

20A 500V N-Channel Enhancement Mode Power MOSFET

Features :

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

Applications :

- Switching applications

Mechanical Data :

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

General Description

These Silicon N-channel enhanced vdmofets, is obtained by the self-aligned planar used technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. Which accords with the RoHS standard.

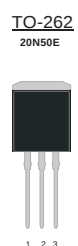
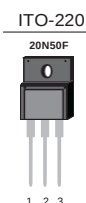
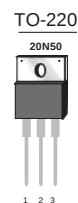
Ordering Information

PartNo.	Package Type	Package	Quality(box)
KW20N50	TO-220	Tube	1000
KW20N50F	ITO-220	Tube	1000
KW20N50D	TO-263	Tape & Reel	800
KW20N50E	TO-262	Tube	1000

Product Summary			
V _{DS}	R _{DS(on)} (Ω) Typ	I _D (A)	Q _g (Typ)
500V	0.22@ 10V	20	52nc

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

Parameter	Symbol	TO-220/TO-263/TO-262	ITO-220	Unit
Drain-Source Voltage	V _{DS}	500		V
Gate-Source Voltage	V _{GS}	±30		V
Continuous Drain Current	I _D	20		A
		12.5		
Pulsed Drain Current(Note 1)	I _{DM}	80		A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	1200		mJ
Peak Diode Recovery dv/dt	dv/dt	5		V/ns
Power Dissipation T _C =25°C	P _D	230	45	W
Isolation Voltage	V _{ISO}	/	2500	V
Operating Junction and Storage Temperature	T _J /T _{STG}	-55~+150		°C
Maximum Temperature for soldering	TL	300		°C



Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram

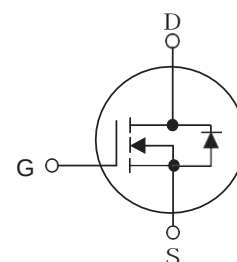


Table 2. Thermal Characteristics

Parameter	Symbol	TO-220/TO-263/TO-262	ITO-220	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62.5	62.5	C/W
Thermal resistance Junction to Case	$R_{\theta JC}$	0.54	2.78	C/W

Table 3. Electrical Characteristics (T_J=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 =250μA	500			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =500V, 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 =250μA	2		4	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =10A		0.22	0.3	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		2919		pF
Output Capacitance		C _{OSS}			277		pF
Reverse Transfer Capacitance		C _{RSS}			16		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		t _{d (on)}	V _{DD} =250V, I _D =20A, R _G =10Ω		34		ns
Turn-On Rise Time		t _r			65		ns
Turn-Off Delay Time		t _{d (off)}			82		ns
Turn-Off Fall Time		t _f			45		ns
Total Gate Charge		Q _G	V _{DD} =400V, I _D =20A, V _{GS} =10V		52		nC
Gate-Source Charge		Q _{GS}			12.6		nC
Gate-Drain Charge		Q _{GD}			18.6		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =20A			1.5	V
Maximum Continuous Drain-Source Diode Forward Current		I _S				20	A
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _S =20A		535		ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs		75		nC

Notes: 1 Repetitive Rating: Pulse width limited by maximum junction temperature 2

