

### General Description

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

### Features

- Fast switching
- Low on-resistance
- Low gate charge
- Low reverse transfer capacitances
- 100% avalanche tested

### Mechanical Data

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

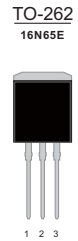
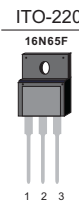
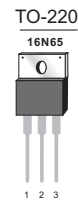
### Application

- Switching applications

### Ordering Information

Part No.	Package Type	Package	Quality(box)
16N65	TO-220	Tube	1000
16N65F	ITO-220	Tube	1000
16N65D	TO-263	Tape & Reel	800
16N65E	TO-262	Tube	1000

Product Summary			
V <sub>DS</sub>	R <sub>DS(on)</sub> (Ω) Typ	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ)
650V	0.49@10V	16	54nc



### Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

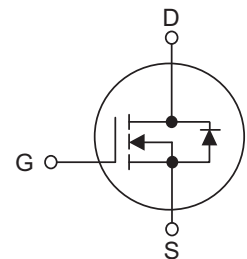


Table1 Absolute Maximum Ratings (T<sub>C</sub>=25°C, unless otherwise specified)

Parameter	Symbol	TO-220/TO-262/TO-263	ITO-220	Unit
Drain-Source Voltage	V <sub>DS</sub>	650		V
Gate-Source Voltage	V <sub>GS</sub>	±30		V
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> =25°C	16	A
		T <sub>C</sub> =100°C	11.5	
Pulsed Drain Current (Note 1)	I <sub>DM</sub>	64		A
Single Pulse Avalanche Energy(Note 2)	E <sub>AS</sub>	800		mJ
Power Dissipation T <sub>C</sub> =25°C	P <sub>D</sub>	180	70	W
Isolation Voltage	V <sub>ISO</sub>	/	2500	V
Operating Junction and Storage Temperature	T <sub>J</sub> /T <sub>STG</sub>	-55 ~ +150		°C

Table 2. Thermal Characteristics

Parameter	Symbol	TO-220/TO-262/TO-263	ITO-220	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62.5	62.5	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.69	1.79	$^{\circ}C/W$

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	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			1	$\mu A$
Gate- Source Leakage Current	Forward	$V_{GS}=30V, V_{DS}=0V$			100	nA
	Reverse	$V_{GS}=-30V, V_{DS}=0V$			-100	nA
On Characteristics(Note 4)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=8A$		0.49	0.55	$\Omega$
Dynamic Characteristics(Note 5)						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		2450		pF
Output Capacitance	$C_{OSS}$			218		pF
Reverse Transfer Capacitance	$C_{RSS}$			18.5		pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=325V, I_D=16A,$ $V_{GS}=10V, R_G=25\Omega$		30		ns
Turn-On Rise Time	$t_R$			70		ns
Turn-Off Delay Time	$t_d(off)$			145		ns
Turn-Off Fall Time	$t_f$			74		ns
Total Gate Charge	$Q_G$	$V_{DD}=325V, I_D=16A,$ $V_{GS}=10V$		54		nC
Gate-Source Charge	$Q_{GS}$			10		nC
Gate-Drain Charge	$Q_{GD}$			21		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=16A$			1.5	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				160	A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=18A$		410		ns
Reverse Recovery Charge	$Q_{RR}$	$di/dt=100A/\mu s$ (Note 1)		3500		nC

