

General Description

These N-channel enhancement mode power mosfets 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,TO-263, TO-263-7L, TO-252 Package

Application

- AC-DC switching power supply
- UPS power supply
- Power tool

Ordering Information

Part No.	Package Type	Package	Quality(box)
D160N06	TO-220	Tube	1000
D160N06D7	TO-263-7L	Tape & Reel	800
D160N06D	TO-263	Tape & Reel	800
D160N06M	TO-252	Tape & Reel	3000

Product Summary			
V_{DS}	$R_{DS(on)}$ (m Ω) Typ	I_D (A)	Q_g (Typ)
60V	3.5 @ 10V	160	130nc



Block Diagram

Pin Definition:

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

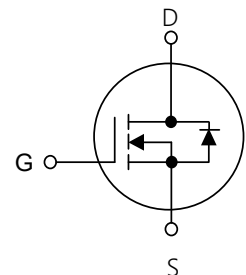


Table1 Absolute Maximum Ratings ($T_c=25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	D160N06/D160N06D/ D160N06M/ D160N06D7	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 25	V
Continuous Drain Current	I_D	$T_c=25^\circ\text{C}$	160
		$T_c=100^\circ\text{C}$	105
Pulsed Drain Current (Note 1)	I_{DM}	600	A
Single Pulse Avalanche Energy(Note 2)	E_{AS}	1400	mJ
Avalanche Current(Note 1)	I_{AR}	75	A
Power Dissipation $T_c=25^\circ\text{C}$	P_D	185	W
Operating Junction and Storage Temperature	T_J/T_{STG}	-55~+175	$^\circ\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	D160N06/D160N06D/ D160N06M/D160N06D7	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.81	$^{\circ}C/W$

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}	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA
Gate-Source Leakage Current	Forward	$V_{GS}=25V, V_{DS}=0V$	-	-	100	nA
	Reverse	$V_{GS}=-25V, V_{DS}=0V$	-	-	-100	nA
On Characteristics(Note 3)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=60A$	-	3.5	4.5	m Ω
Dynamic Characteristics(Note 4)						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	4350	-	pF
Output Capacitance	C_{OSS}		-	850	-	pF
Reverse Transfer Capacitance	C_{RSS}		-	330	-	pF
Gate Resistance	R_G	$V_{DD}=0V, V_{GS}=0V, f=1MHz$	-	0.7	-	Ω
Switching Characteristics (Note 4)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=30V, I_D=60A$ $V_{GS}=10V, R_G=25\Omega,$	-	28	-	ns
Turn-On Rise Time	t_r		-	21	-	ns
Turn-Off Delay Time	$t_d(off)$		-	43	-	ns
Turn-Off Fall Time	t_f		-	54	-	ns
Total Gate Charge	Q_G	$V_{DD}=48V, I_D=60A,$ $V_{GS}=10V$	-	130	-	nC
Gate-Source Charge	Q_{GS}		-	24	-	nC
Gate-Drain Charge	Q_{GD}		-	47	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=60A$	-	-	1.3	V
Maximum Continuous Drain-Source Diode Forward Current	I_S		-	-	160	A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_F=60A$	-	30	-	ns
Reverse Recovery Charge	Q_{RR}	$dI_F/dt=100A/\mu s$ (Note 1)	-	50	-	nC

