

General Description

These N-channel enhancement mode power mosfets Used advanced trench technology design, provided excellent Rdson and low gate charge. Which accords with the RoHS standard.

Product Summary			
V _{DS}	R _{DS(on)} (mΩ) Typ	I _D (A)	Q _g (Typ)
40V	4.2 @ 10V	110	52nc

Features

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

Mechanical Data

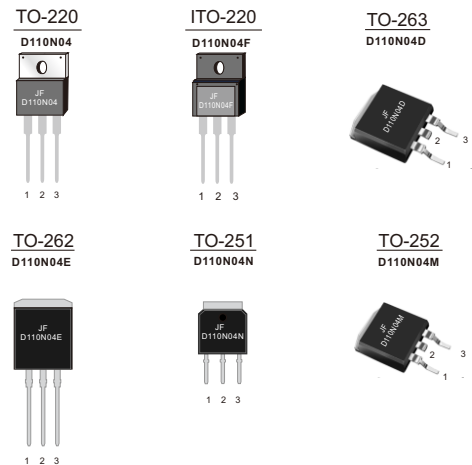
- Case:TO-220,ITO-220,TO-263,TO-262,TO-251,TO-252 Package

Application

- Switching applications

Ordering Information

Part No.	Package Type	Package	Quality(box)
D110N04	TO-220	Tube	1000
D110N04F	ITO-220	Tube	1000
D110N04D	TO-263	Tape & Reel	800
D110N04E	TO-262	Tube	1000
D110N04N	TO-251	Tube	1000
D110N04M	TO-252	Tape & Reel	3000



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

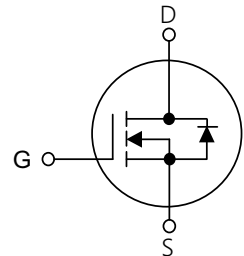


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter	Symbol	D110N04/D110N04D/D110N04E D110N04M/D110N04N		D110N04F	Unit
Drain-Source Voltage	V _{DS}	40			V
Gate-Source Voltage	V _{GS}	±20			V
Continuous Drain Current	I _D	T _C =25°C	110		A
		T _C =100°C	85		
Pulsed Drain Current (Note 1)	I _{DM}	480			A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	280			mJ
Avalanche Current(Note 2)	I _{AR}	34			A
Power Dissipation T _C =25°C	P _D	120		36	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55~+175			°C

Table 2. Thermal Characteristics

Parameter	Symbol	D110N04/D110N04D/ D110N04M/D110N04N D110N04E	D110N04F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	1.25	4.17	$^{\circ}C/W$

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}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	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 3)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=30A$	-	4.2	5.5	m Ω
		$V_{GS}=4.5V, I_D=30A$	-	5.5	7.2	m Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	-	2289	-	pF
Output Capacitance	C_{OSS}		-	232	-	pF
Reverse Transfer Capacitance	C_{RSS}		-	176	-	pF
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=20V, I_D=45A,$ $V_{GS}=4.5V, R_G=2\Omega$	-	20	-	ns
Turn-On Rise Time	t_r		-	113	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	34	-	ns
Turn-Off Fall Time	t_f		-	118	-	ns
Total Gate Charge	Q_G	$V_{DD}=20V, I_D=45A,$ $V_{GS}=10V$	-	52	-	nC
Gate-Source Charge	Q_{GS}		-	9.7	-	nC
Gate-Drain Charge	Q_{GD}		-	12	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 3)						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=30A$	-	0.84	1.2	V
Maximum Continuous Drain-Source Diode Forward Current	I_S		-	-	120	A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_F=45A$	-	48.8	-	ns
Reverse Recovery Charge	Q_{RR}	$dI_F/dt=100A/\mu s$ (Note 1)	-	15.8	-	nC

