

800V N-Channel Super Junction Power MOSFET

Description:

This series of power MOSFET use N channel Multi-EPI Super-Junction technology and design to provide better characteristics, such as fast switchingtime, low Ciss and Crss, low on resistance and excellent avalanche characteristics,making it especially suitable for applications which require superior power density and outstanding efficiency.

Features:

- Low on-resistance
- Ultra low gate charge and input capacitance
- 100% avalanche tested
- Rohs compliant

Mechanical Data:

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

Application:

- Switching applications

Ordering Information

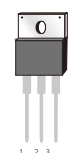
Part No.	Package Type	Package	Quality(box)
KWSJ11N80	TO-220	Tube	1000
KWSJ11N80F	ITO-220	Tube	1000
KWSJ11N80D	TO-263	Tape & Reel	800
KWSJ11N80N	TO-251	Tube	1000
KWSJ11N80M	TO-252	Tape & Reel	2500

Product Summary

V _{DS}	R _{DS(on)} (Ω) Typ	I _D (A)	Q _g (Typ)
800V	0.5 @ 10V	11	38nc

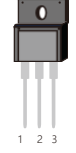
TO-220

KWSJ11N80



ITO-220

KWSJ11N80F



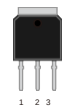
TO-263

KWSJ11N80D



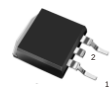
TO-251

KWSJ11N80N



TO-252

KWSJ11N80M



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

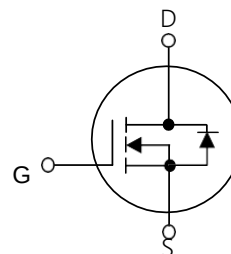


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

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	T _C =25°C	11	A
		T _C =100°C	9	
Pulsed Drain Current (Note 1)	I _{DM}	22		A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	200		mJ
Avalanche Current(Note 1)	I _{AR}	2		A
Repetitive Avalanche Energy(Note 1)	E _{AR}	0.4		mJ
Reverse Diode Recovery dv/dt(Note 3)	dv/dt	15		V/ns
Drain Source Voltage Slope (V _{DS} =480V)	dv/dt	50		V/ns
Power Dissipation T _C =25°C	P _D	37	26	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +150		°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	$R_{\theta JC}$	1.2	4.1	$^{\circ}\text{C/W}$

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 =5.0A		0.50	0.55	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1MHz		680		pF
Output Capacitance		C _{OSS}			240		pF
Reverse Transfer Capacitance		C _{RSS}			7		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		t _{d (on)}	V _{DD} =400V,I _D =5.0A, R _G =20Ω		15		ns
Turn-On Rise Time		t _R			10		ns
Turn-Off Delay Time		t _{d (off)}			110		ns
Turn-Off Fall Time		t _f			10		ns
Total Gate Charge		Q _G	V _{DS} =400V,I _D =5.0A, V _{GS} =10V		38	90	nC
Gate-Source Charge		Q _{GS}			4		nC
Gate-Drain Charge		Q _{GD}			4.5		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =5. 0A		1.0	1.5	V
Maximum Continuous Drain-Source Diode Forward Current		I _S				11	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				30	A
Reverse Recovery Time		t _{rr}	V _R =400V, I _S =5. 0A		475		ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs (Note 1)		5.8		μC

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

$L=79mH, I_{AS}=3.5A, V_{DD}=50V$, Starting $T_J=25^{\circ}\text{C}$

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

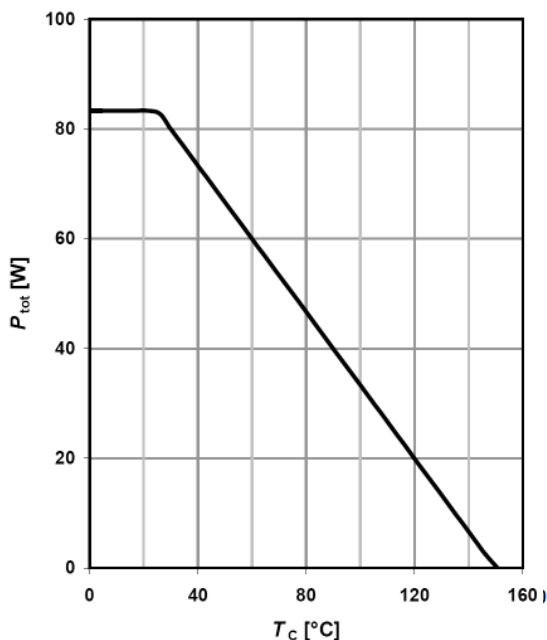
4 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycles $\leq 2\%$