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

2 $L=0.5mH, I_D=75A, V_{DD}=50V, V_{GATE}=60V,$ Starting $T_J=25^{\circ}C$

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

4 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

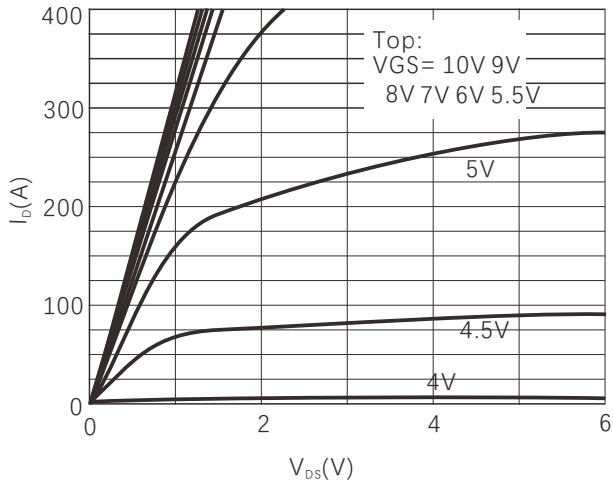


Figure 2. Normalized $R_{DS(ON)}$ vs Temperature

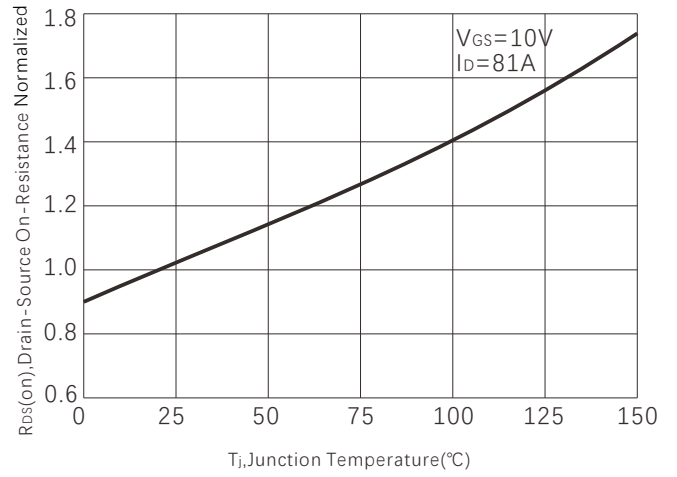


