

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

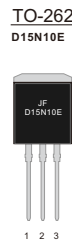
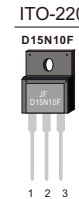
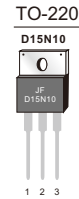
Application

- 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 Ω) 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

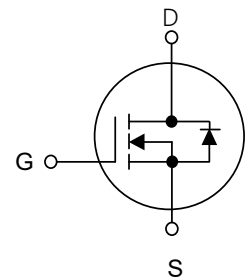


Table1 Absolute Maximum Ratings ($T_c=25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	D15N10/D15N10D/D15N10E D15N10M/D15N10N D15N10D7	D15N10F	Unit
Drain-Source Voltage	V_{DS}	100		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current	I_D	$T_c=25^\circ\text{C}$	15*	A
		$T_c=100^\circ\text{C}$	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 $T_c=25^\circ\text{C}$	P_D	45	18	W
Operating Junction and Storage Temperature	T_J/T_{STG}	-55~+175		$^\circ\text{C}$

* 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 ($T_c=25^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu\text{A}$	100	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	-	-	100	nA
	Reverse				-100	nA
On Characteristics(Note 3)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	-	3.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4A$	-	86	110	m Ω
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}	$V_{GS}=0V, I_F=4A$ $di_F/dt=100A/\mu\text{s}(\text{Note 1})$	-	41	-	ns
Reverse Recovery Charge	Q_{RR}		-	31.8	-	nC

Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature
 2 $L=0.5\text{mH}, I_D=13A, V_{DD}=50V, V_{GATE}=10V, \text{Starting } T_J=25^{\circ}\text{C}$
 3 Pulse Test: Pulse width $\leq 300\mu\text{s}, \text{Duty cycle} \leq 2\%$
 4 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