5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

1 Power dissipation

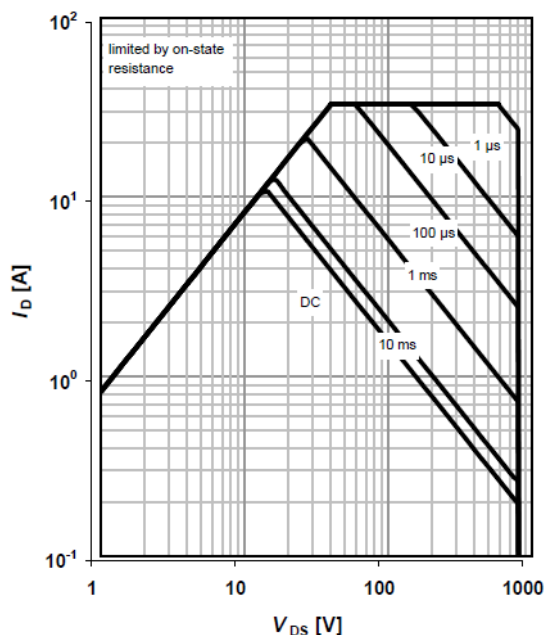
$$P_{\text{tot}} = f(T_c)$$



2 Safe operating area

$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; D = 0$$

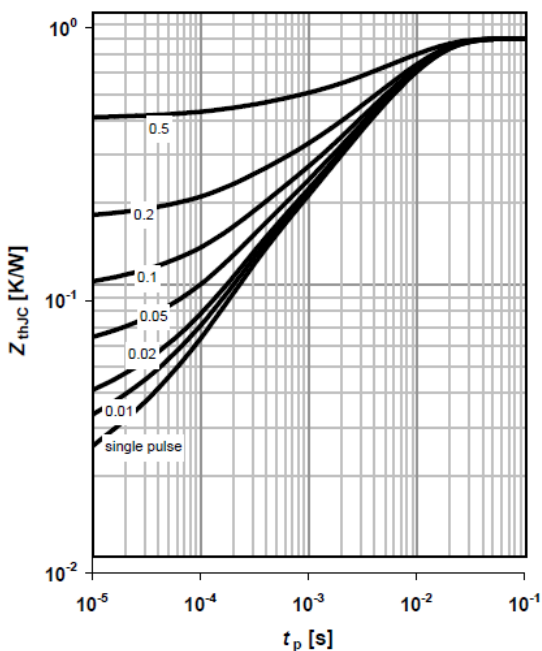
parameter: t_p



3 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

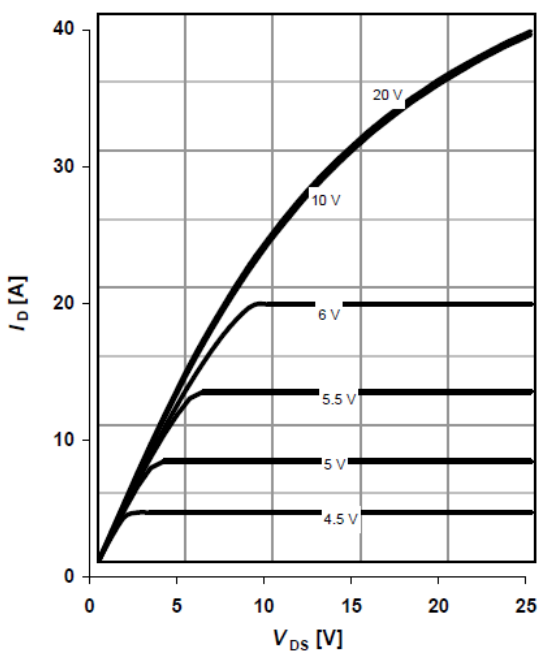
parameter: $D = t_p / T$



4 Typ. output characteristics

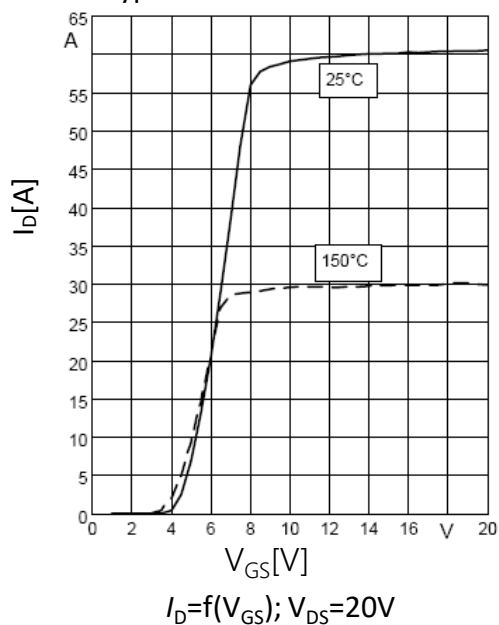
$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}; t_p = 10 \mu\text{s}$$

