

Features

- Fast switching
- Low gate charge
- Improved dv/dt capability
- 100% avalanche tested
- RoHS product

Product Summary		
V _{DS}	R _{DS(on)} (Ω) Typ	I _D (A)
650V	1.15 @ 10V	7

Mechanical Data

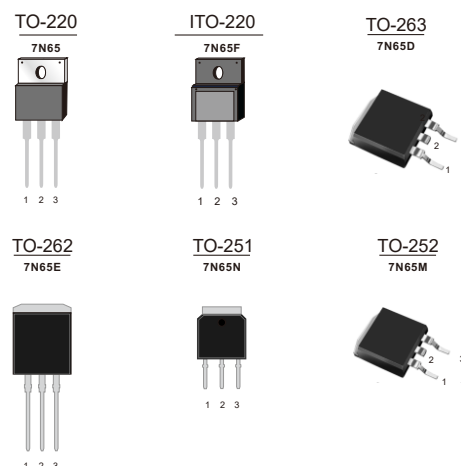
- Case: TO-220, ITO-220, TO-263, TO-262, TO-251, TO-252 Package

Application

- Switching applications
- LED power supplies

Ordering Information

Part No.	Package Type	Package	Quantity(box)
7N65	TO-220	Tube	1000
7N65F	ITO-220	Tube	1000
7N65D	TO-263	Tape & Reel	800
7N65E	TO-262	Tube	1000
7N65N	TO-251	Tube	1000
7N65M	TO-252	Tape & Reel	3000



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

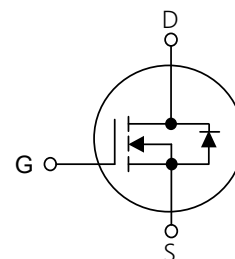


Table1 Absolute Maximum Ratings (T_c=25°C, unless otherwise specified)

Parameter	Symbol	7N65/7N65D/7N65E 7N65M/7N65N	4N65F	Unit
Drain-Source Voltage	V _{DS}	650		V
Gate-Source Voltage	V _{GS}	±30		V
Continuous Drain Current T _C =25°C	I _D	7	7*	A
Avalanche Energy(Note 2)	E _{AS}	756		mJ
Pulsed Drain Current (Note 1)	I _{DM}	28		A
Power Dissipation T _C =25°C	P _D	120	30	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +150		°C

※ limited by maximum junction temperature

Table 2. Thermal Characteristics

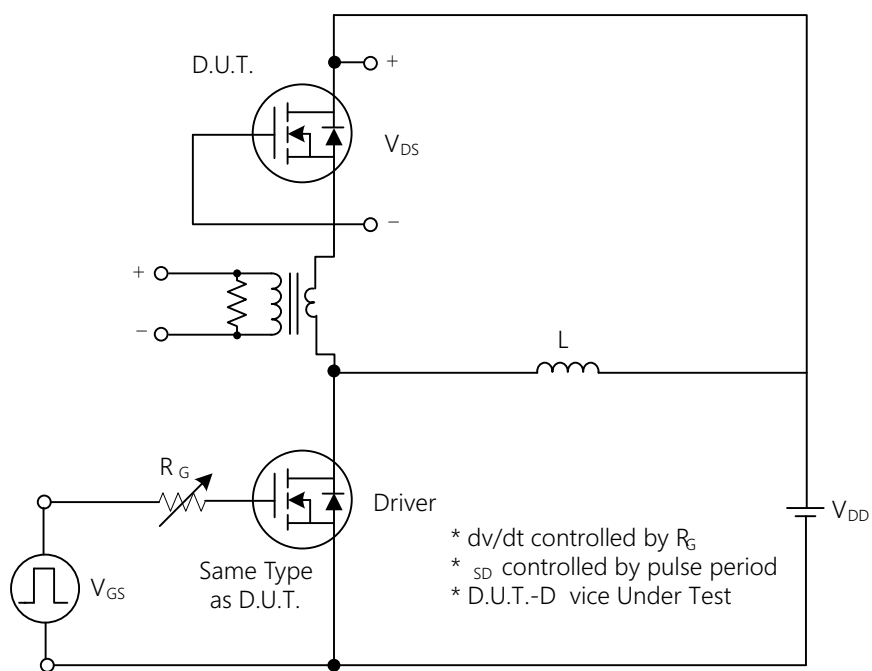
Parameter	Symbol	7N65/7N65D/7N65E 7N65M/7N65N	7N65F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62.5	62.5	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	1.04	3.20	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

