

800V N-Channel Super Junction Power MOSFET

General Description:

KW20N80 is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding. KW20N80 is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance. This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy KW20N80 is suitable for various AC/DC power conversion in switching mode operation for higher efficiency.

Features:

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

Mechanical Data:

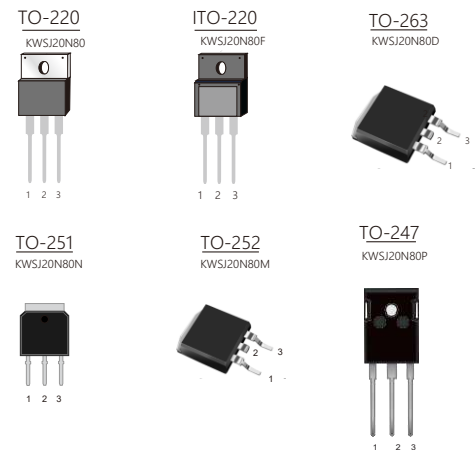
- Case: TO-220, ITO-220, TO-263, TO-251, TO-252, TO-247 Package

Application:

- Switching applications

Ordering Information

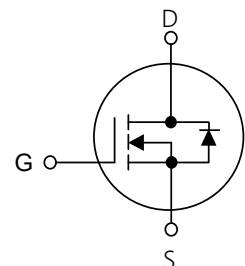
Part No.	Package Type	Package	Quality(box)
KWSJ20N80	TO-220	Tube	1000
KWSJ20N80F	ITO-220	Tube	1000
KWSJ20N80D	TO-263	Tape & Reel	800
KWSJ20N80N	TO-251	Tube	1000
KWSJ20N80M	TO-252	Tape & Reel	2500
KWSJ20N80P	TO-247	Tube	600



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source



Product Summary

V _{DS}	R _{DS(on)} (Ω) Typ	I _D (A)	Q _g (Typ)
800V	0.22 @ 10V	20	70nc

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

Parameter	Symbol	TO-220/TO-263/TO-251/TO-252/TO-247	ITO-220	Unit
Drain-Source Voltage	V _{DS}	800		V
Gate-Source Voltage	V _{GS}	±30		V
Continuous Drain Current	I _D	20		A
		10		
Pulsed Drain Current (Note 1)	I _{DM}	62		A
Single Pulse Avalanche Energy (Note 2)	E _{AS}	485		mJ
Avalanche Current (Note 1)	I _{AR}	4		A
Repetitive Avalanche Energy (Note 1)	E _{AR}	1		mJ
Reverse Diode Recovery dv/dt (Note 3)	dv/dt	4.5		V/ns
Power Dissipation T _c =25°C	P _D	205	35	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/TO-247	ITO-220	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	80	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.6	3.6	$^{\circ}\text{C}/\text{W}$

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	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		0.22	0.24	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1MHz		1440		pF
Output Capacitance		C _{OSS}			300		pF
Reverse Transfer Capacitance		C _{RSS}			10		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		t _{d(on)}	V _{DD} =400V,I _D =5.0A, R _G =20Ω		25		ns
Turn-On Rise Time		t _R			55		ns
Turn-Off Delay Time		t _{d(off)}			70		ns
Turn-Off Fall Time		t _f			40		ns
Total Gate Charge		Q _G	V _{DS} =480V,I _D =10A, V _{GS} =10V		70	90	nC
Gate-Source Charge		Q _{GS}			7.8		nC
Gate-Drain Charge		Q _{GD}			9		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =10A		1.0	1.5	V
Maximum Continuous Drain-Source Diode Forward Current		I _S				20	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				60	A
Reverse Recovery Time		trr	V _R =400V, I _S =10A		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 $L=79\text{mH}$, $I_{AS}=3.5A$, $V_{DD}=50V$, Starting $T_J=25^{\circ}\text{C}$

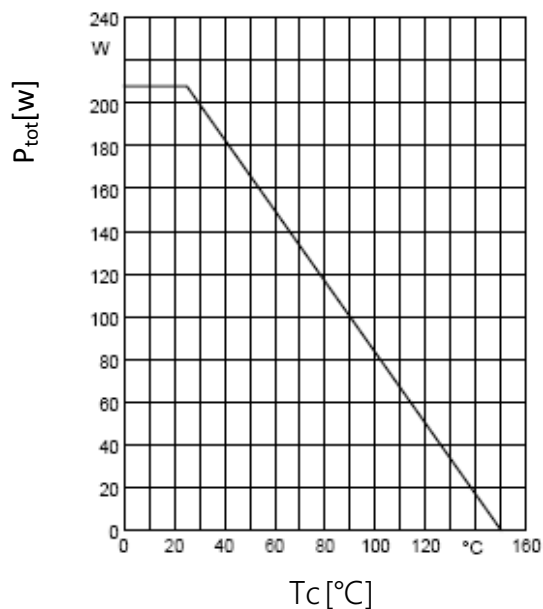
3 $I_{SD} \leq I_D$, $dI/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, starting $T_J=25^{\circ}\text{C}$

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

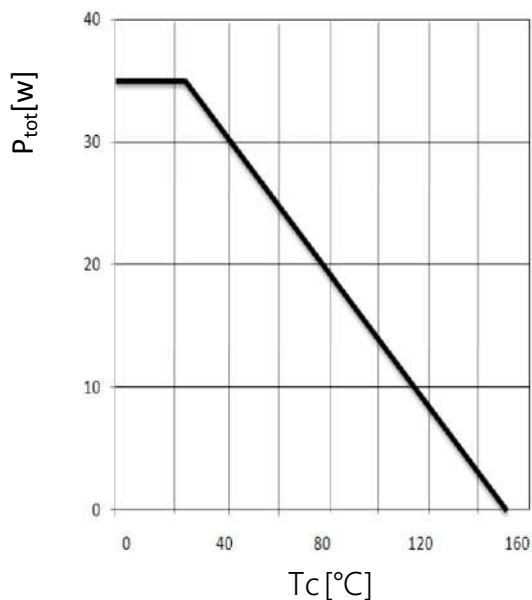
5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