parameter: V_{GS}

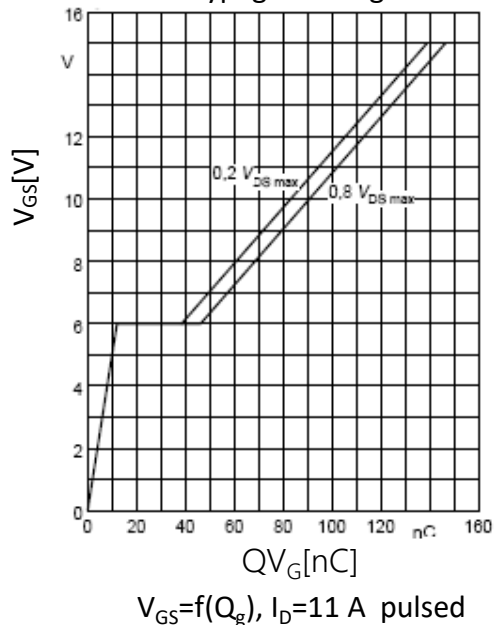


Typical Characteristics Diagrams

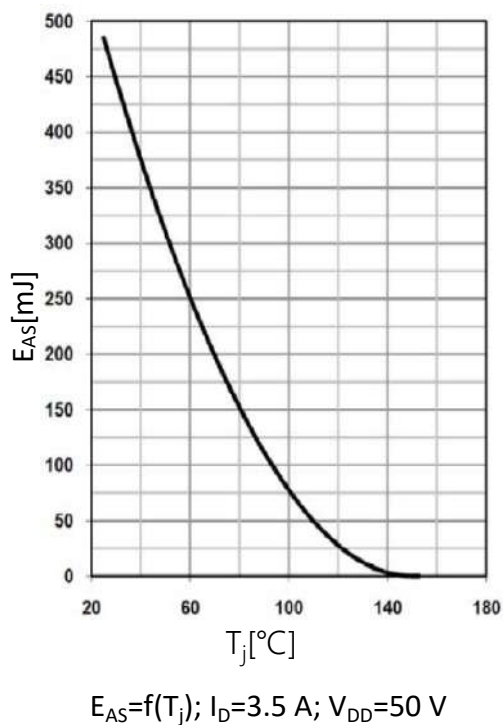
5. Typ. transfer characteristics



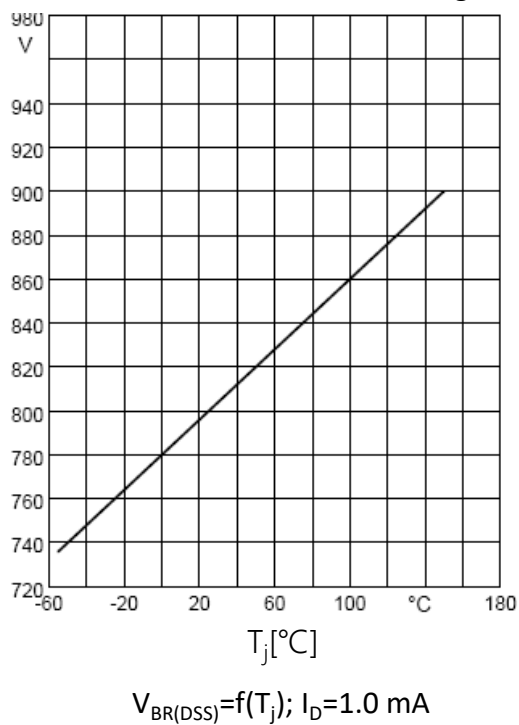
6. Typ. gate charge



7. Avalanche energy



8. Drain-source breakdownvoltage

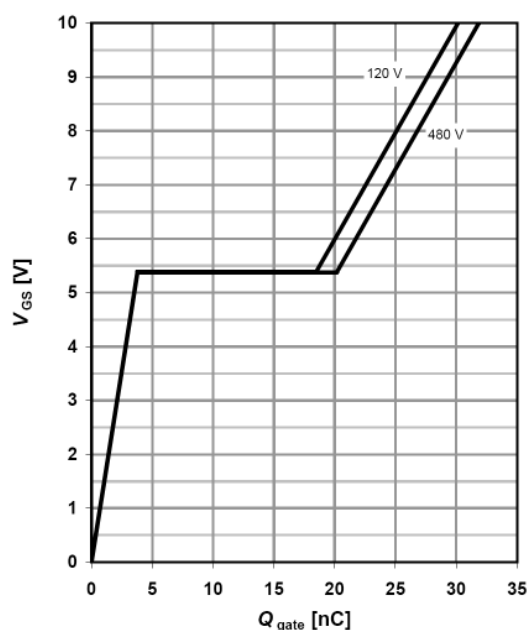


Typical Characteristics Diagrams