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

2 $L=0.5mH, I_D=34A, V_{DD}=32V$, Starting $T_J=25^{\circ}C$

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

Typical Characteristics Diagrams

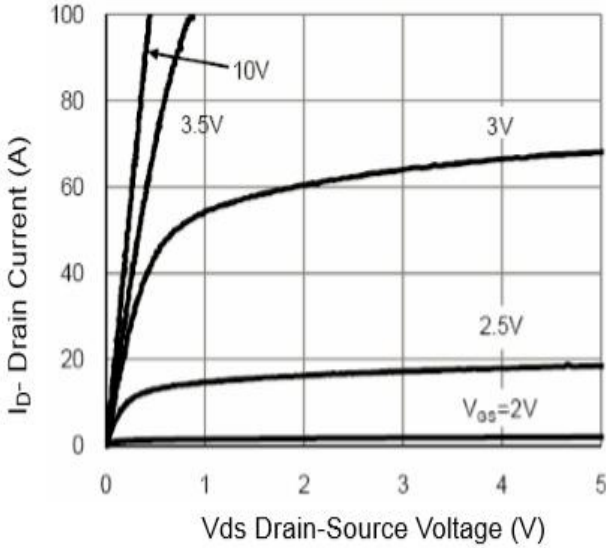


Figure 1 Output Characteristics