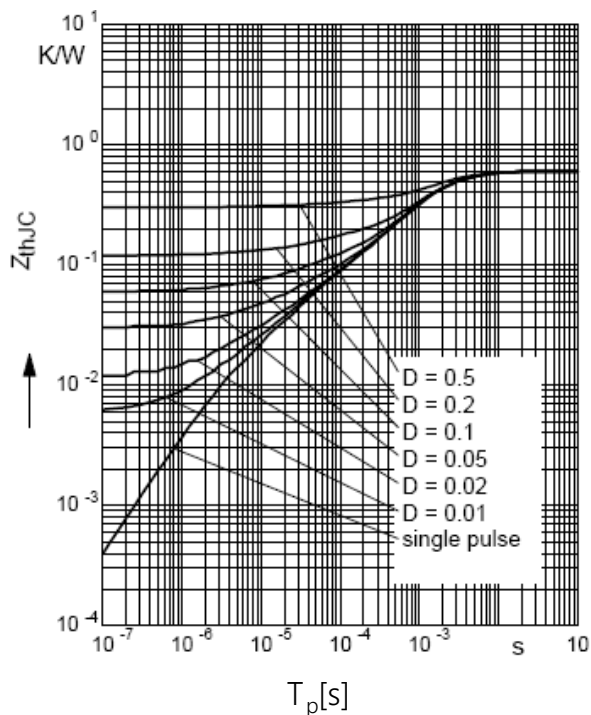
Power dissipation
TO-220



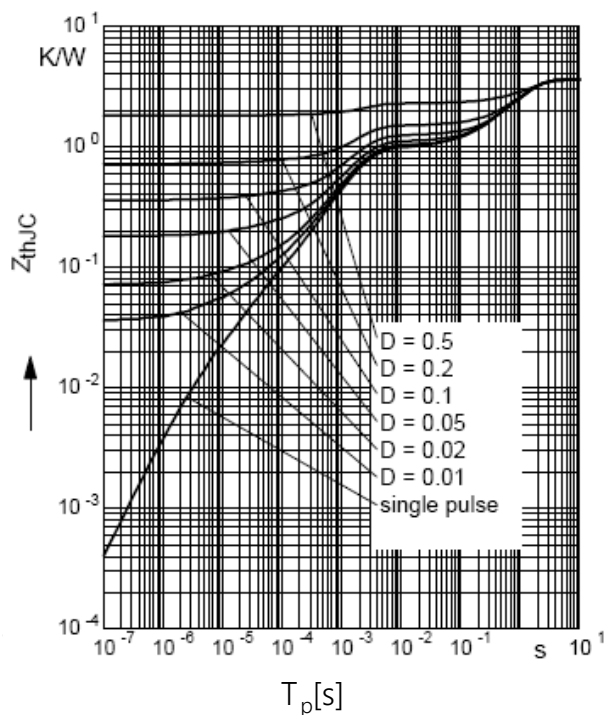
Power dissipation
ITO-220



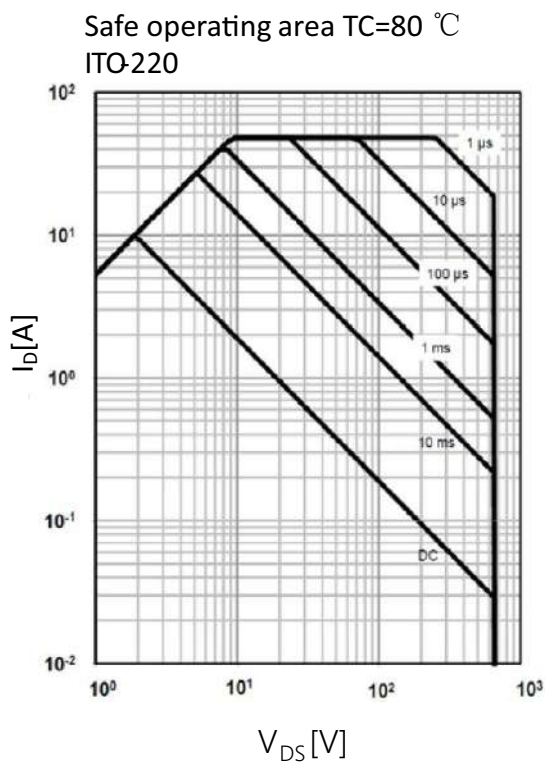
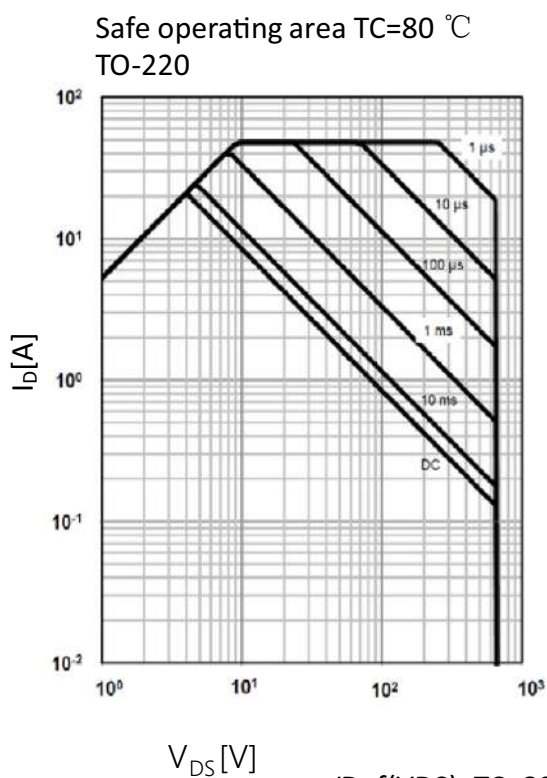
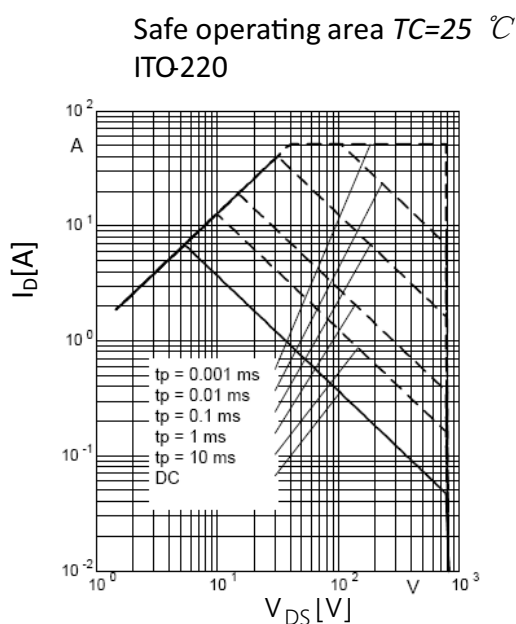
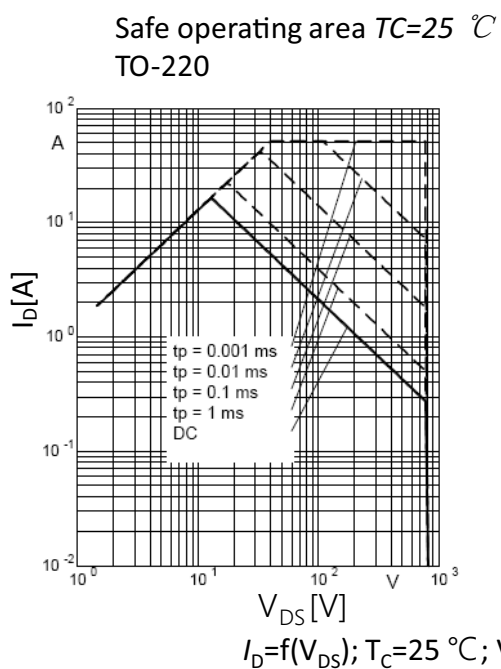
Max. transient thermal impedance
TO-220