$L=10mH, I_D=15.5A, \text{Starting } T_J=25^\circ C$

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

5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

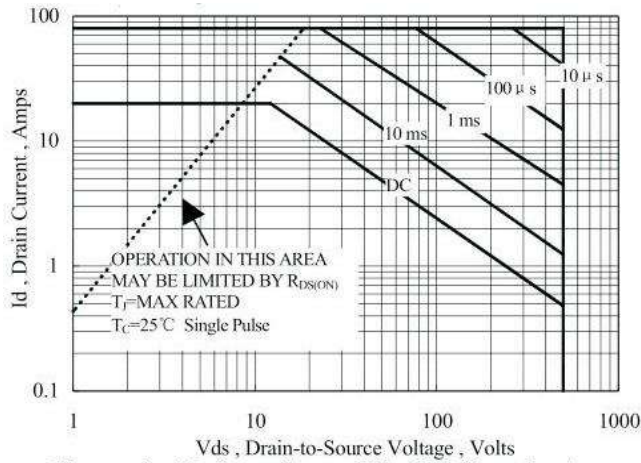


Figure 1 Maximum Forward Bias Safe Operating Area

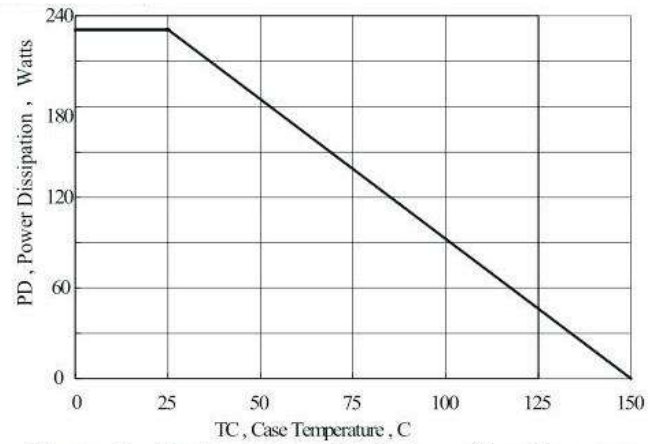


Figure 2 Maximum Power Dissipation vs Case Temperature

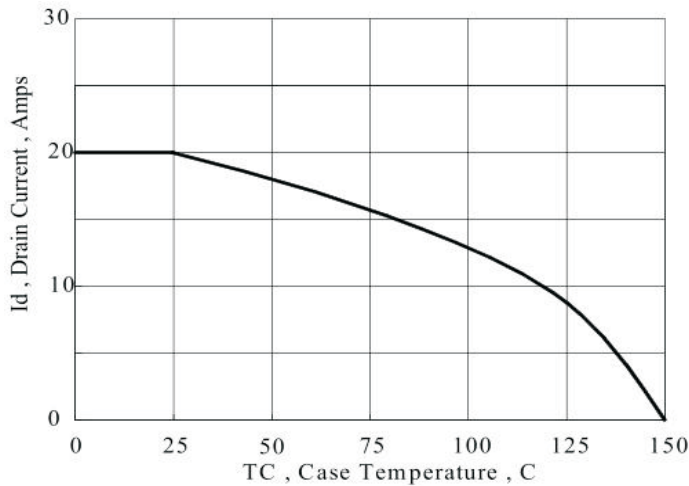