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

2  $L=10mH, I_D=12.6A, V_{DD}=50V, V_{GATE}=650V$ , Starting  $T_J=25^{\circ}C$

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

5 Guaranteed by design, not subject to production



Typical Characteristics Diagrams

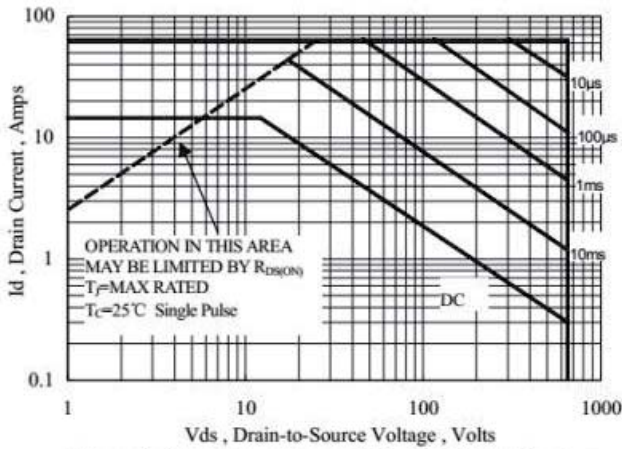


Figure 1-1 Maximum Forward Bias Safe Operating Area

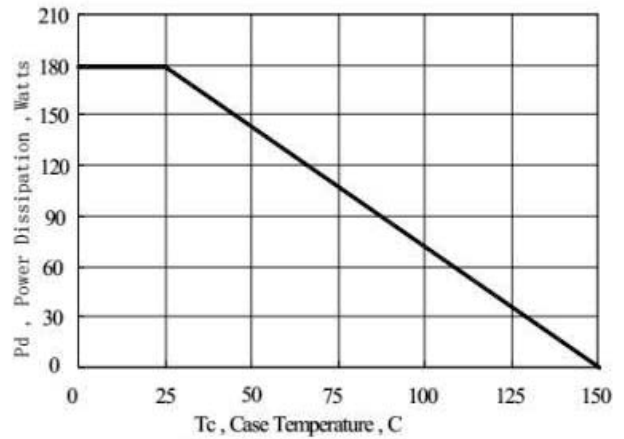


Figure 2-1 Maximum Power Dissipation vs Case Temperature

