

800V 5A Power MOSFET

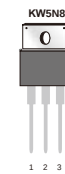
Features:

- $R_{DS(ON)} < 1.5\Omega @ V_{GS} = 10V$
- 100% avalanche tested
- RoHS compliant

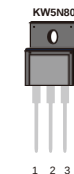
Mechanical Data:

- Case: TO-220, ITO-220, TO-251, TO-252, TO-263 package

TO-220



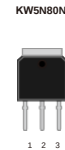
ITO-220



TO-263



TO-251



TO-252



Ordering Information

Part No.	Package Type	Package	Quality(box)
KW5N80	TO-220	Tube	1000
KW5N80F	ITO-220	Tube	1000
KW5N80E	TO-263	Tape & Reel	800
KW5N80M	TO-252	Tape & Reel	3000
KW5N80N	TO-251	Tube	1000

Product Summary

V_{DS}	$R_{DS(on)}$ (Ω) Typ	I_D (A)	Q_g (Typ)
800V	1.3 @ 10V	5	15nc

Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram

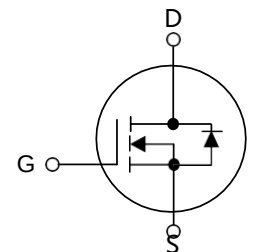


Table1 Absolute Maximum Ratings ($T_c = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	TO-220/TO-263 TO-251/TO-252	ITO-220	Unit
Drain-Source Voltage	V_{DS}	800		V
Gate-Source Voltage	V_{GS}	± 30		V
Continuous Drain Current	I_D	4.2		A
		2.65		
Pulsed Drain Current (Note 1)	I_{DM}	11		A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	46		mJ
Avalanche Current repetitive	I_{AR}	1		A
Repetitive Avalanche Energy, $I_D = 1A, V_{DD} = 50V$ repetitive	E_{AR}	0.2		mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	15		V/ns
Drain Source voltage slope ($V_{DS} = 720V$)	dV_{DS}/dt	50		V/ns
Power Dissipation $T_c = 25^\circ\text{C}$	P_D	37	26	W
Operating Junction and Storage Temperature	T_J/T_{STG}	$-55 \sim +150$		$^\circ\text{C}$
Maximum Temperature for soldering	T_L	300		$^\circ\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	TO-220/TO-263 TO-251/TO-252	ITO-220	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	80	$^{\circ}\text{C/W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	3.4	5.0	$^{\circ}\text{C/W}$

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	800	--	--	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =800V,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	2.5	--	4.5	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =2A	--	1.3	1.5	Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1MHz	--	320	--	pF
Output Capacitance		C _{OSS}		--	75	--	pF
Reverse Transfer Capacitance		C _{RSS}		--	5	--	pF
Switching Characteristics							
Turn-On Delay Time		t _{d(on)}	V _{DD} =400V,I _D =2A , R _G =20Ω	--	10	--	ns
Turn-On Rise Time		t _r		--	8	--	ns
Turn-Off Delay Time		t _{d(off)}		--	60	--	ns
Turn-Off Fall Time		t _f		--	13	--	ns
Total Gate Charge		Q _G	V _{DS} =480V,I _D =2A, V _{GS} =10V	--	15	--	nC
Gate-Source Charge		Q _{GS}		--	3	--	nC
Gate-Drain Charge		Q _{GD}		--	6	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage(Note 4)		V _{SD}	V _{GS} =0V,I _S =2A	--	0.9	1.5	V
Maximum Continuous Drain-Source Diode Forward Current		I _S		--	--	4	A
Reverse Recovery Time		t _{rr}	V _{GS} =0V,I _F =2A	--	180	--	ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs	--	1.5	--	μC

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

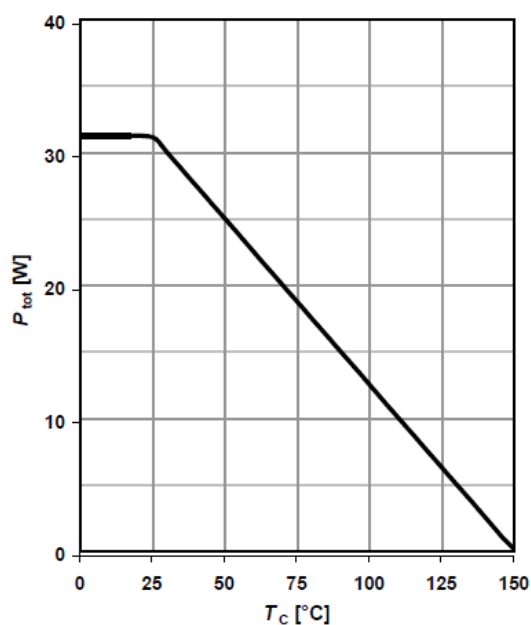
$I_{AS}=4A, V_{DD}=150V, L=60mH, \text{Star ting } T_J=25^{\circ}\text{C}$

