

## General Description

These N-channel enhancement mode power mosfets Used advanced splite gate trench technology design, provided excellent Rdson 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 Package

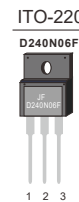
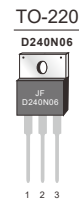
## Application

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

## Ordering Information

Part No.	Package Type	Package	Quality(box)
D240N06	TO-220	Tube	1000
D240N06F	ITO-220	Tube	1000
D240N06D	TO-263	Tape & Reel	800
D240N06E	TO-262	Tube	1000
D240N06D7	TO-263-7L	Tape & Reel	800

Product Summary			
V <sub>DS</sub>	R <sub>DS(on)</sub> (mΩ) Typ	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ)
60V	2.5 @ 10V	240	61nc



## Block Diagram

Pin Definition:

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

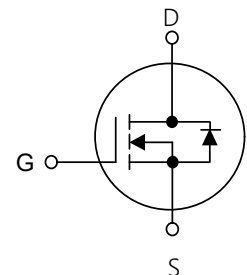


Table1 Absolute Maximum Ratings (T<sub>c</sub>=25°C, unless otherwise specified)

Parameter	Symbol	D240N06/D240N06D/D240N06E		D240N06F	Unit
		D240N06D7			
Drain-Source Voltage	V <sub>DS</sub>	60			V
Gate-Source Voltage	V <sub>GS</sub>	±20			V
Continuous Drain Current	I <sub>D</sub>	T <sub>c</sub> =25°C	240	240*	A
		T <sub>c</sub> =100°C	166	166*	
Pulsed Drain Current (Note 1)	I <sub>DM</sub>	960			A
Single Pulse Avalanche Energy (Note 2)	E <sub>AS</sub>	1045			mJ
Power Dissipation T <sub>c</sub> =25°C	P <sub>D</sub>	277		55	W
Operating Junction and Storage Temperature	T <sub>J</sub> /T <sub>STG</sub>	-55~+175			°C

※ limited by maximum junction temperature

Table 2. Thermal Characteristics

Parameter	Symbol	D240N06/D240N06D/ D240N06E/D240N06D7	D240N06F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	50	75	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.54	2.73	$^{\circ}\text{C}/\text{W}$

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	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu\text{A}$	60	-	-	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu\text{A}$
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	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.0	3.0	4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=90A$	-	2.5	3.0	m $\Omega$
Dynamic Characteristics(Note 5)						
Input Capacitance	$C_{ISS}$	$V_{DS}=30V, V_{GS}=0V, f=1\text{MHz}$	-	3791	-	pF
Output Capacitance	$C_{OSS}$		-	1698	-	pF
Reverse Transfer Capacitance	$C_{RSS}$		-	56.7	-	pF
Gate Resitance	$R_G$	$V_{DD}=0V, V_{GS}=0V, f=1\text{MHz}$	-	1.8	-	$\Omega$
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=30V, I_D=90A$ $V_{GS}=10V, R_{GEN}=1.6\Omega,$	-	17.6	-	ns
Turn-On Rise Time	$t_r$		-	102.3	-	ns
Turn-Off Delay Time	$t_d(off)$		-	33	-	ns
Turn-Off Fall Time	$t_f$		-	106.9	-	ns
Total Gate Charge	$Q_G$	$V_{DD}=30V, I_D=90A,$ $V_{GS}=10V$	-	61	-	nC
Gate-Source Charge	$Q_{GS}$		-	25.5	-	nC
Gate-Drain Charge	$Q_{GD}$		-	12.9	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=95A$	-	-	1.2	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		-	-	120	A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=60A$	-	42.4	-	ns
Reverse Recovery Charge	$Q_{RR}$	$dI_F/dt=110A/\mu\text{s}$ (Note 1)	-	29.7	-	nC

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

2  $L=0.5\text{mH}, I_D=65A, V_{DD}=50V, V_{GATE}=10V, \text{Starting } T_J=25^{\circ}\text{C}$