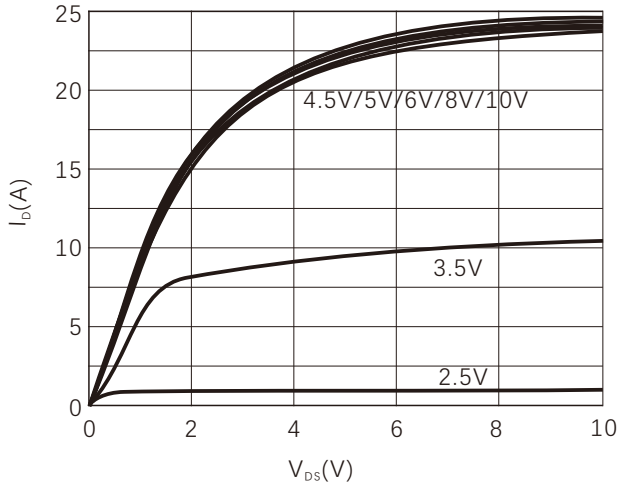


Figure 2. Transfer Characteristics

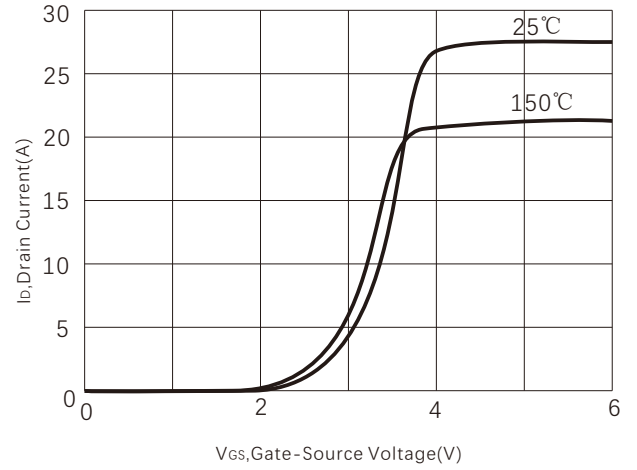


Figure 3. V_{TH} vs Junction Temperature

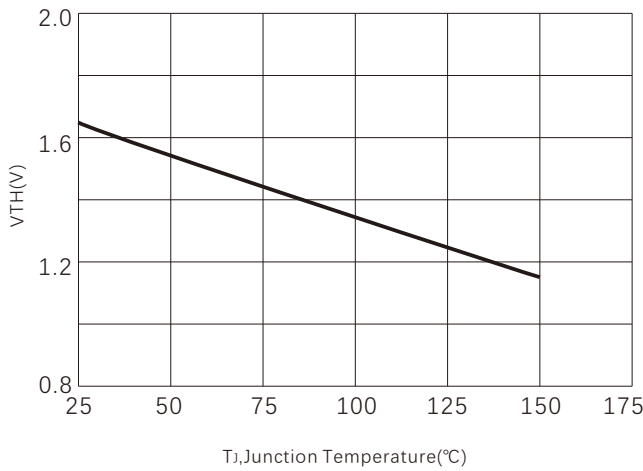


Figure 4. Capacitance

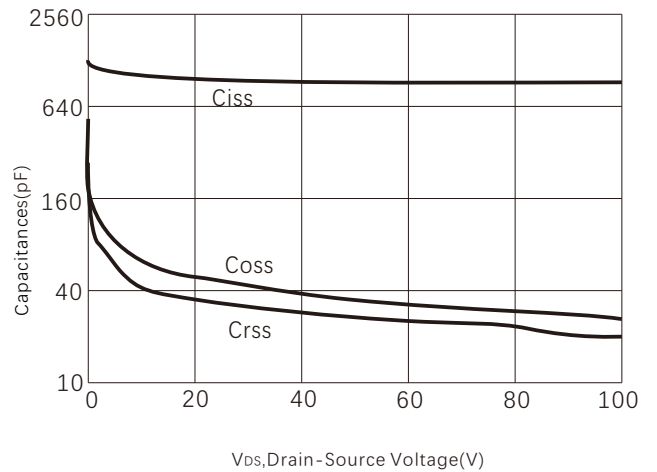