9 Typ. gate charge

$$V_{GS}=f(Q_{gate}); I_D=11 \text{ A pulsed}$$

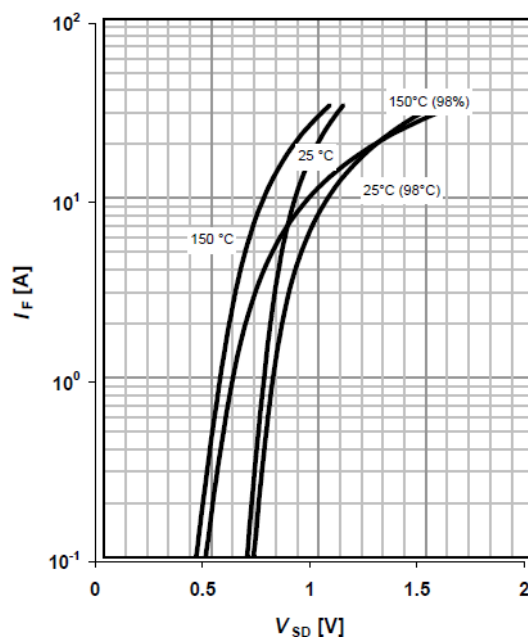
parameter: V_{DD}



10 Forward characteristics of reverse diode

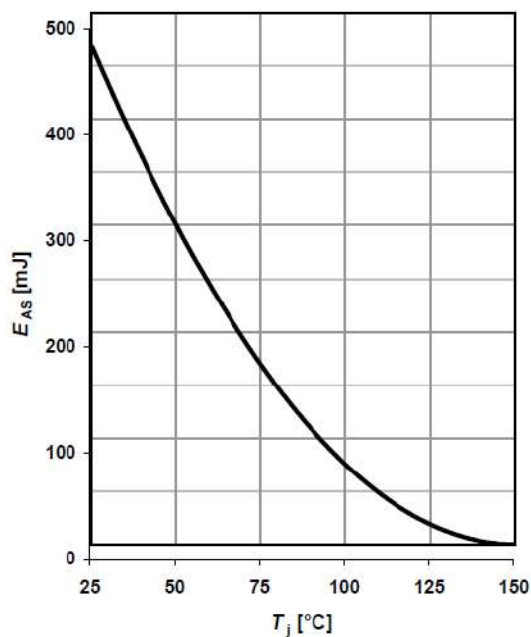
$$I_F=f(V_{SD}); t_p=10 \mu s$$

parameter: T_j



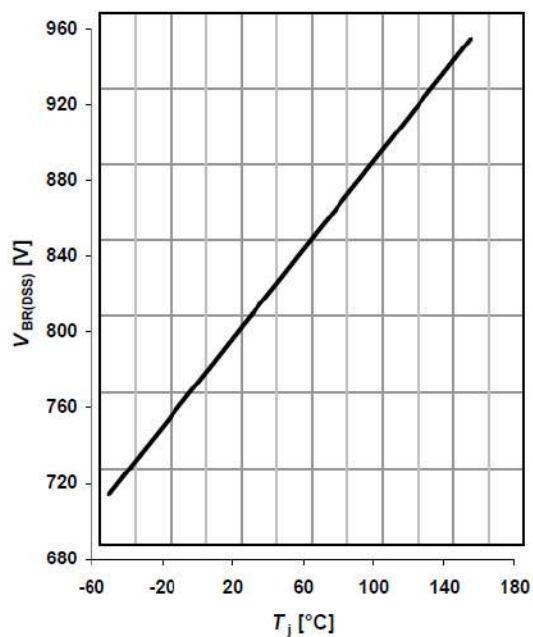
11 Avalanche energy

$$E_{AS}=f(T_j); I_D=2.2 \text{ A}; V_{DD}=50 \text{ V}$$