Max. transient thermal impedance
ITO-220

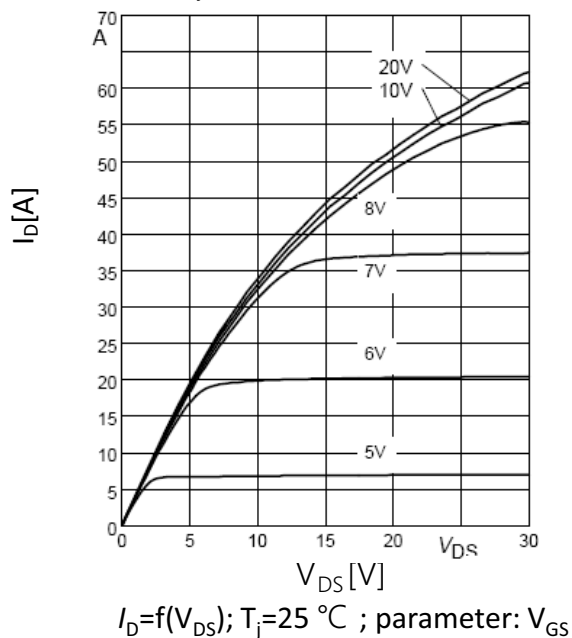


Typical Characteristics Diagrams

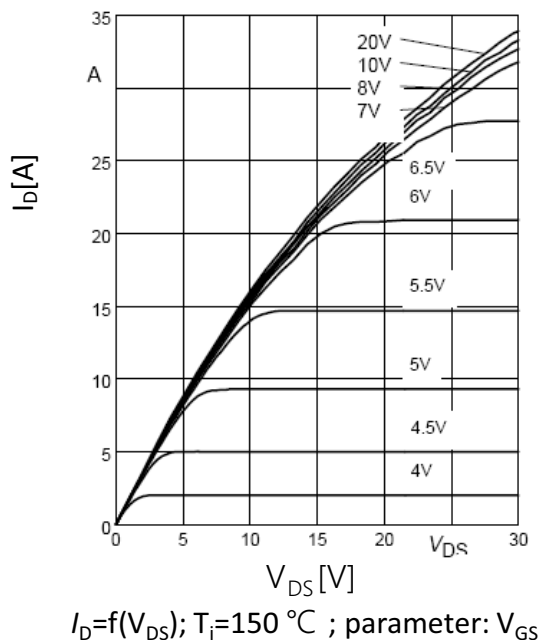


Typical Characteristics Diagrams

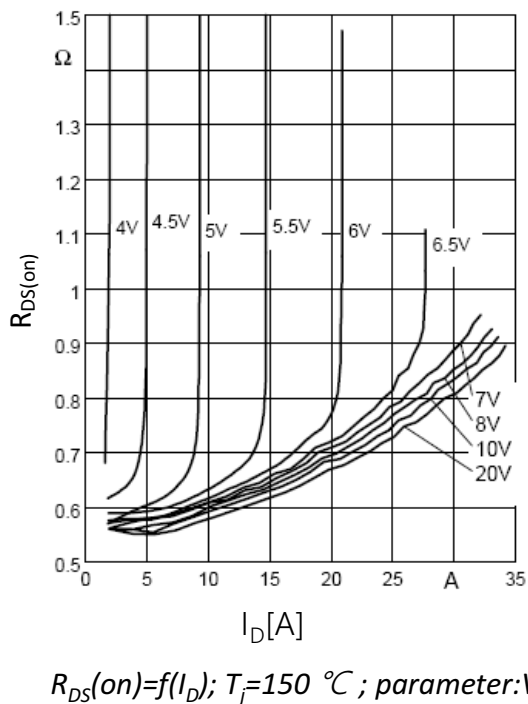
Typ. output characteristics
 $T_j = 25^\circ\text{C}$



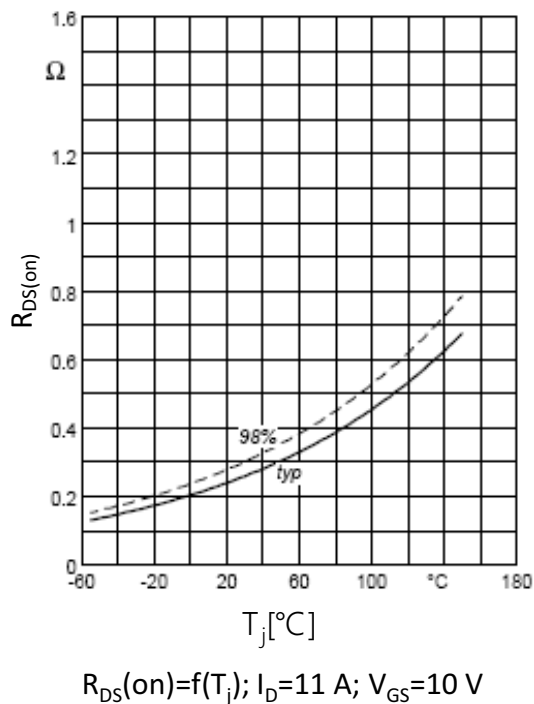
Typ. output characteristics
 $T_j = 150^\circ\text{C}$