Figure 5. $R_{DS(on)}$ vs V_{GS}

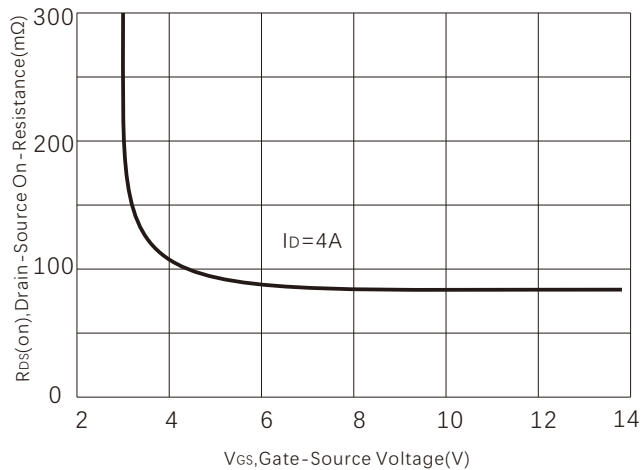


Figure 6. Source-Drain Diode Forward Voltage

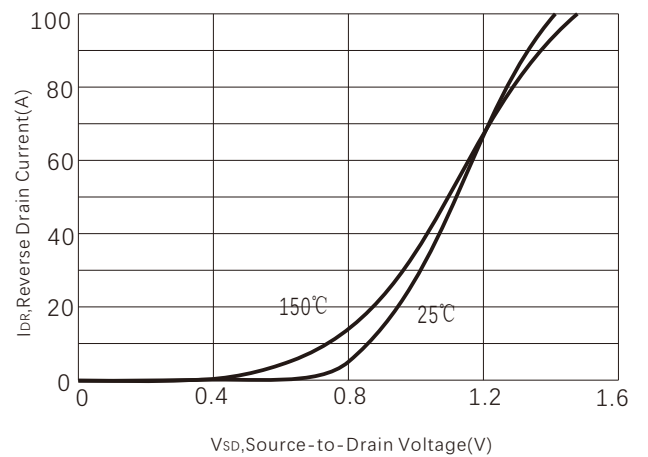


Figure 7. $R_{DS(ON)}$ vs Junction Temperature

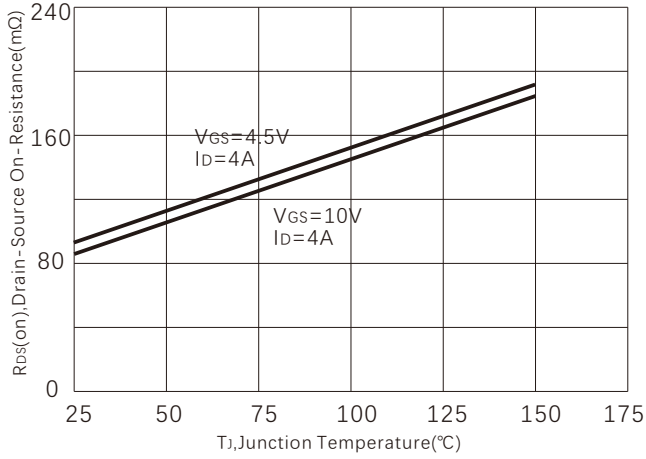