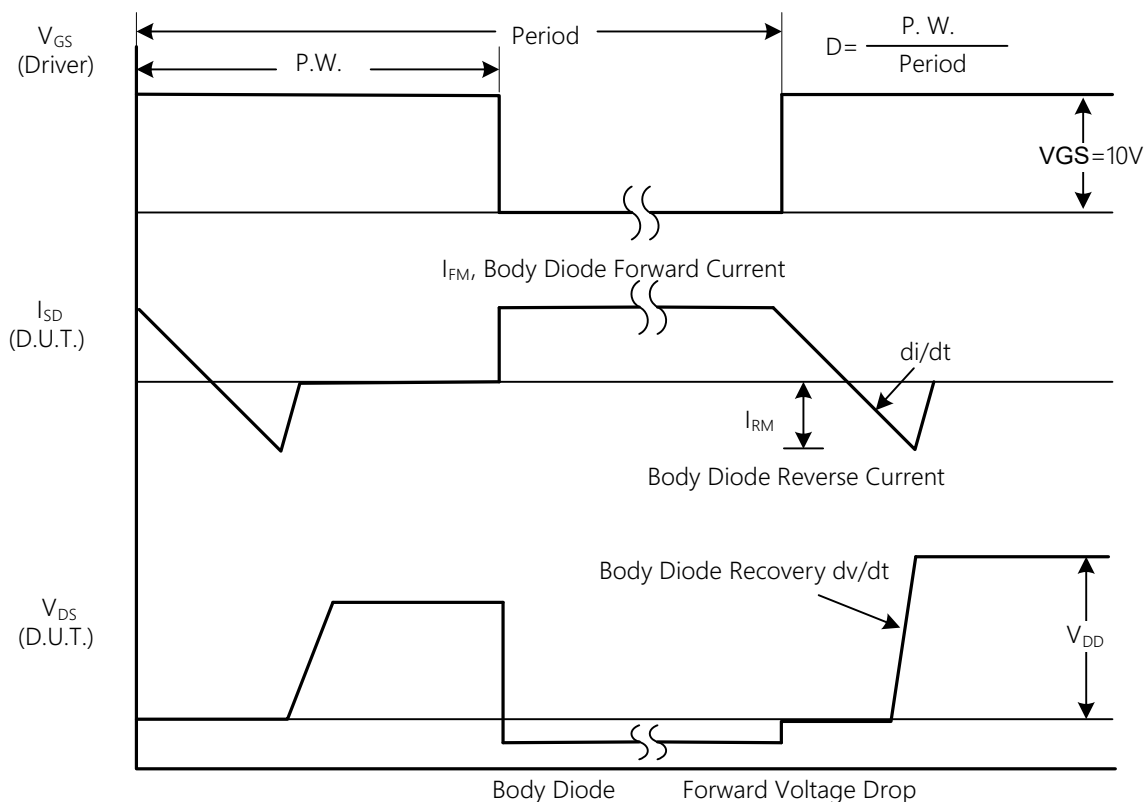
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250μA	650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V,V _{GS} =0V			1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _{DS} =0V			100	nA
	Reverse		V _{GS} =-30V,V _{DS} =0V			-100	nA
On Characteristics(Note 4)							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250mA	2		4	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =3.5A		1.15	1.35	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1MHz		1200		pF
Output Capacitance		C _{OSS}			100		pF
Reverse Transfer Capacitance		C _{RSS}			10.5		pF
Switching Characteristics (Note 4)							
Turn-On Delay Time		td(on)	V _{DD} =300V,I _D =7A R _{GEN} =25Ω	-	38.5	-	ns
Turn-On Rise Time		t _r		-	33.6	-	ns
Turn-Off Delay Time		td(off)		-	65.5	-	ns
Turn-Off Fall Time		t _f		-	15.2	-	ns
Total Gate Charge		Q _G	V _{DD} =520V,I _D =7A, V _{GS} =10V	-	23	-	nC
Gate-Source Charge		Q _{GS}		-	7.6	-	nC
Gate-Drain Charge		Q _{GD}		-	8.8	-	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V,I _S =7A		-	1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I _S			-	7	A
Reverse Recovery Time		t _{rr}	V _{GS} =0V,I _F =7A		320		ns
Reverse Recovery Charge		Q _{RR}	diF/dt=100A/μs(Note 1)		2.4		nC

Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature
2 $L=30mH, I_{AS}=5.25A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$
3 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
4 Guaranteed by design, not subject to production