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

5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

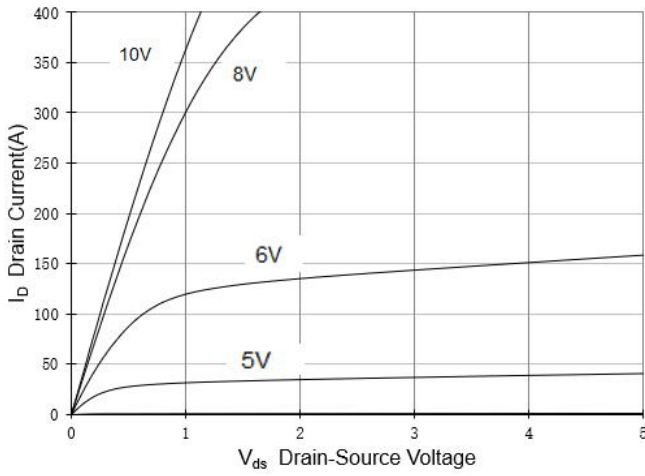


Figure 1 Output Characteristics

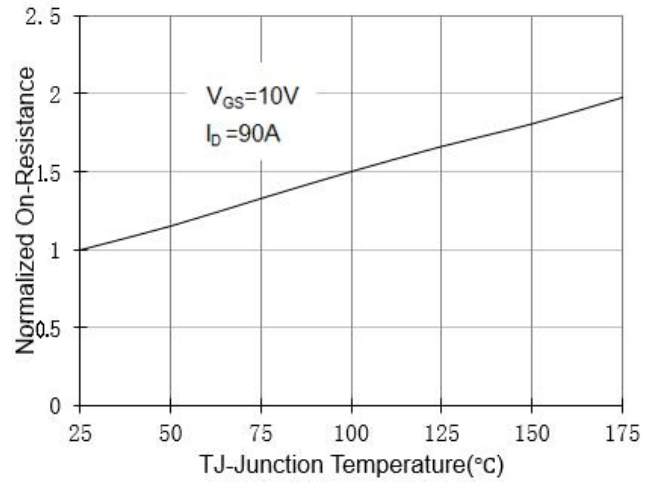


Figure 2 Rdson-Junction Temperature

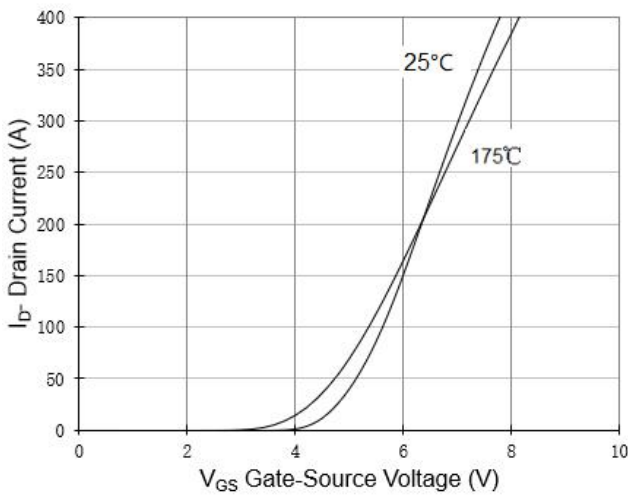


Figure 3 Transfer Characteristics