Figure 3 Maximum Continuous Drain Current vs Case Temperature

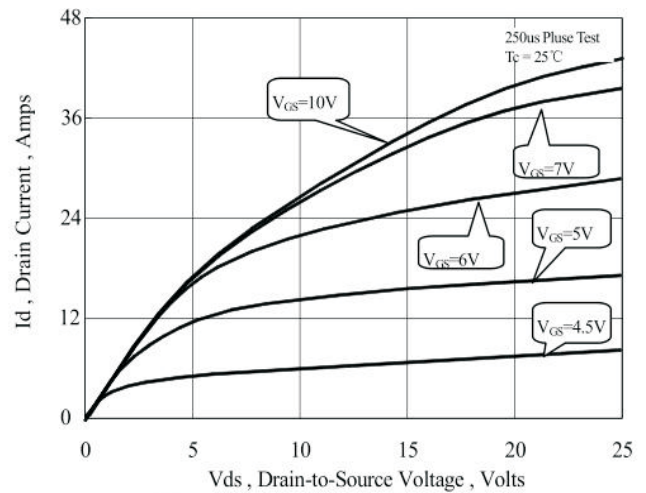


Figure 4 Typical Output Characteristics

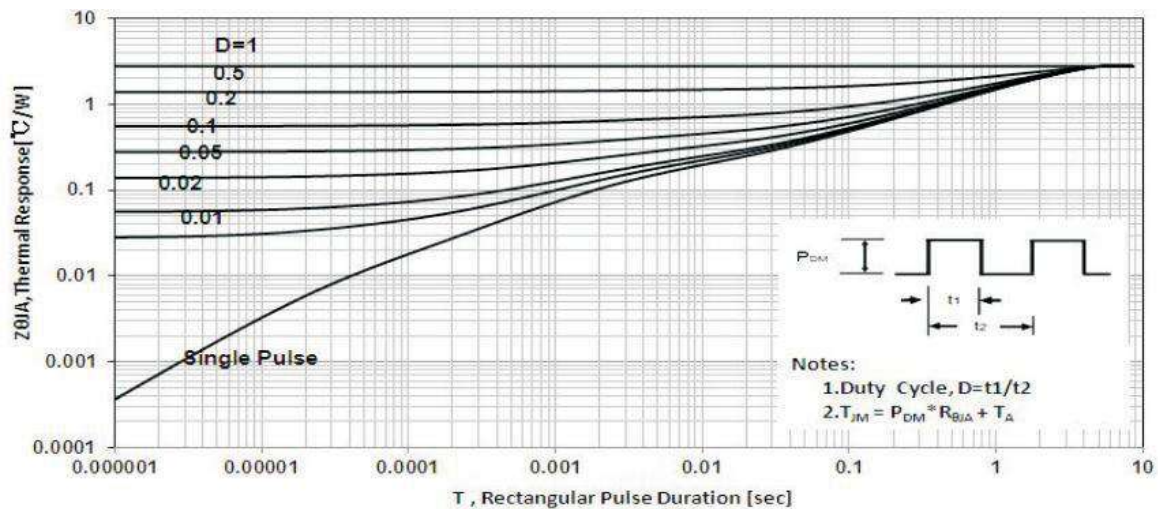


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

Typical Characteristics Diagrams

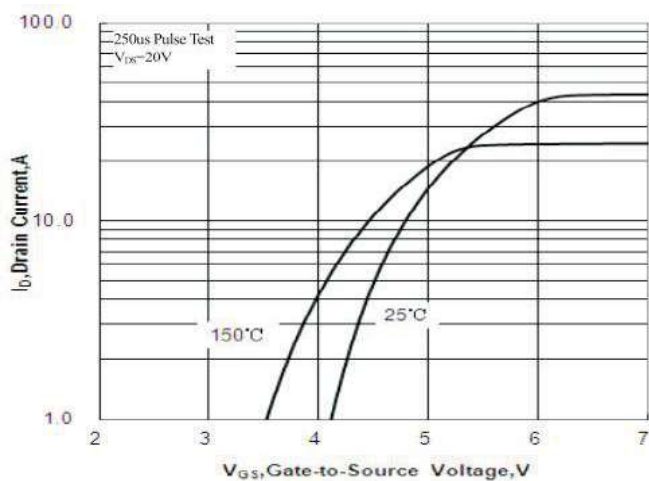


Figure 6 Typical Transfer Characteristics

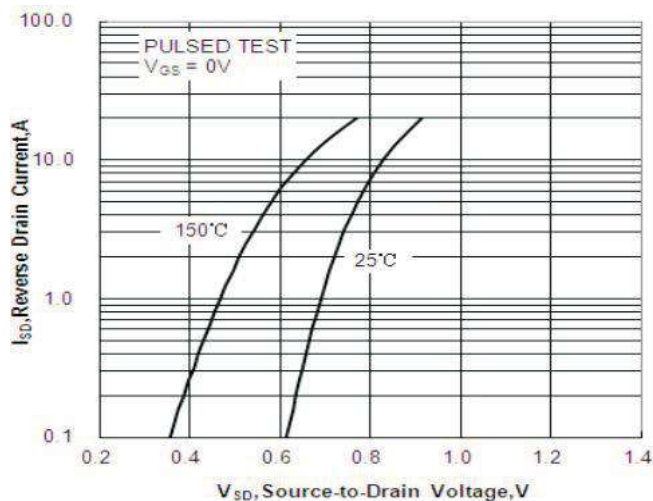


Figure 7 Typical Body Diode Transfer Characteristics