Figure 8. $R_{DS(ON)}$ vs Drain Current

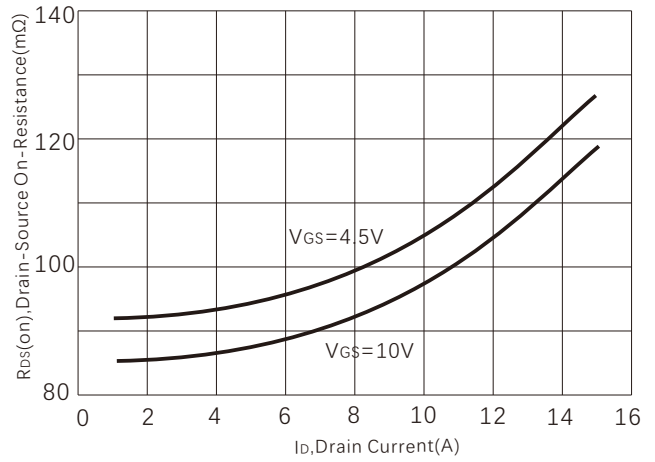


Figure 9. Safe operating area

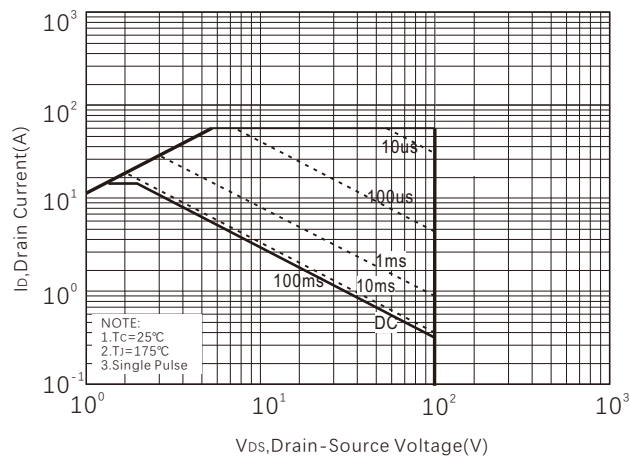
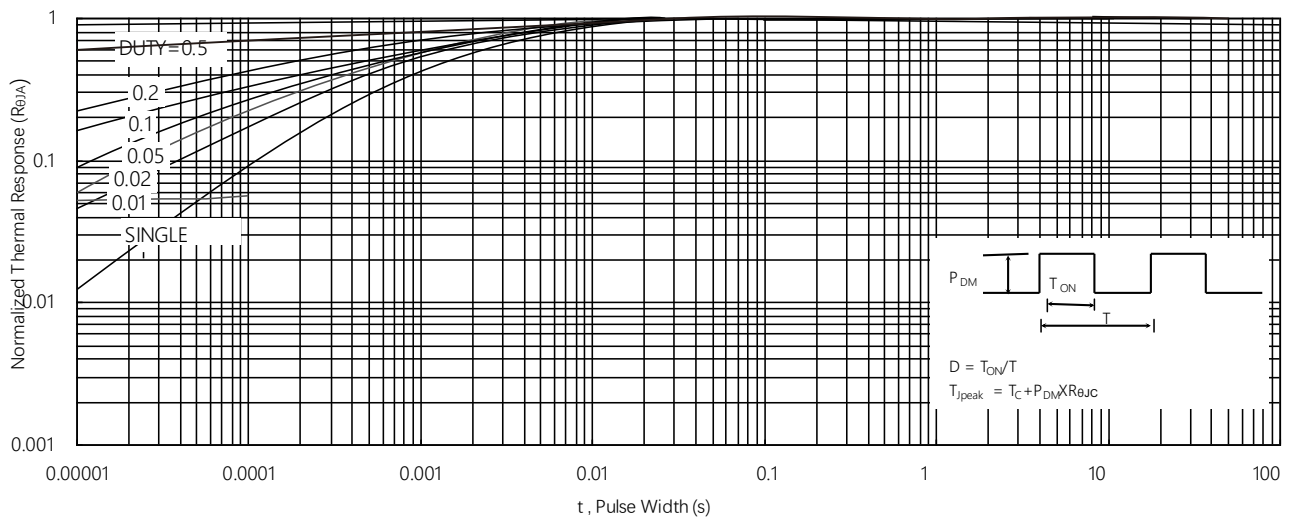
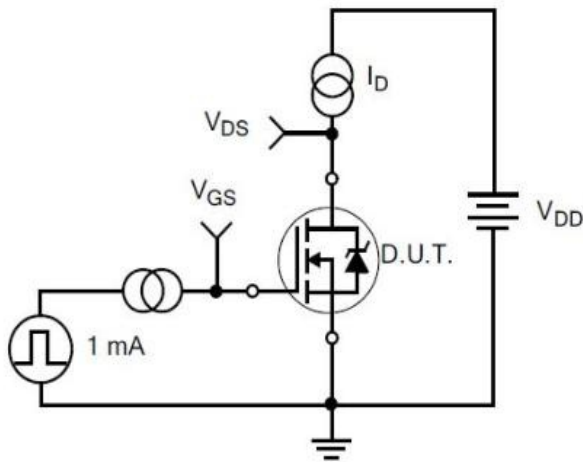