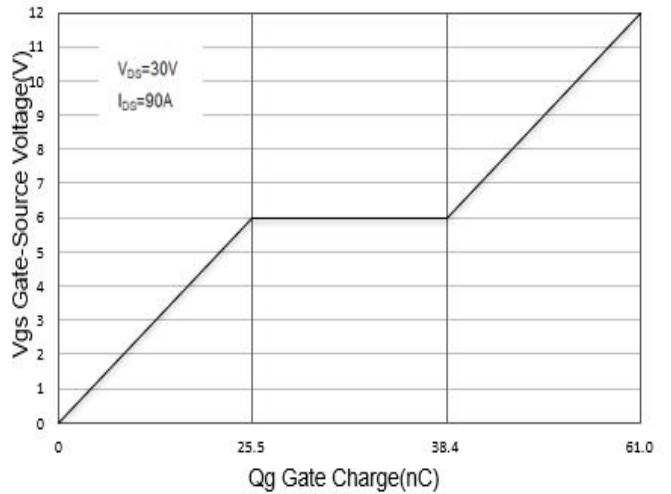


Figure 4 Gate Charge

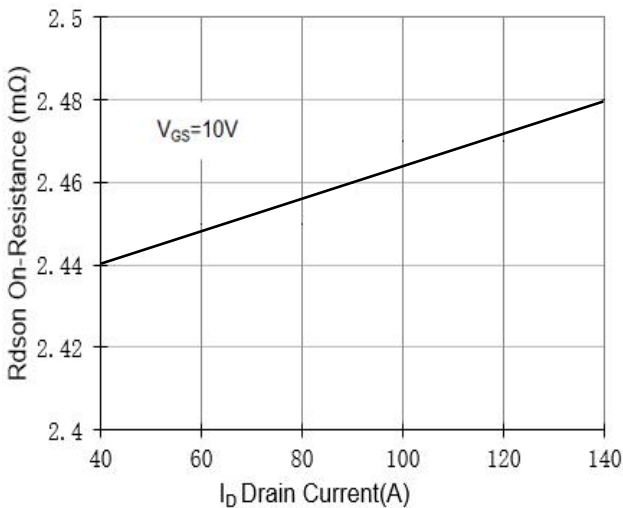


Figure 5 Rdson-Drain Current

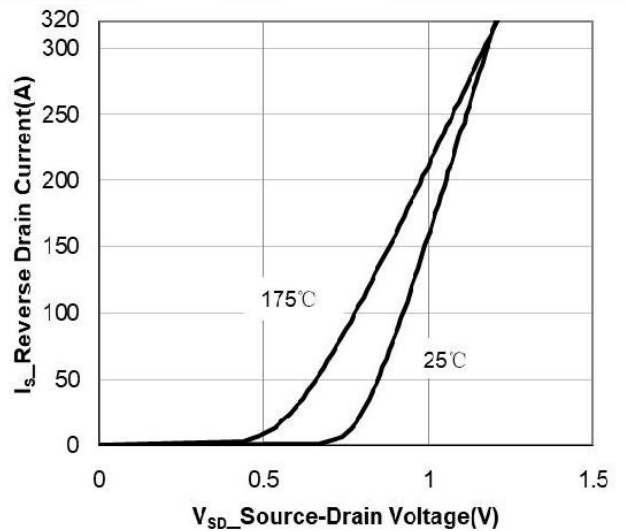


Figure 6 Source-Drain Diode Forward

Typical Characteristics Diagrams

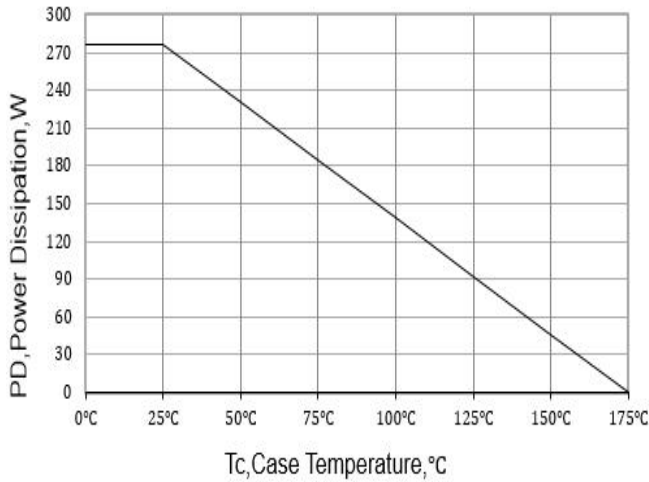


Figure 7 Power De-rating