Figure 3. On-Resistance vs. Drain Current

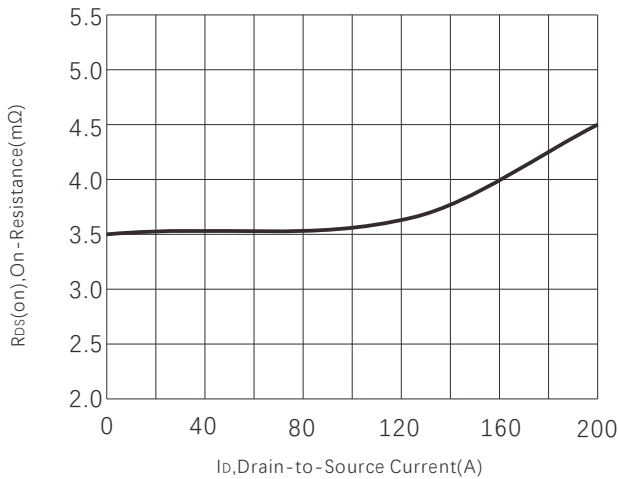


Figure 4. Capacitance

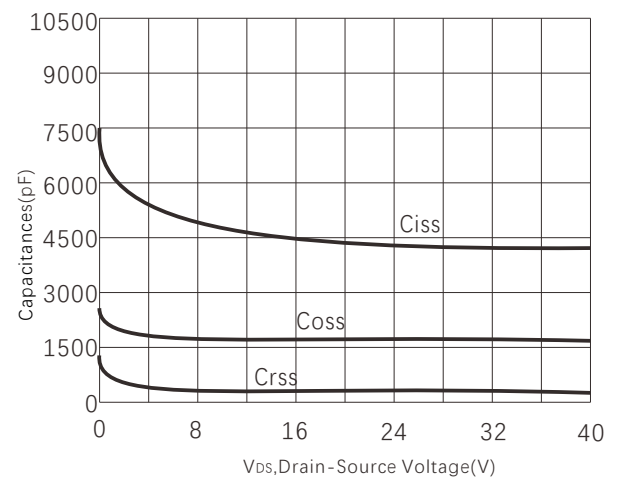


Figure 5. Gate charge

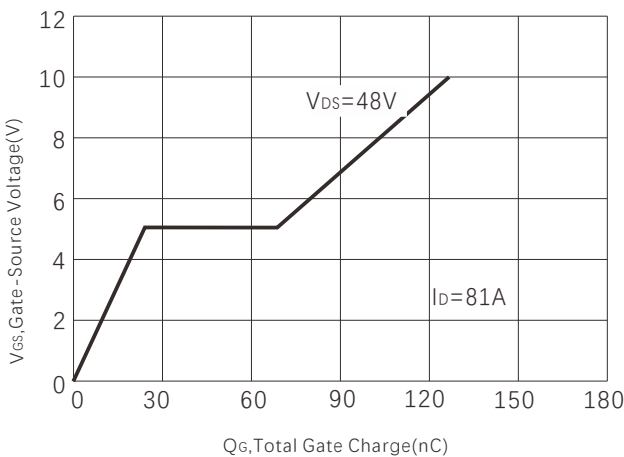


Figure 6. Source-Drain Diode Forward Voltage

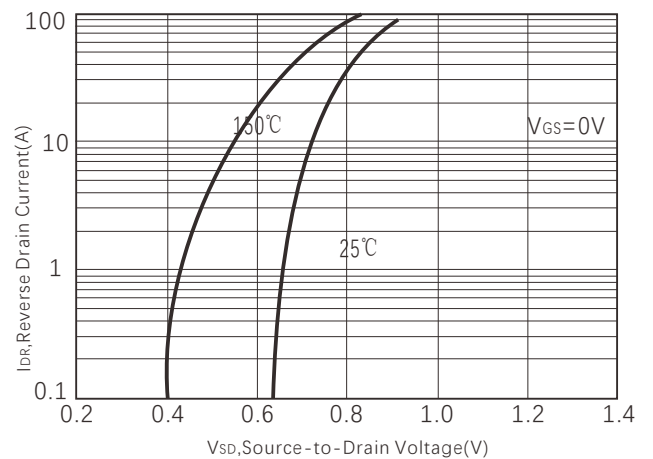


Figure 7. Maximum Drain Current vs Temperature