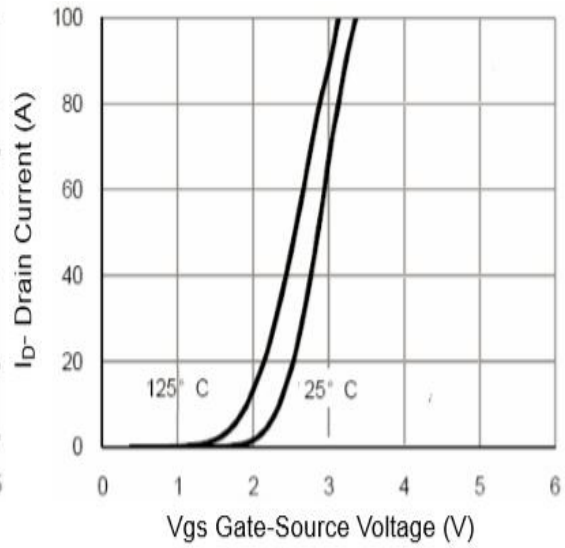


Figure 2 Transfer Characteristics

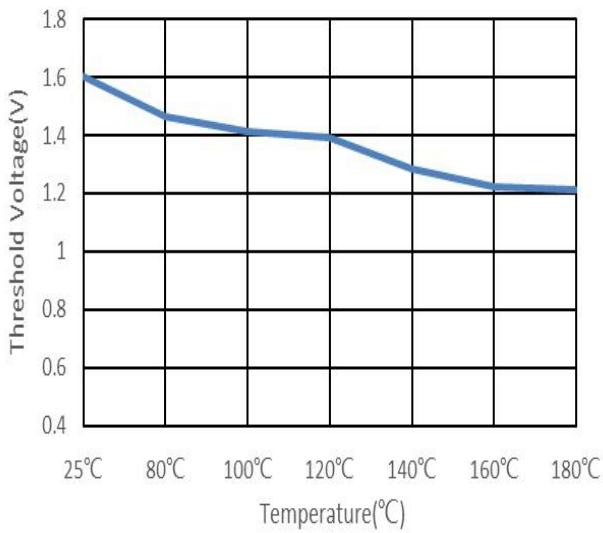


Figure 3. Threshold vs Temperature

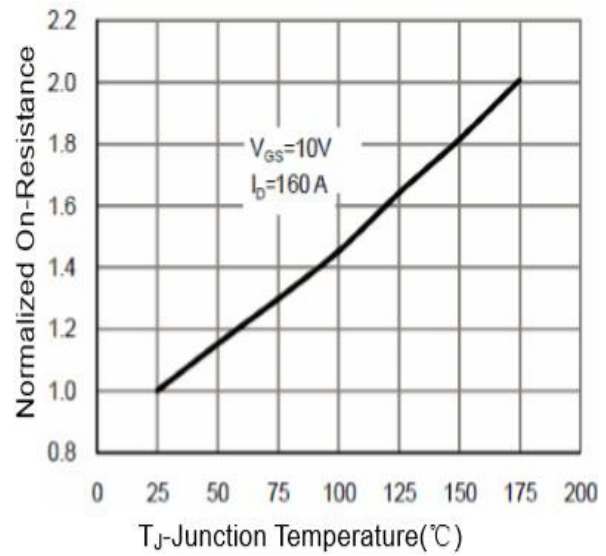


Figure 4. $R_{ds(on)}$ vs Temperature

Typical Characteristics Diagrams

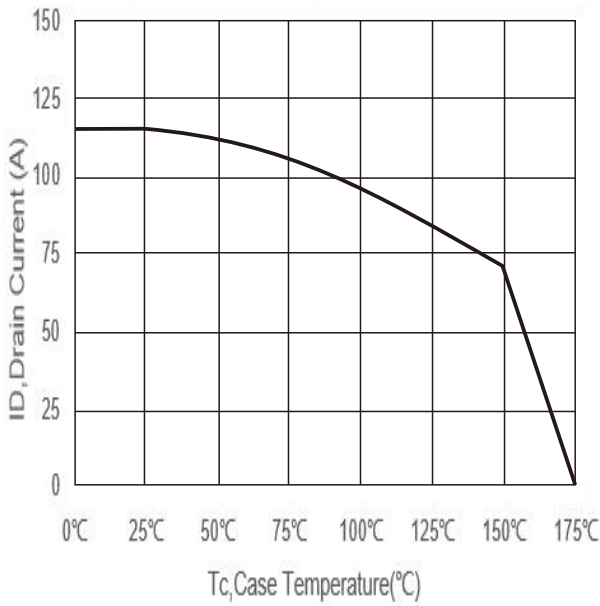