Typ. drain-source on-state resistance

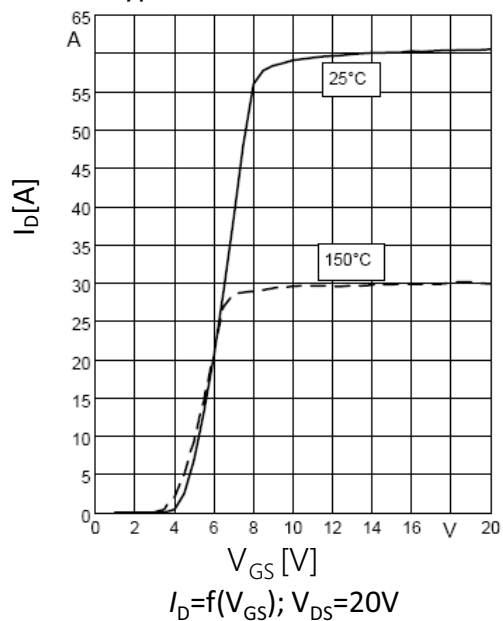


Typ. drain-source on-state resistance

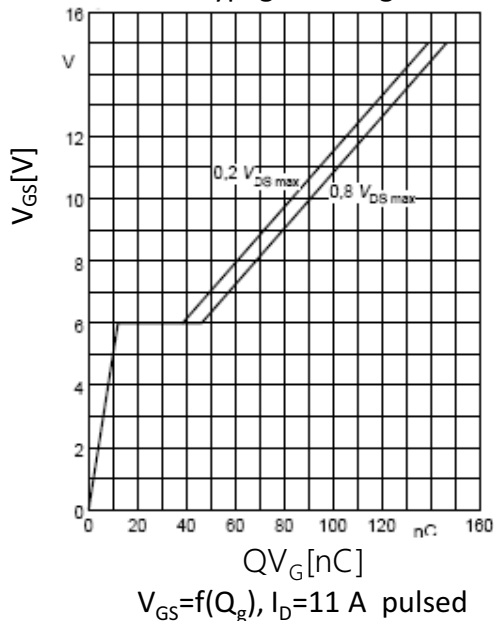


Typical Characteristics Diagrams

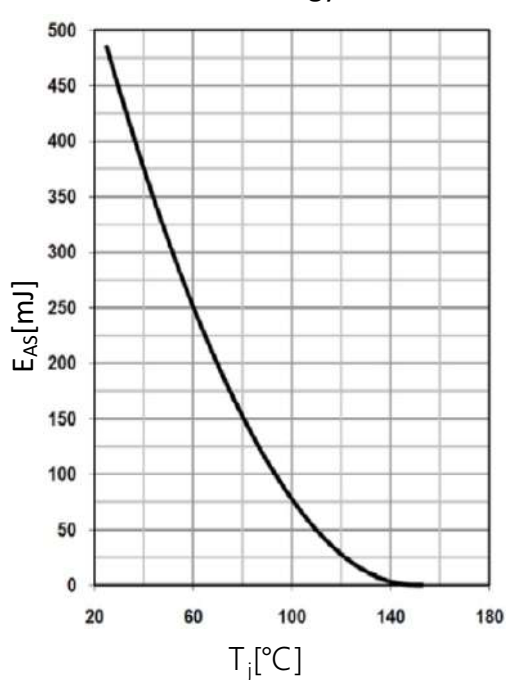
Typ. transfer characteristics



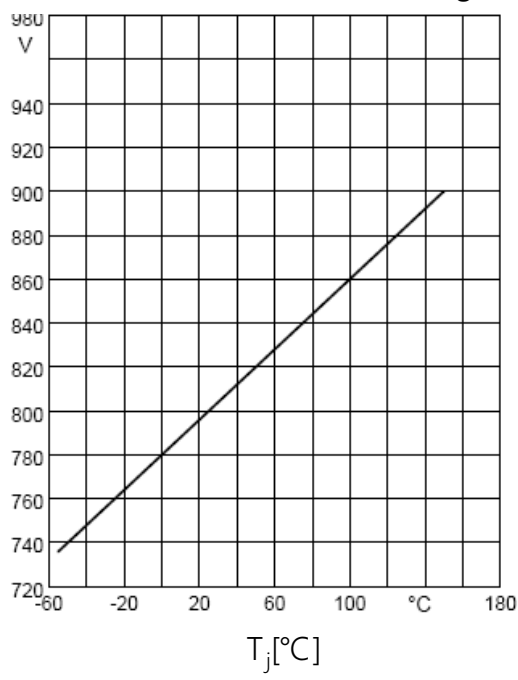
Typ. gate charge



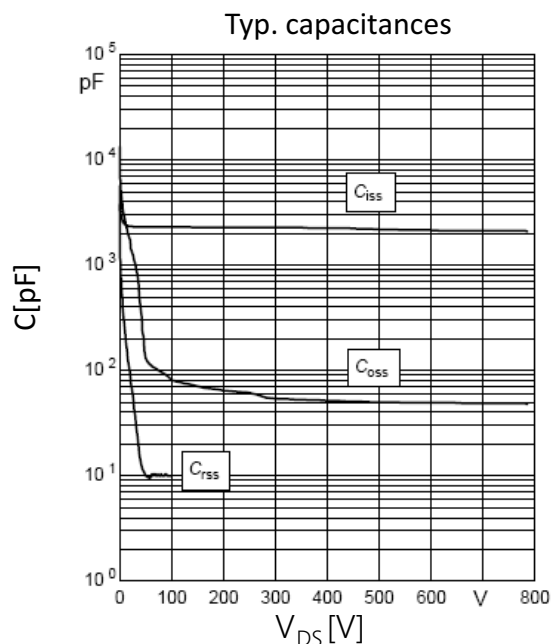
Avalanche energy



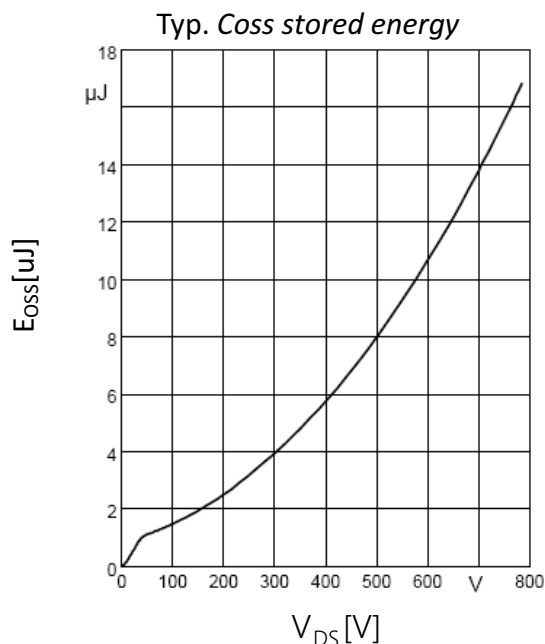