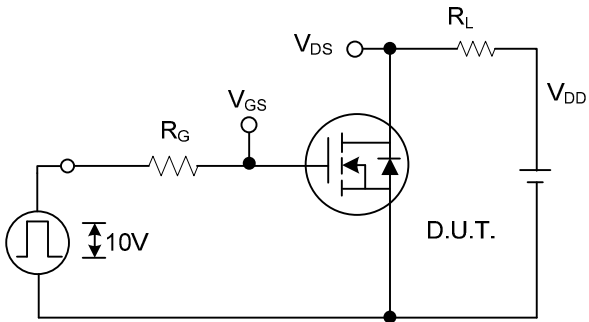
TEST CIRCUITS AND WAVEFORMS



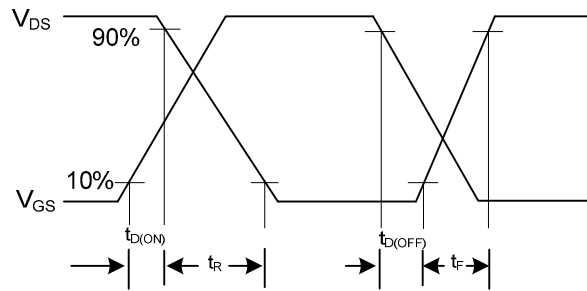
Peak Diode Recovery dv/dt Test Circuit



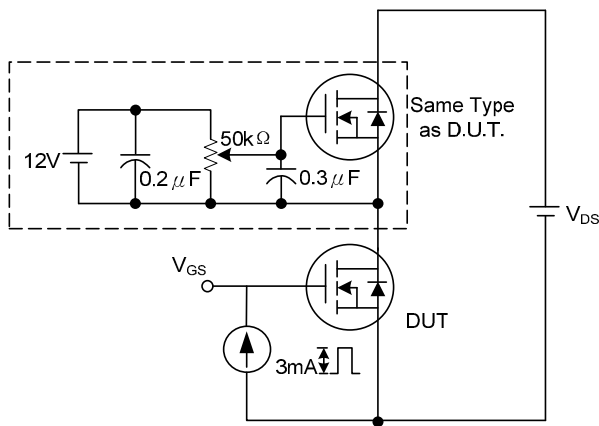
Peak Diode Recovery dv/dt Waveforms



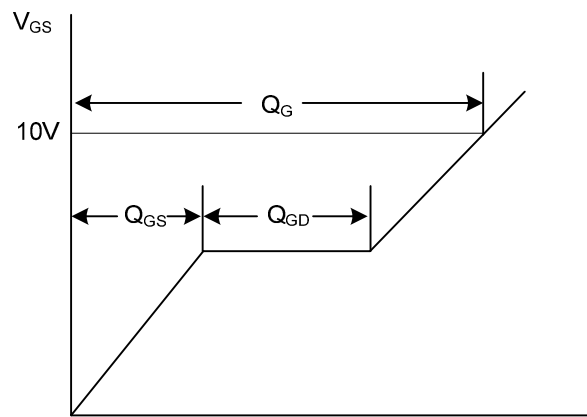
Switching Test Circuit



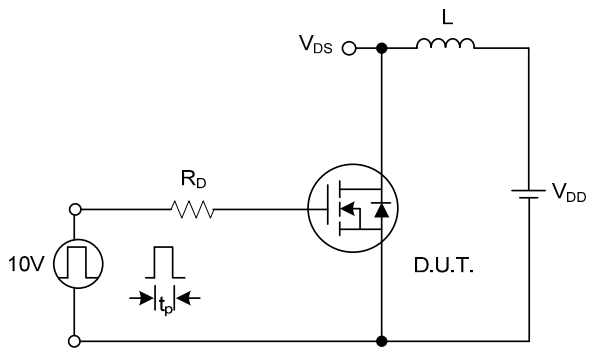
Switching Waveforms



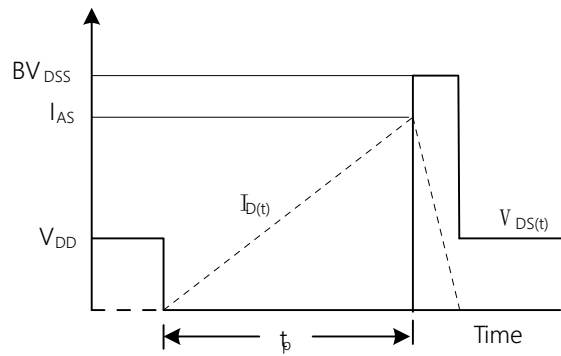
Gate Charge Test Circuit



Charge
Gate Charge Waveform