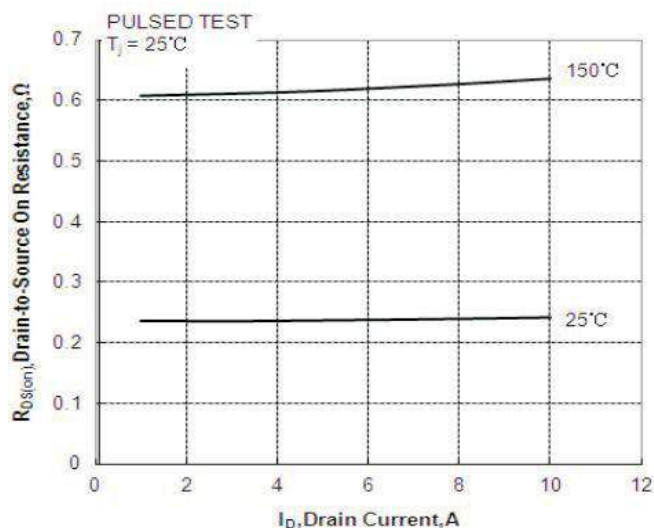


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

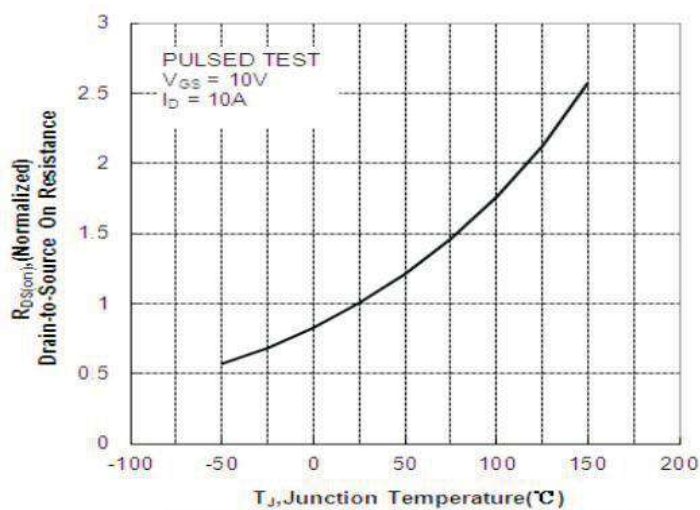


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature

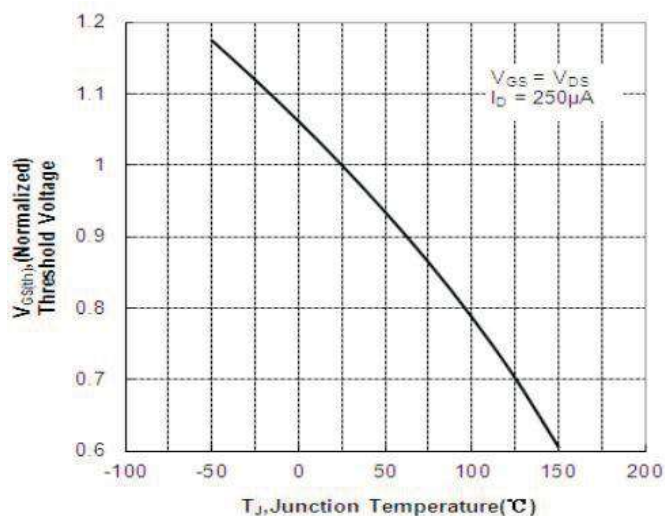


Figure 10 Typical Threshold Voltage vs Junction Temperature

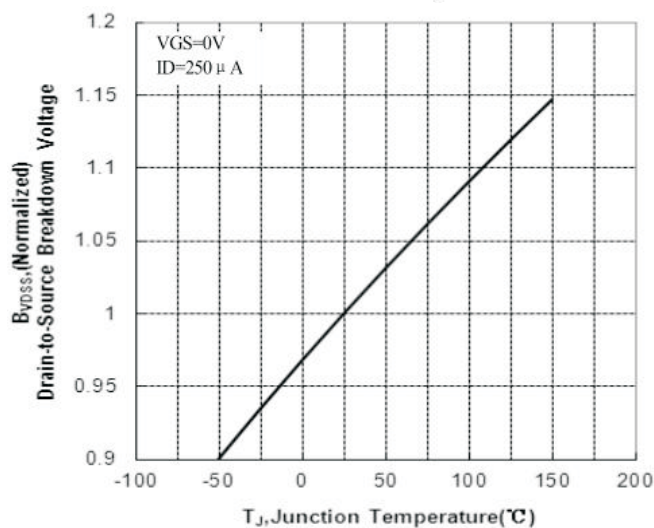


Figure 11 Typical Breakdown Voltage vs Junction Temperature

Typical Characteristics Diagrams

