

General Description

These N-channel enhancement mode power mosfets Used advanced splite gate 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-263-7L, TO-262, TO-251, TO-252 Package

Application

- Power switching applications
- DC-DC Converters
- Full bridge control

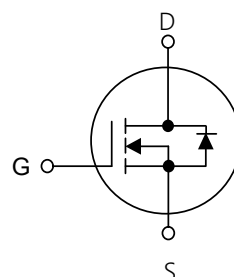
Ordering Information

Part No.	Package Type	Package	Quality(box)
D60N06	TO-220	Tube	1000
D60N06F	ITO-220	Tube	1000
D60N06D	TO-263	Tape & Reel	800
D60N06E	TO-262	Tube	1000
D60N06N	TO-251	Tube	1000
D60N06M	TO-252	Tape & Reel	3000
D60N06D7	TO-263-7L	Tape & Reel	800

Product Summary			
V_{DS}	$R_{DS(on)}$ (m Ω) Typ	I_D (A)	Q_g (Typ)
68V	10.5 @ 10V	60	46.3nc



Block Diagram



Pin Definition:

1. Gate
2. Drain
- 3/4/5/6/7. Source

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

Parameter	Symbol	D60N06/D60N06D/D60N06E D60N06M/D60N06N D60N06D7	D60N06F	Unit
Drain-Source Voltage	V_{DS}	68		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current	I_D	60		A
		42		
Pulsed Drain Current (Note 1)	I_{DM}	240		A
Single Pulse Avalanche Energy(Note 2)	E_{AS}	300		mJ
Power Dissipation $T_c=25^\circ\text{C}$	P_D	110	35	W
Operating Junction and Storage Temperature	T_J/T_{STG}	$-55 \sim +175$		$^\circ\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	D60N06/D60N06D/ D60N06M/D60N06N D60N06E/D60N06D7	D60N06F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}\text{C/W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	1.36	4.29	$^{\circ}\text{C/W}$

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

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250μA	68	-	-	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =68V,V _{GS} =0V	-	-	1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =20V,V _{DS} =0V	-	-	100	nA
	Reverse		V _{GS} =-20V,V _{DS} =0V	-	-	-100	nA
On Characteristics(Note 3)							
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 =30A	-	10.5	15	mΩ
Dynamic Characteristics(Note 4)							
Input Capacitance		C _{ISS}	V _{DS} =35V,V _{GS} =0V,f=1MHz	-	2160	-	pF
Output Capacitance		C _{OSS}		-	147	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	120	-	pF
Gate Resisitance		R _G	V _{DD} =0V,V _{GS} =1V,f=1MHz	-	1.28	-	Ω
Switching Characteristics (Note 4)							
Turn-On Delay Time		t _{d(on)}	V _{DD} =35V,I _D =30A V _{GS} =10V,R _{GEN} =2Ω,	-	21	-	ns
Turn-On Rise Time		t _r		-	100	-	ns
Turn-Off Delay Time		t _{d(off)}		-	9.5	-	ns
Turn-Off Fall Time		t _f		-	17	-	ns
Total Gate Charge		Q _G	V _{DD} =35V,I _D =30A, V _{GS} =10V	-	46.3	-	nC
Gate-Source Charge		Q _{GS}		-	15.2	-	nC
Gate-Drain Charge		Q _{GD}		-	14.5	-	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =60A	-	-	1.2	V
Maximum Continuous Drain-Source Diode Forward Current		I _S		-	-	30	A
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _F =30A	-	24.2	-	ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs (Note 1)	-	18.2	-	nC

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

2 $L=0.5\text{mH}$, $I_D=35A$, $V_{DD}=50V$, $V_{GATE}=10V$, Starting $T_J=25^{\circ}\text{C}$