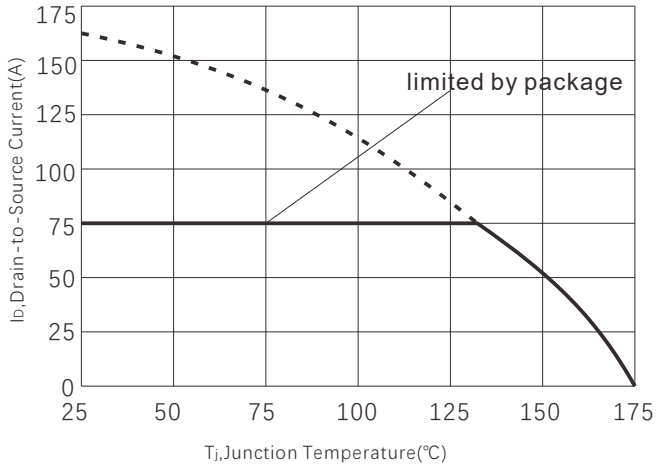


Figure 8. Gate Threshold Voltage vs Temperature

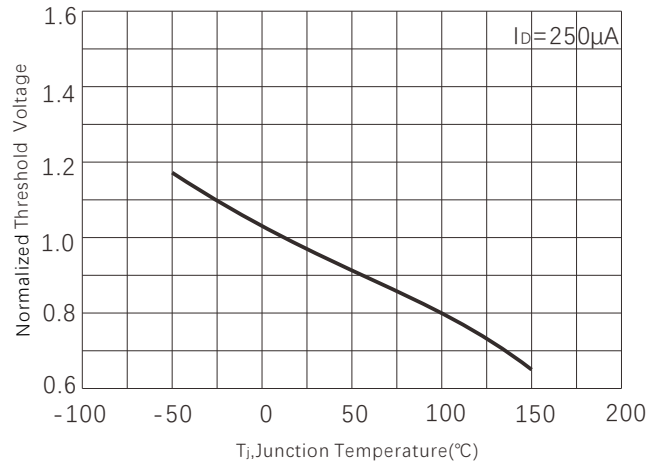


Figure 9. Safe operating area

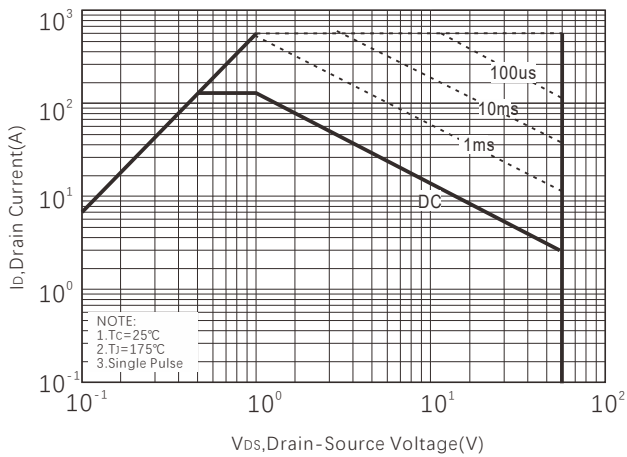


Figure 10. Power dissipation

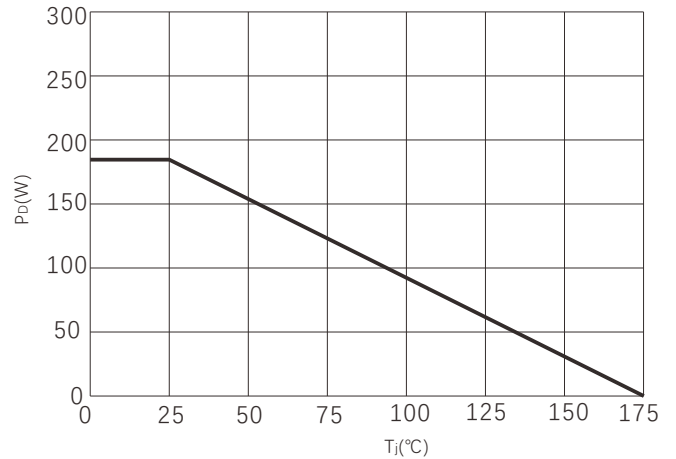
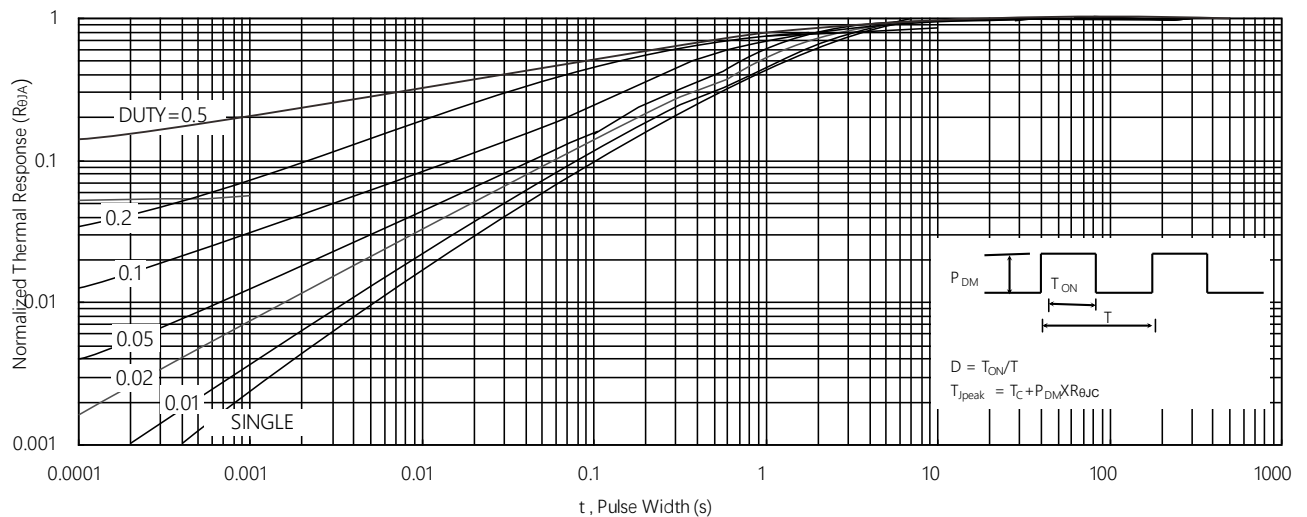
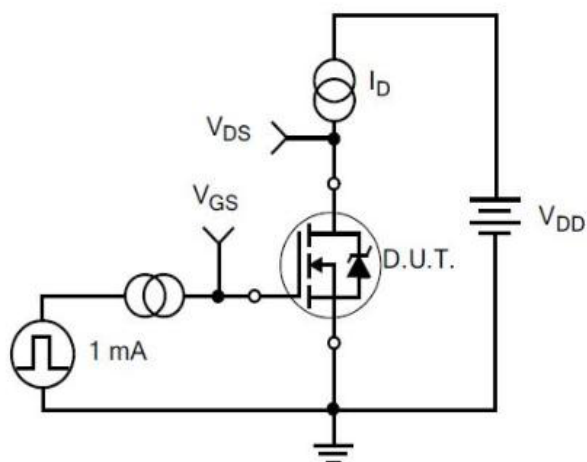