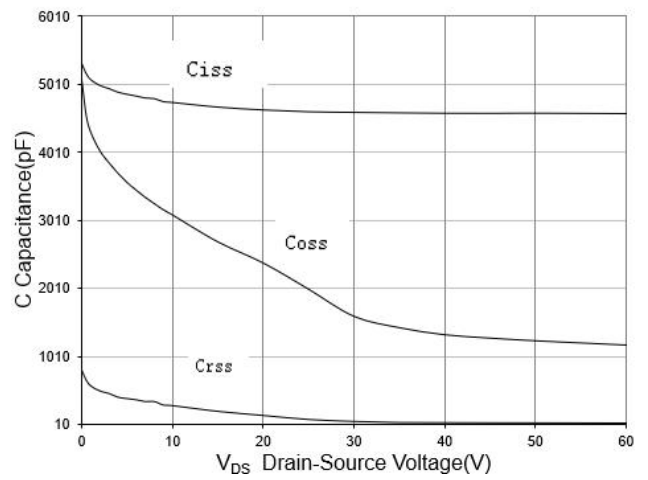


Figure 8 Capacitance vs Vds

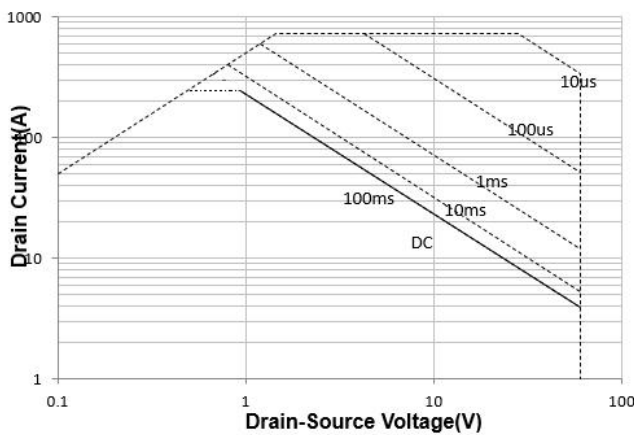


Figure 9 Safe Operation Area

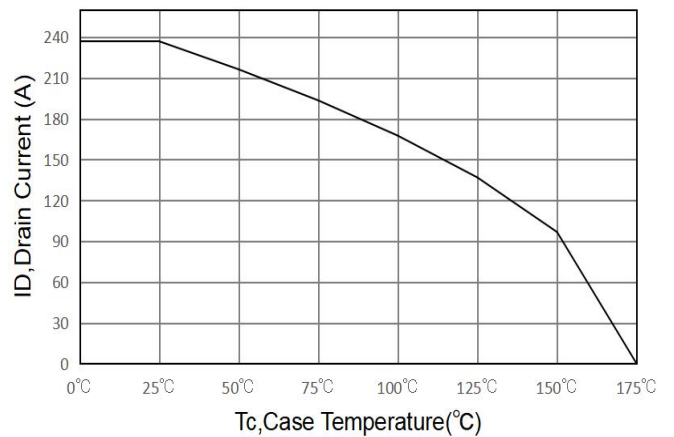


Figure 10 Current De-rating

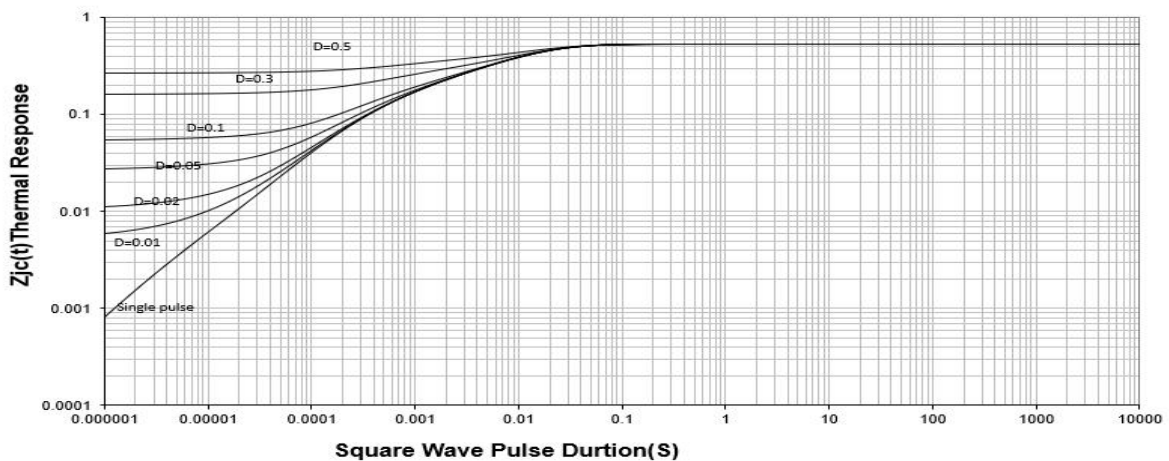
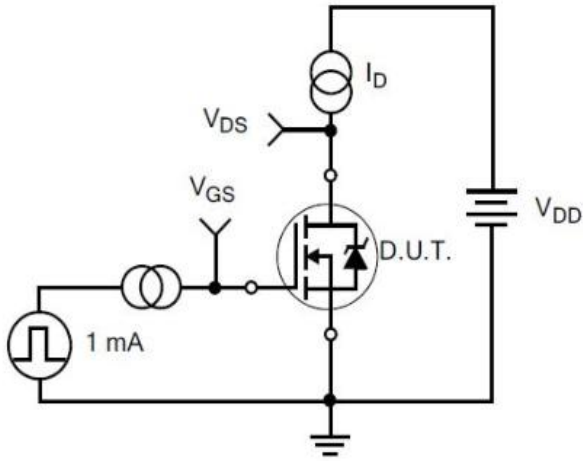
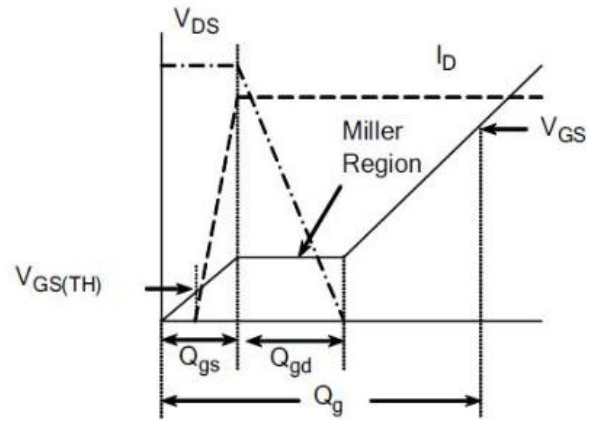