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

4 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

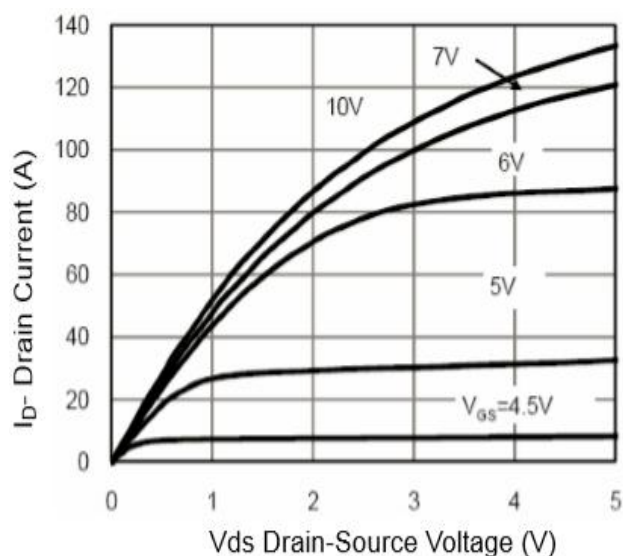


Fig 1 Output Characteristics

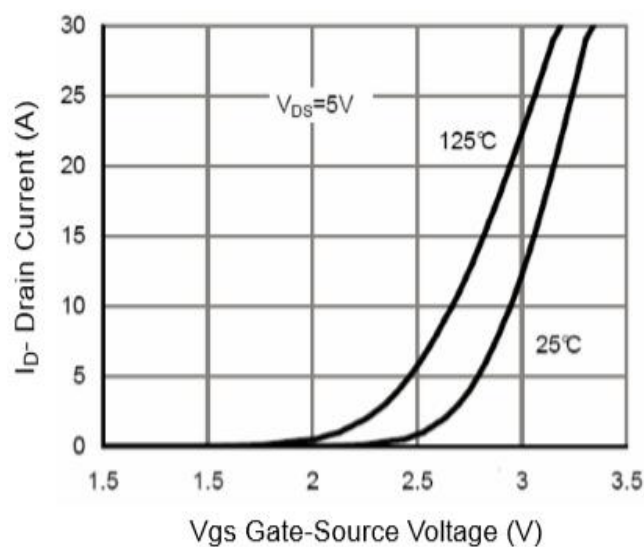


Fig 2 Transfer Characteristics