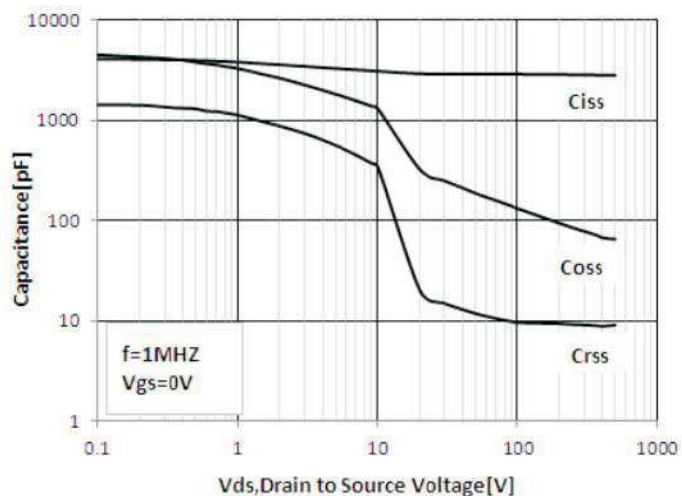


Figure 12 Typical Capacitance vs Drain to Source Voltage

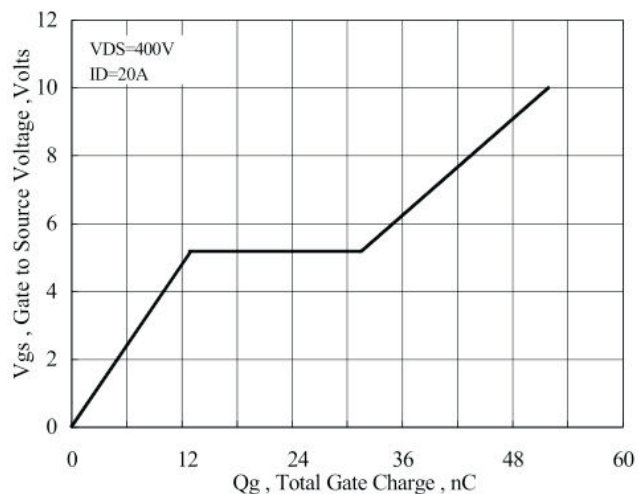


Figure 13 Typical Gate Charge vs Gate to Source Voltage

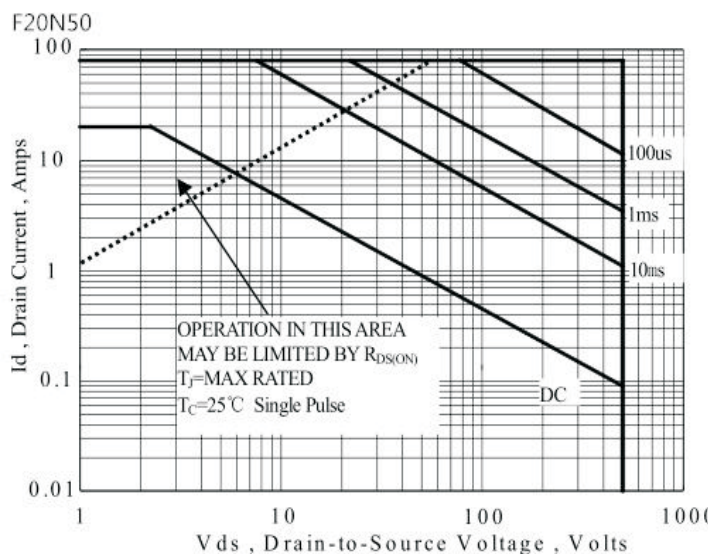


Figure 14 Maximum Forward Bias Safe Operating Area

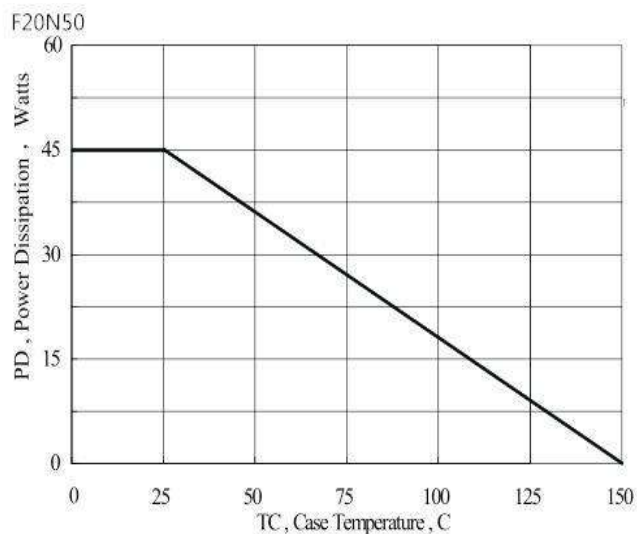
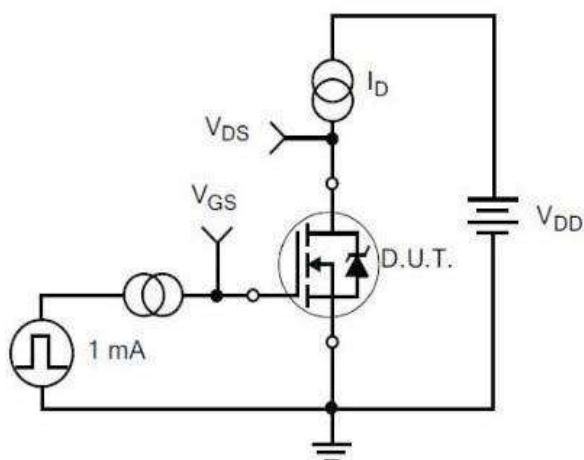
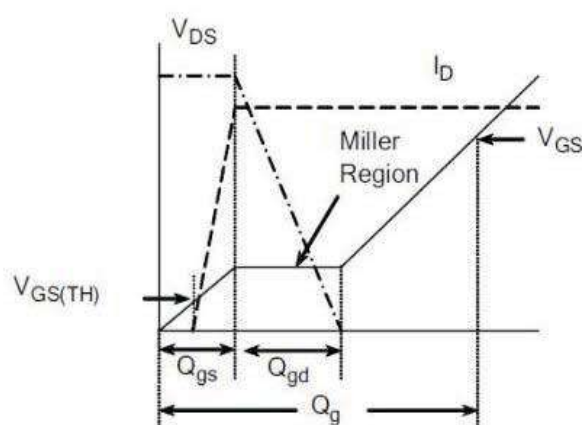