Drain-source breakdown voltage



Typical Characteristics Diagrams

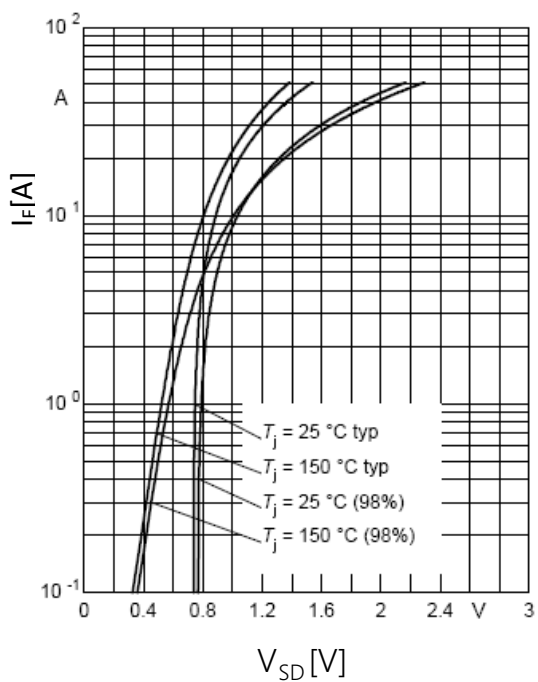


$$C=f(V_{DS}); V_{GS}=0V; f=1MHz$$



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

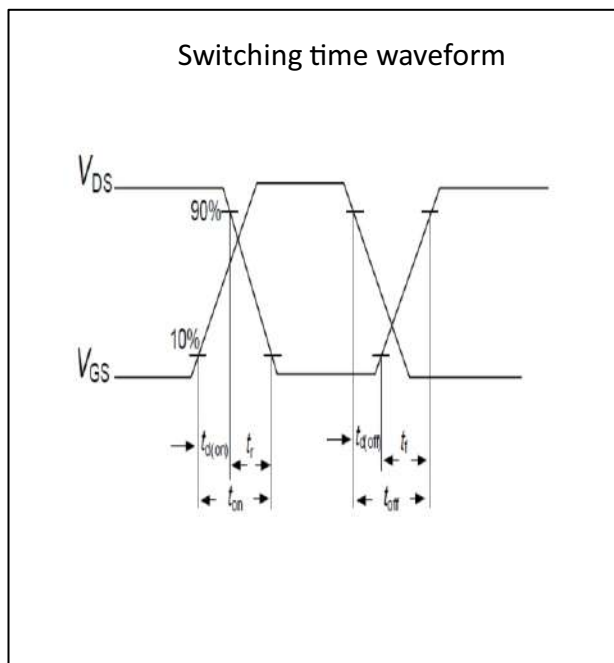
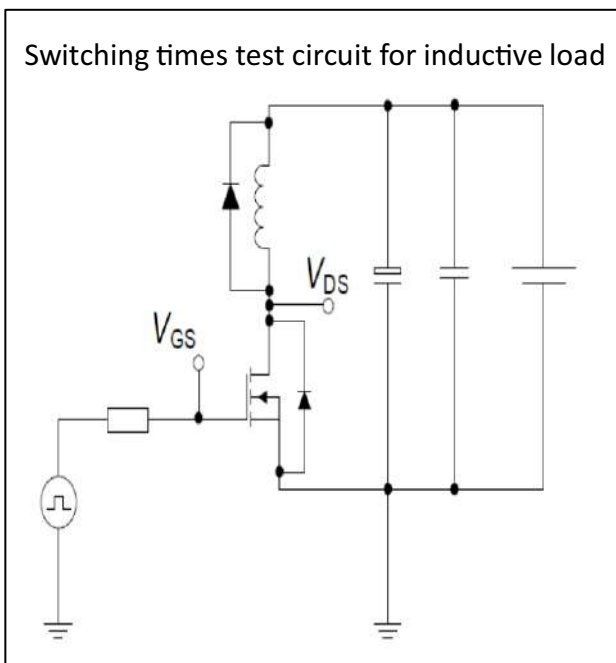
Forward characteristics of reverse diode



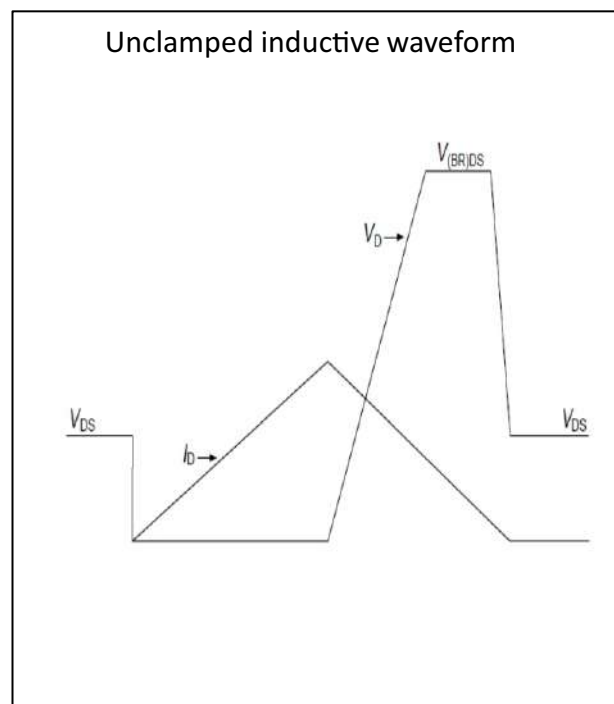
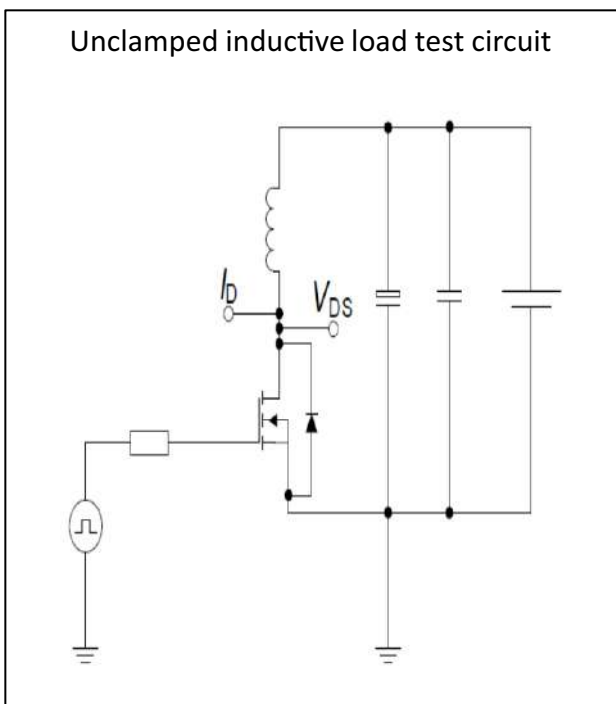
$$I_F=f(V_{SD}); \text{parameter: } T_j$$

