

### 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 reverse transfer capacitances
- Low gate charge and Low on-resistance
- 100% avalanche tested

### Mechanical Data

- Case:TO-220,ITO-220,TO-263,TO-263-7L, TO-262,TO-251, TO-252 Package

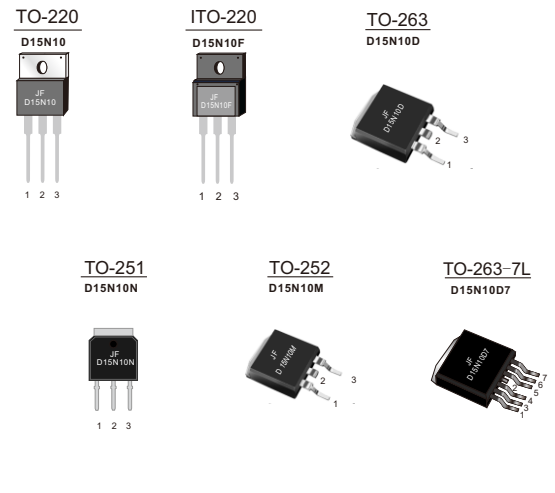
### Application

- Power switching applications
- Inverter management system
- Electric tools

### Ordering Information

Part No.	Package Type	Package	Quality(box)
D15N10	TO-220	Tube	1000
D15N10F	ITO-220	Tube	1000
D15N10D	TO-263	Tape & Reel	800
D15N10E	TO-262	Tube	1000
D15N10N	TO-251	Tube	1000
D15N10M	TO-252	Tape & Reel	3000
D15N10D7	TO-263-7L	Tape & Reel	800

Product Summary			
$V_{DS}$	$R_{DS(on)}$ (m $\Omega$ ) Typ	$I_D$ (A)	$Q_g$ (Typ)
100V	86 @ 10V 4A	15	21.5nc



### Block Diagram

Pin Definition:  
 1. Gate  
 2. Drain  
 3/4/5/6/7. Source

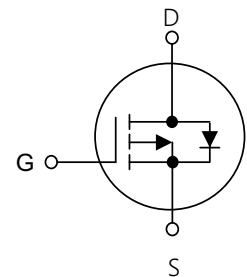


Table1 Absolute Maximum Ratings (Tc=25°C, unless otherwise specified)

Parameter	Symbol	D15N10/D15N10D/D15N10E D15N10M/D15N10N D15N10D7	D15N10F	Unit
Drain-Source Voltage	$V_{DS}$	100		V
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V
Continuous Drain Current	$I_D$	Tc=25°C	15*	A
		Tc=100°C	10*	
Pulsed Drain Current (Note 1)	$I_{DM}$	60		A
Single Pulse Avalanche Energy(Note 2)	$E_{AS}$	42		mJ
Avalanche Current(Note 2)	$I_{AR}$	13		A
Power Dissipation Tc=25°C	$P_D$	45	18	W
Operating Junction and Storage Temperature	$T_J/T_{STG}$	-55~+175		°C

※ limited by maximum junction temperature

Table 2. Thermal Characteristics

Parameter	Symbol	D15N10/D15N10D/ D15N10M/D15N10N D15N10E/D15N10D7	D15N10F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	3.33	8.33	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics (Tc=25°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	$\mu A$	
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	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	-	3.0	V	
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4A$	-	86	110	m $\Omega$	
Dynamic Characteristics(Note 4)							
Input Capacitance	$C_{ISS}$	$V_{DS}=50V, V_{GS}=0V, f=1\text{MHz}$	-	966	-	pF	
Output Capacitance	$C_{OSS}$		-	33	-	pF	
Reverse Transfer Capacitance	$C_{RSS}$		-	26	-	pF	
Switching Characteristics (Note 4)							
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=50V, I_D=4A$ $V_{GS}=10V, R_{GEN}=3\Omega,$	-	5.5	-	ns	
Turn-On Rise Time	$t_r$		-	19.2	-	ns	
Turn-Off Delay Time	$t_{d(off)}$		-	17.2	-	ns	
Turn-Off Fall Time	$t_f$		-	20	-	ns	
Total Gate Charge	$Q_G$	$V_{DD}=50V, I_D=4A,$ $V_{GS}=10V$	-	21.5	-	nC	
Gate-Source Charge	$Q_{GS}$		-	5.1	-	nC	
Gate-Drain Charge	$Q_{GD}$		-	3.2	-	nC	
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=4A$	-	-	1.2	V	
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		-	-	15	A	
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=4A$	-	41	-	ns	
Reverse Recovery Charge	$Q_{RR}$	$di_F/dt=100A/\mu s$ (Note 1)	-	31.8	-	nC	

- Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature  
 2 L=0.5mH, I<sub>D</sub>=13A, V<sub>DD</sub>=50V, V<sub>GATE</sub>=10V, Starting T<sub>J</sub>=25°C  
 3 Pulse Test: Pulse width ≤300μs, Duty cycle ≤2%  
 4 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

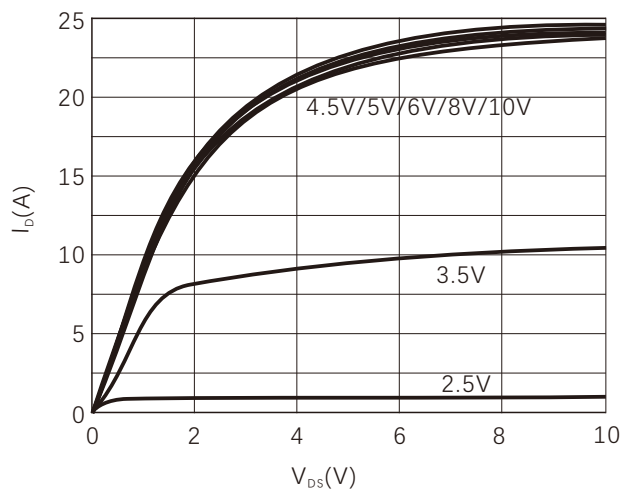


Figure 2. Transfer Characteristics

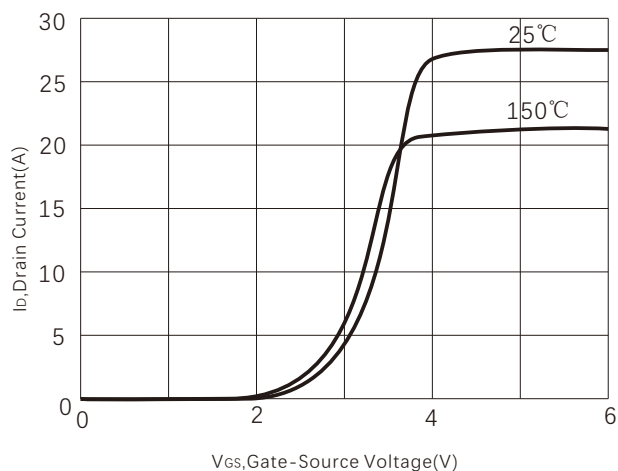