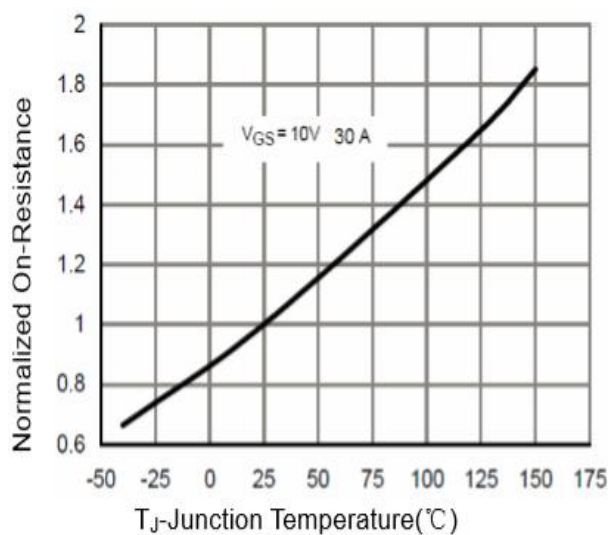


Fig 3 RDSON vs Junction Temperature

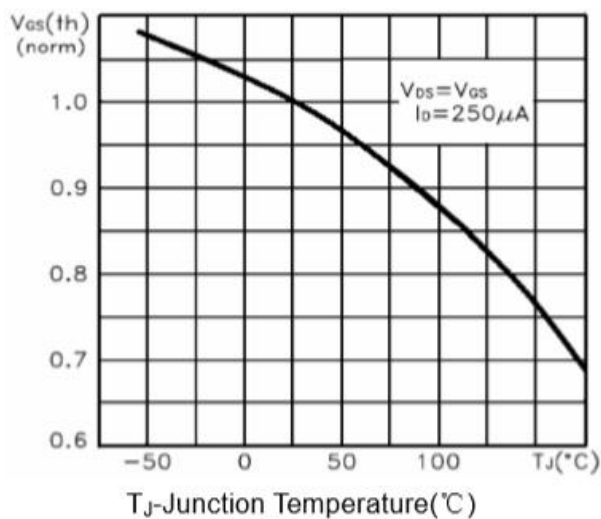


Fig 4 VTH vs Junction Temperature

Typical Characteristics Diagrams

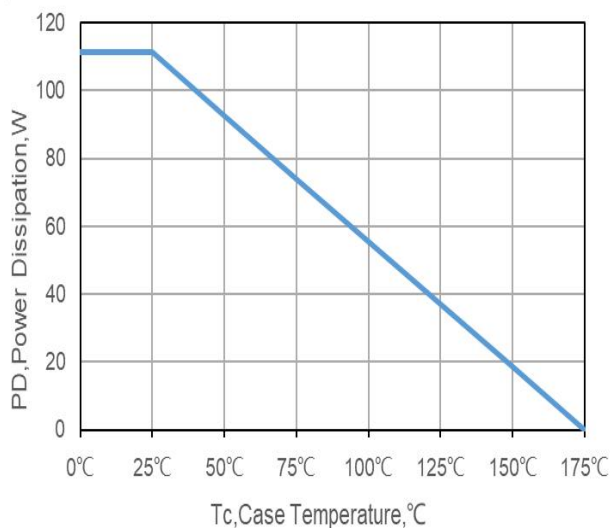


Fig 5 VTH vs Junction Temperature