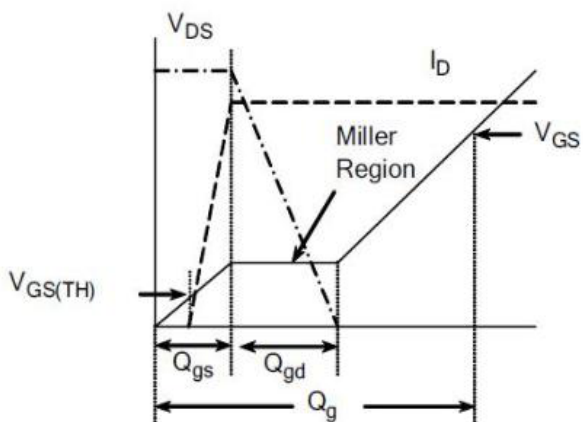
Figure 11. Normalized Maximum Transient Thermal Impedance



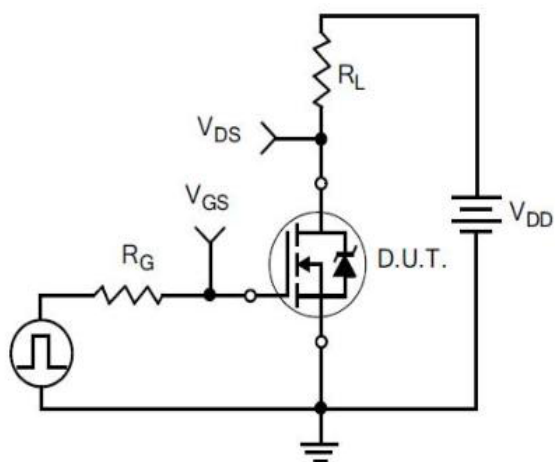
Typical Test Circuit



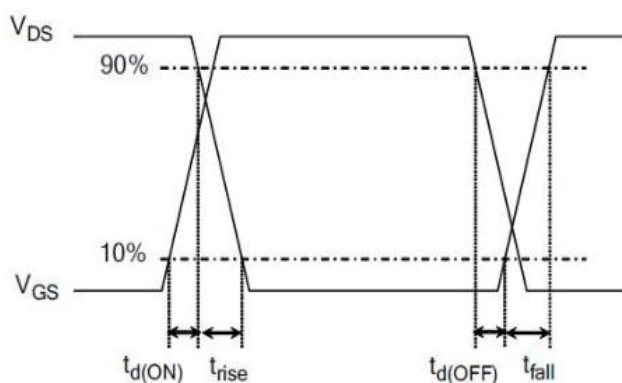
1) Gate Charge Test Circuit



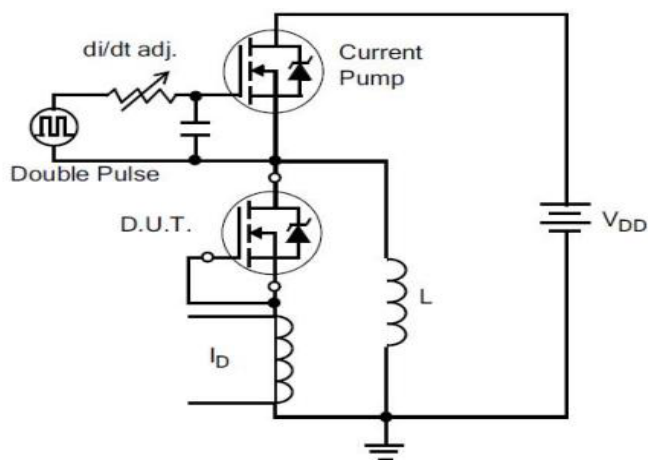