Figure 5. Power De-rating

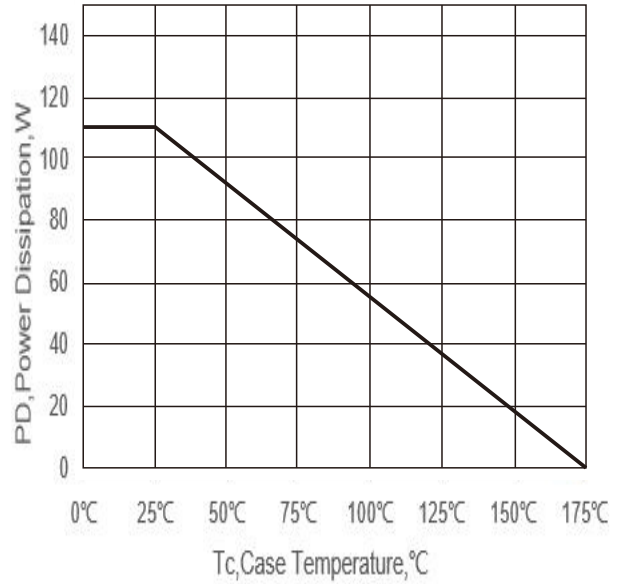


Figure 6. ID Current Deratin

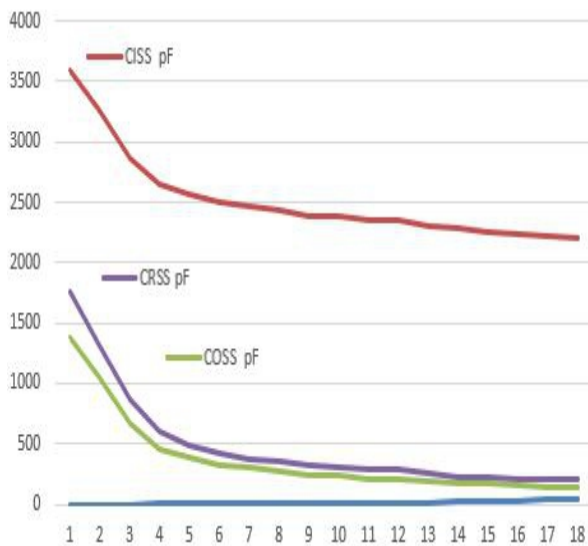


Figure 7. Capacitance Characteristics

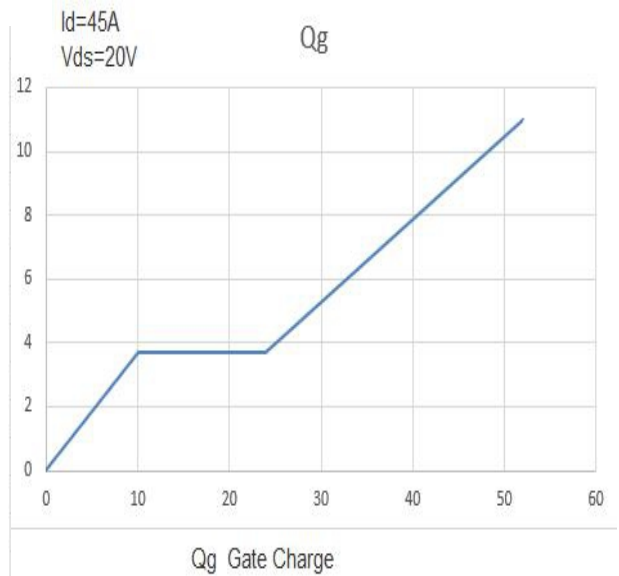
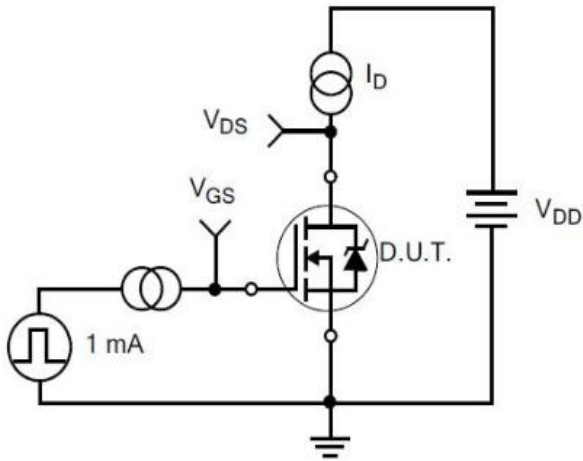
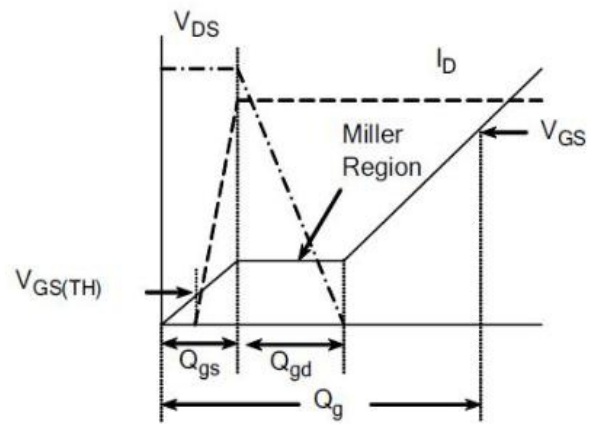