3 $I_{SD} \leq I_D, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}, \text{Star ting } T_J=25^{\circ}\text{C}$

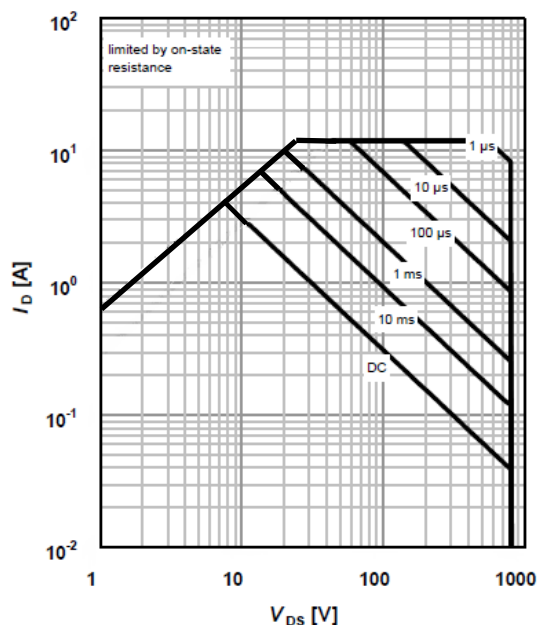
4 Pulse Test: Pulse width $\leq 300\mu s, \text{Duty cycle} \leq 2\%$