Figure 3.  $V_{TH}$  vs Junction Temperature

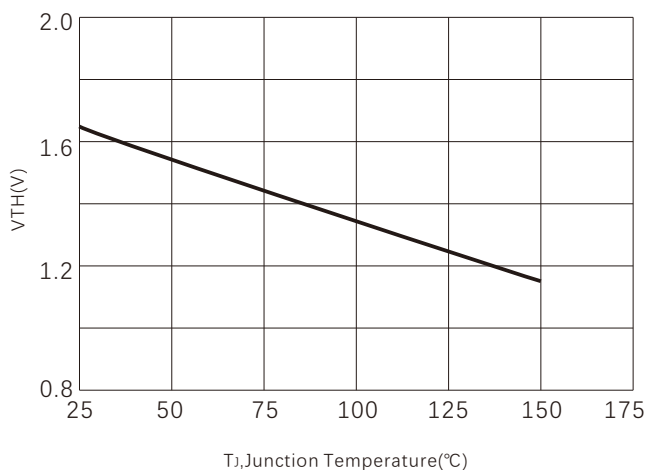


Figure 4. Capacitance

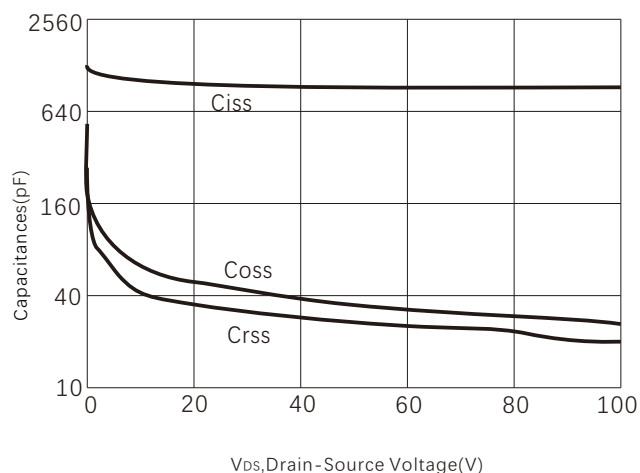


Figure 5.  $R_{DS(on)}$  vs  $V_{GS}$

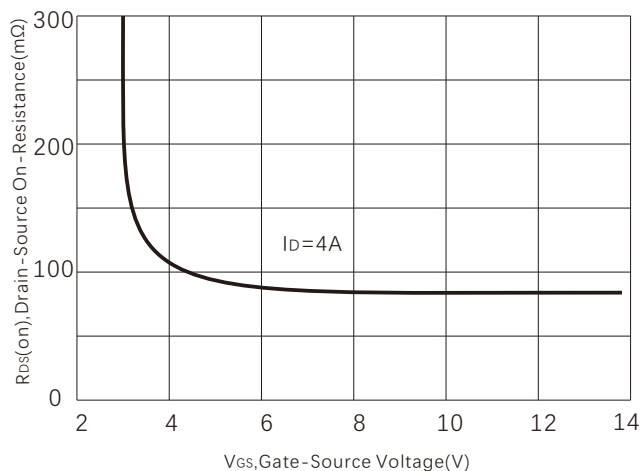


Figure 6. Source-Drain Diode Forward Voltage

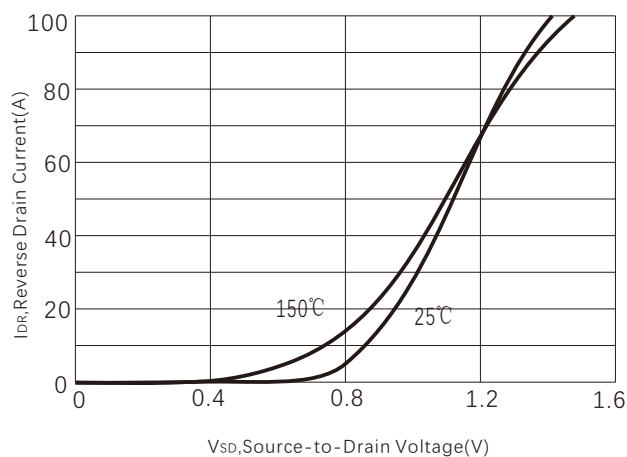


Figure 7.  $R_{DS(ON)}$  vs Junction Temperature