2) Gate Charge Waveform



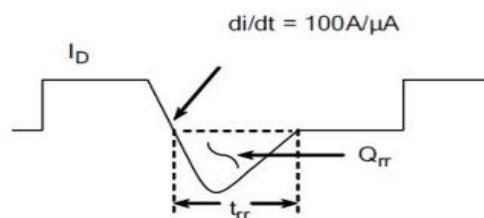
3) Resistive Switching Test Circuit



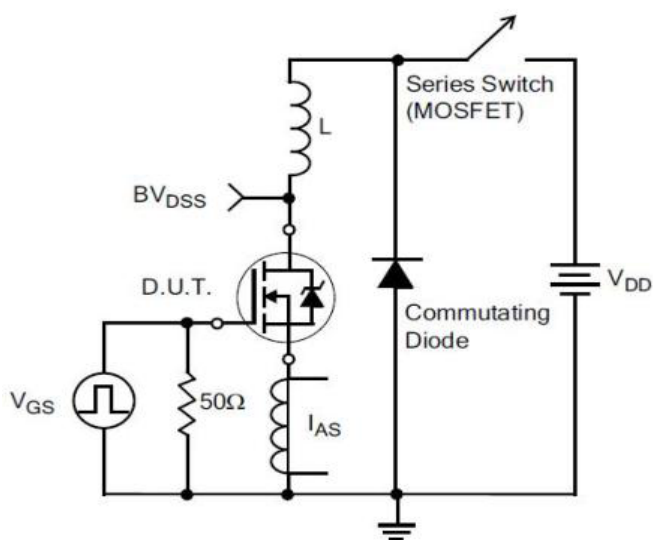
4) Resistive Switching Waveforms



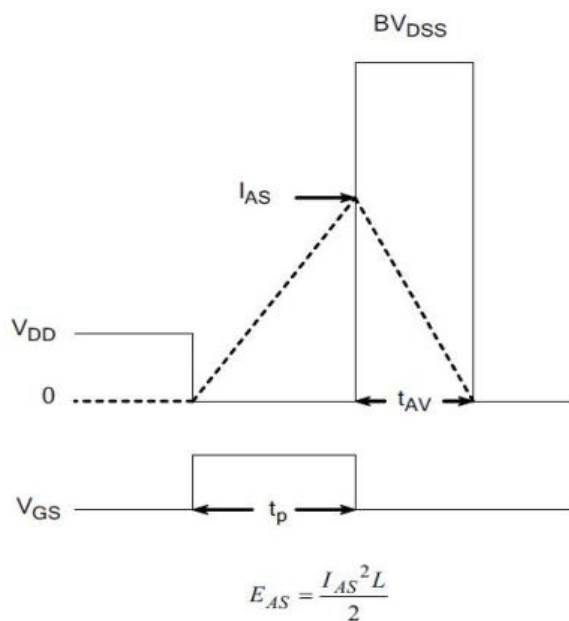
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