Typical characteristics Diagrams

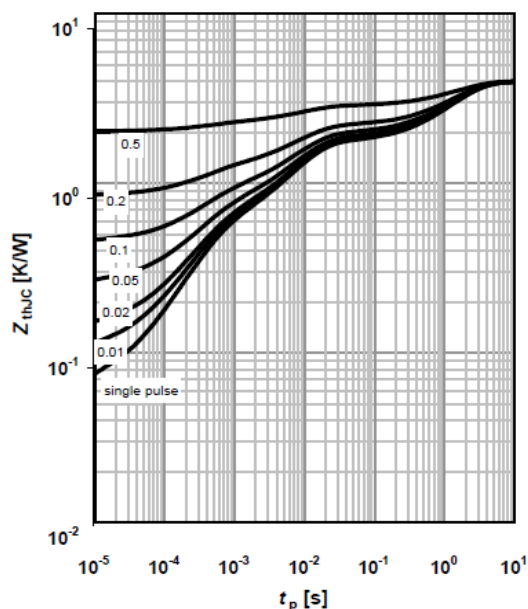
1 Power dissipation



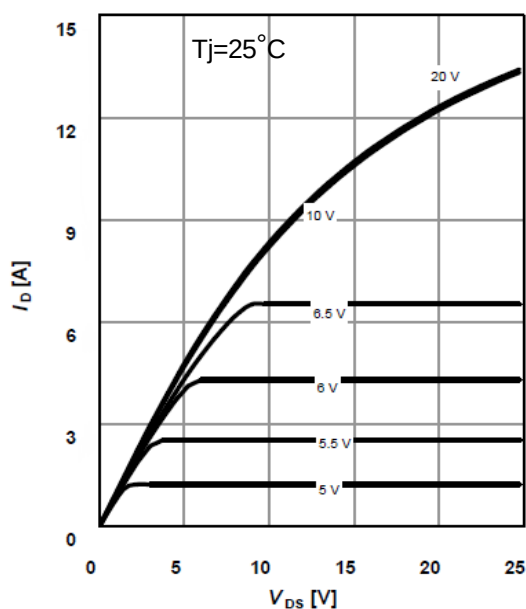
2 Safe operating area



3 Max.transient thermal impedance
 TO-220 TO-263
 TO-251 TO-252

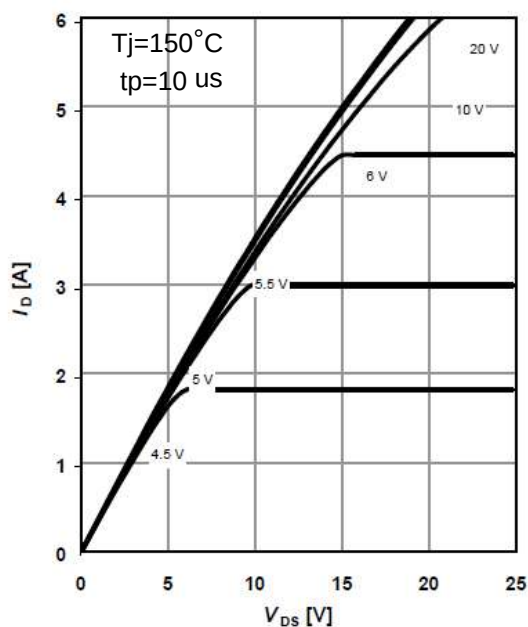


4 Typ.output characteristics

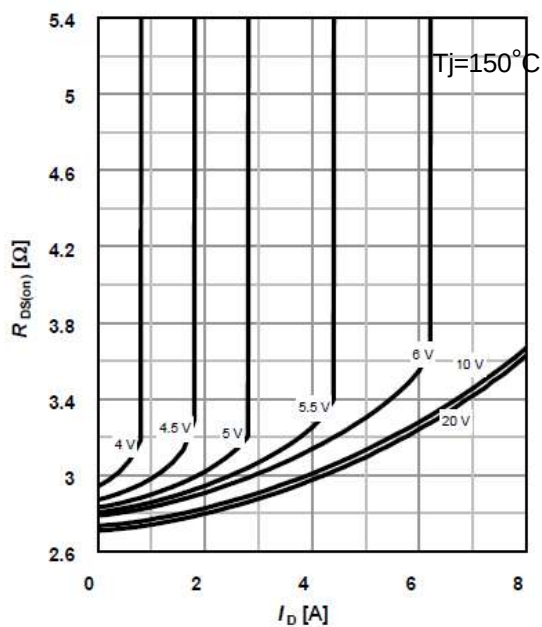


Typical characteristics Diagrams

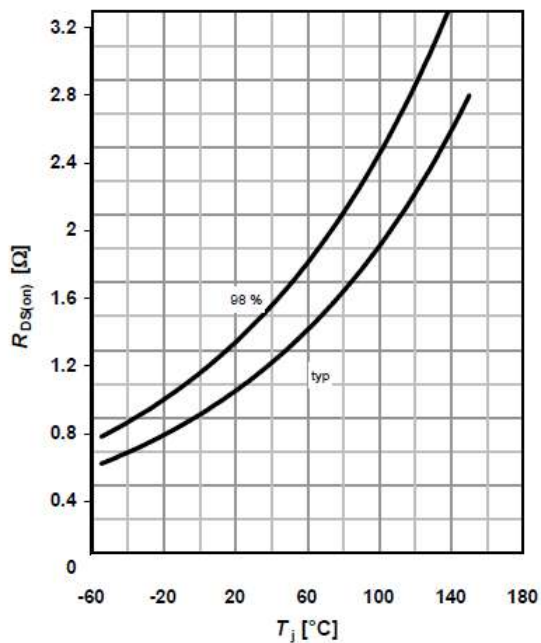
5 Typ.output characteristics