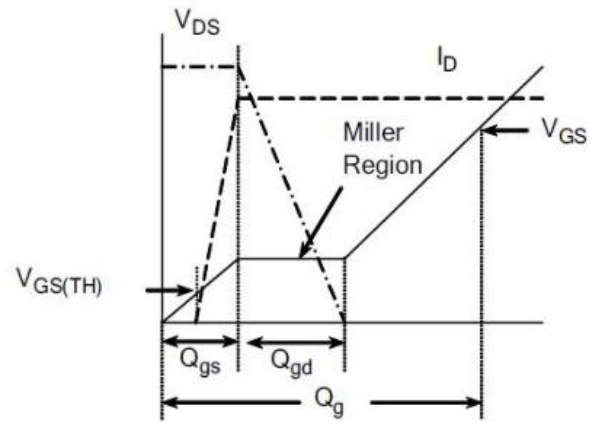
Figure 10. Normalized Maximum Transient Thermal Impedance



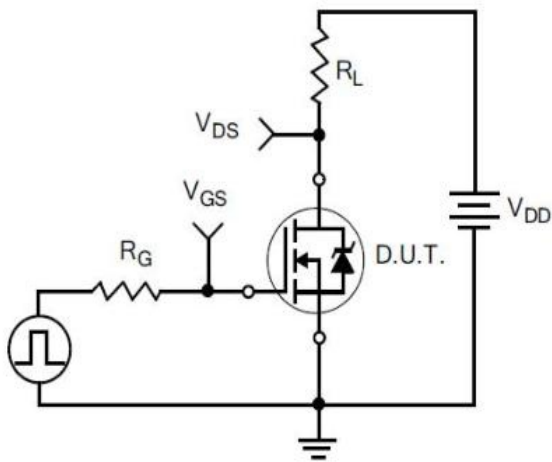
Typical Test Circuit



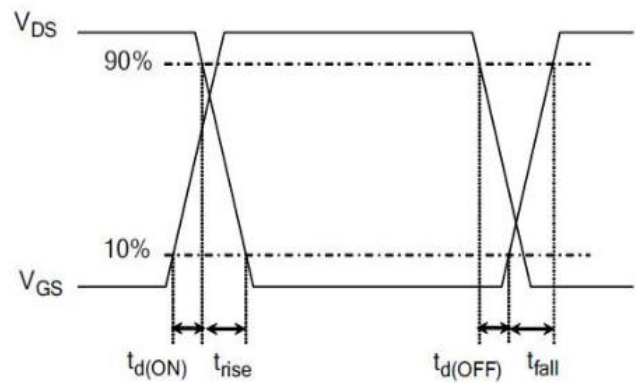
1) Gate Charge Test Circuit



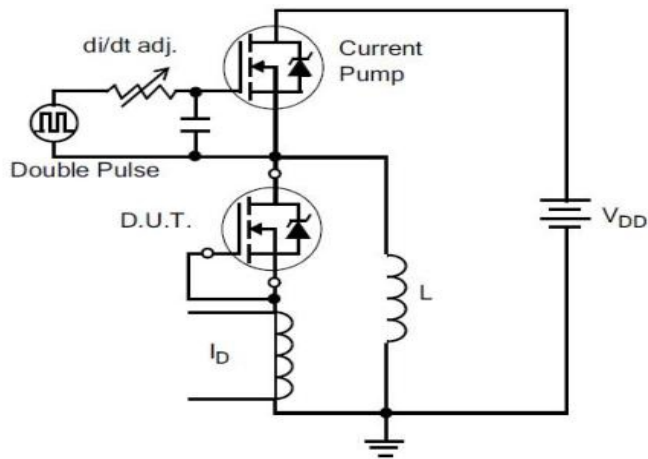
2) Gate Charge Waveform



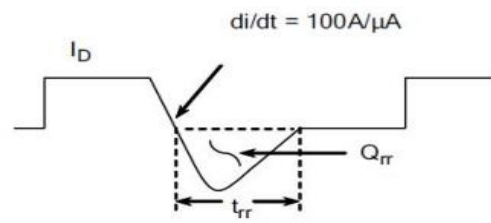
3) Resistive Switching Test Circuit



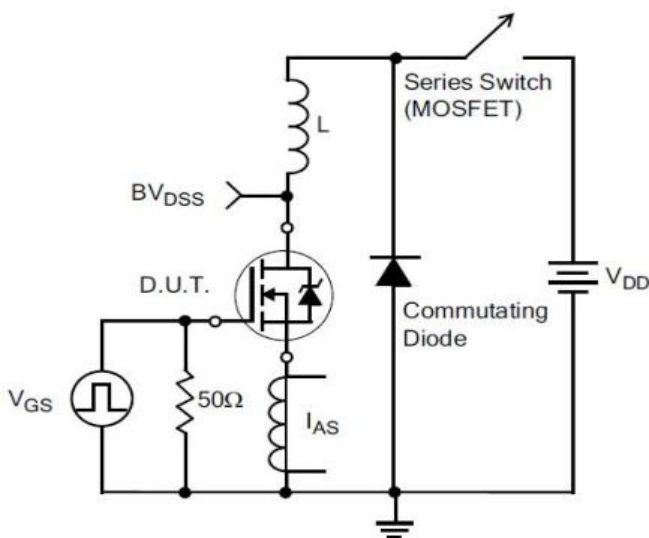
4) Resistive Switching Waveforms



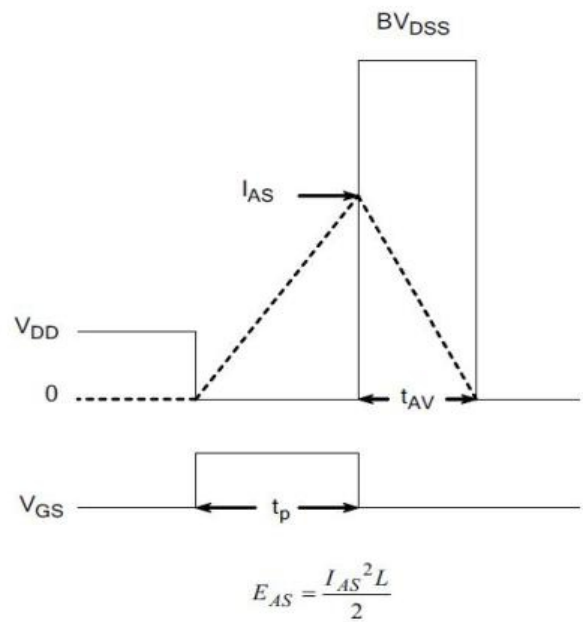
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