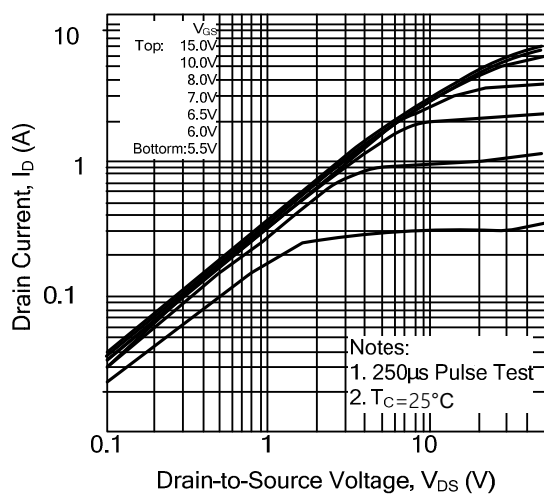
Unclamped Inductive Switching Test Circuit



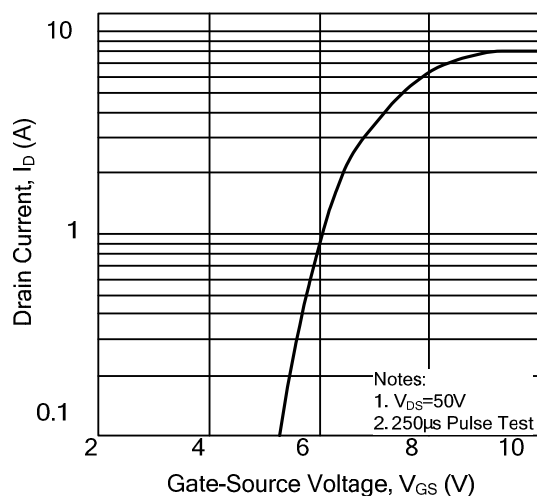
Unclamped Inductive Switching Waveforms

Typical Characteristics Diagrams

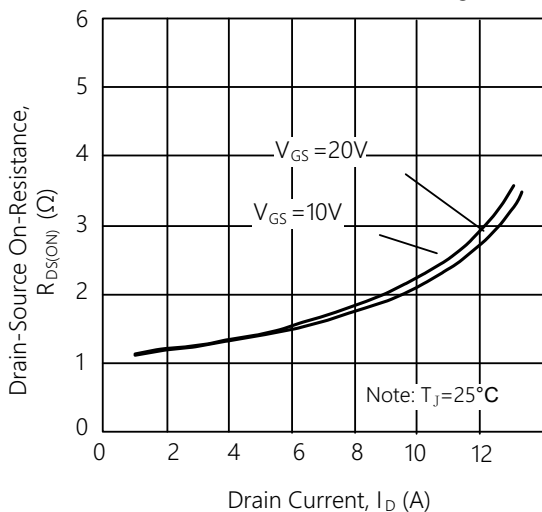
On-State Characteristics



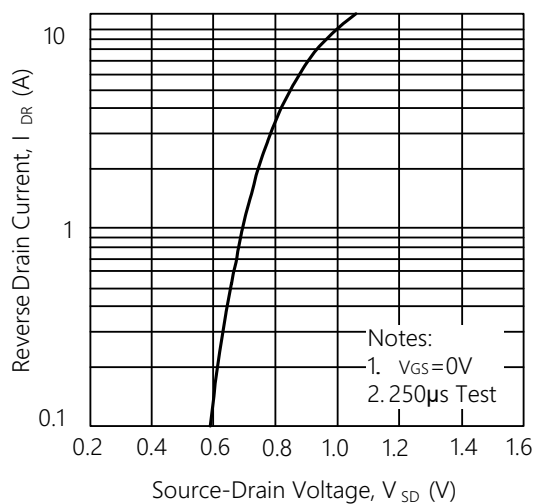
Transfer Characteristics



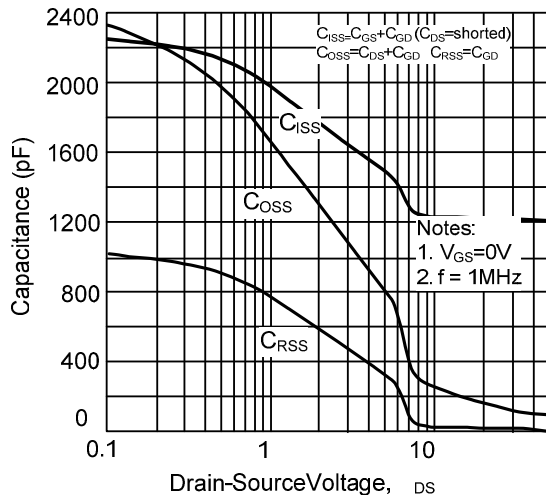
On-Resistance Variation vs. Drain Current and Gate Voltage