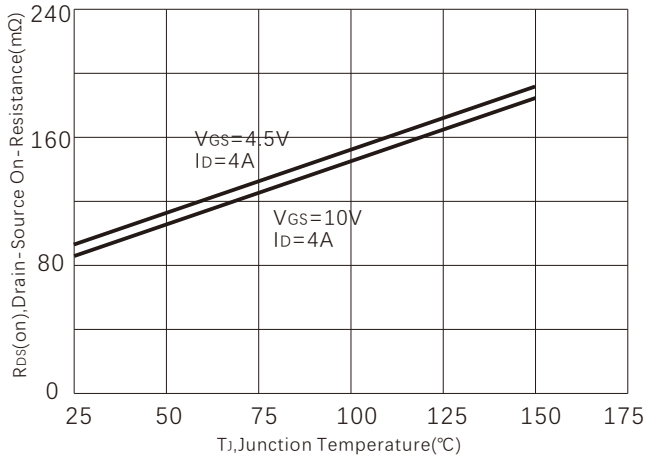


Figure 8.  $R_{DS(ON)}$  vs Drain Current

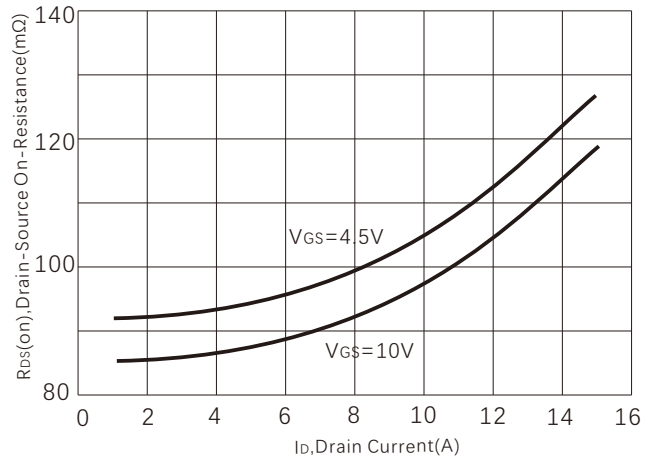


Figure 9. Safe operating area

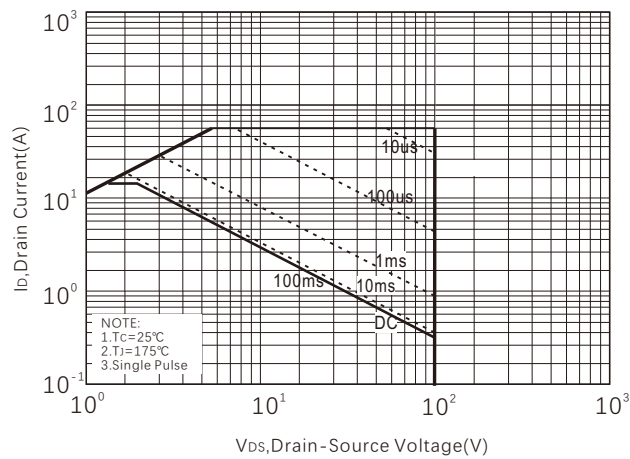
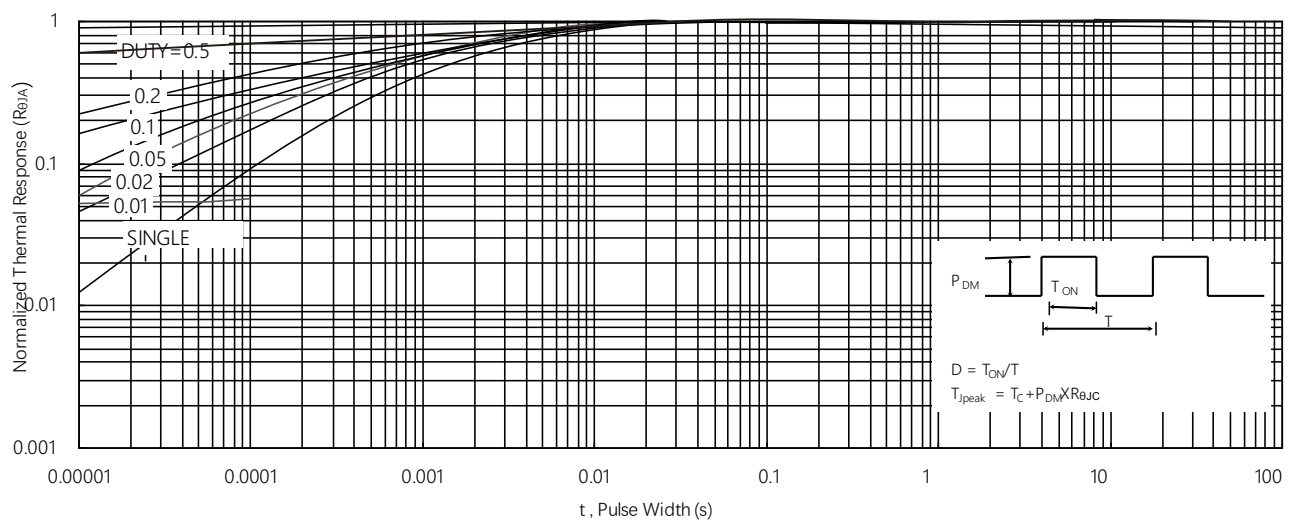
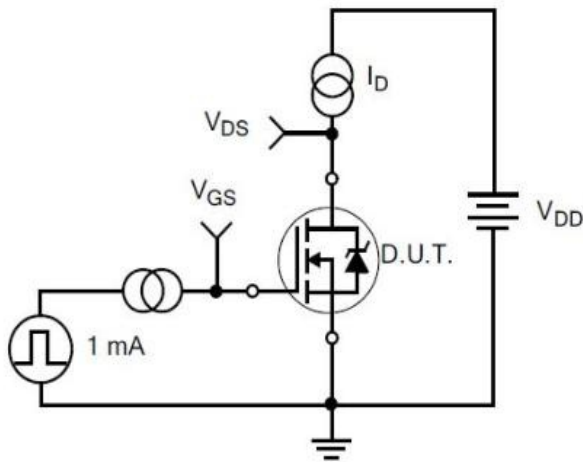


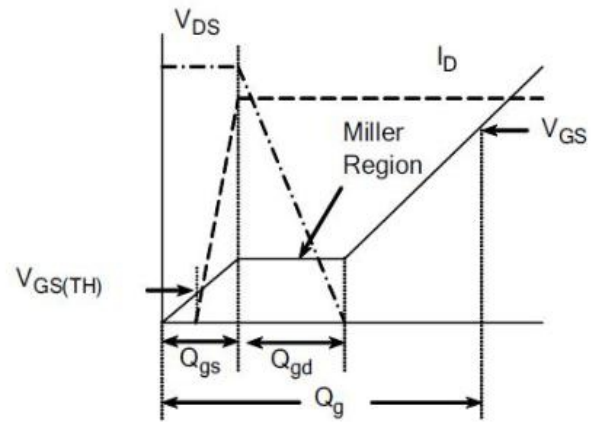
Figure 10. Normalized Maximum Transient Thermal Impedance