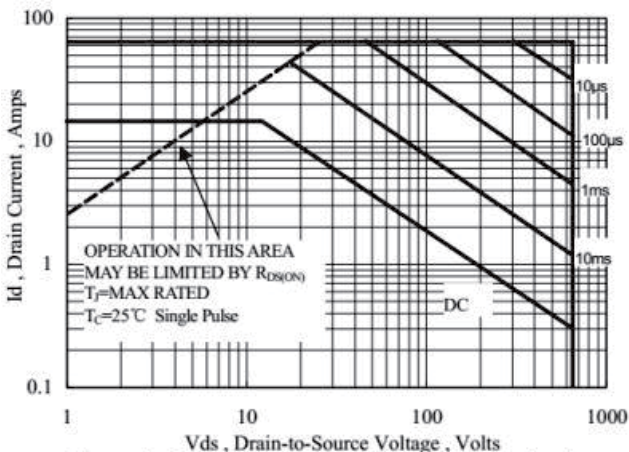


Figure 1-2 Maximum Forward Bias Safe Operating Area

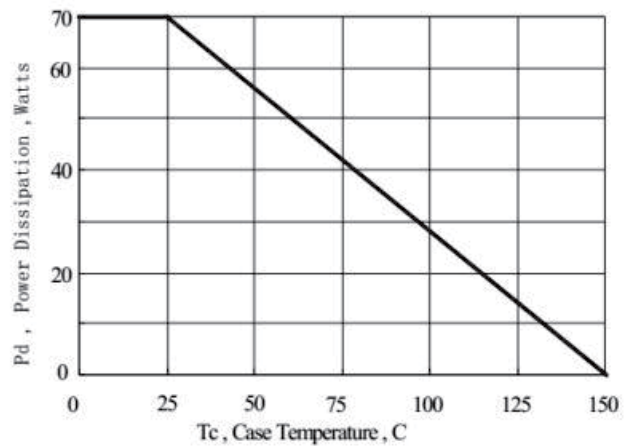


Figure 2-2 Maximum Power Dissipation vs Case Temperature

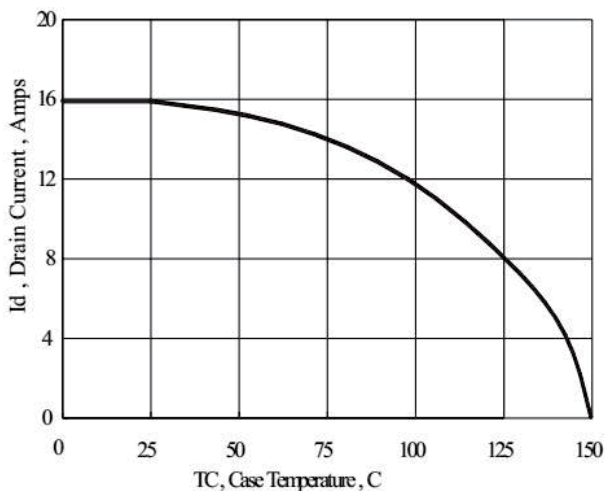


Figure 3 Maximum Continuous Drain Current vs Case Temperature

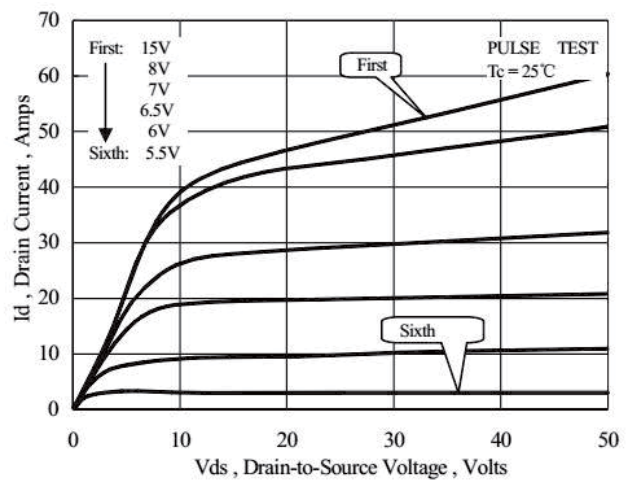
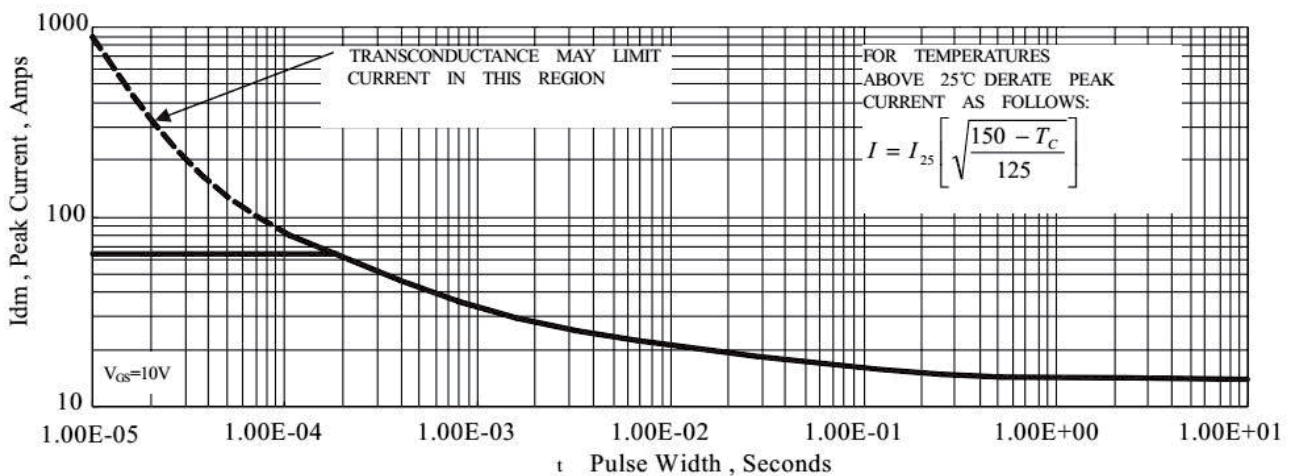
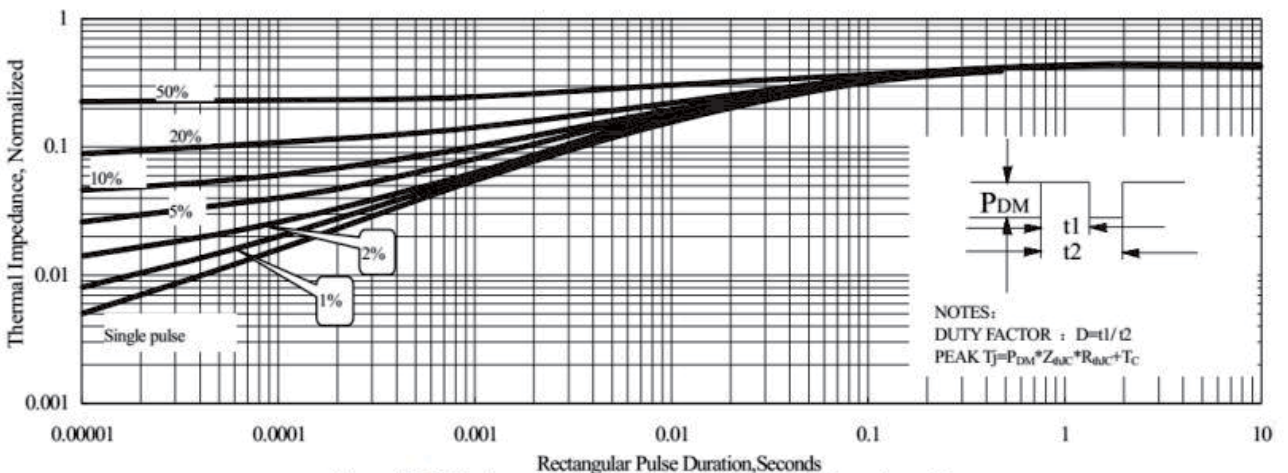
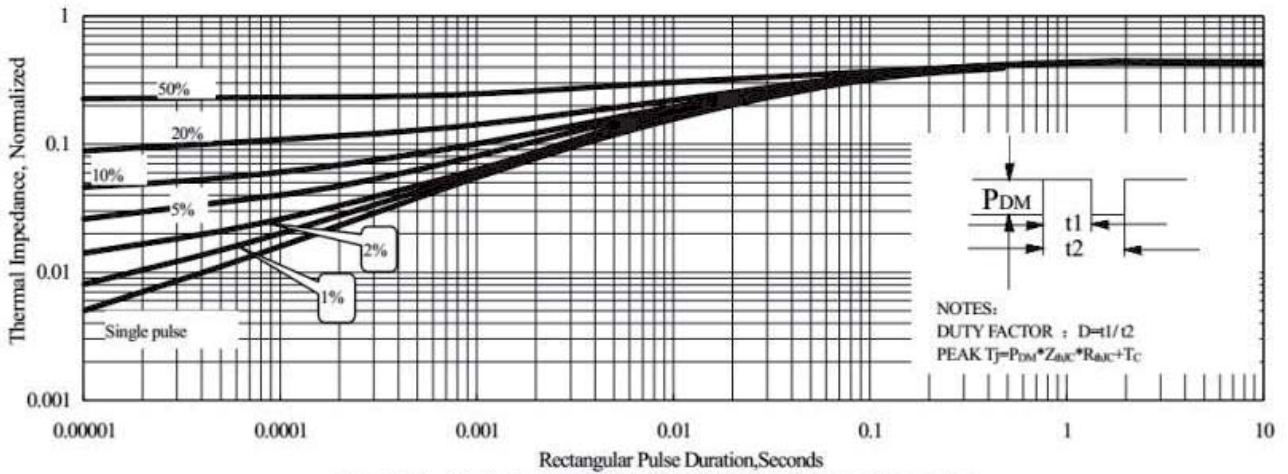