Figure 11 Maximum Transient Thermal Impedance

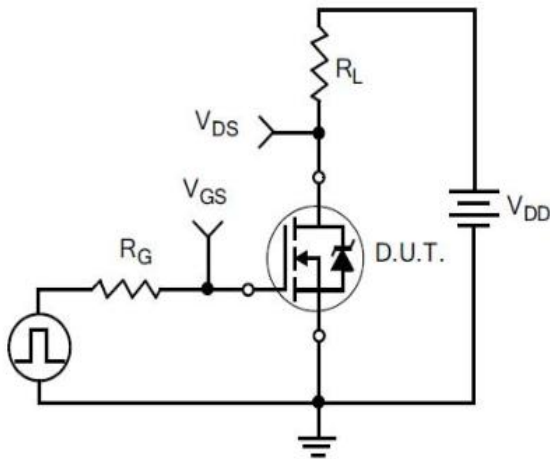
Typical Test Circuit



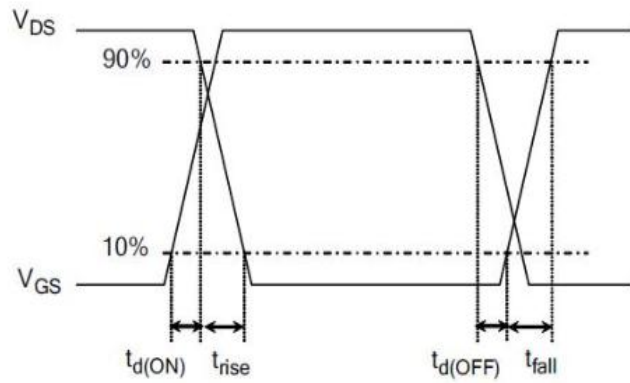
1) Gate Charge Test Circuit



2) Gate Charge Waveform

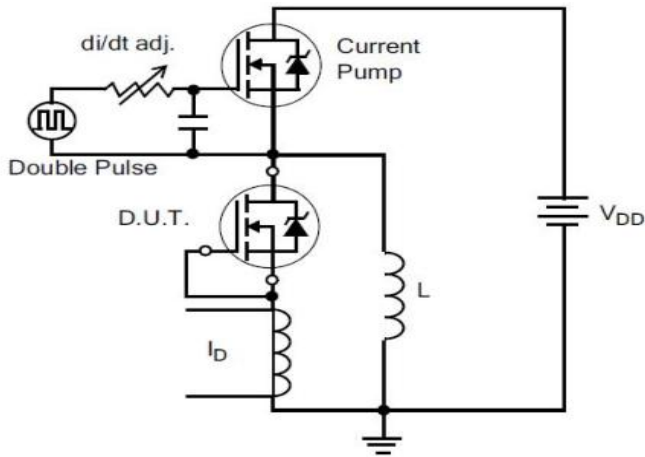


3) Resistive Switching Test Circuit

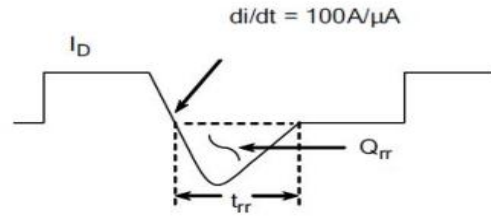


4) Resistive Switching Waveforms

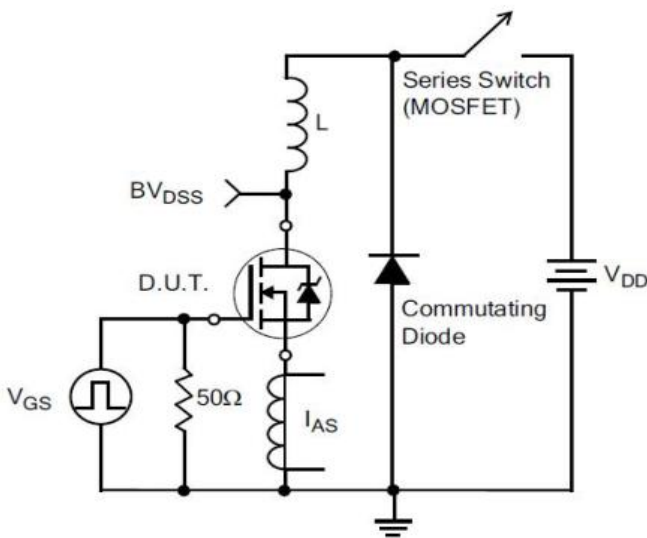
Typical Test Circuit



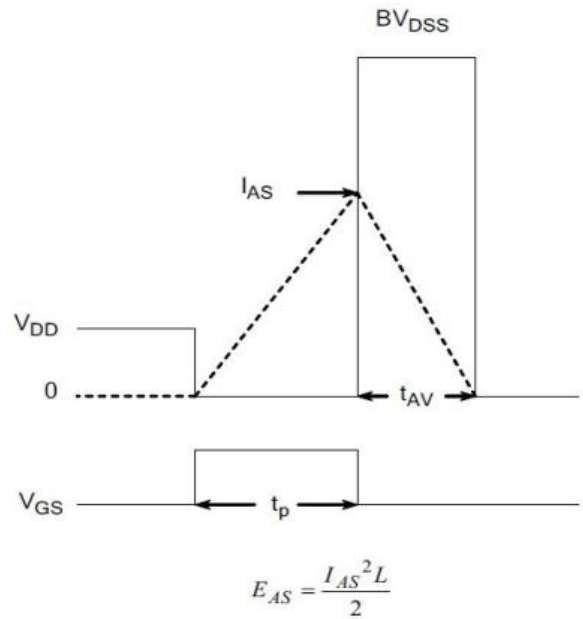
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