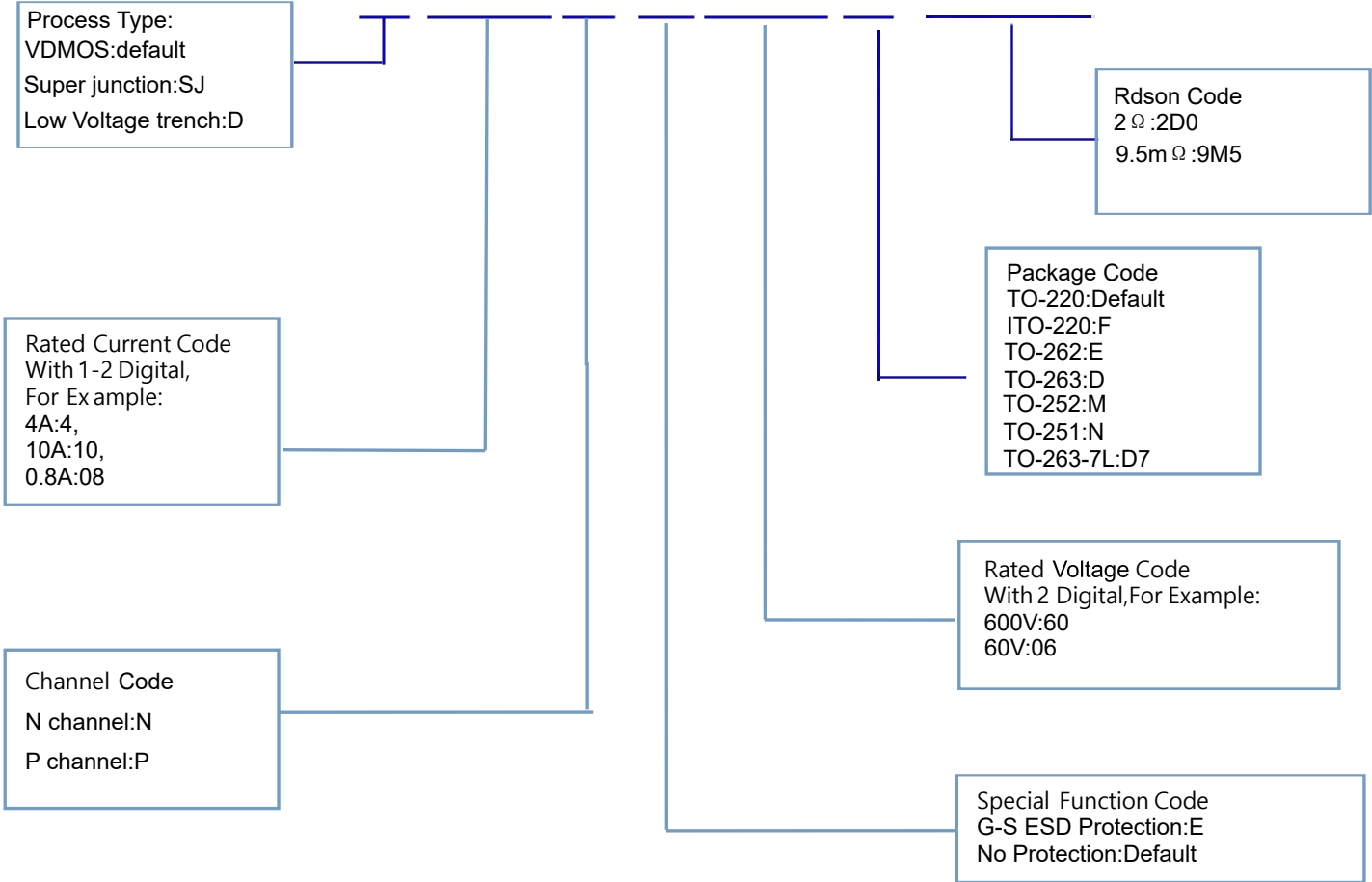
7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