Figure 8. Gate Charge Characteristics

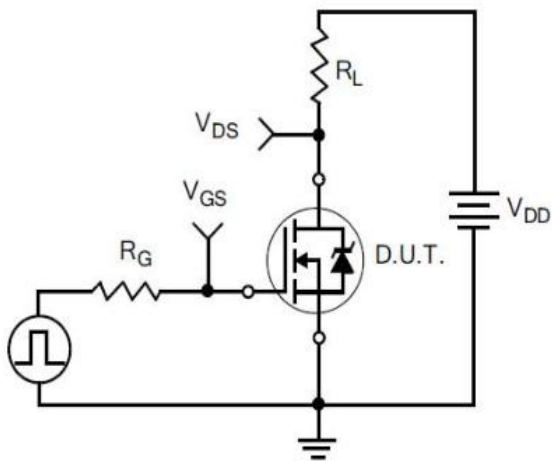
Typical Test Circuit



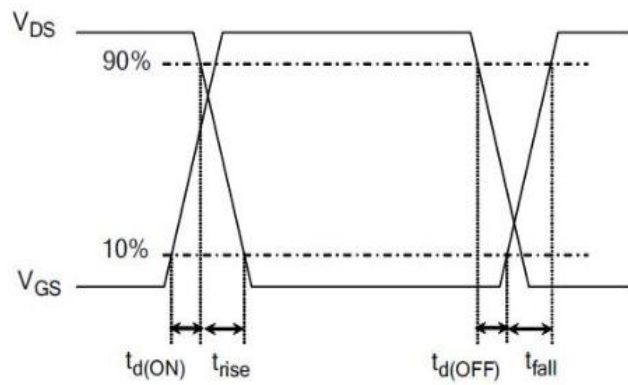
1) Gate Charge Test Circuit



2) Gate Charge Waveform

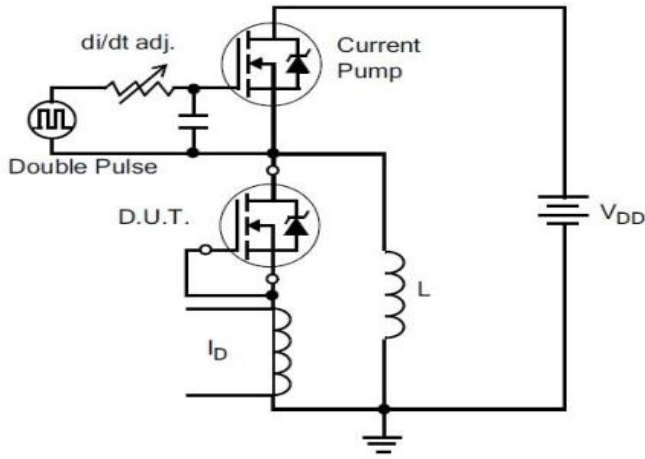


3) Resistive Switching Test Circuit

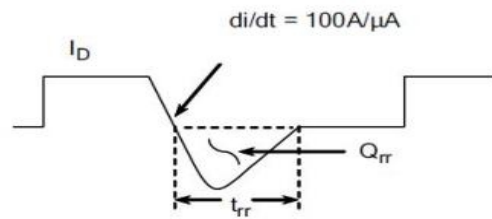


4) Resistive Switching Waveforms

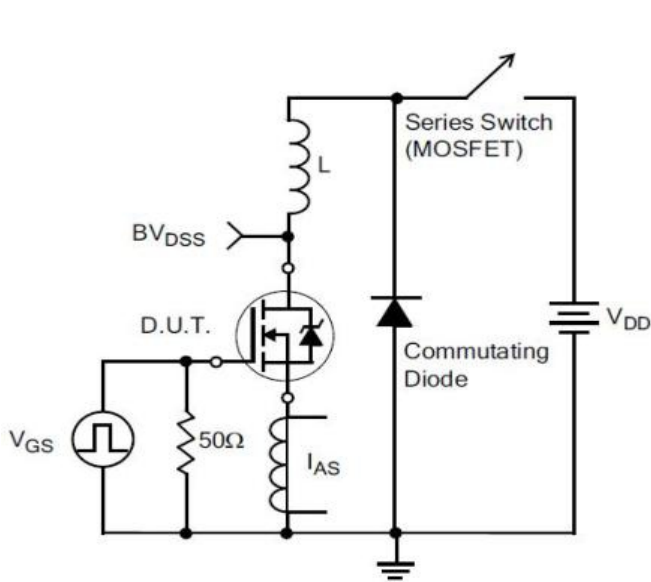
Typical Test Circuit



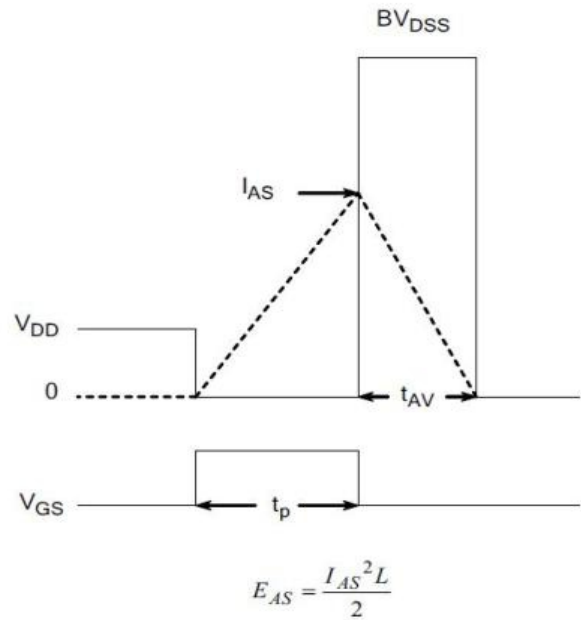
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