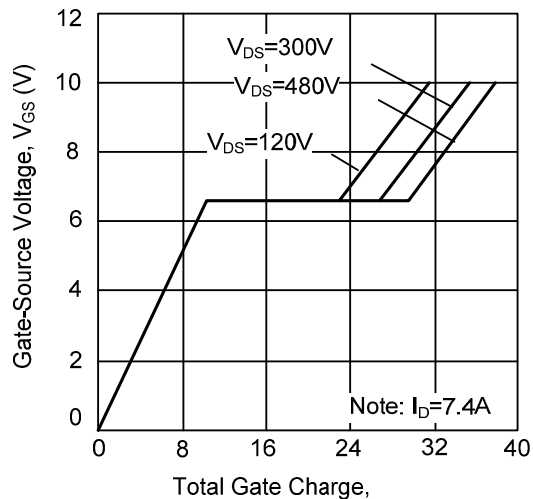
On State Current vs. Allowable Case Temperature

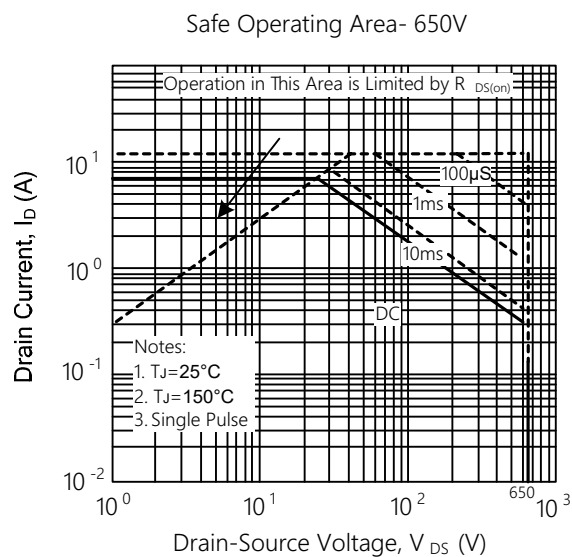
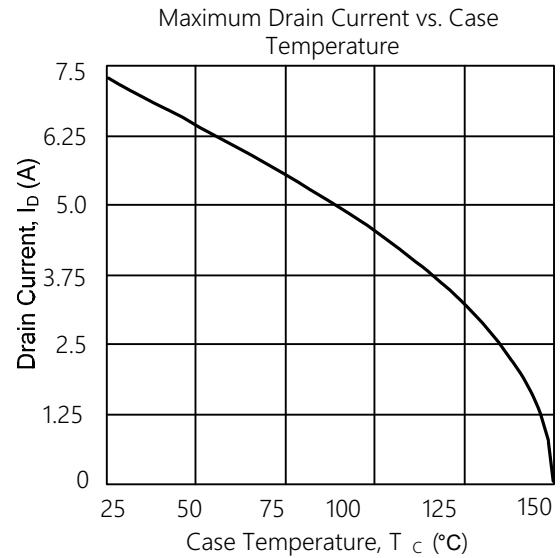
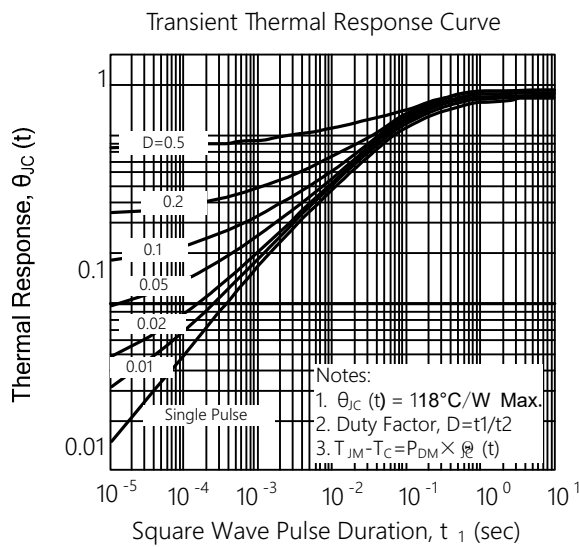
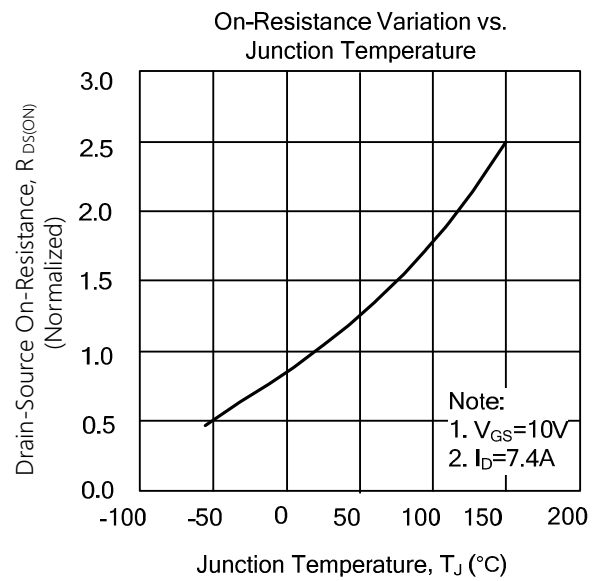
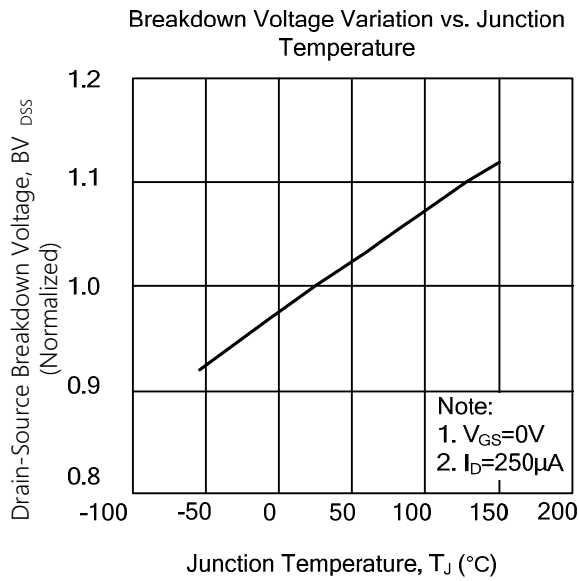