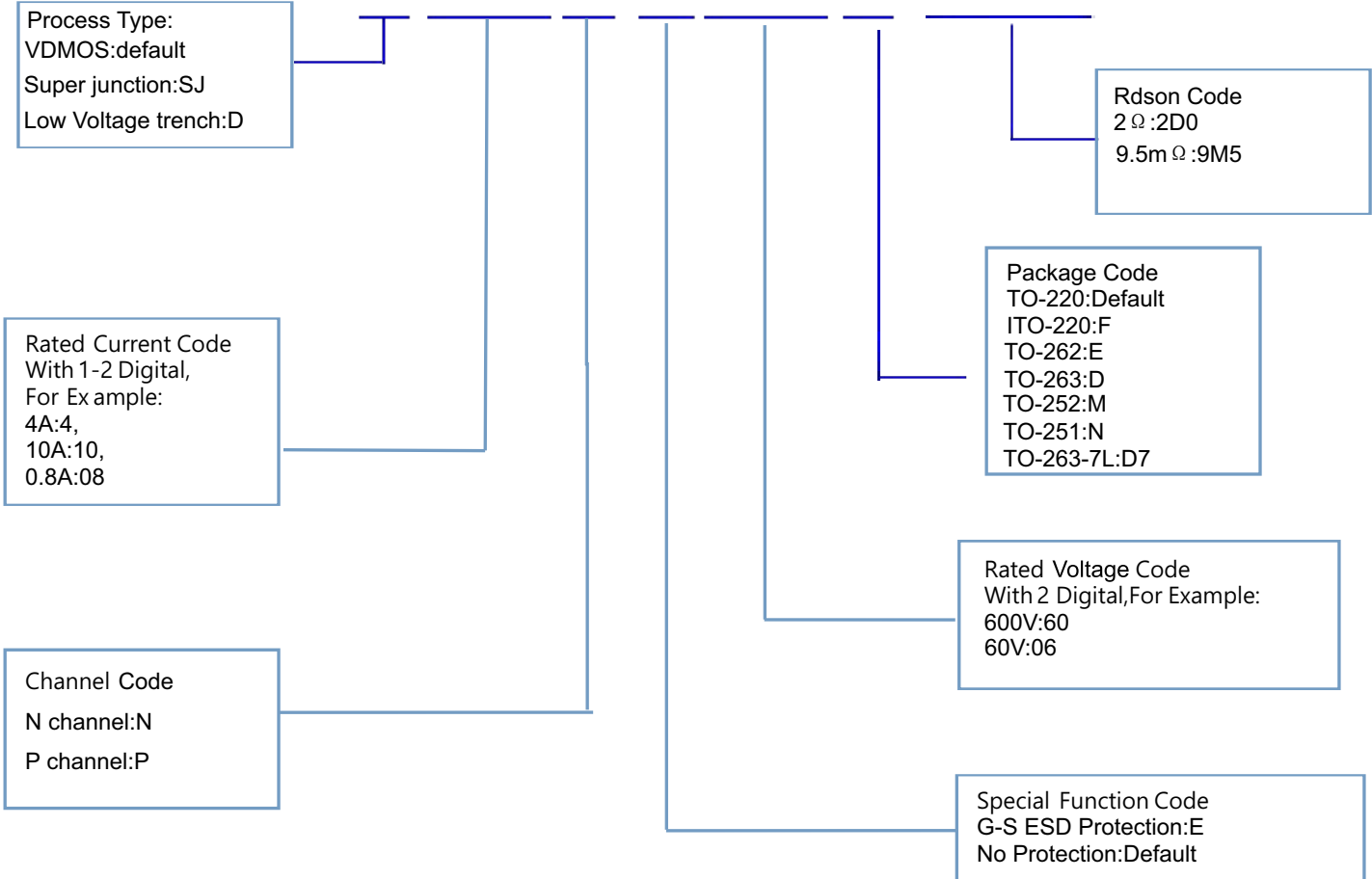
7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