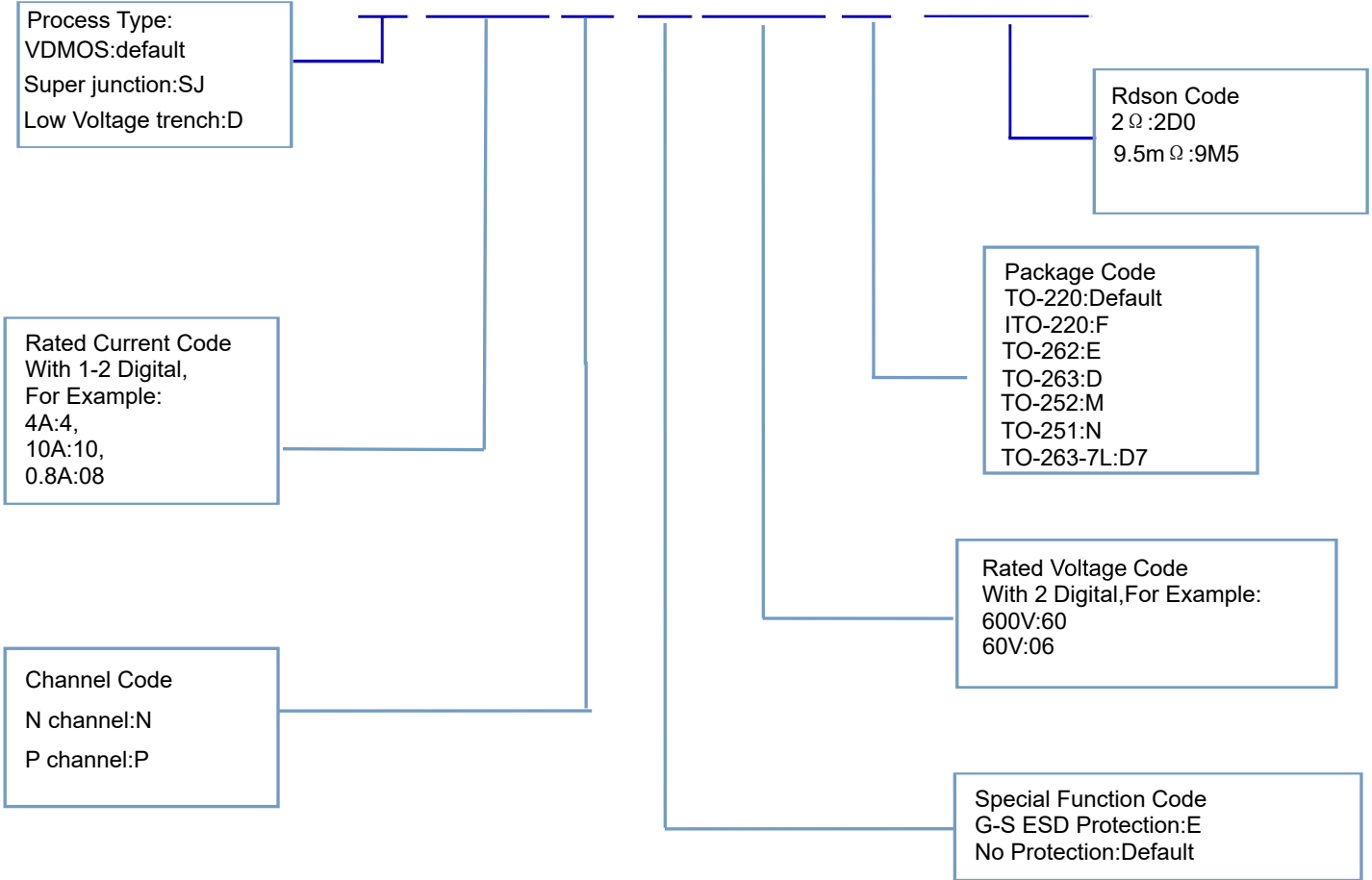
7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