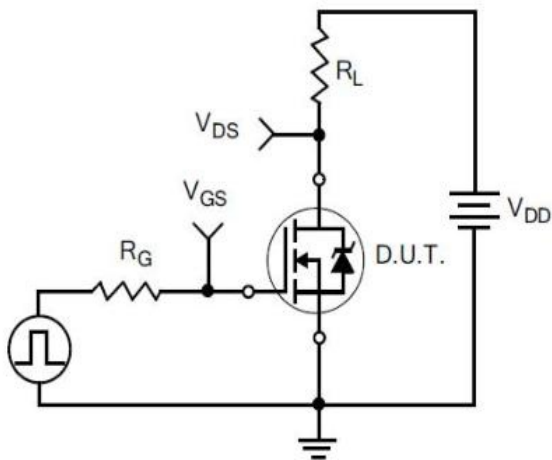
Typical Test Circuit



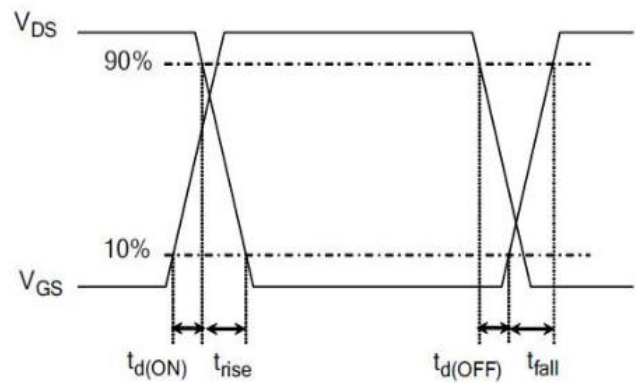
1) Gate Charge Test Circuit



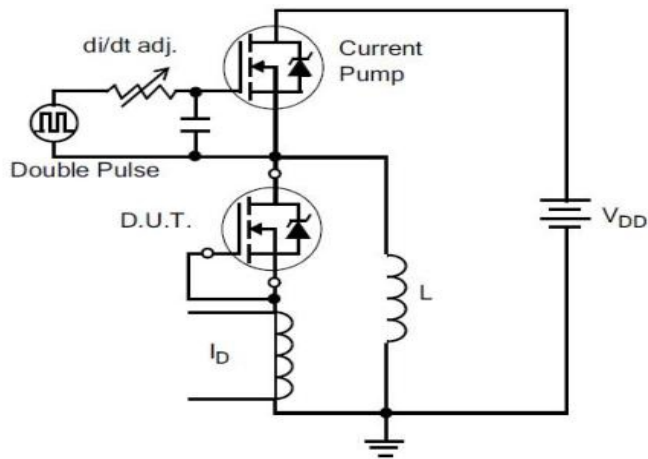
2) Gate Charge Waveform



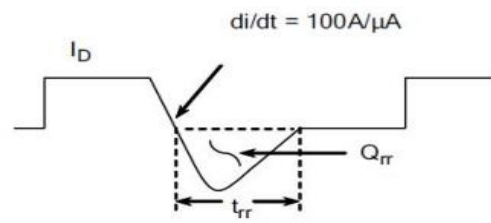
3) Resistive Switching Test Circuit