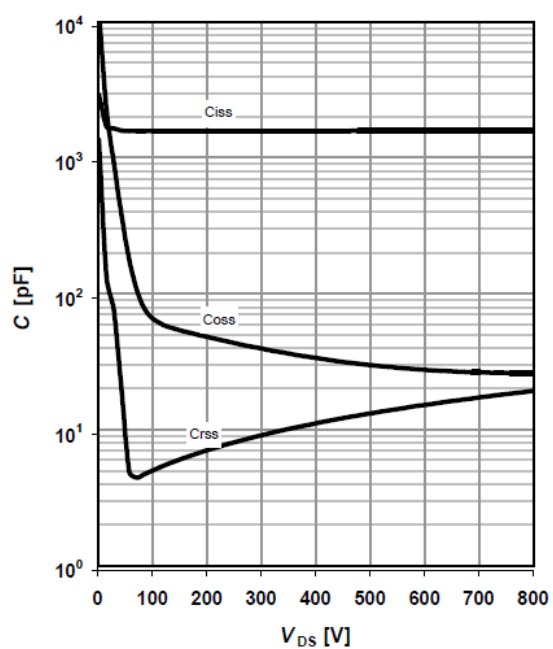
12 Drain-source breakdown voltage

$$V_{BR(DSS)}=f(T_j); I_D=0.25 \text{ mA}$$



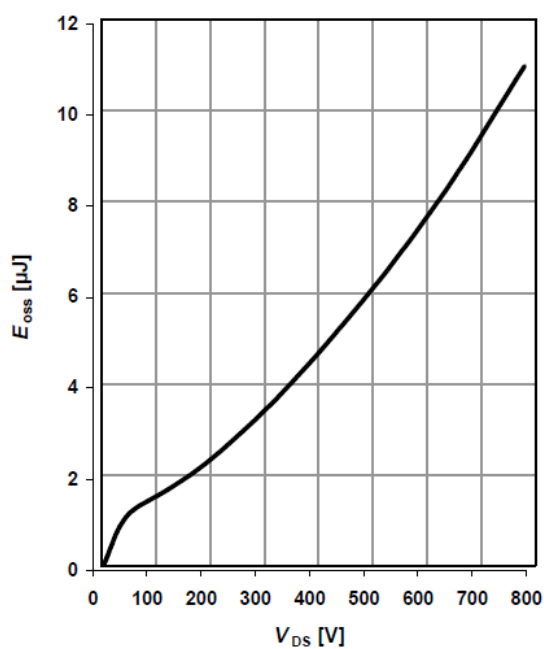
13 Typ. capacitances

$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



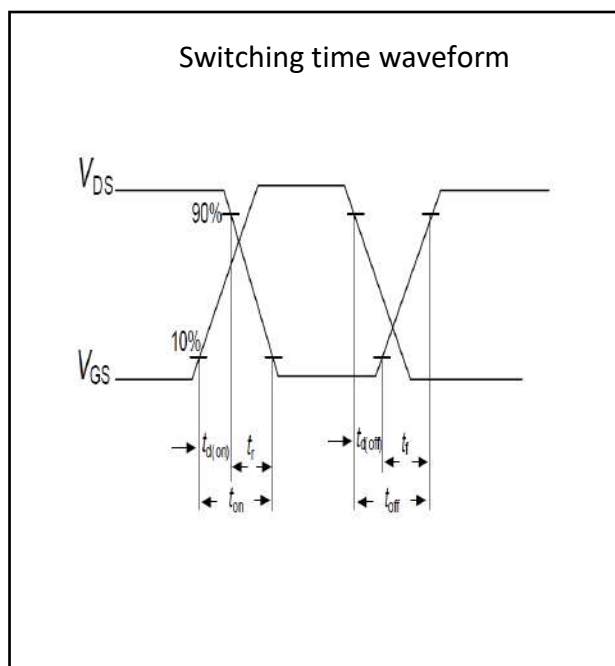
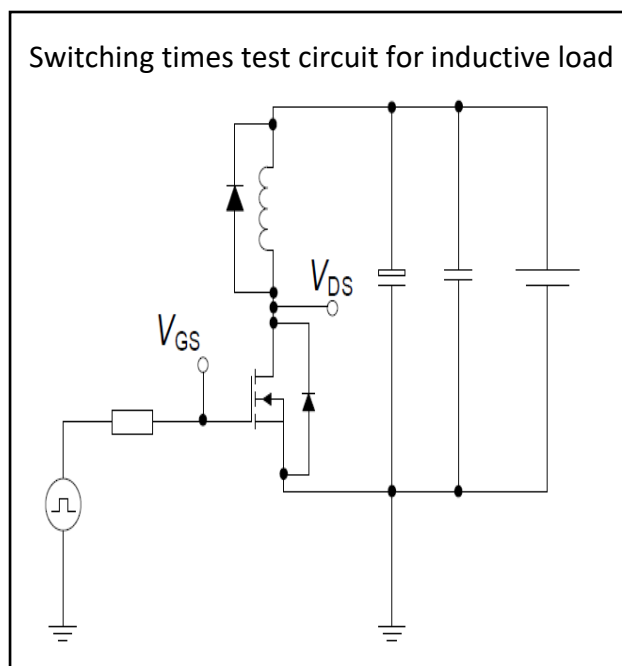
14 Typ. Coss stored energy