Figure 4 Typical Output Characteristics

Typical Characteristics Diagrams





Typical Characteristics Diagrams

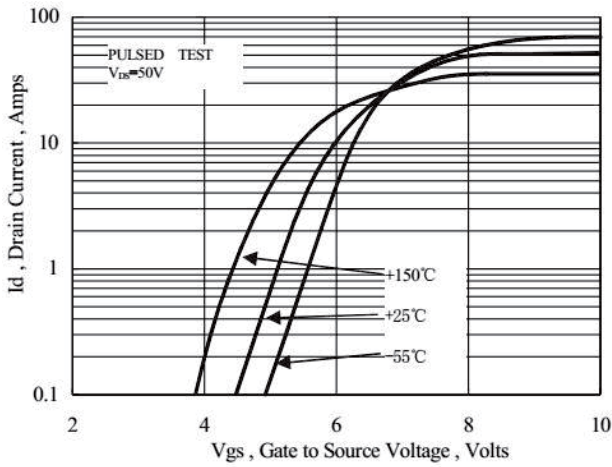


Figure 7 Typical Transfer Characteristics

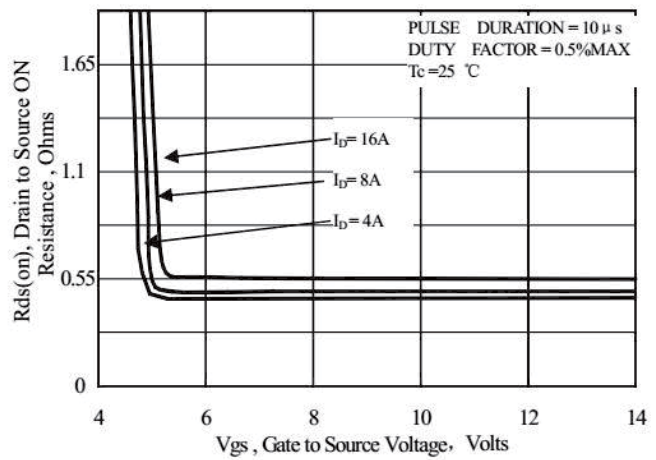


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

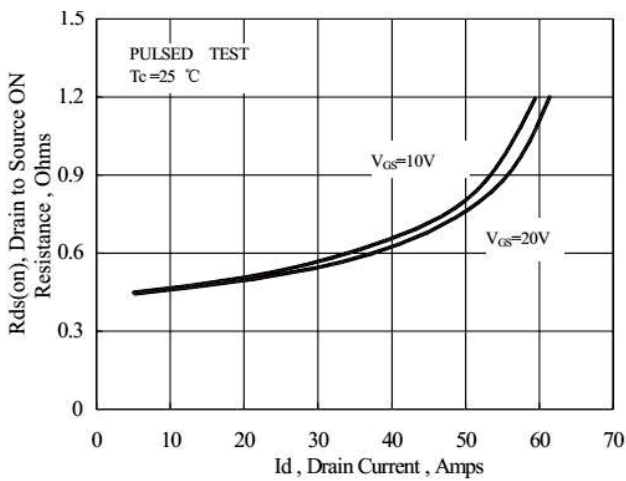


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

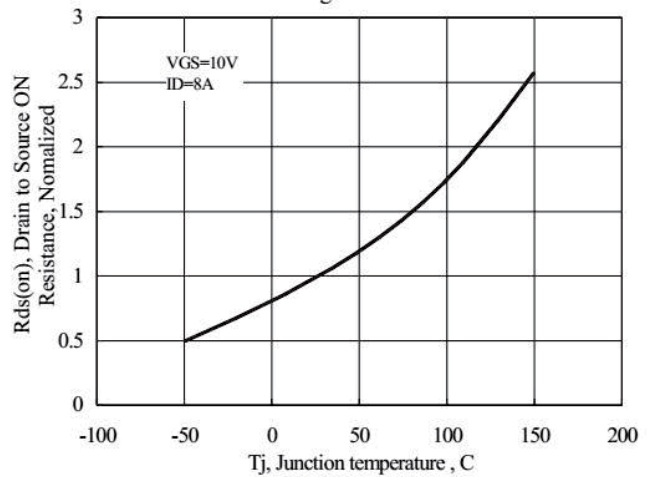


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature

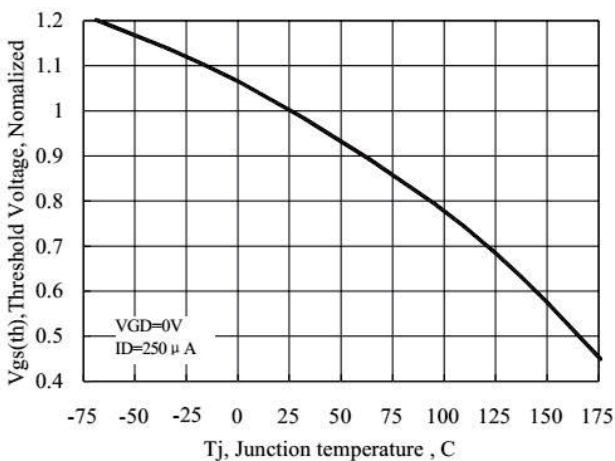


Figure 11 Typical Threshold Voltage vs Junction Temperature