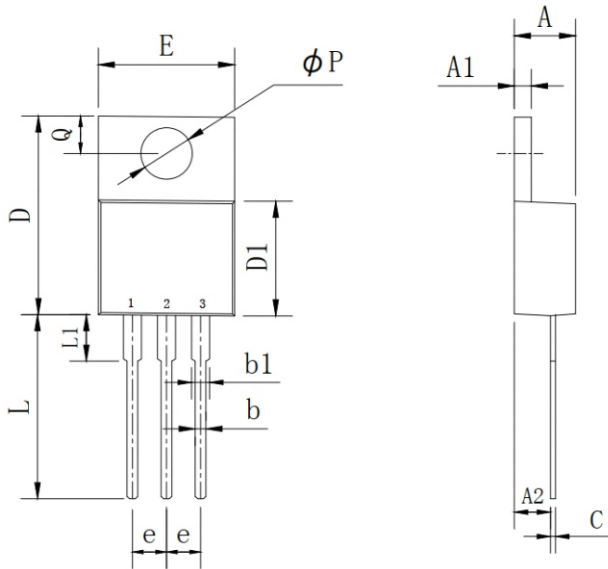
Product Names Rules

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



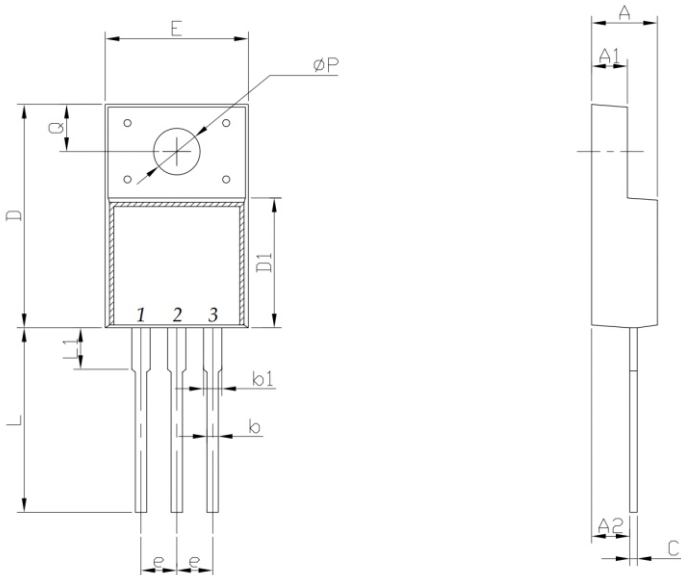
Dimensions

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

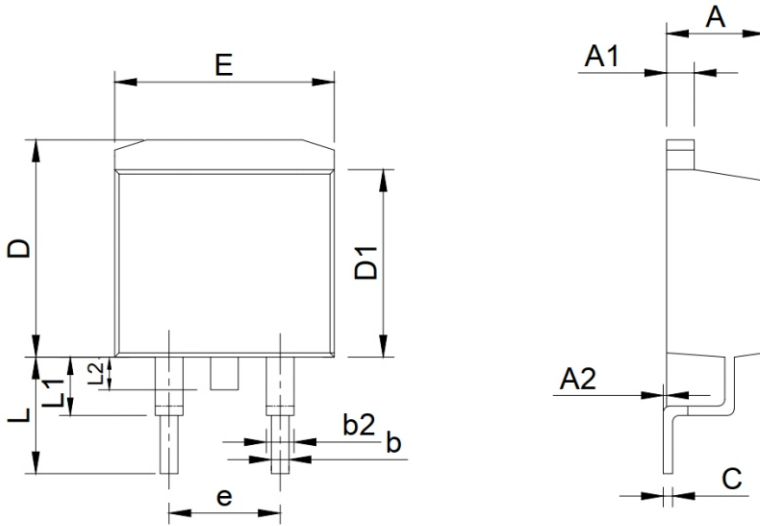
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