$E_{oss}=f(V_{DS})$

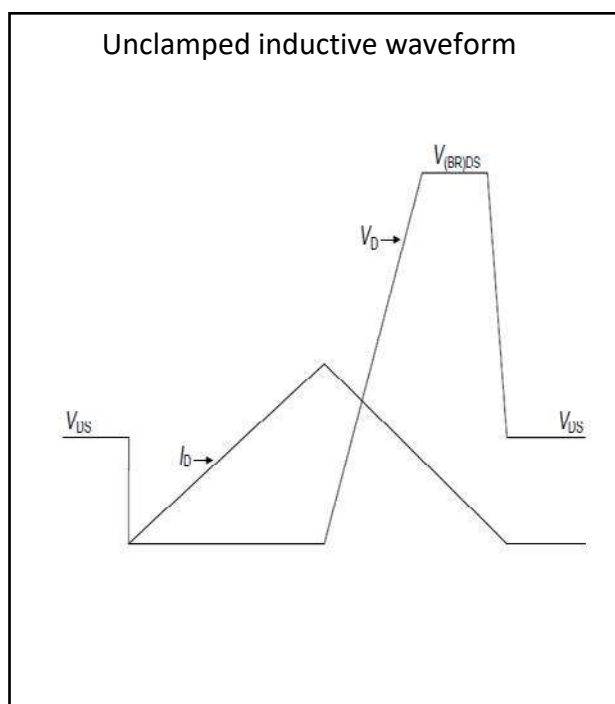
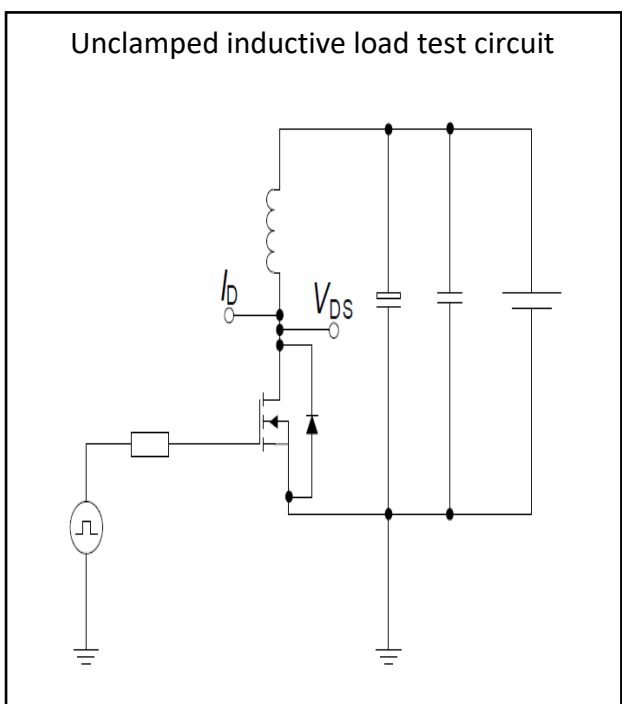


Typical Test Circuit

Switching times test circuit and waveform for inductive load

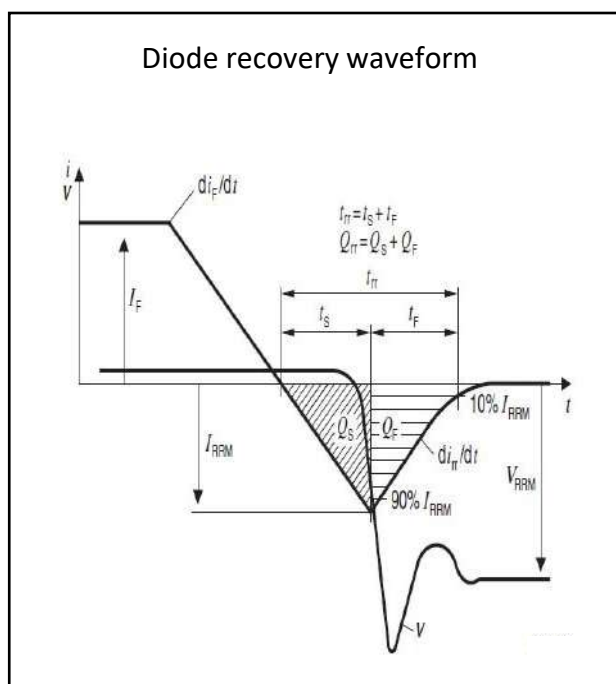
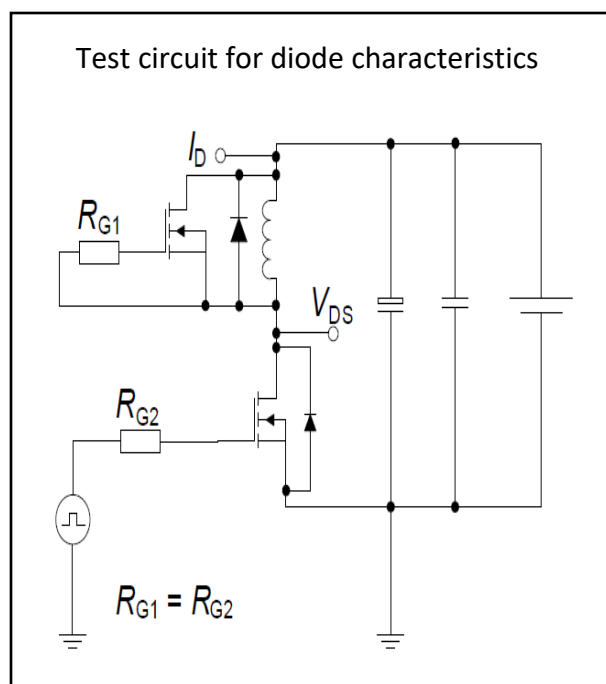