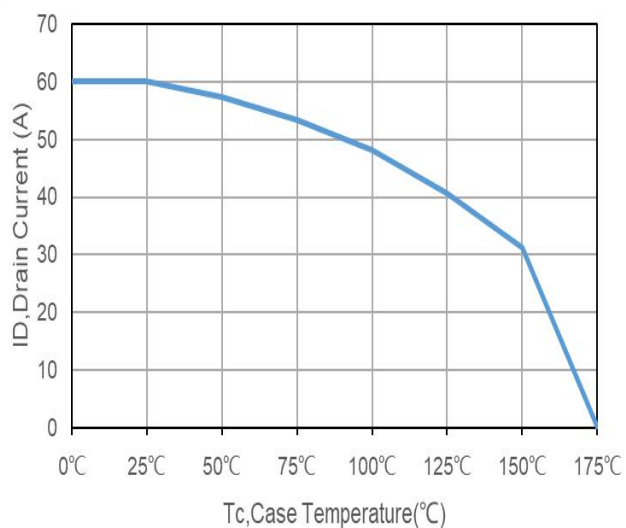


Fig 6 Current De-rating

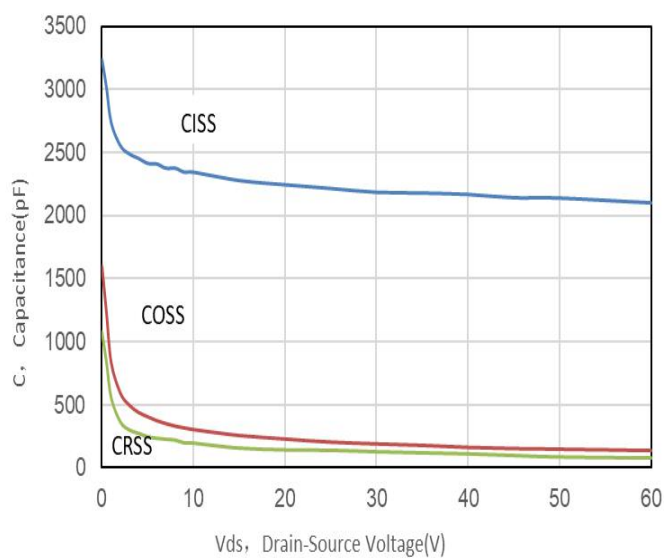


Fig 7 Capacitances vs Vds

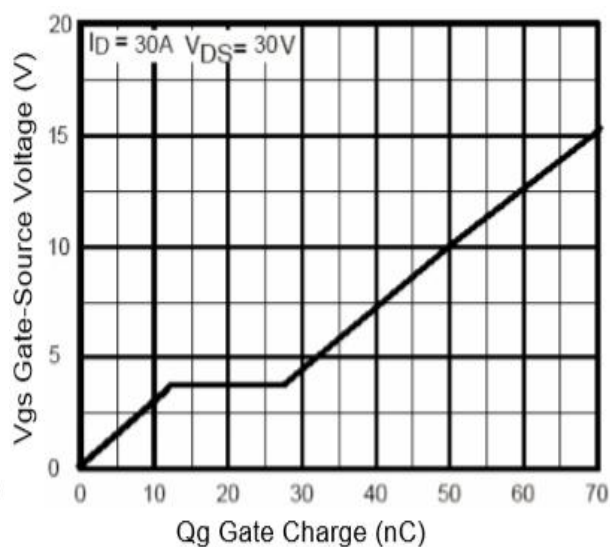
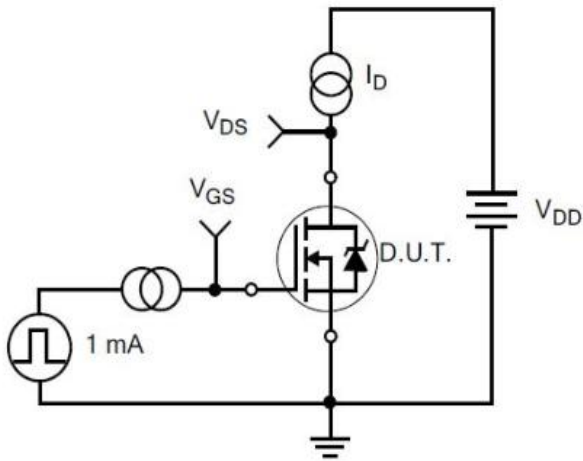
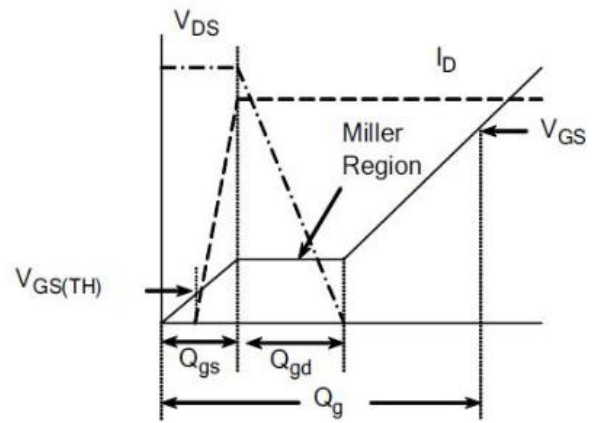