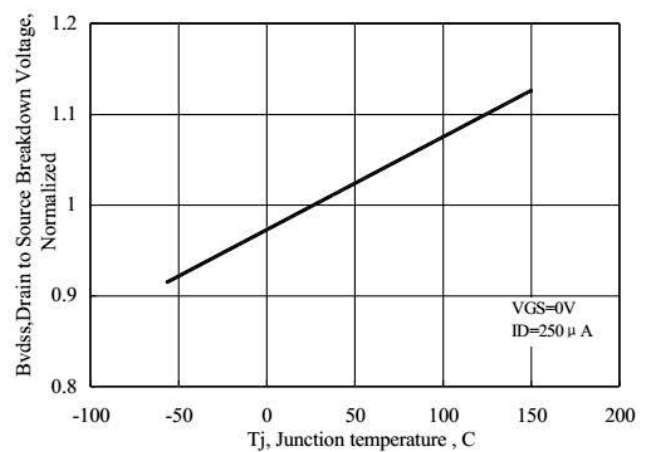


Figure 12 Typical Breakdown Voltage vs Junction Temperature



Typical Characteristics Diagrams

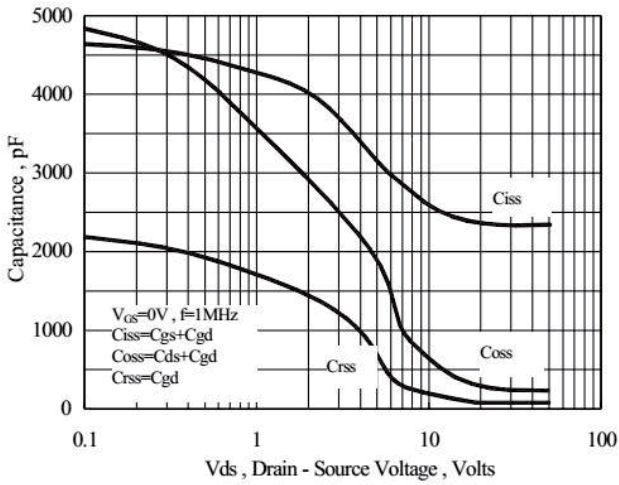


Figure 13 Typical Capacitance vs Drain to Source Voltage

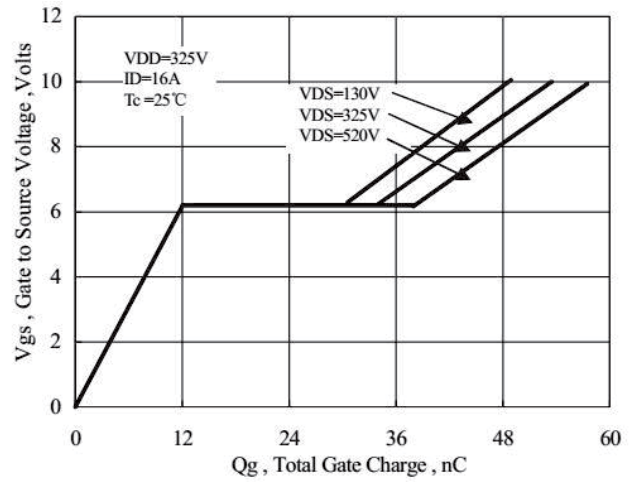


Figure 14 Typical Gate Charge vs Gate to Source Voltage

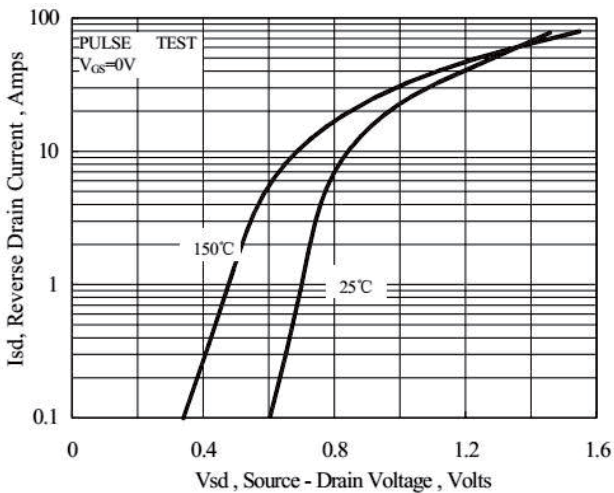


Figure 15 Typical Body Diode Transfer Characteristics

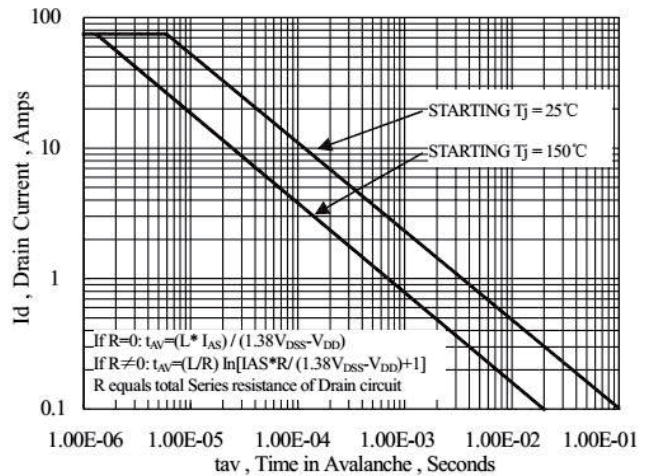
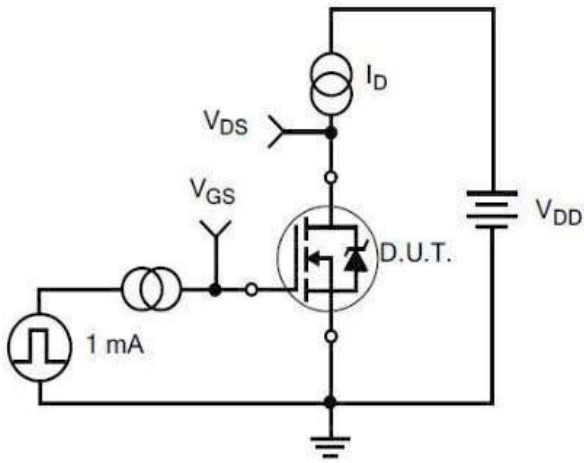
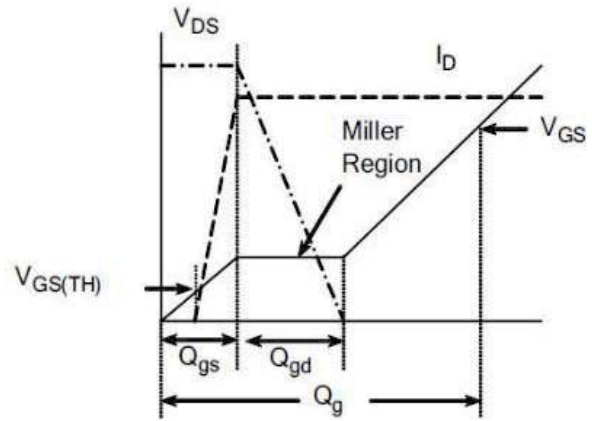