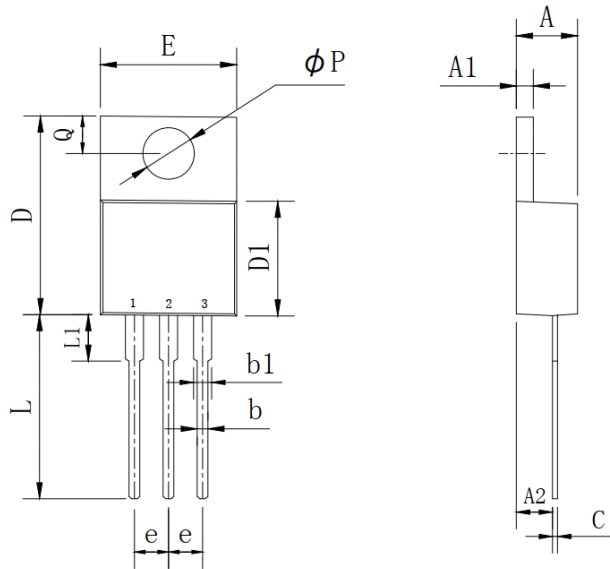
Product Names Rules

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



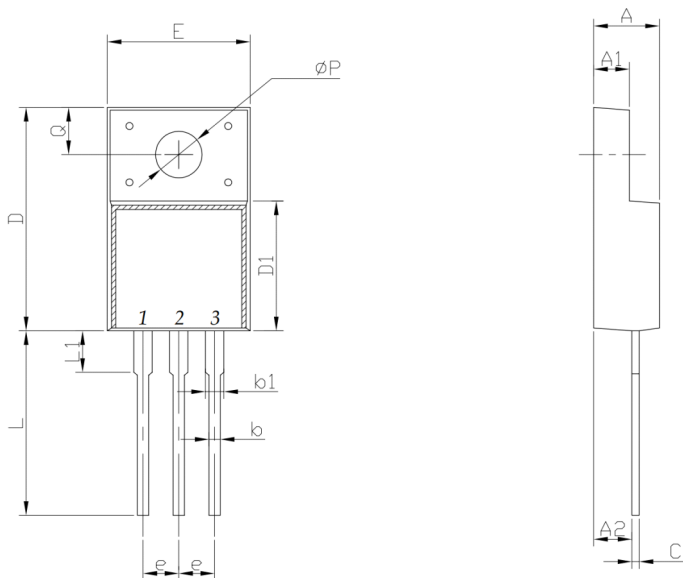
Dimensions

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

ITO-220 PACKAGE OUTLINE DIMENSIONS

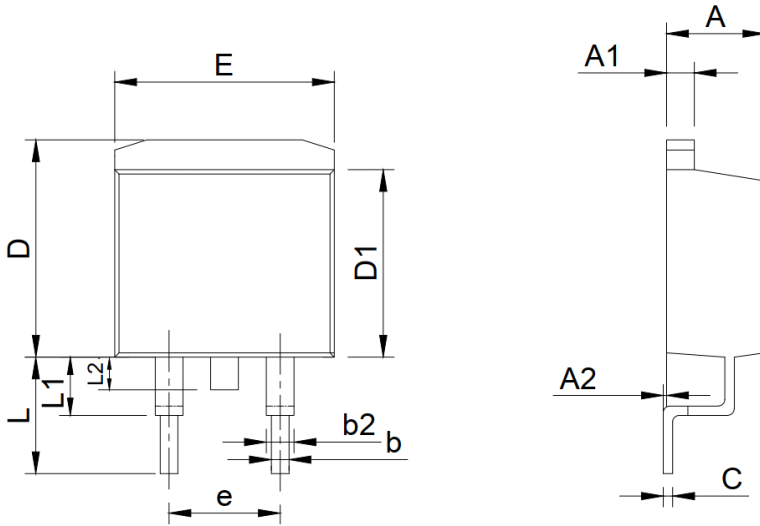


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108