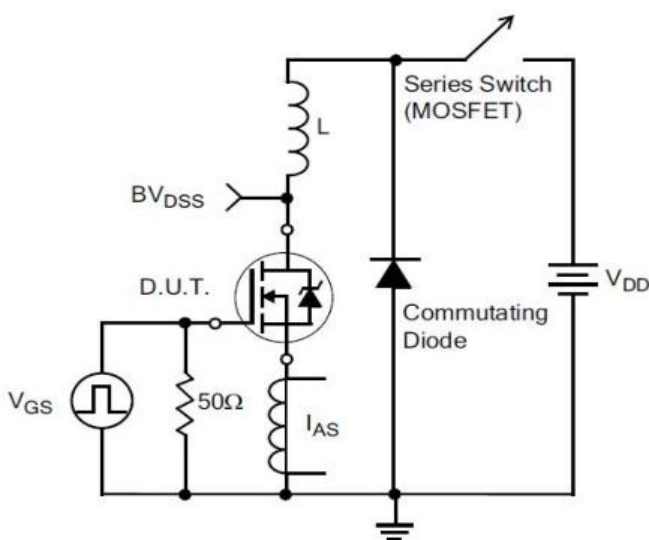
4) Resistive Switching Waveforms



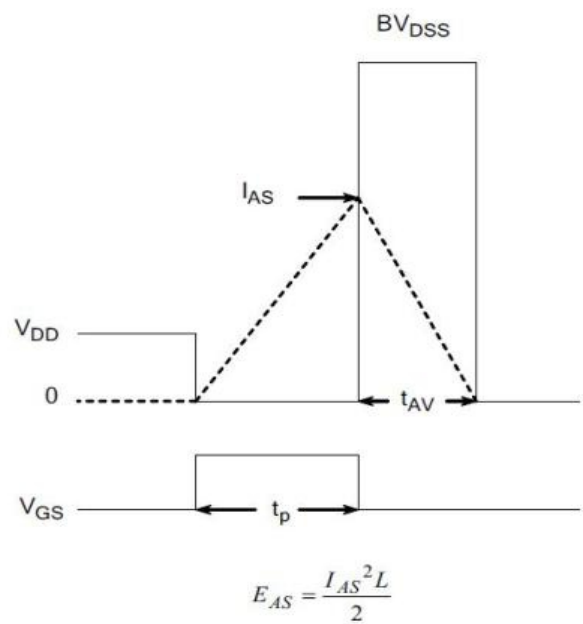
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



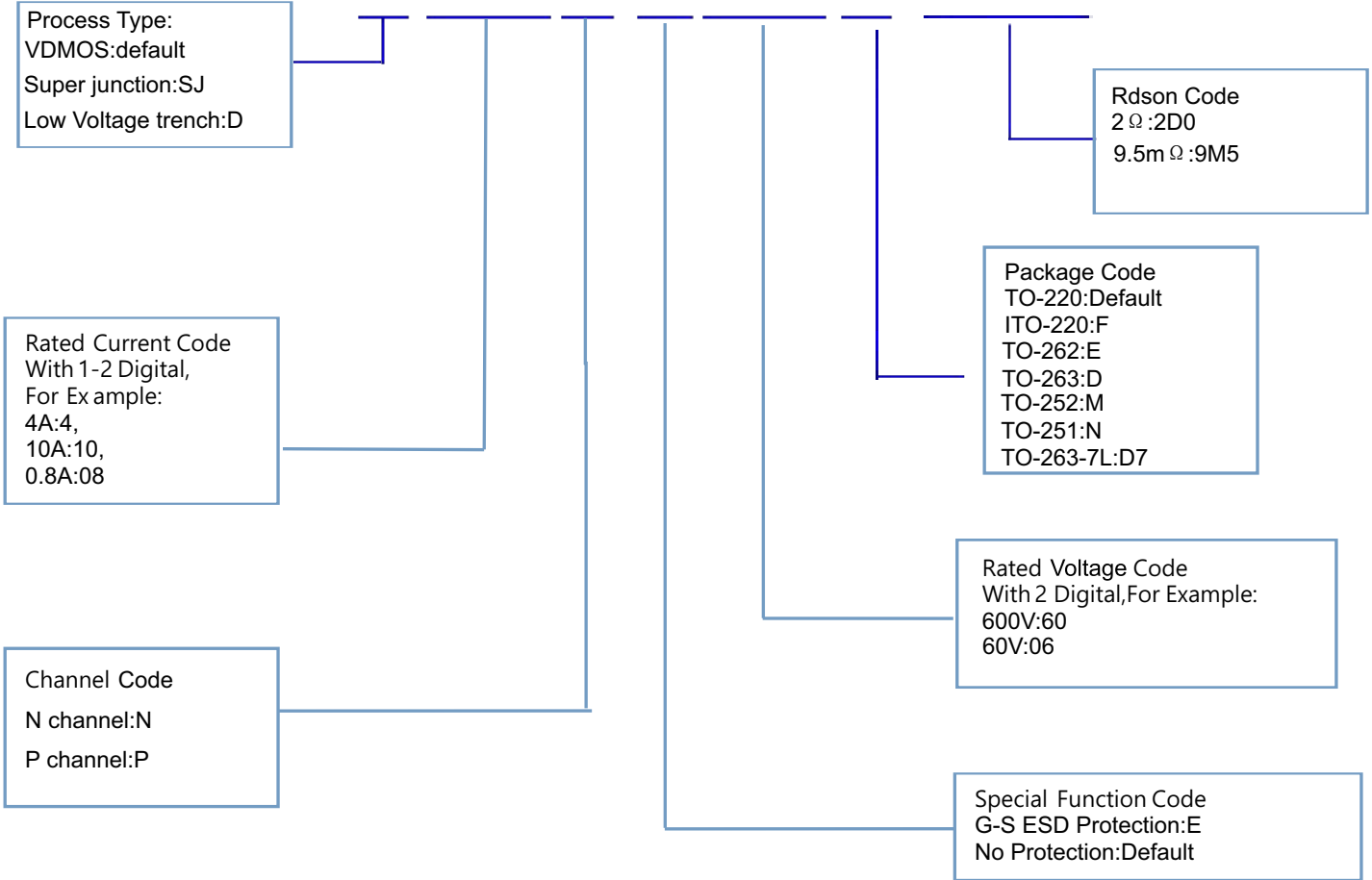
7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