Fig 8 Gate Charge

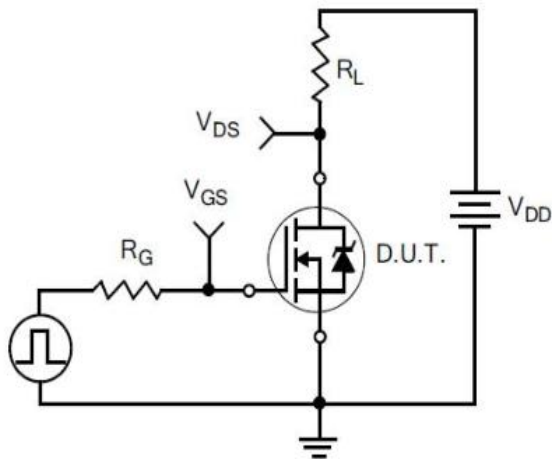
Typical Test Circuit



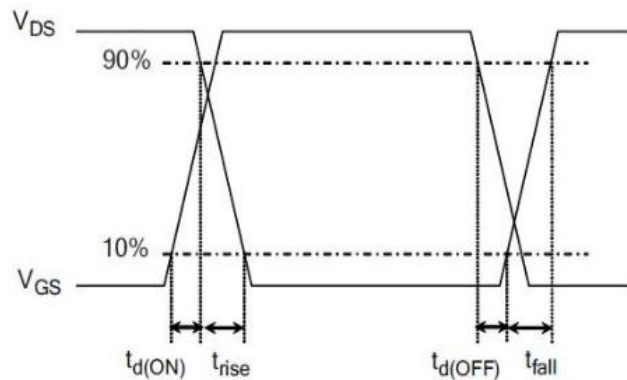
1) Gate Charge Test Circuit



2) Gate Charge Waveform

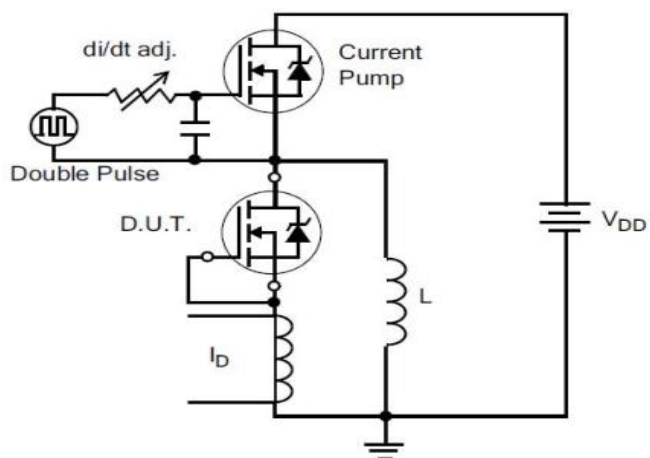


3) Resistive Switching Test Circuit

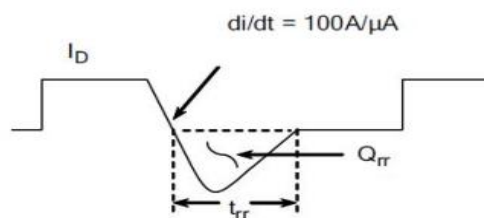


4) Resistive Switching Waveforms

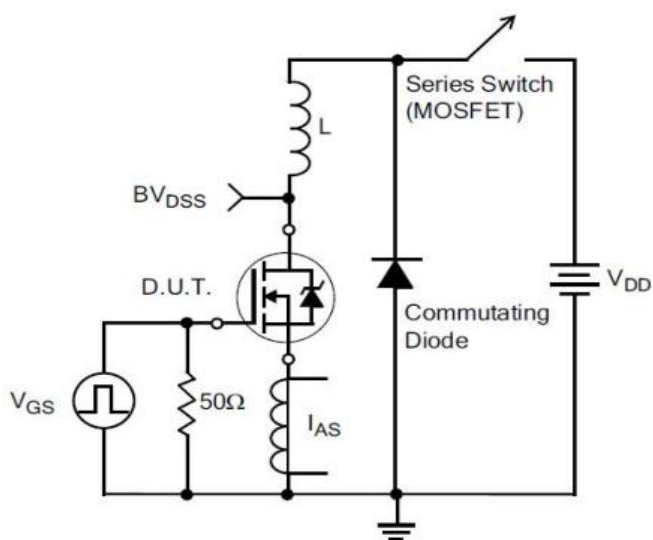
Typical Test Circuit



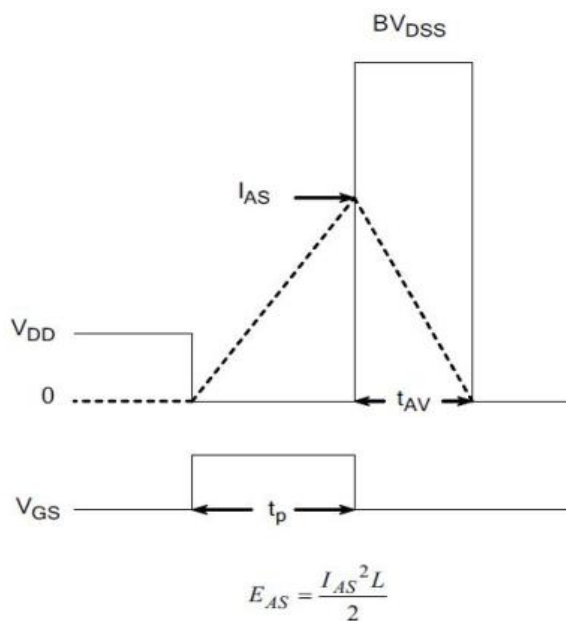
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