Capacitance Characteristics (Non-Repetitive)

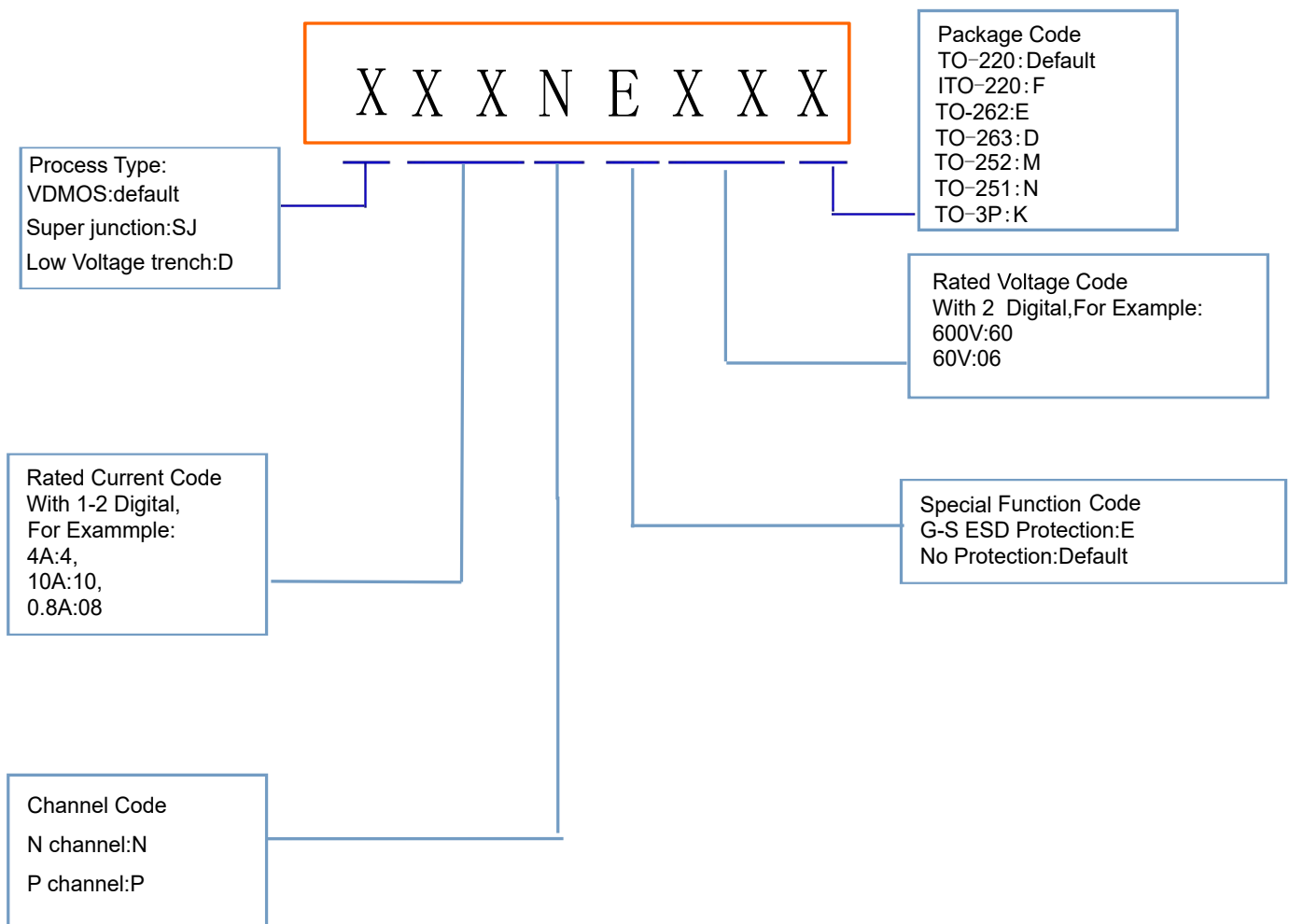


Gate Charge Characteristics



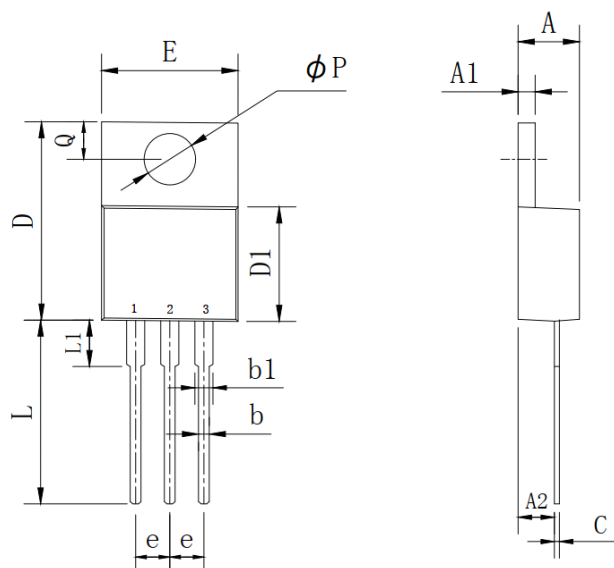


Product Names Rules



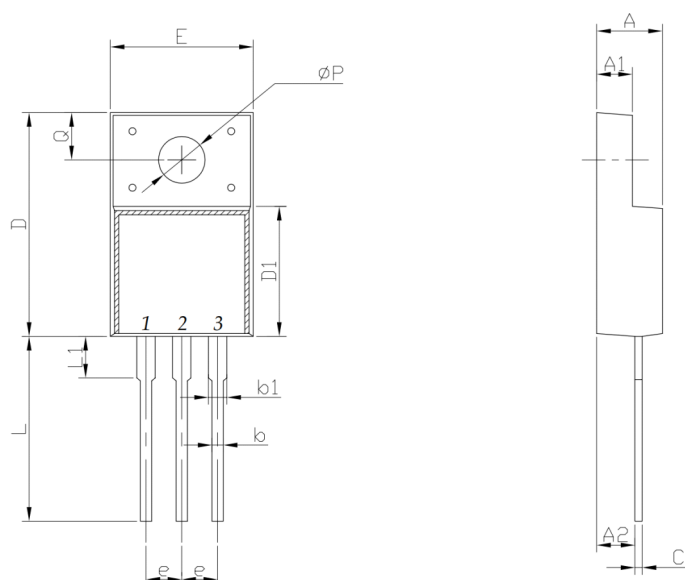
Dimensions

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