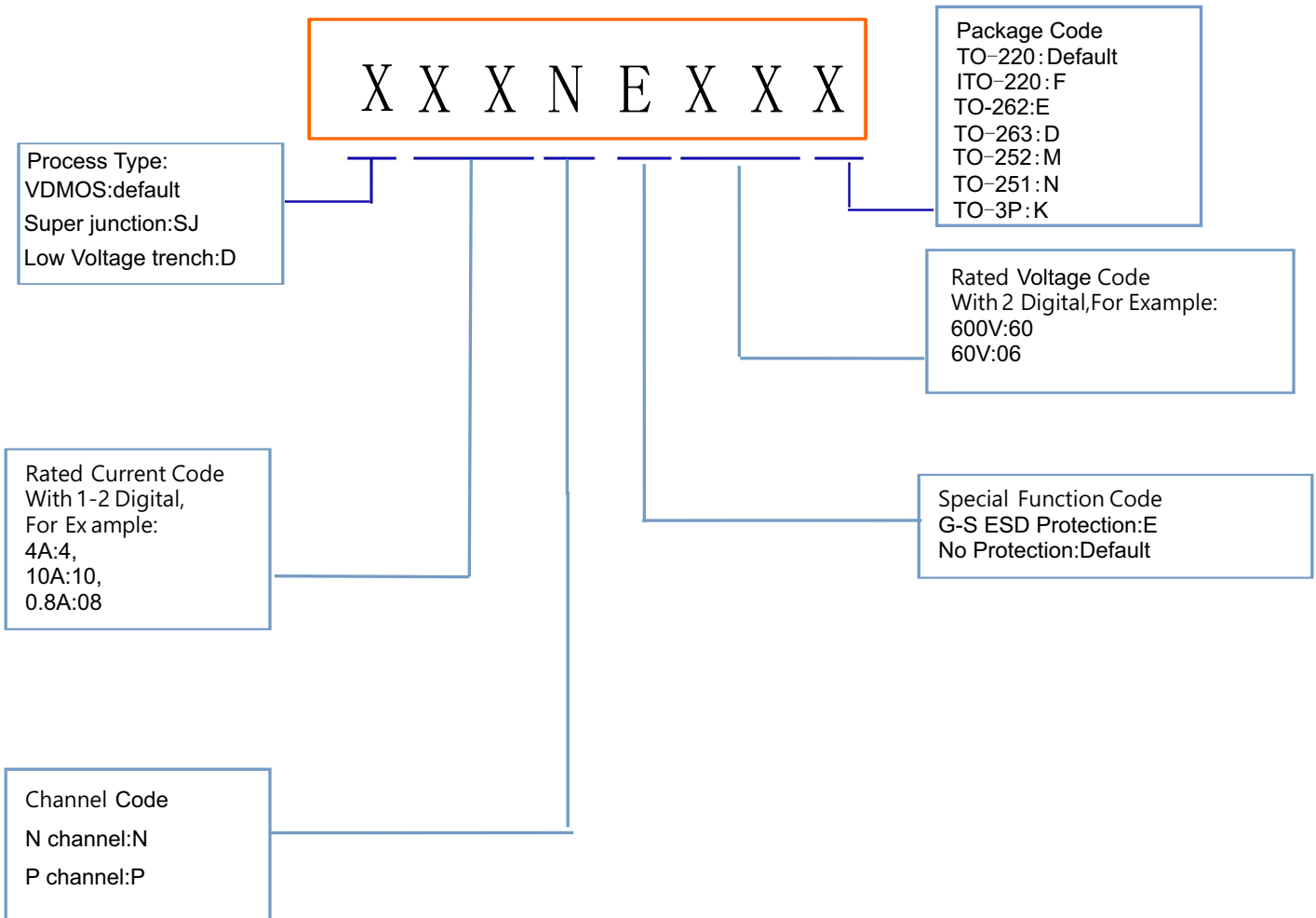


7) . Unclamped Inductive Switching Test Circuit



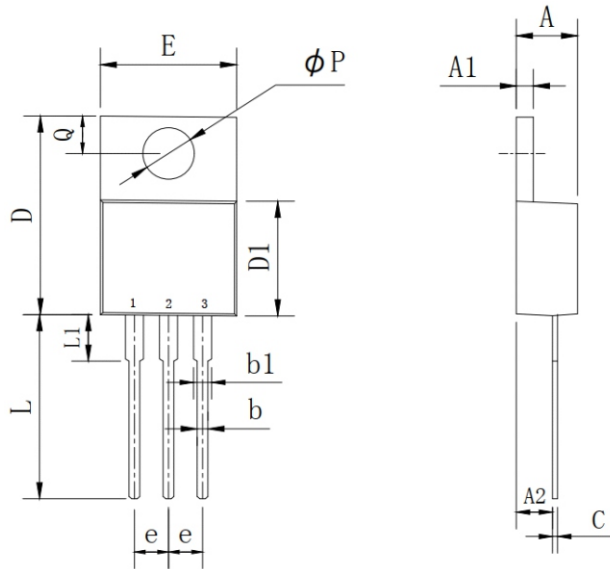
8) Unclamped Inductive Switching Waveforms

Product Names Rules