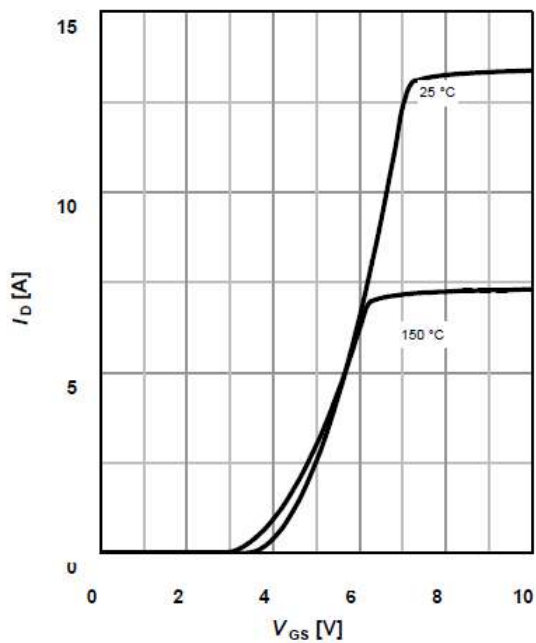
6 Typ.drain-source on-state resistance



7 Drain-source on-state resistance

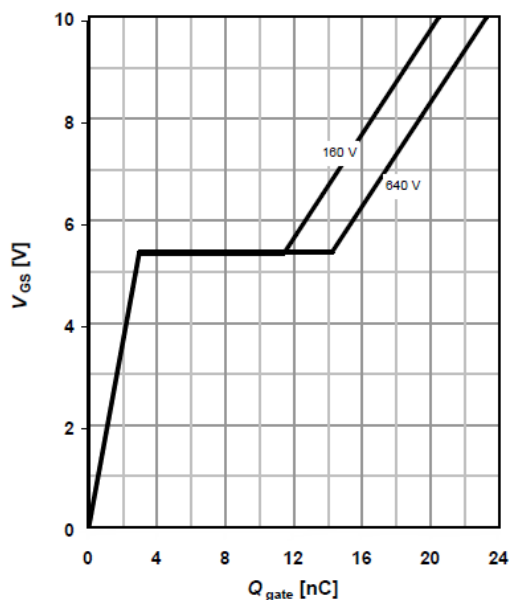


8 Typ.transfer characteristics

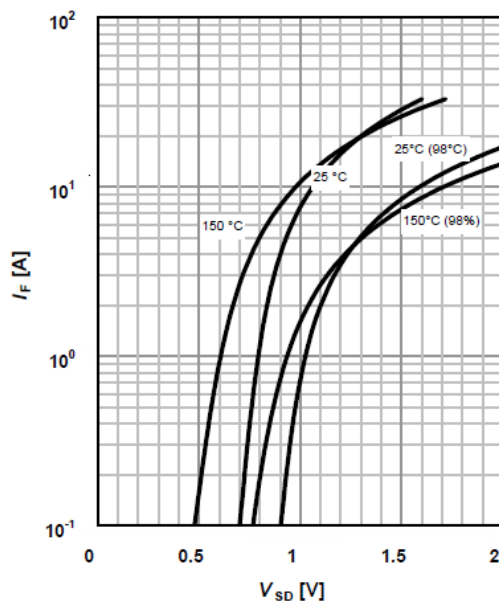


Typical characteristics Diagrams

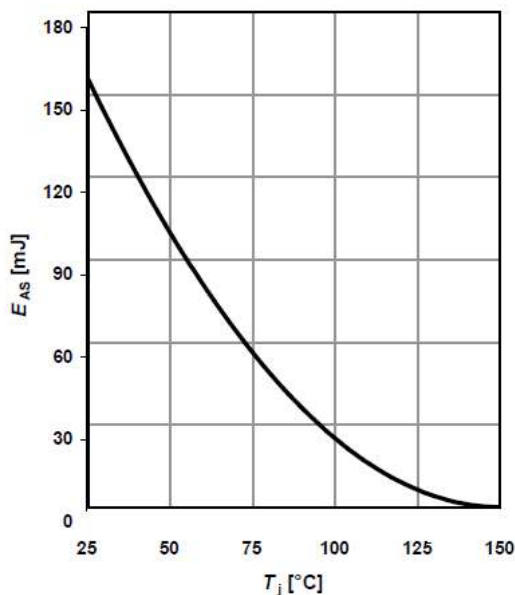
9 Typ.gate charge



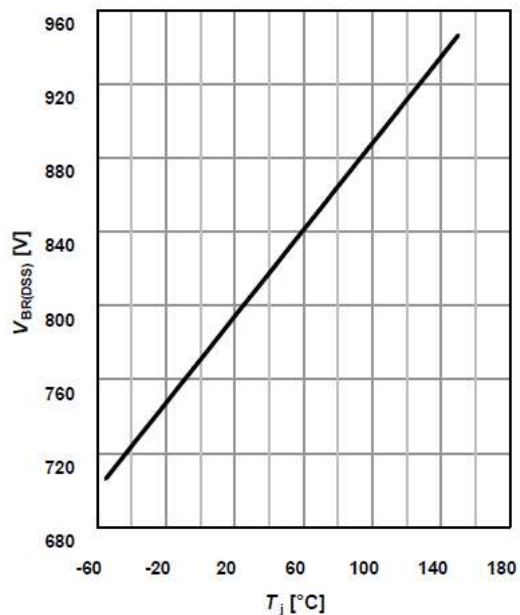
10 Forward characteristics of reverse diode