Figure 15 Maximum Power Dissipation vs Case Temperature

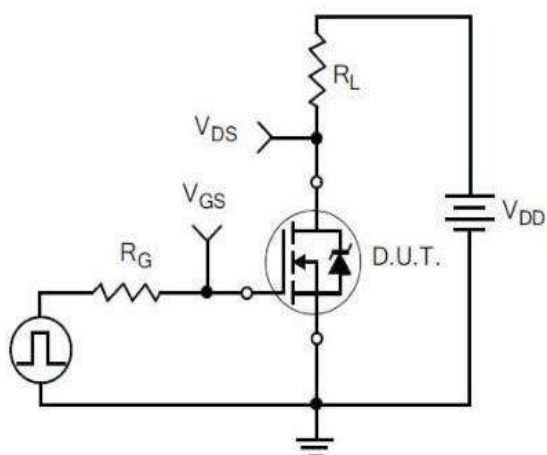
Typical Test Circuit



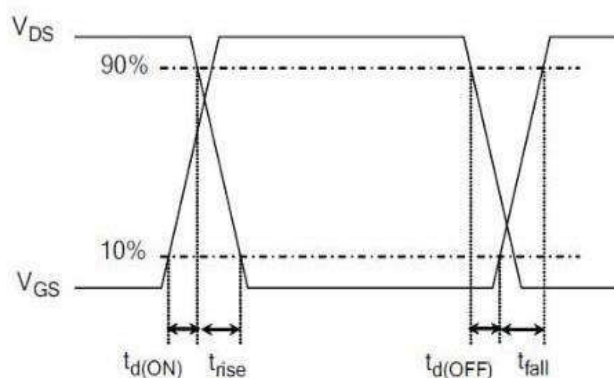
1) Gate Charge Test Circuit



2) Gate Charge Waveform

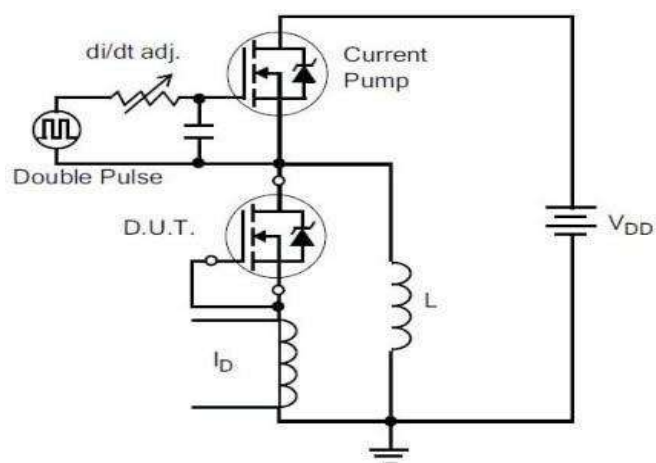


3) Resistive Switching Test Circuit

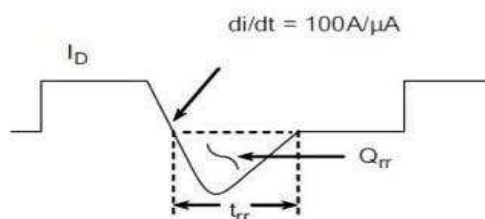


4) Resistive Switching Waveforms

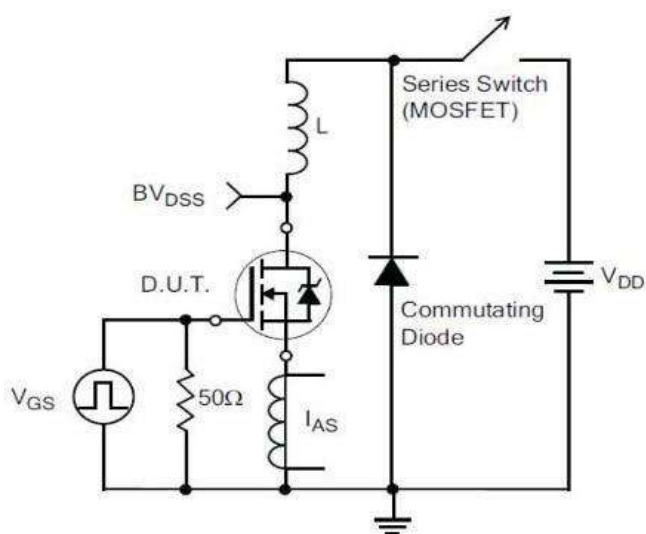
Typical Test Circuit



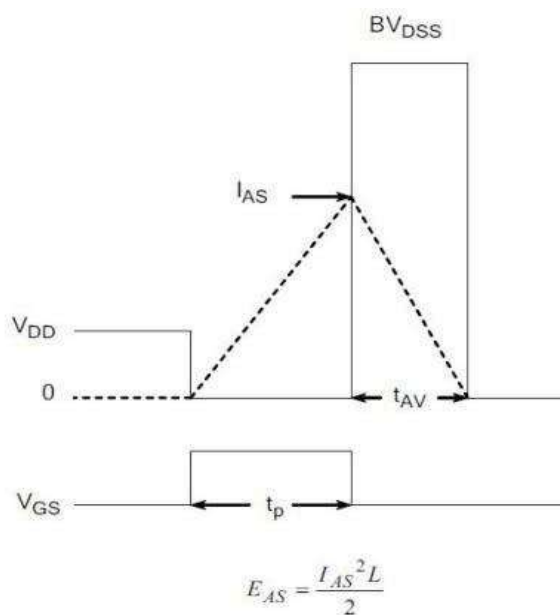
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