Figure 16 Unclamped Inductive Switching Capability

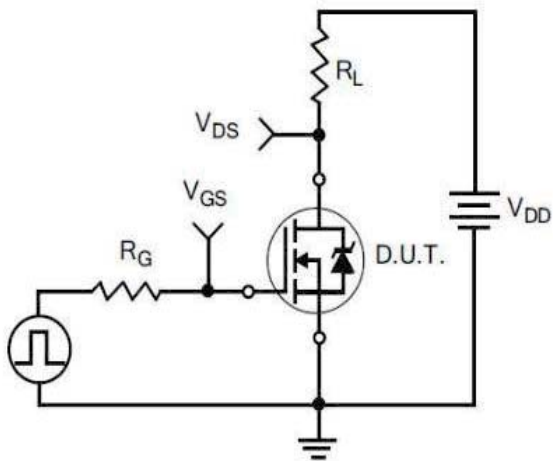
Typical Test Circuit



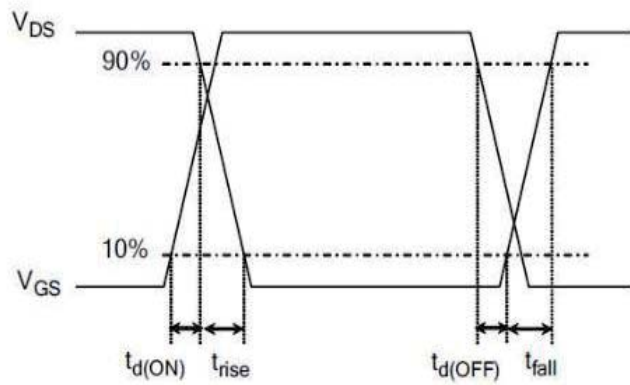
1) Gate Charge Test Circuit



2) Gate Charge Waveform

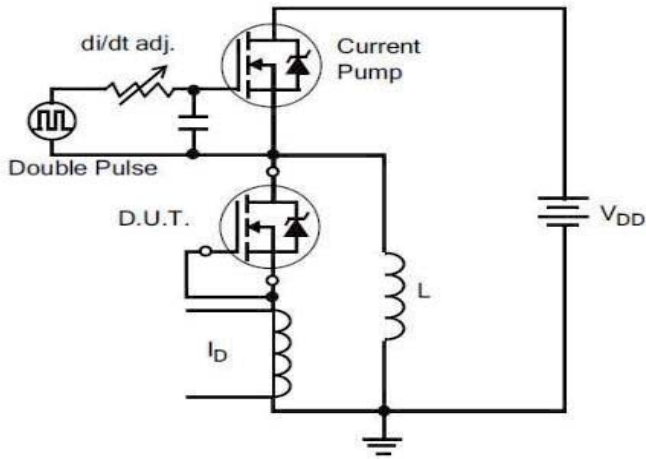


3) Resistive Switching Test Circuit