11 Avalanche energy

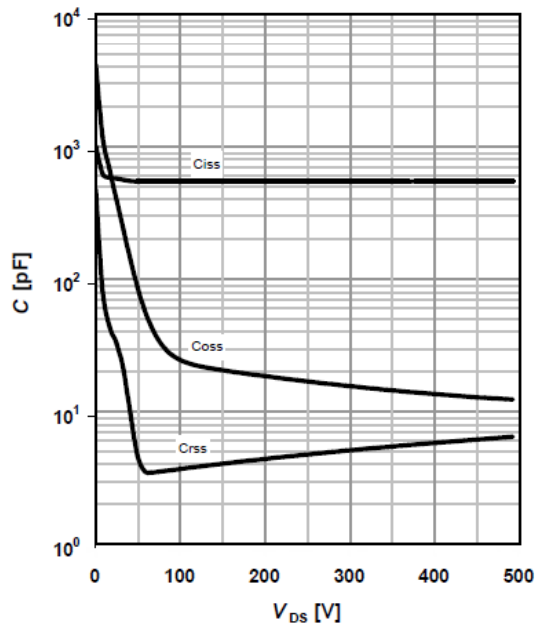


12 Drain-source breakdown voltage

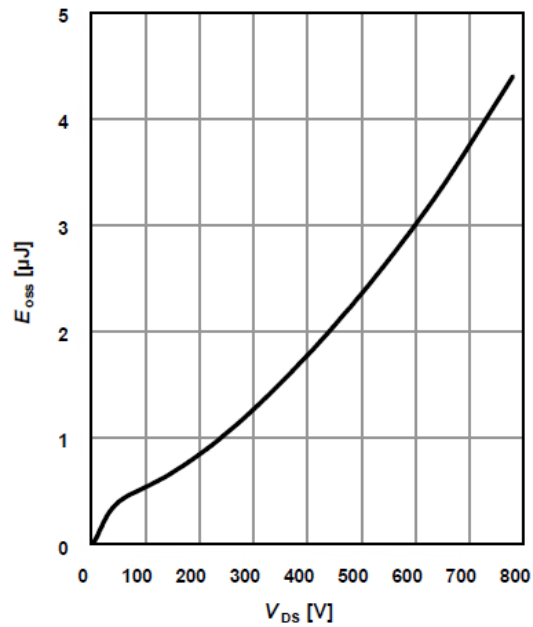


Typical characteristics Diagrams

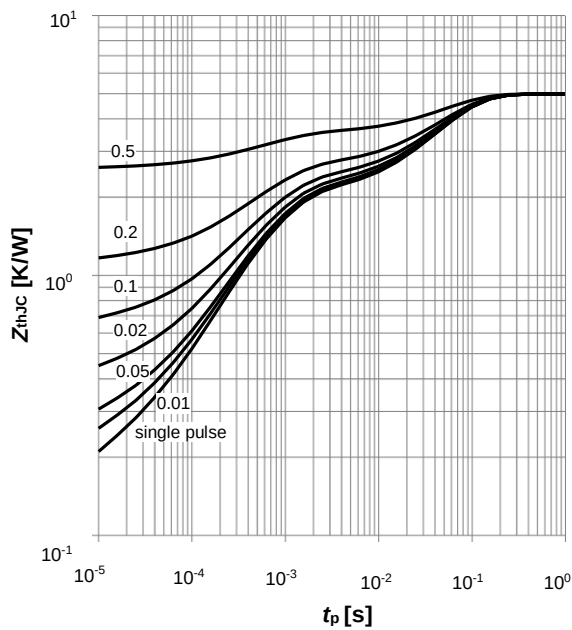
13 Typ.capacitances



14 Typ.Coss stored energy



15 Max.transient thermal impedance
 ITO-220



Typical characteristics Diagrams

Table 20 Switching times test circuit and waveform for inductive load

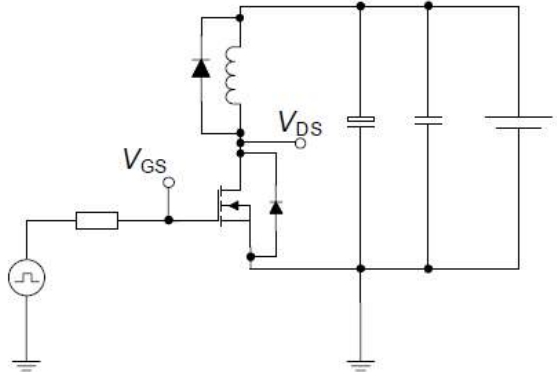
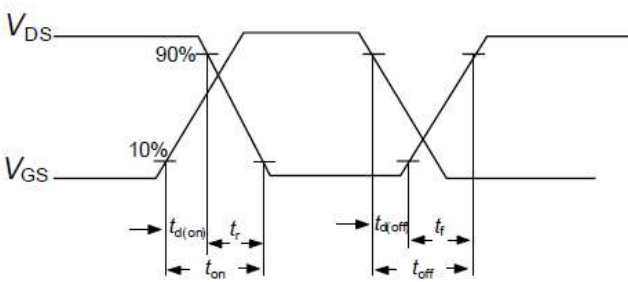
Switching times test circuit for inductive load	Switching time waveform
	