Typical Test Circuit

Switching times test circuit and waveform for inductive load

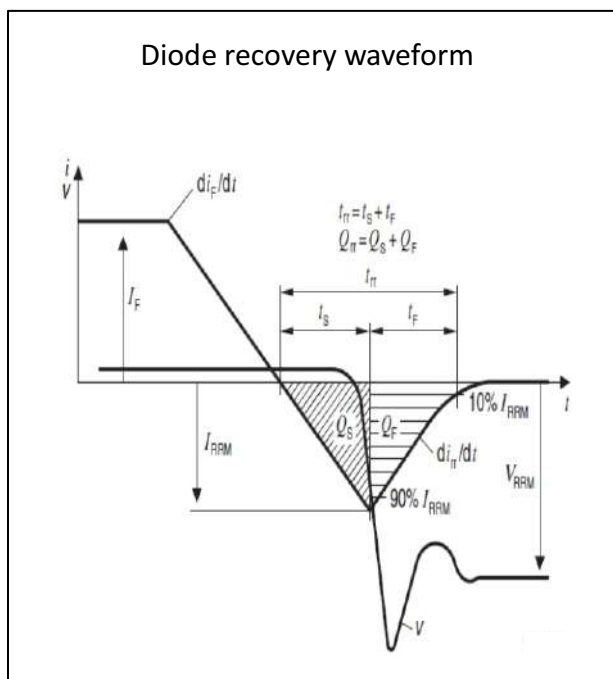
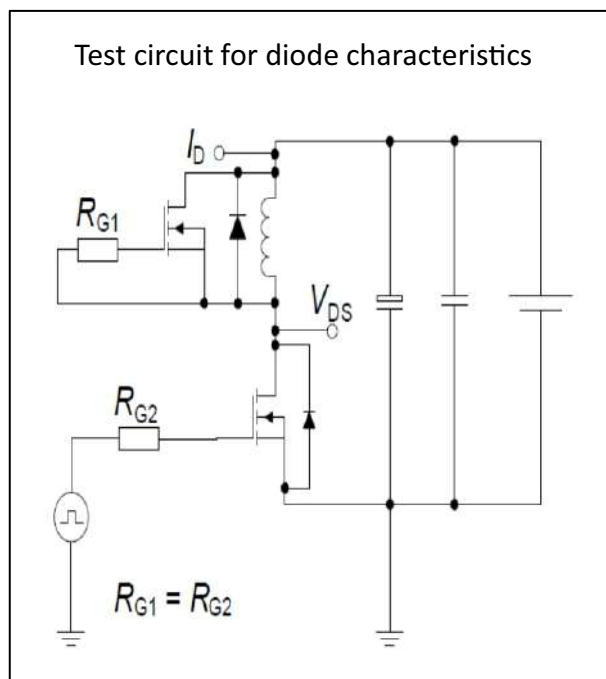