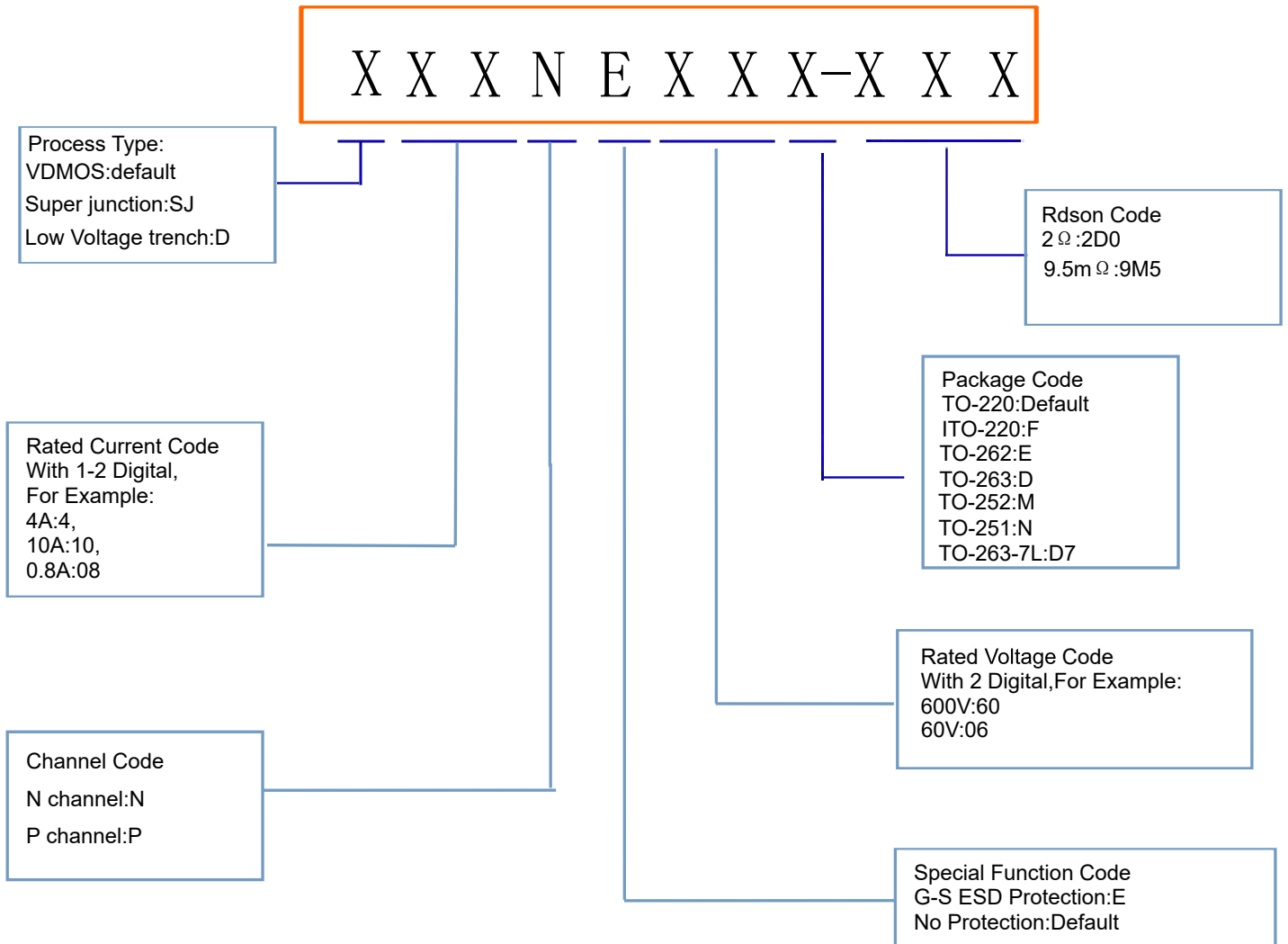


7) . Unclamped Inductive Switching Test Circuit



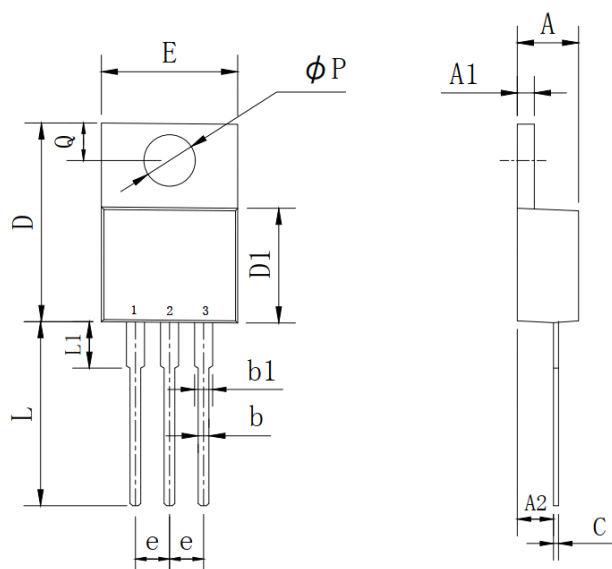
8) Unclamped Inductive Switching Waveforms