Table 21 Unclamped inductive load test circuit and waveform

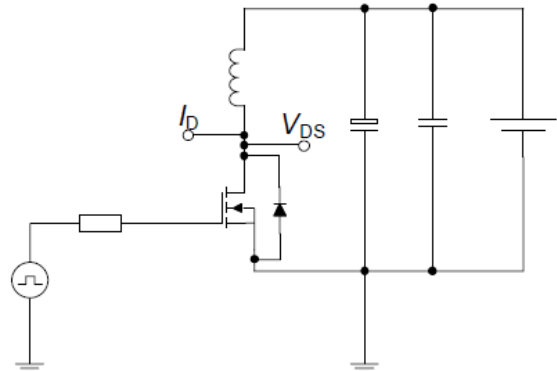
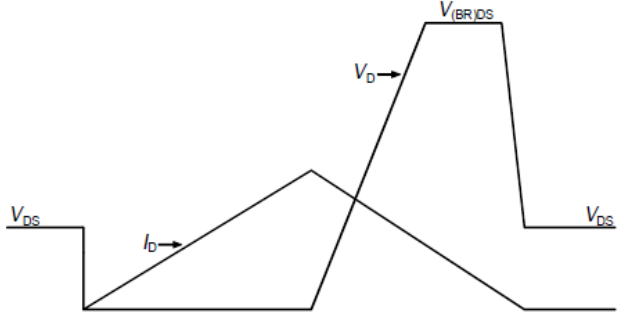
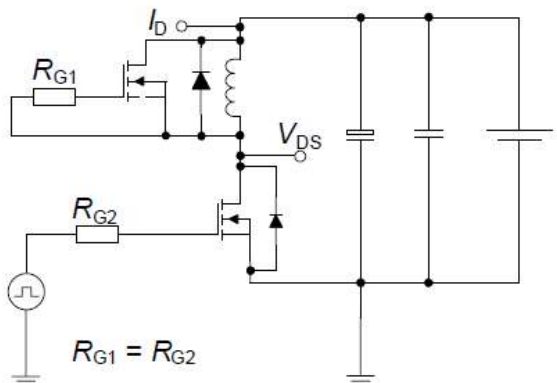
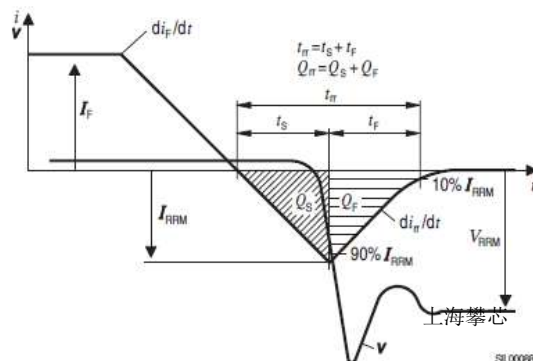
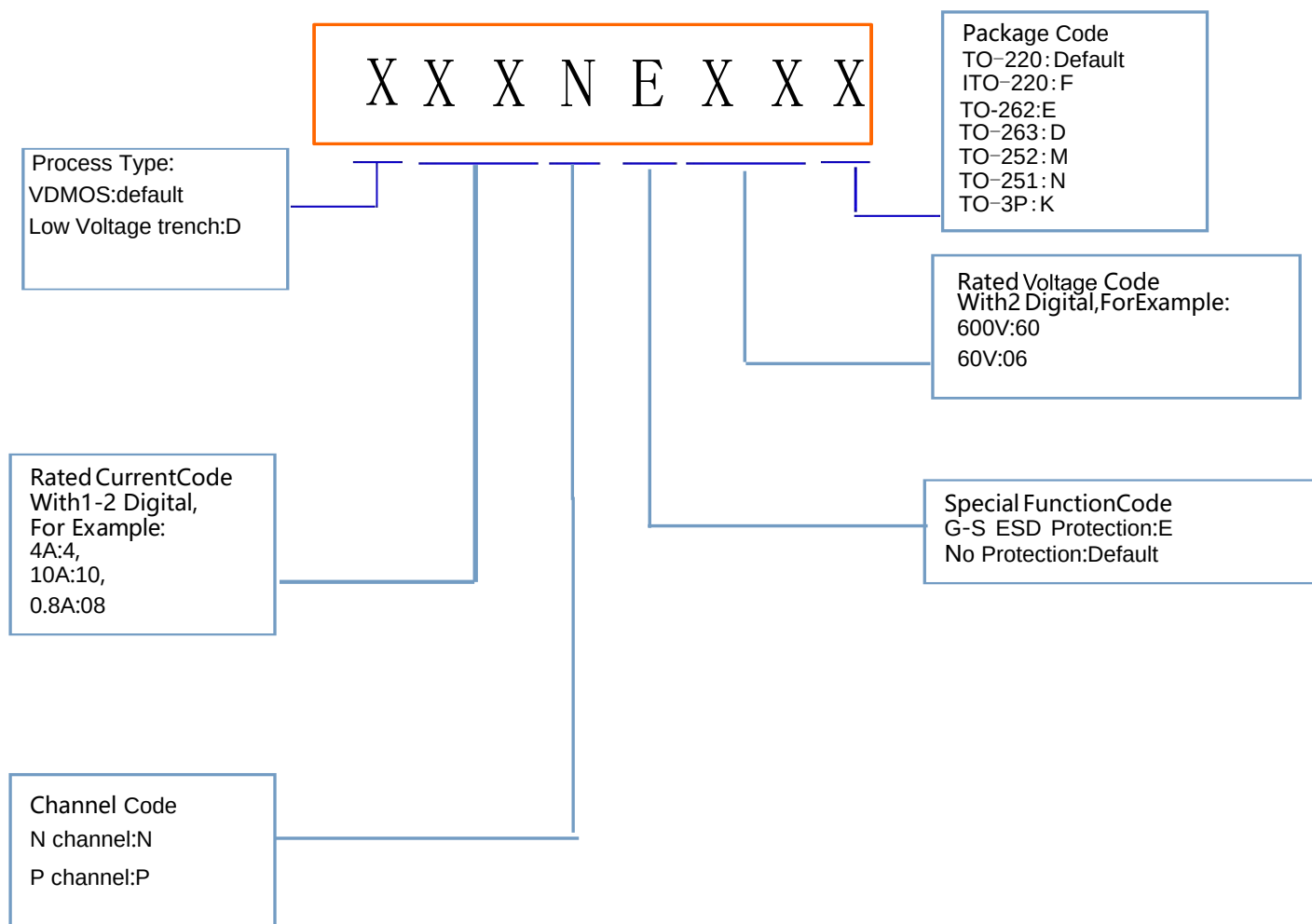
Unclamped inductive load test circuit	Unclamped inductive waveform
	