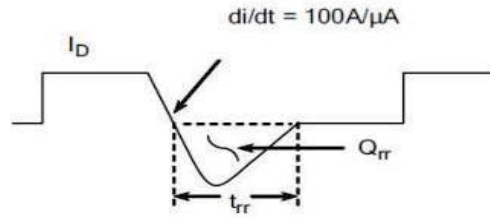


4) Resistive Switching Waveforms

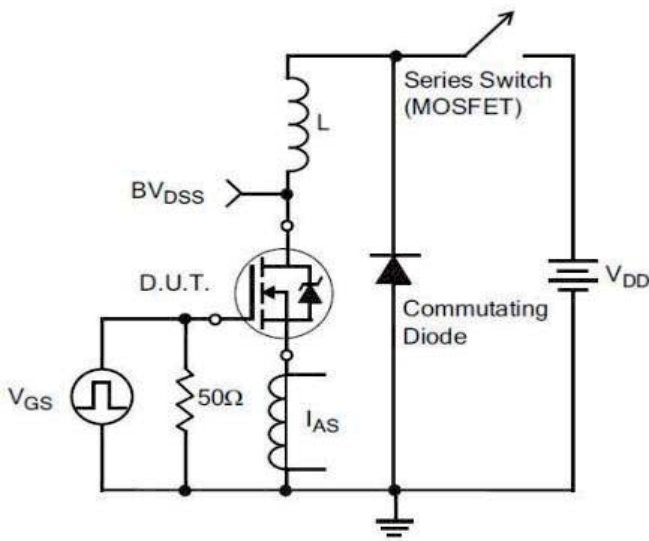
Typical Test Circuit



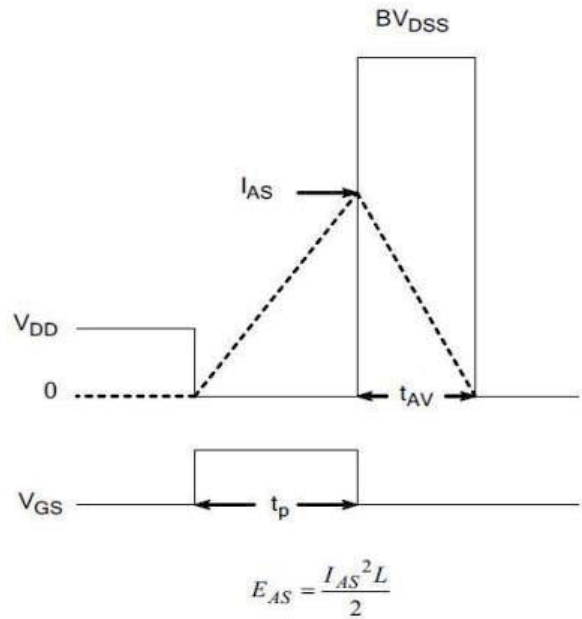
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



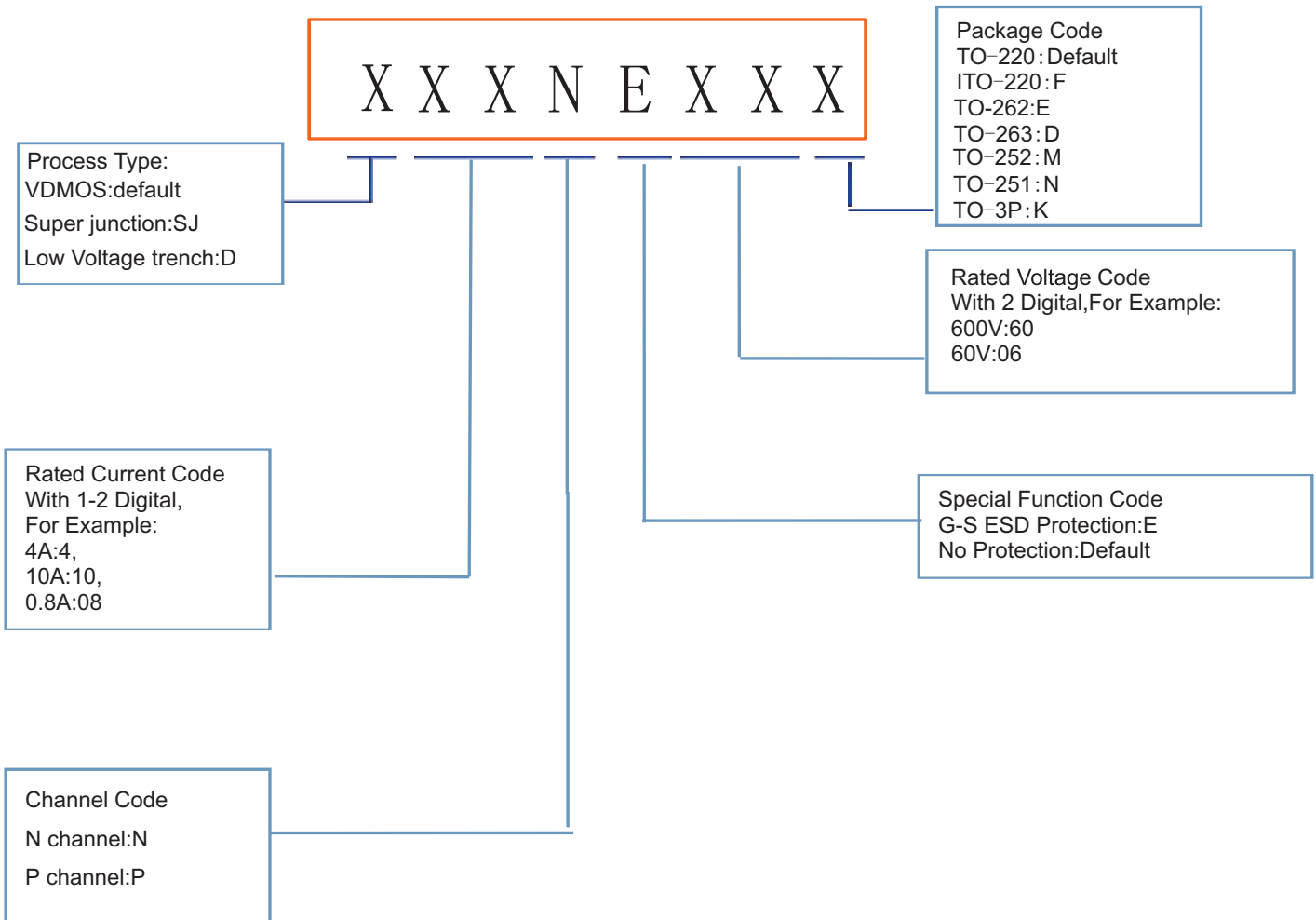
7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