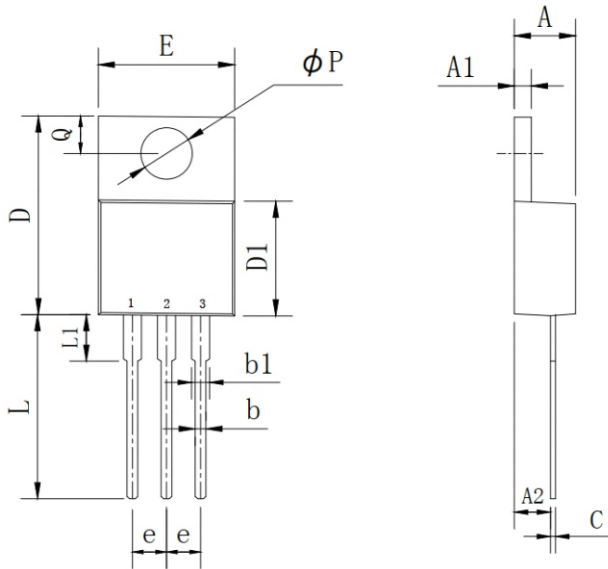
Product Names Rules

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



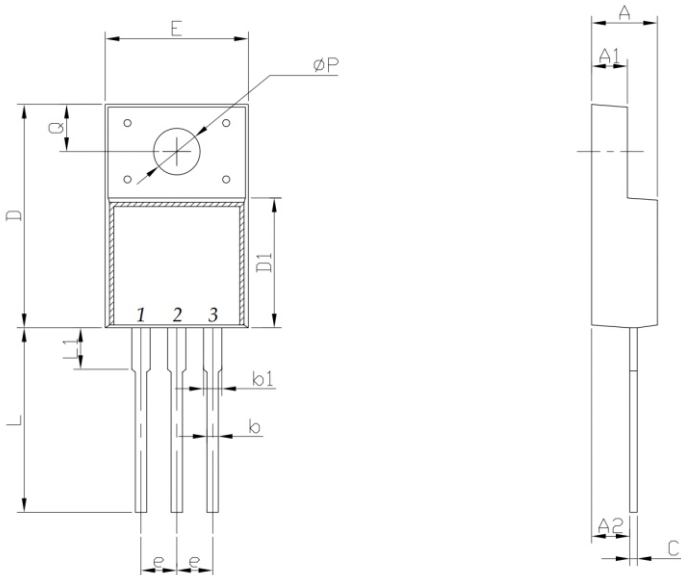
Dimensions

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

ITO-220 PACKAGE OUTLINE DIMENSIONS

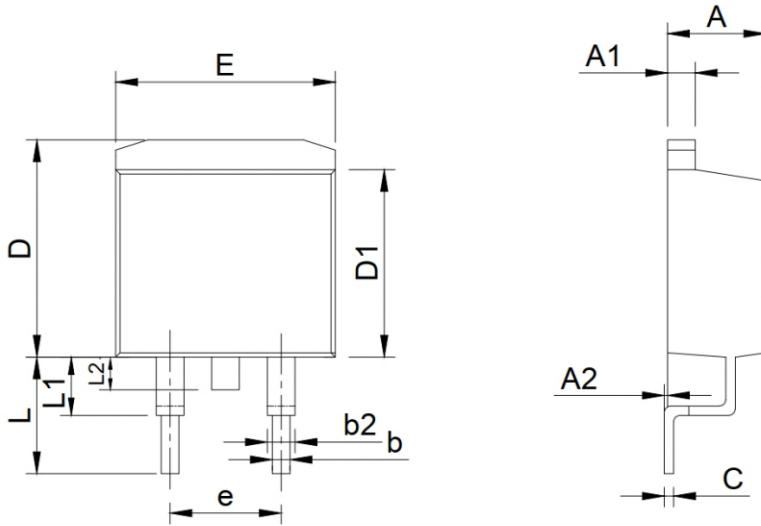


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108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