Table 22 Test circuit and waveform for diode characteristics

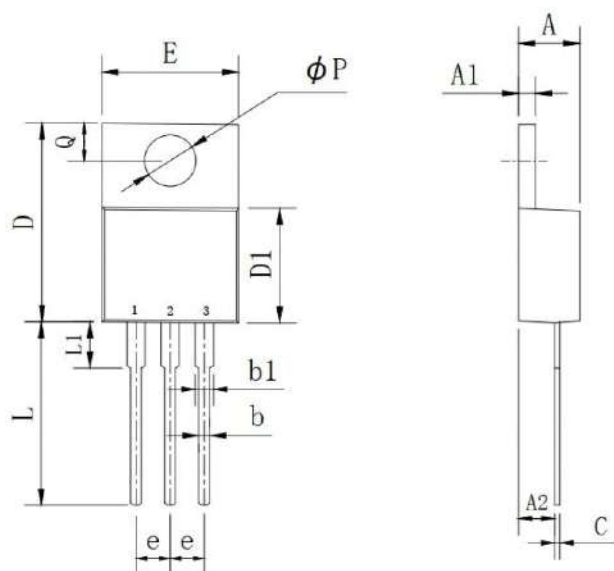
Test circuit for diode characteristics	Diode recovery waveform
	