Unclamped inductive load test circuit and waveform

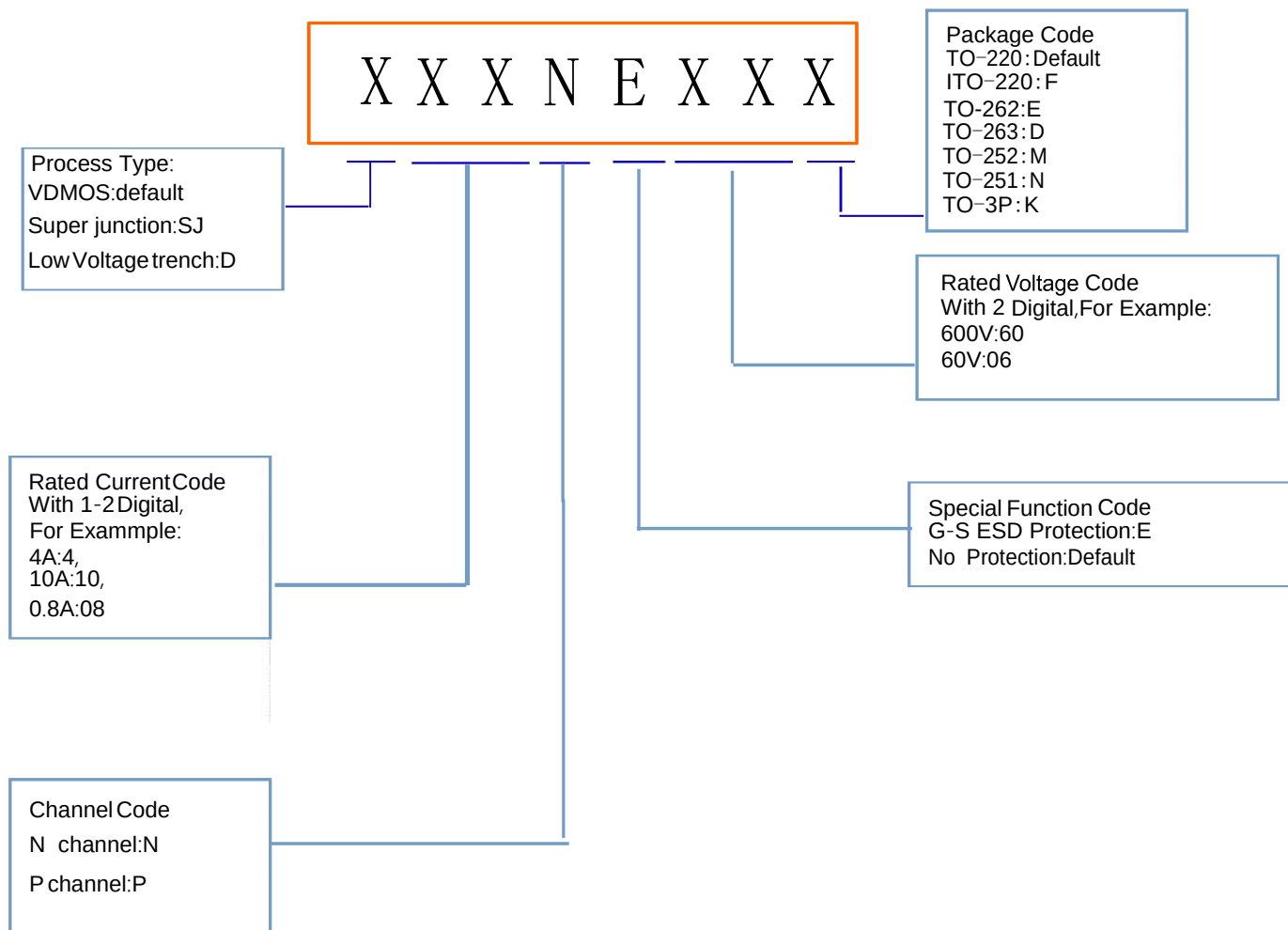


Typical Test Circuit

Test circuit and waveform for diode characteristics

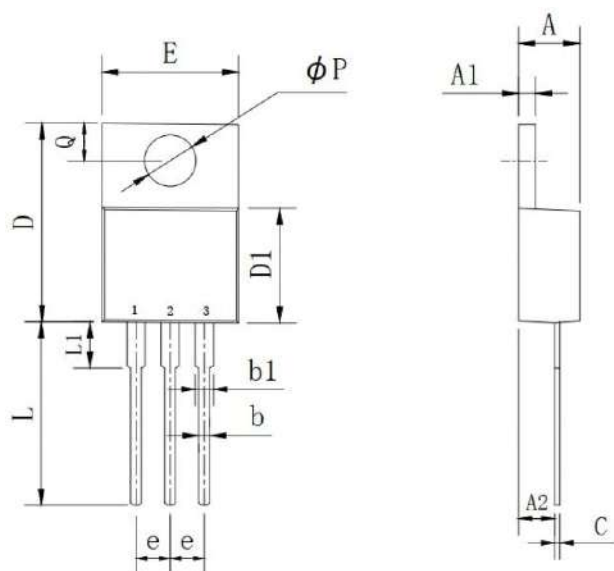


Product Names Rules



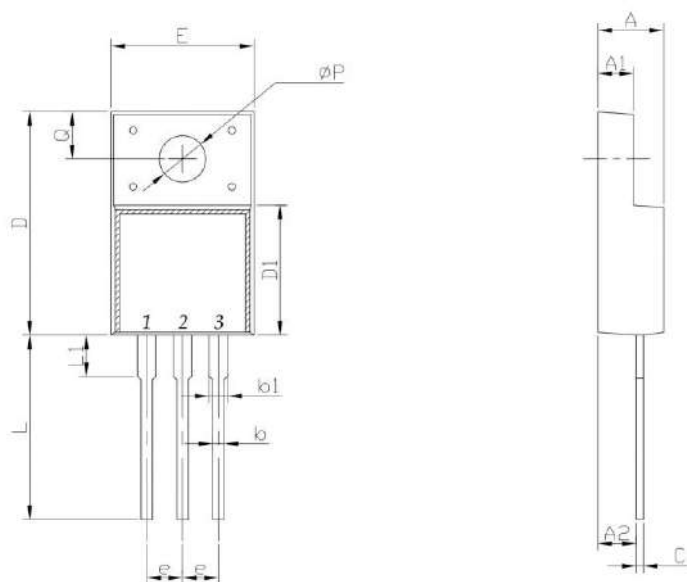
Dimensions

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

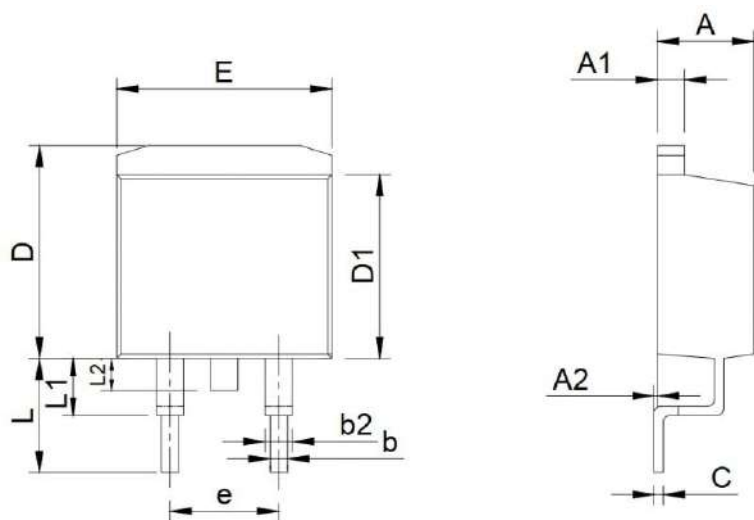