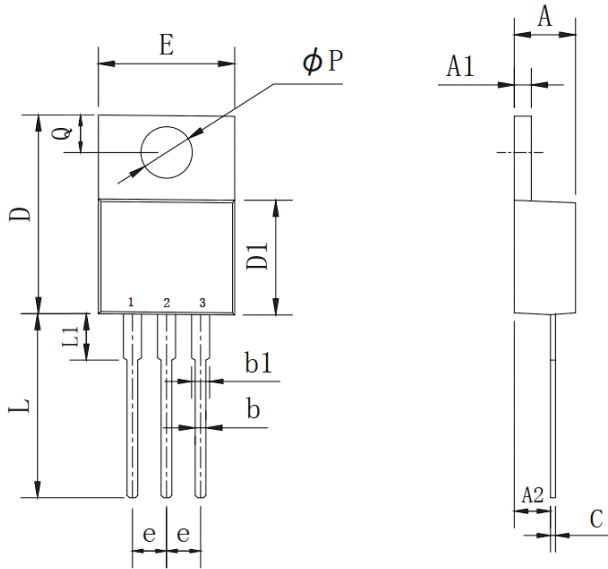


Product Names Rules



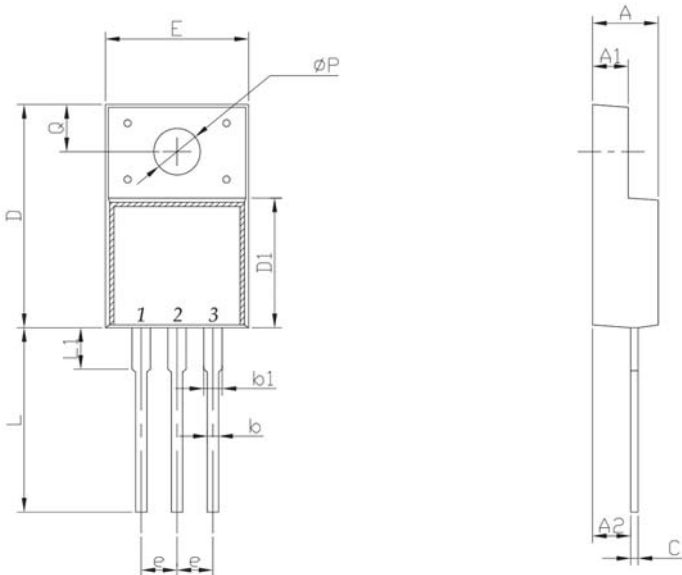
Dimensions

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

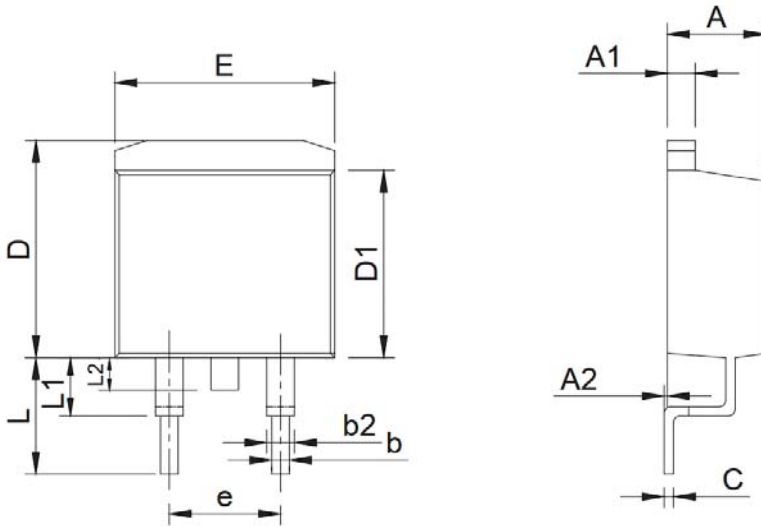
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

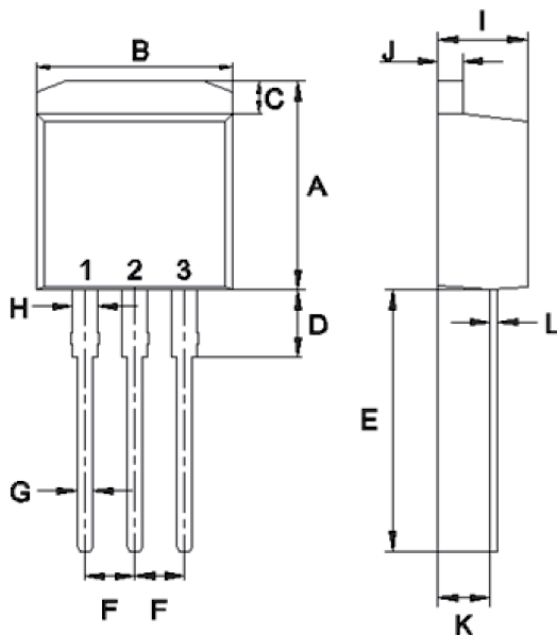
Dimensions

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

## Friendship Reminder

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