Product Names Rules



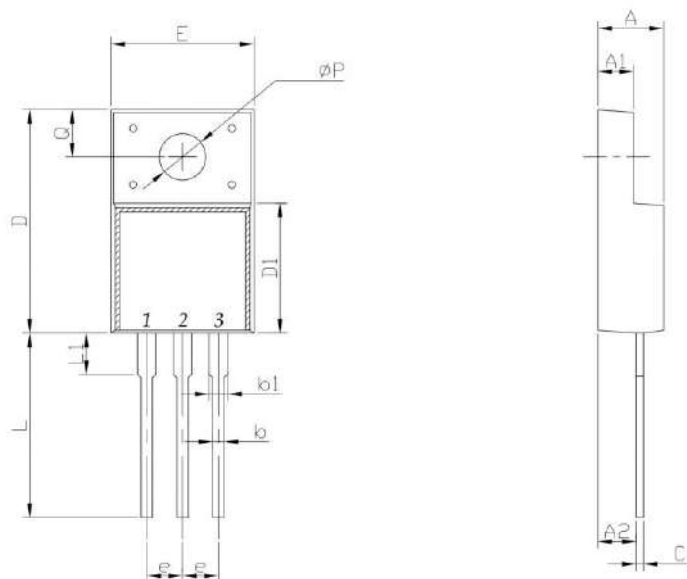
Dimensions

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

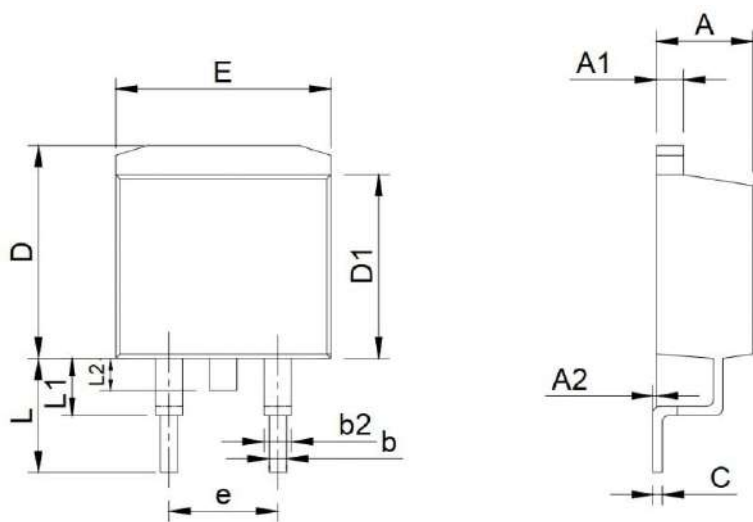
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

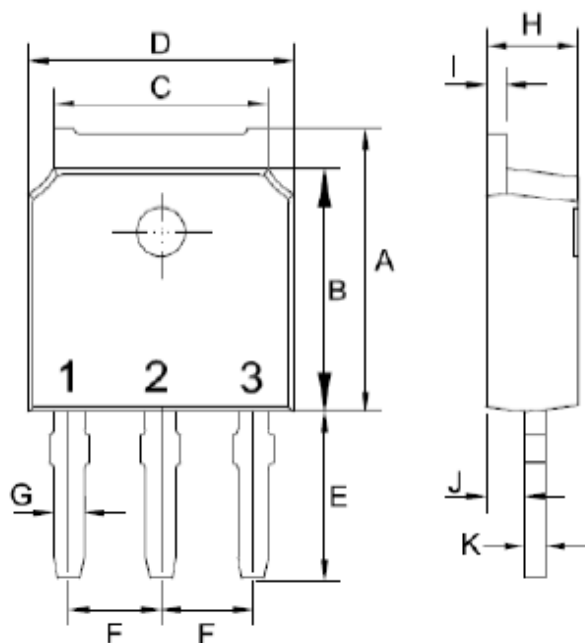
TO-263 PACKAGE OUTLINE DIMENSIONS



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

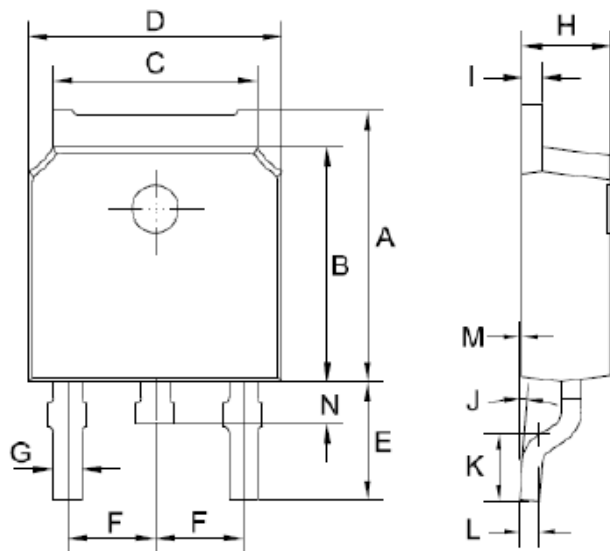
Dimensions

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