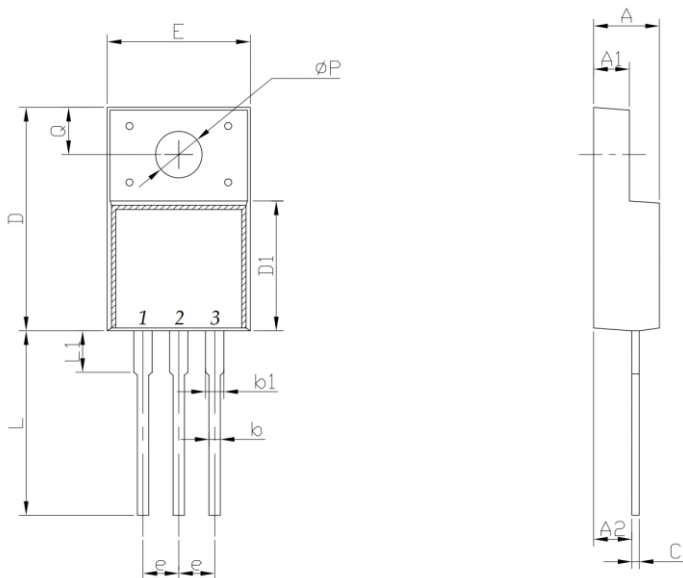
Dimensions

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

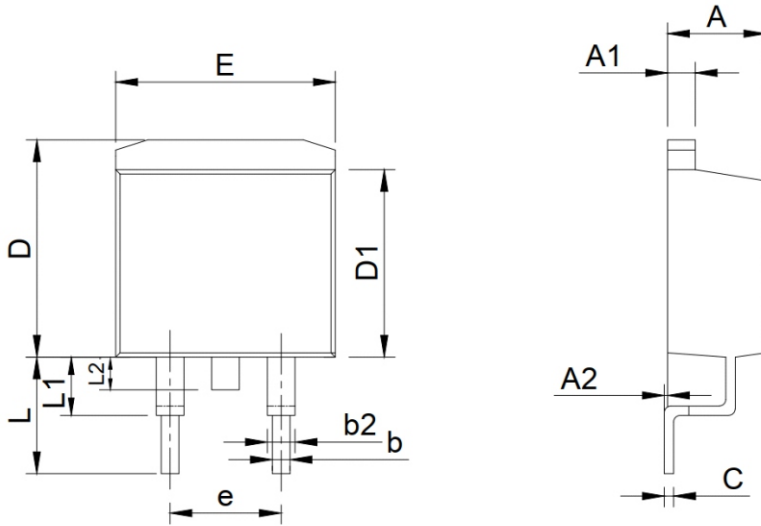
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