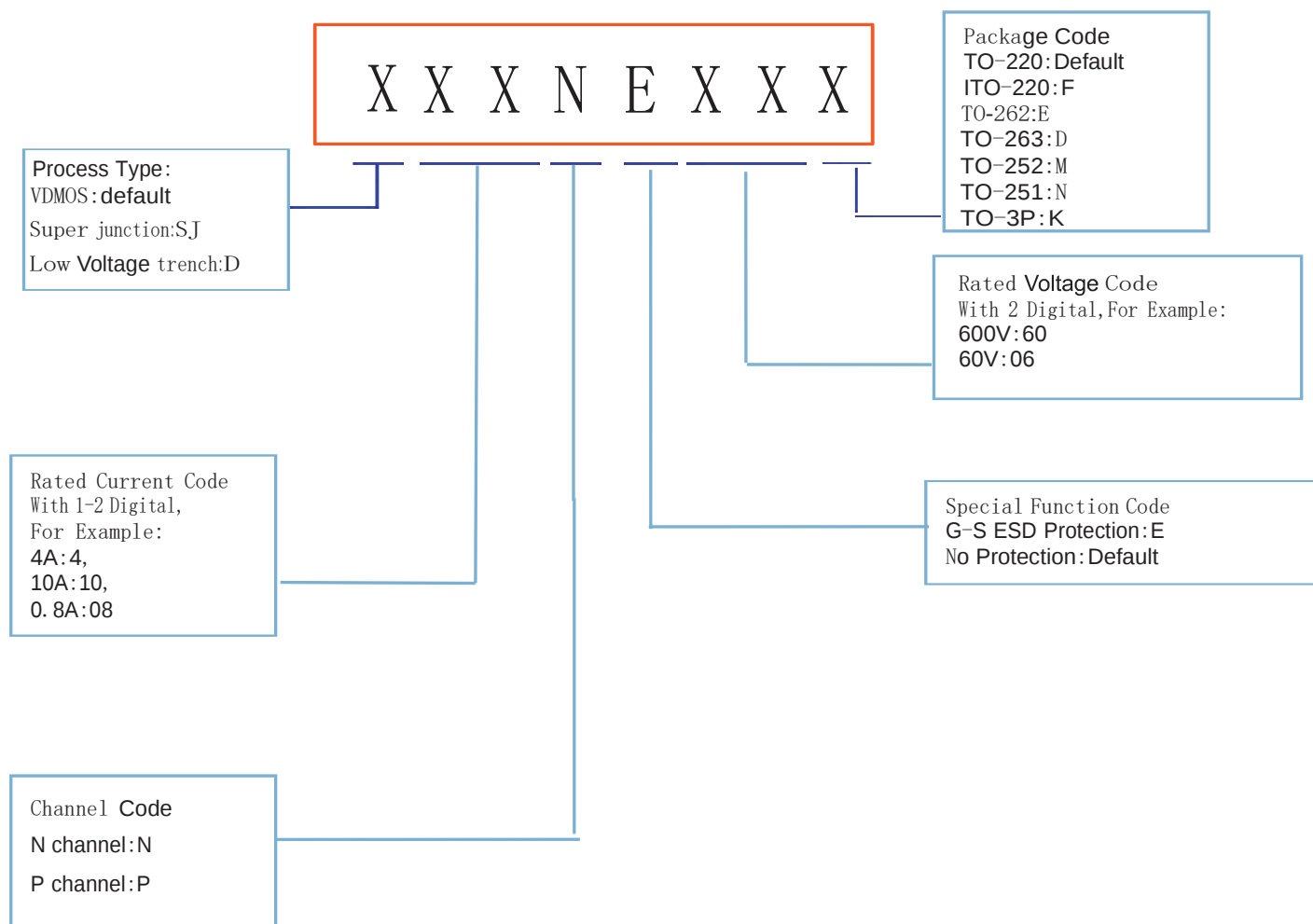


7) Unclamped Inductive Switching Test Circuit

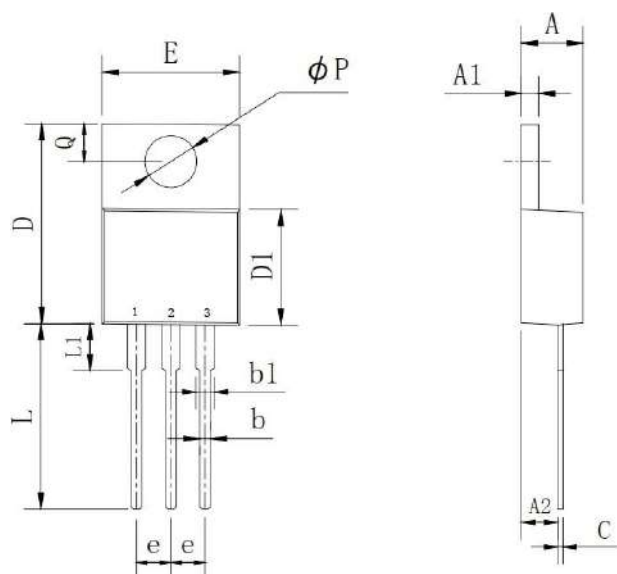


8) Unclamped Inductive Switching Waveforms

Typical Test Circuit

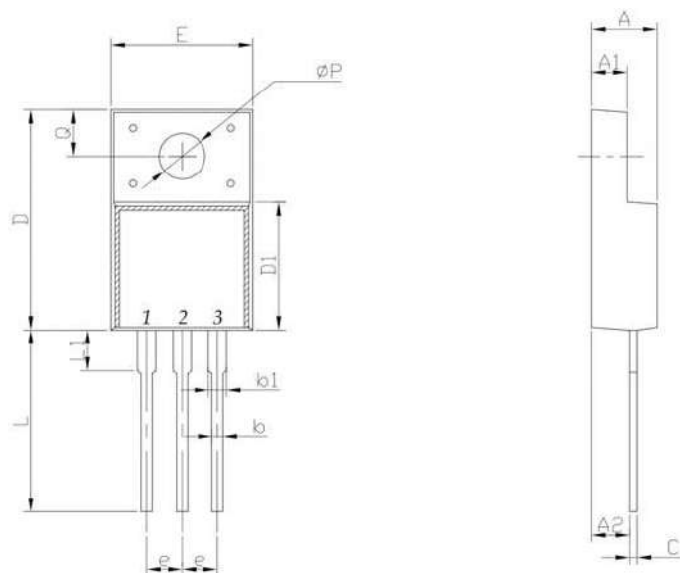


TO-220 PACKAGE OUTLINE DIMENSIONS



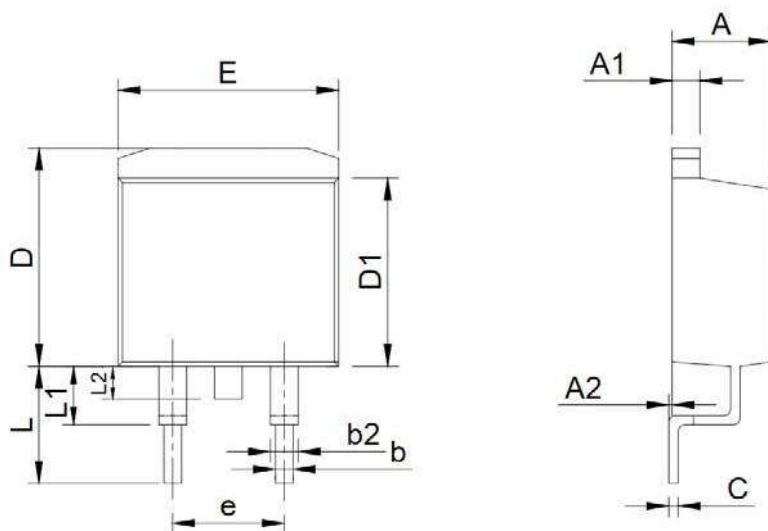
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74	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



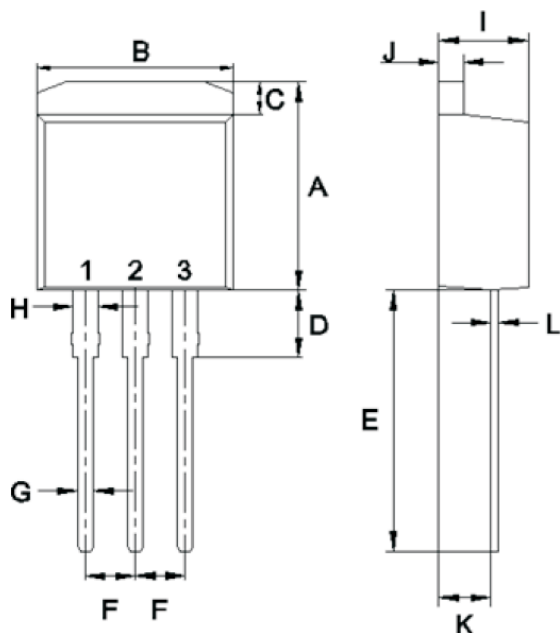
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108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

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