Unclamped inductive load test circuit and waveform

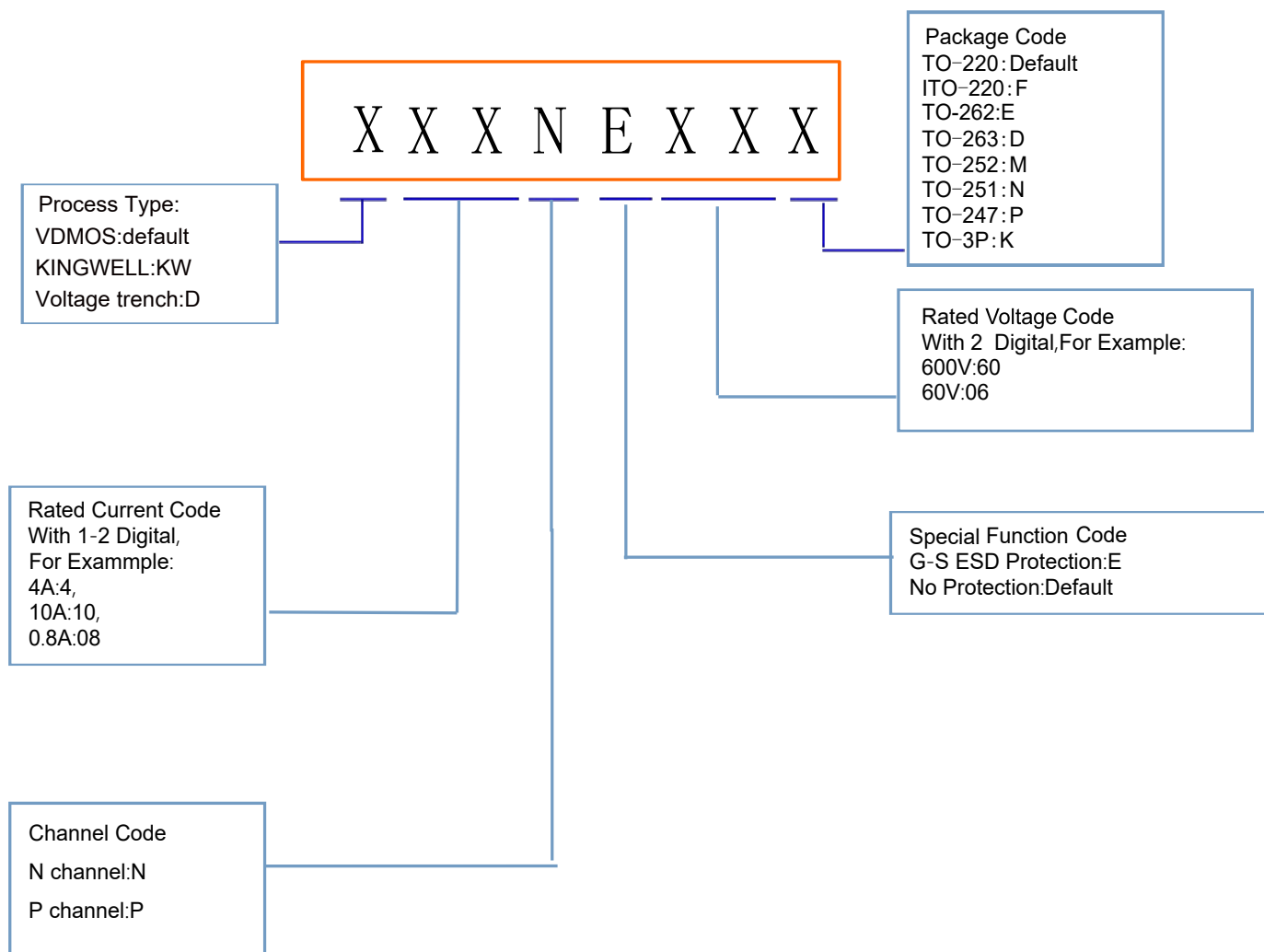


Typical Test Circuit

Test circuit and waveform for diode characteristics

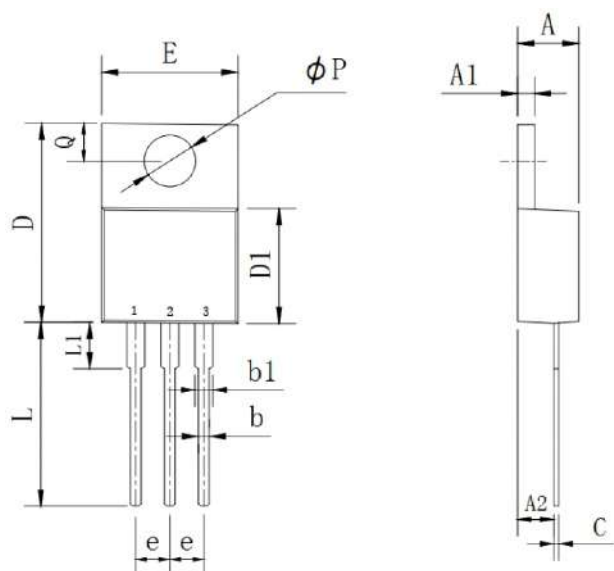


Product Names Rules



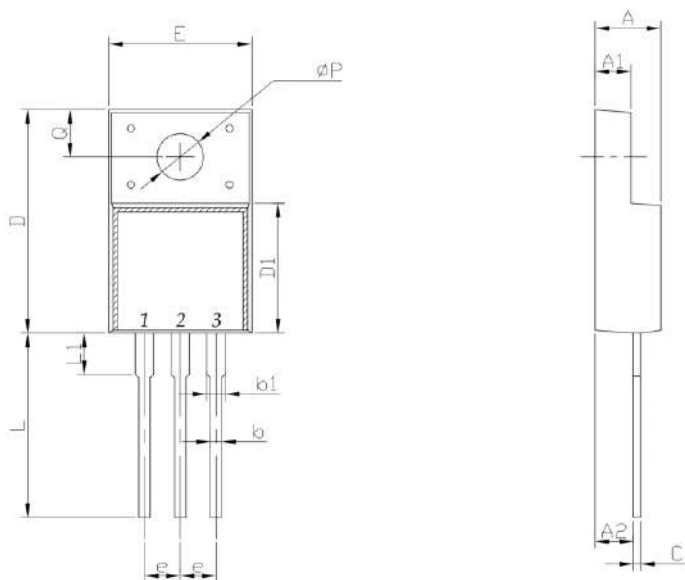