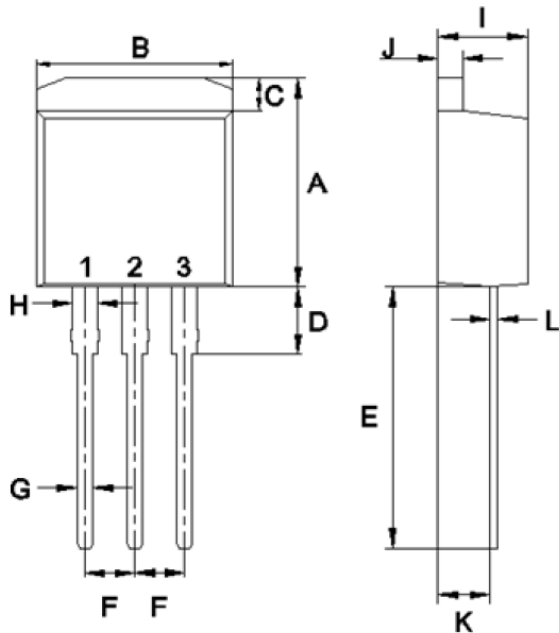
Dimensions

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

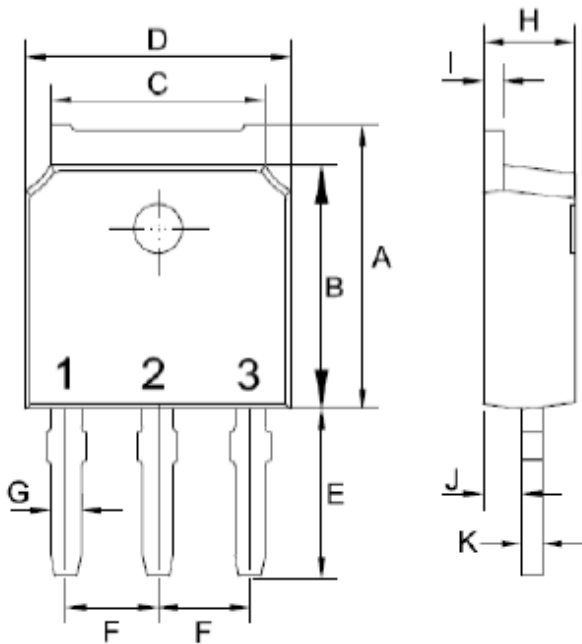
TO-262 PACKAGE OUTLINE DIMENSIONS



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

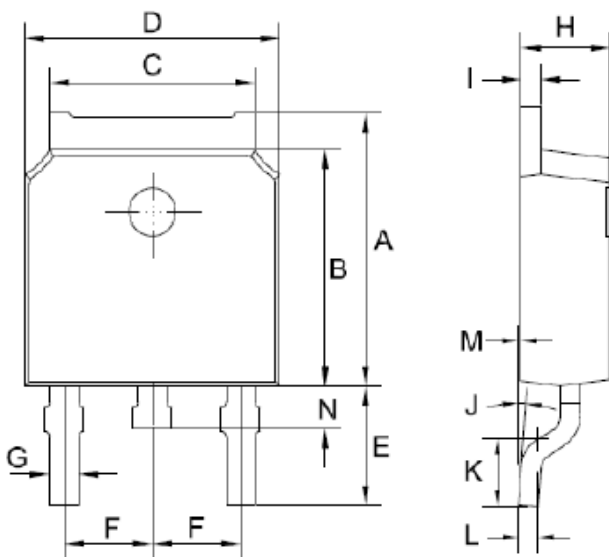
Dimensions

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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