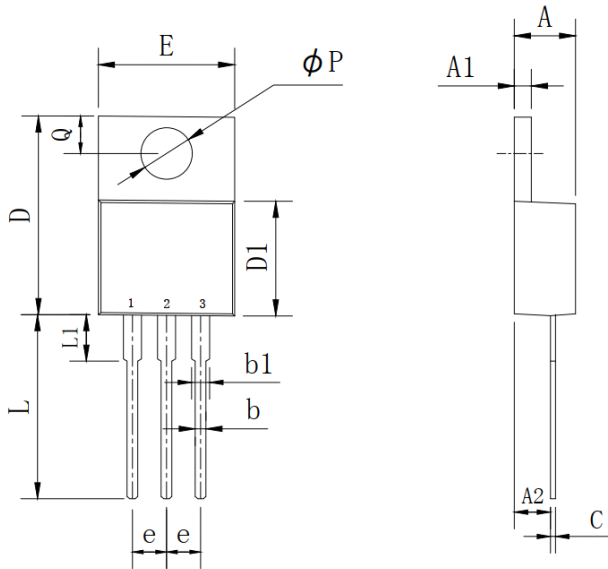
Product Names Rules

X X X N E X X X-X X X



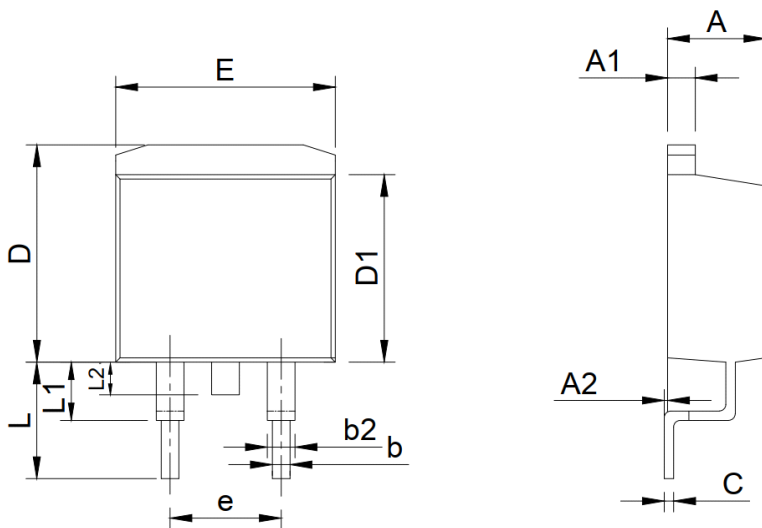
Dimensions

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

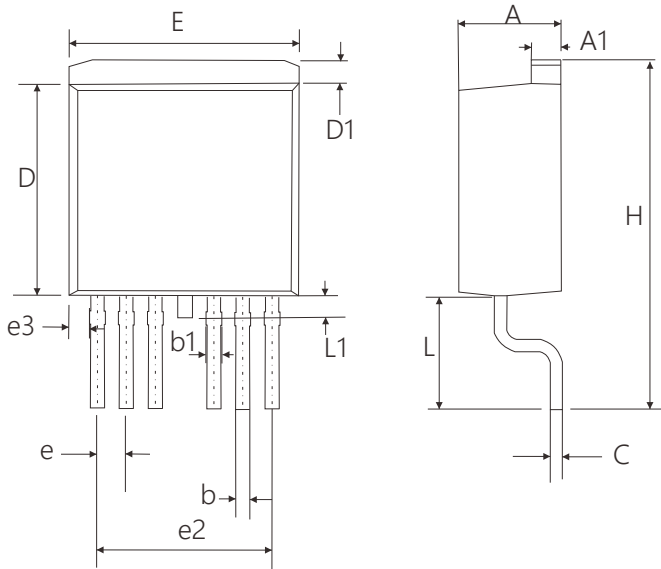
TO-263 PACKAGE OUTLINE DIMENSIONS



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

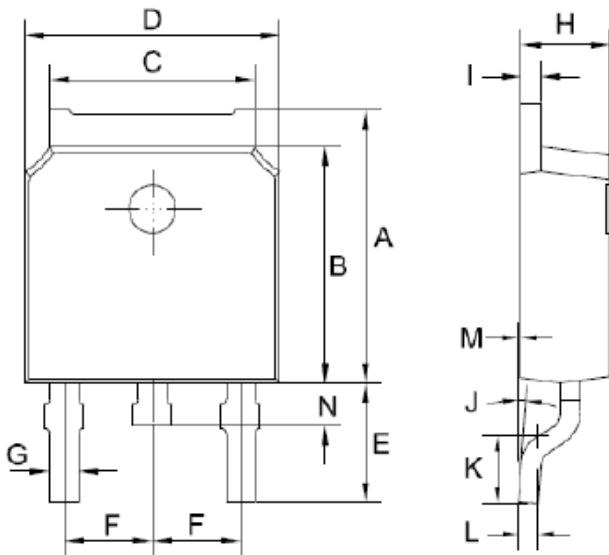
Dimensions

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

TO-252 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters	Dimensions In Millimeters	Dimensions In Millimeters	Dimensions In Millimeters
A	4.25	4.75	4.25	4.75
B	1.2	1.4	1.2	1.4
C	0.5	0.7	0.5	0.7
D	0.5	0.9	0.5	0.9
E	0.4	0.6	0.4	0.6
F	9.05	9.45	9.05	9.45
G	0.7	1.3	0.7	1.3
H	9.8	10.2	9.8	10.2
I	1.07	1.47	1.07	1.47
J	7.32	7.92	7.32	7.92
K	0.64	1.04	0.64	1.04
L	14.65	15.65	14.65	15.65
M	4.47	5.47	4.47	5.47
N	0.90	1.50	0.90	1.50

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