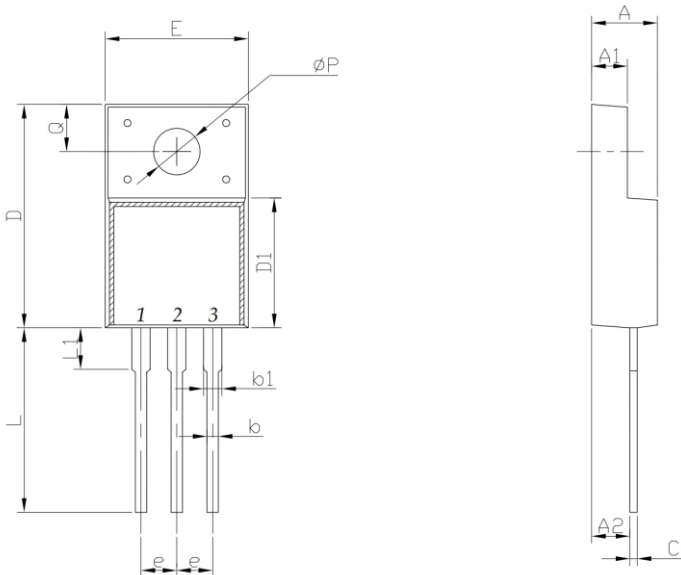
Dimensions

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

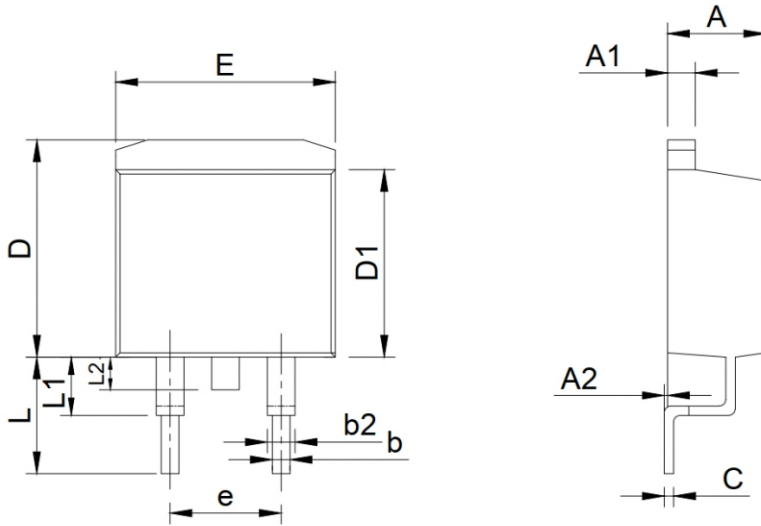
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

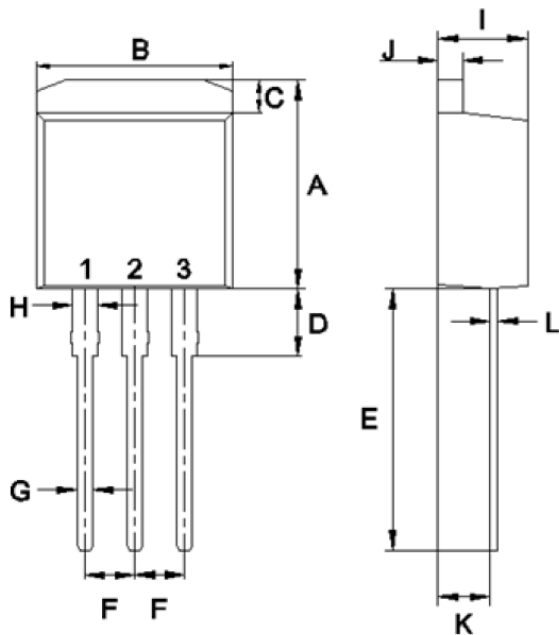
Dimensions

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

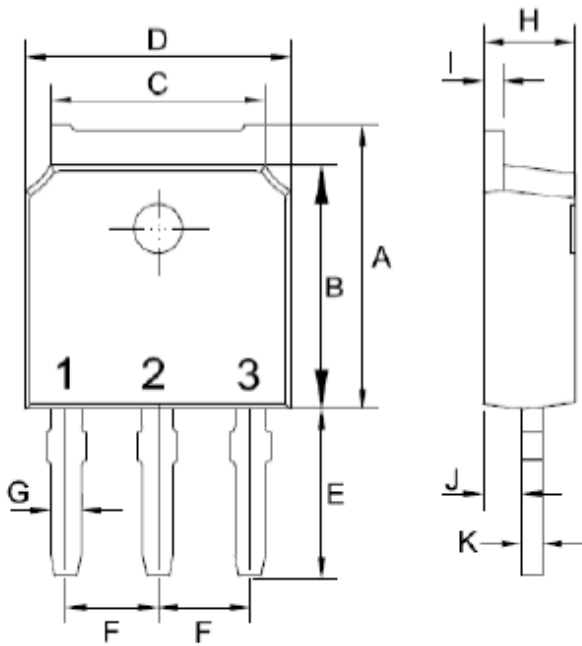
TO-262 PACKAGE OUTLINE DIMENSIONS



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

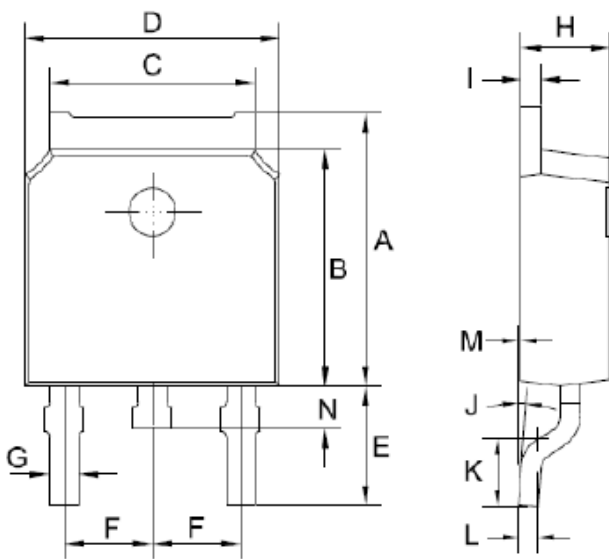
Dimensions

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	0.71	1.31	0.028	0.052
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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