Product Names Rules



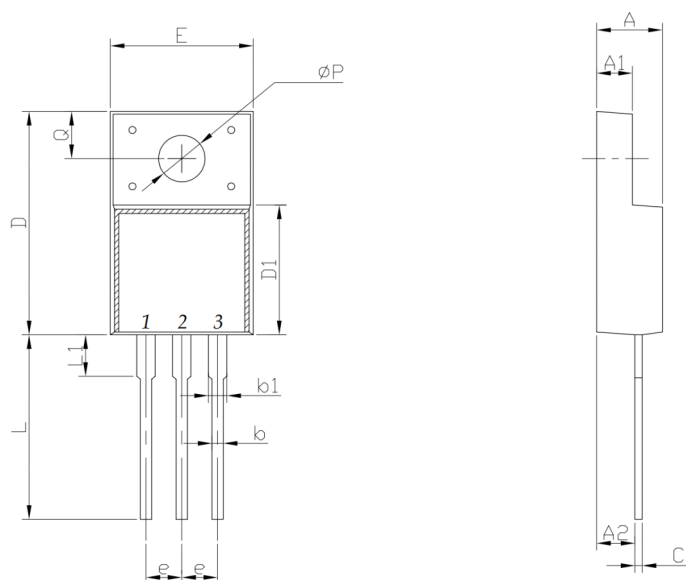
Dimensions

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

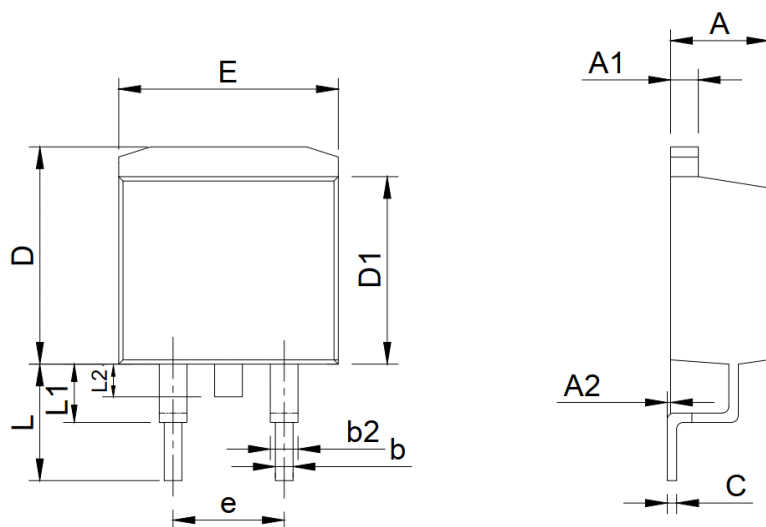
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