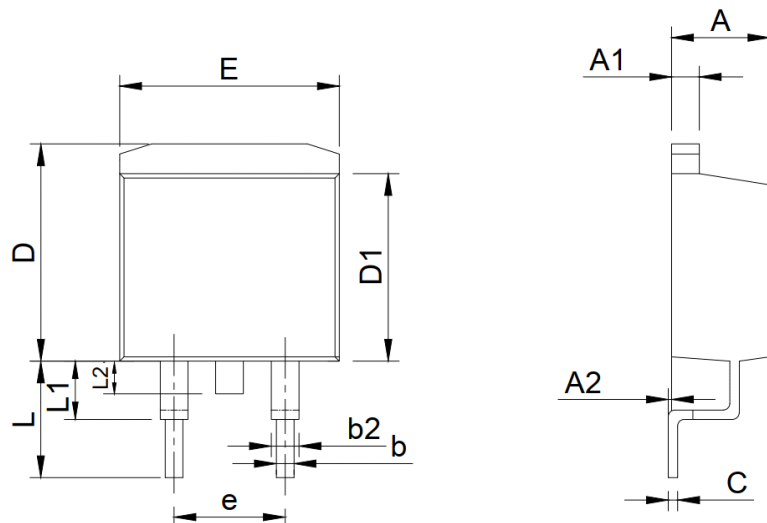
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

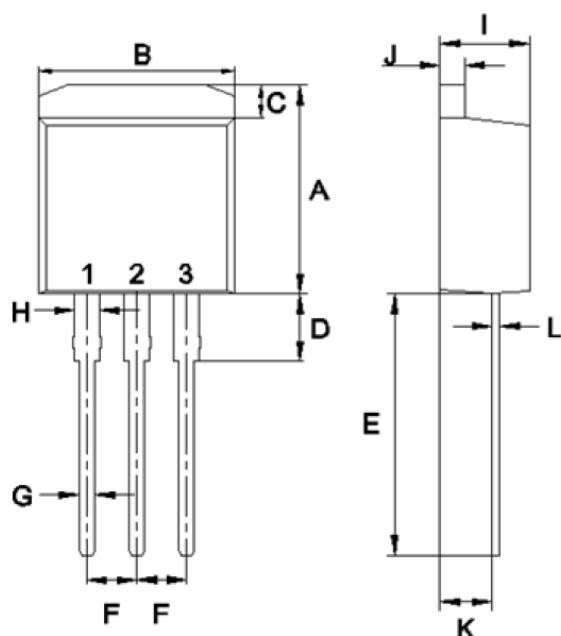
Dimensions

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
b2	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

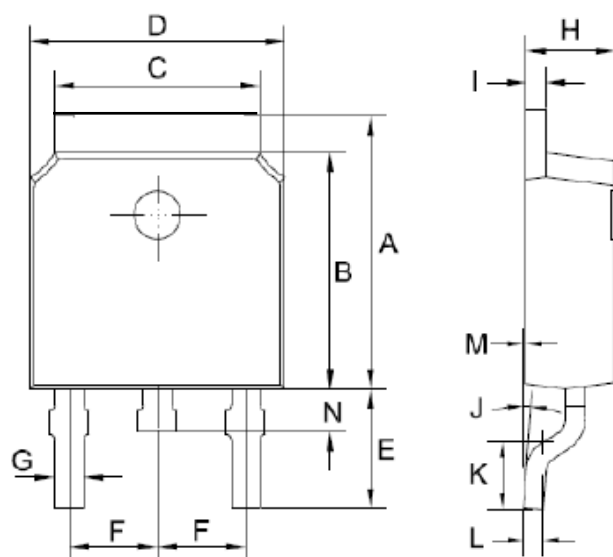