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



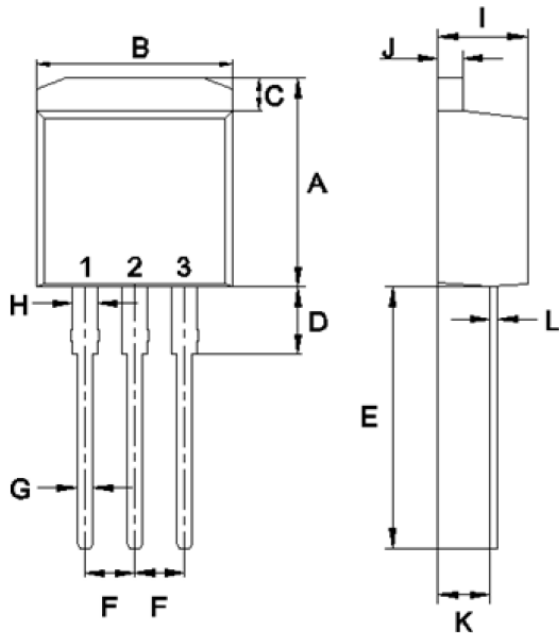
Dimensions

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

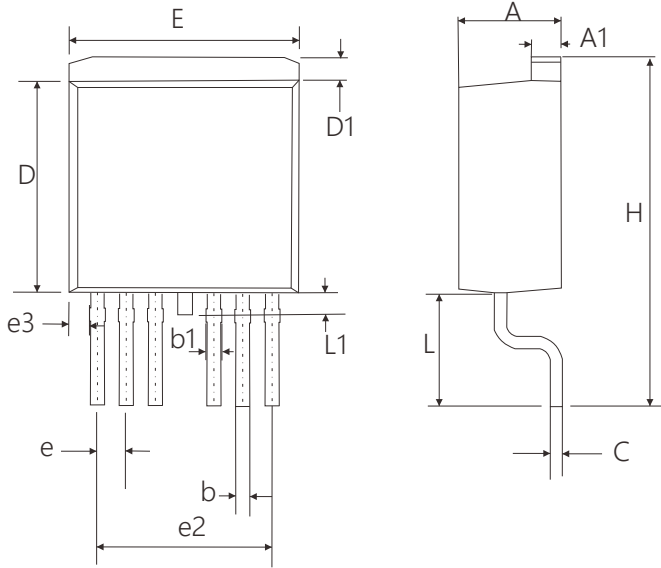
TO-262 PACKAGE OUTLINE DIMENSIONS



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-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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