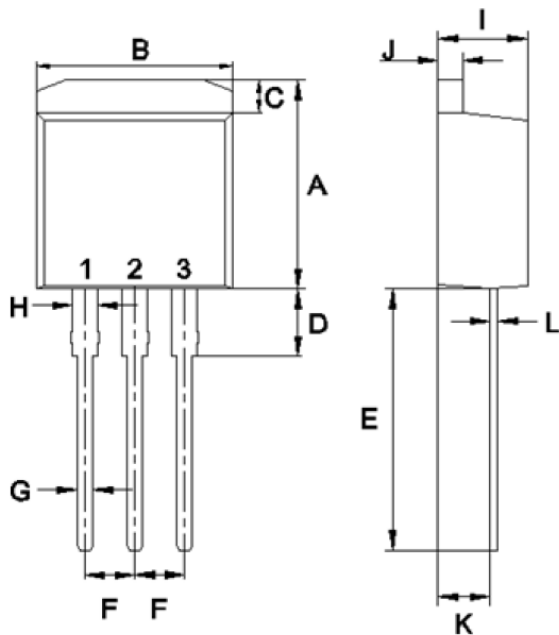
Dimensions

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

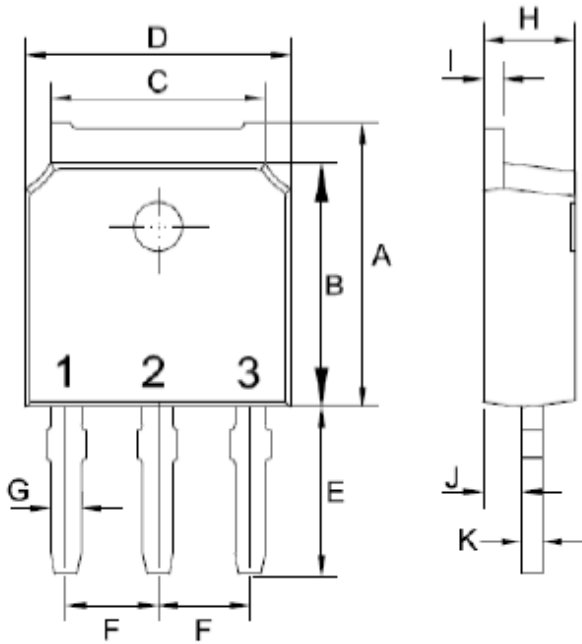
TO-262 PACKAGE OUTLINE DIMENSIONS



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

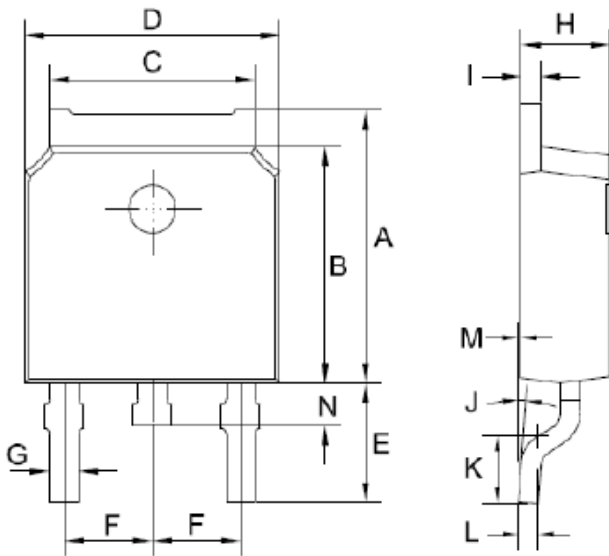
Dimensions

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

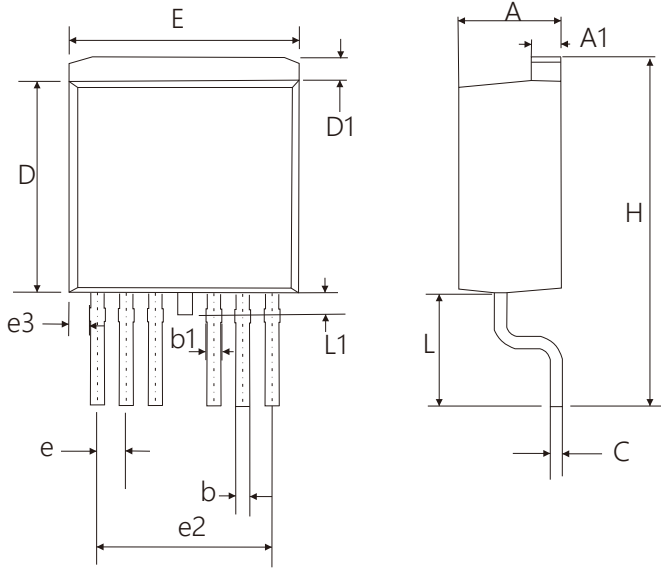
TO-252 PACKAGE OUTLINE DIMENSIONS



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

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