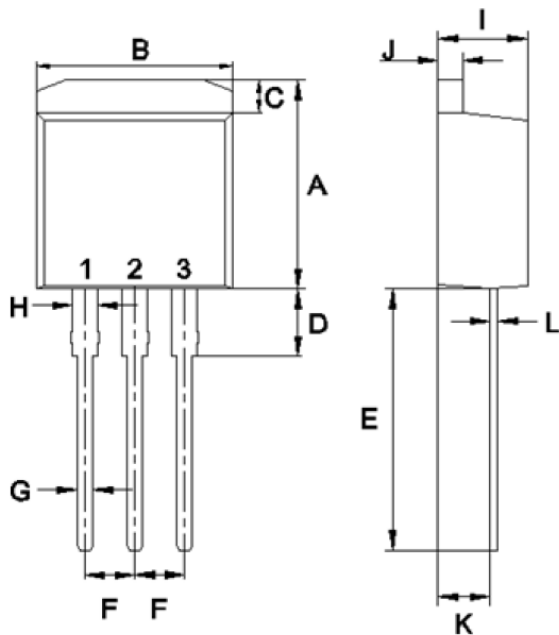
Dimensions

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

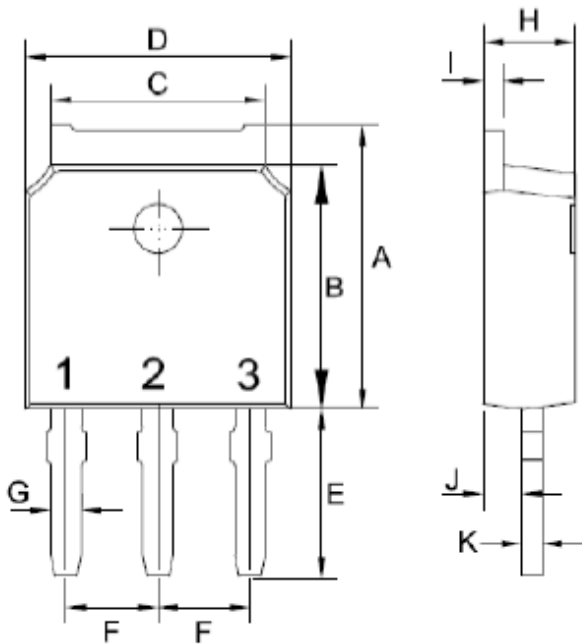
TO-262 PACKAGE OUTLINE DIMENSIONS



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

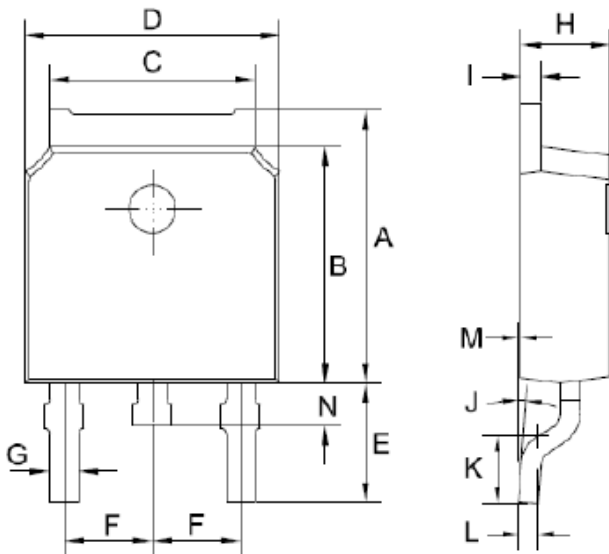
Dimensions

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

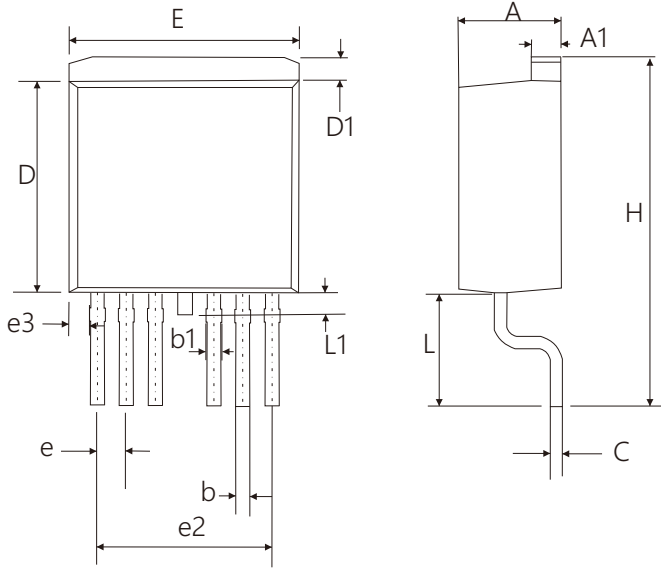
TO-252 PACKAGE OUTLINE DIMENSIONS



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

## Friendship Reminder

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