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

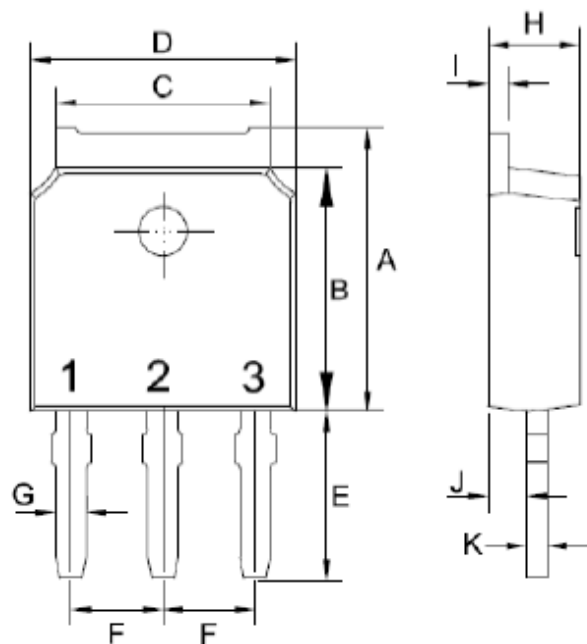
TO-263 PACKAGE OUTLINE DIMENSIONS



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
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

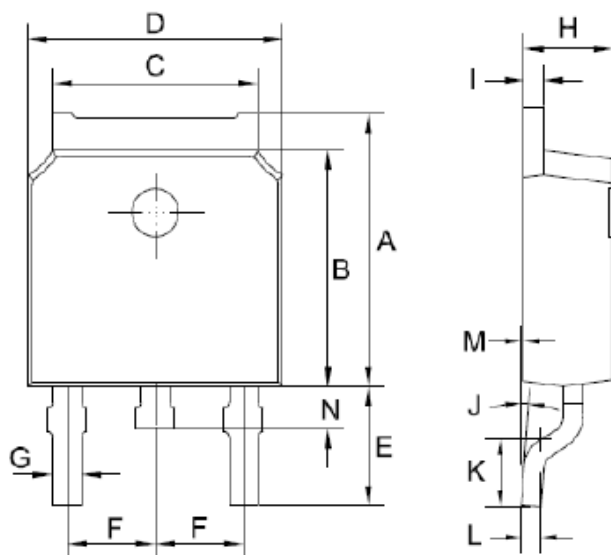
Dimensions

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	0.41	0.81	0.016	0.032
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