TO-262 PACKAGE OUTLINE DIMENSIONS



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

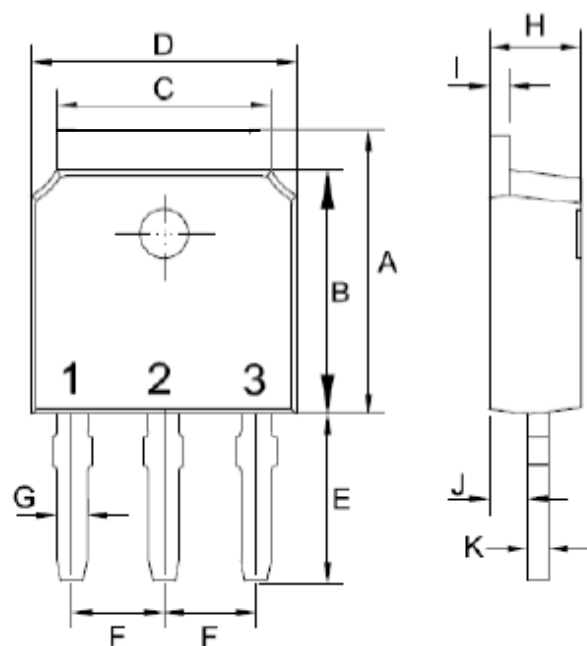
Dimensions

TO-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

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

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