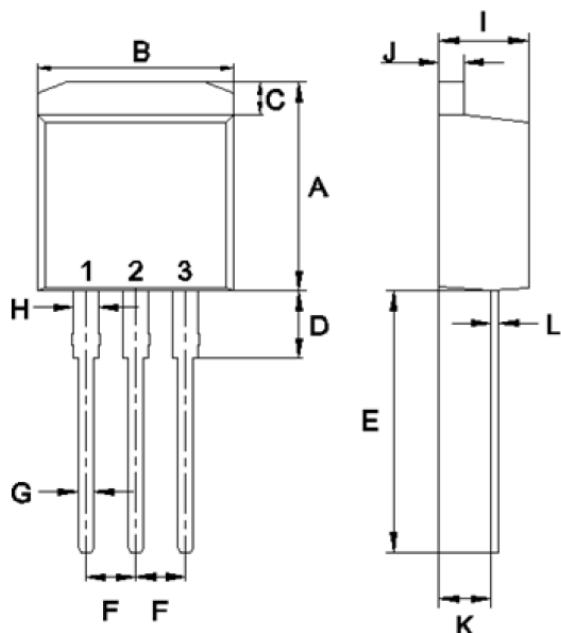
Dimensions

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

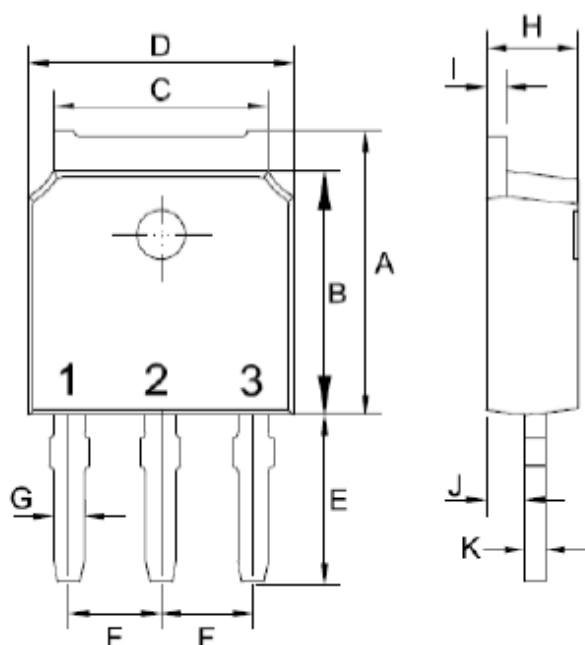
TO-262 PACKAGE OUTLINE DIMENSIONS



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

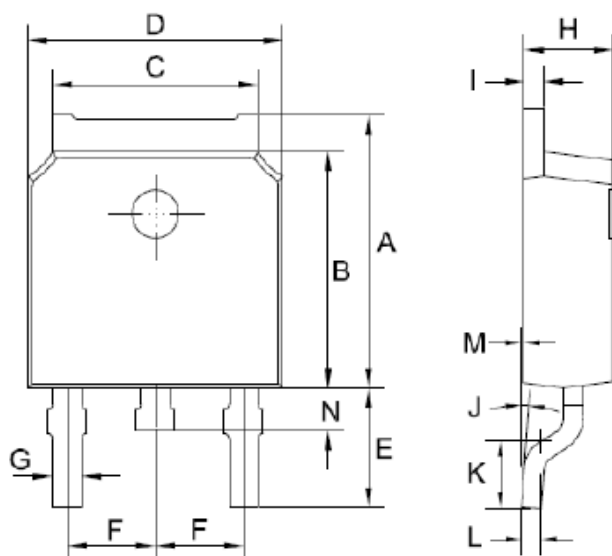
Dimensions

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

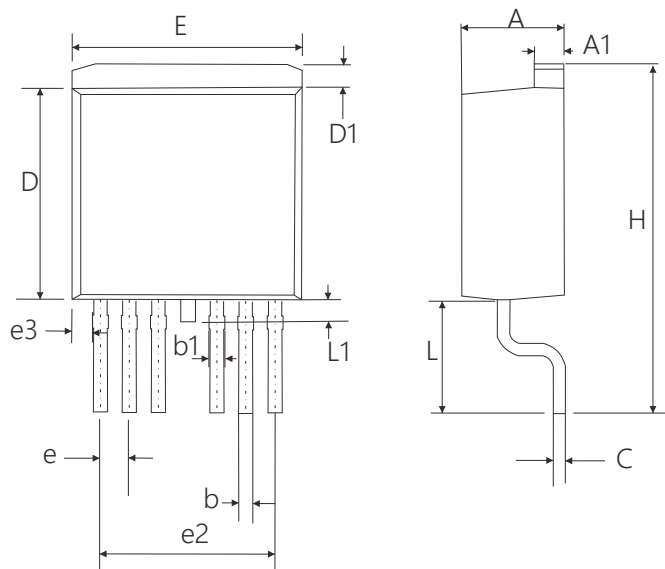
TO-252 PACKAGE OUTLINE DIMENSIONS



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

Dimensions

TO-263-7L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.75	0.167	0.187
A1	1.2	1.4	0.047	0.055
b	0.5	0.7	0.020	0.028
b1	0.5	0.9	0.020	0.035
C	0.4	0.6	0.016	0.024
D	9.05	9.45	0.356	0.372
D1	0.7	1.3	0.028	0.051
E	9.8	10.2	0.386	0.402
e	1.07	1.47	0.042	0.058
e2	7.32	7.92	0.288	0.312
e3	0.64	1.04	0.025	0.041
H	14.65	15.65	0.577	0.616
L	4.47	5.47	0.176	0.215
L1	0.90	1.50	0.035	0.059

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