Dimensions

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

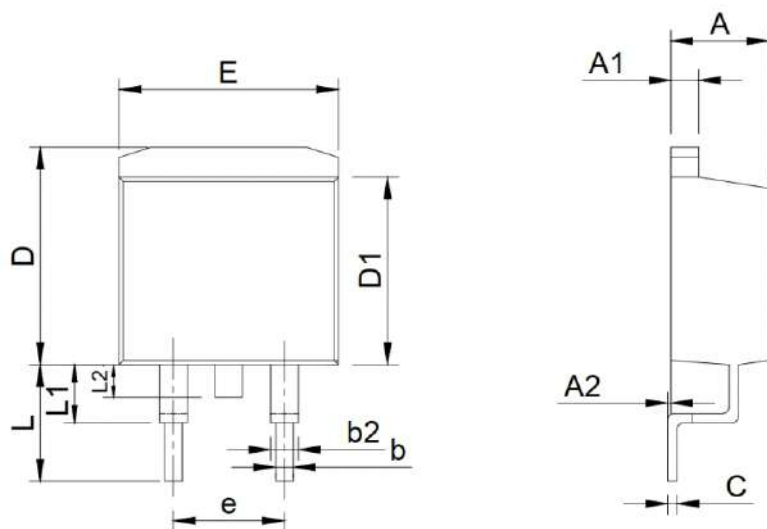
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

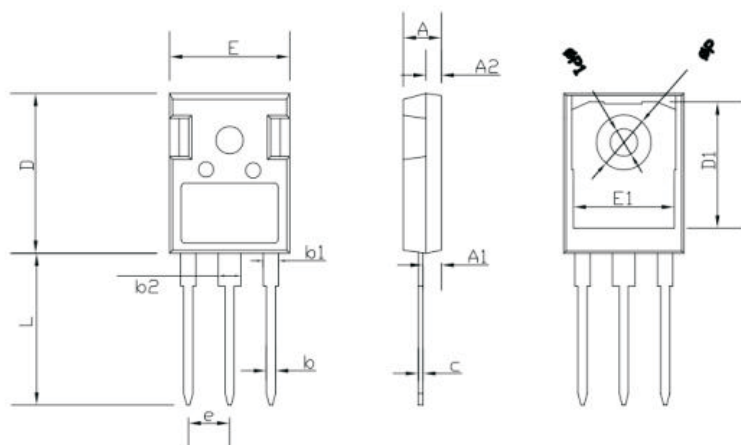
Dimensions

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

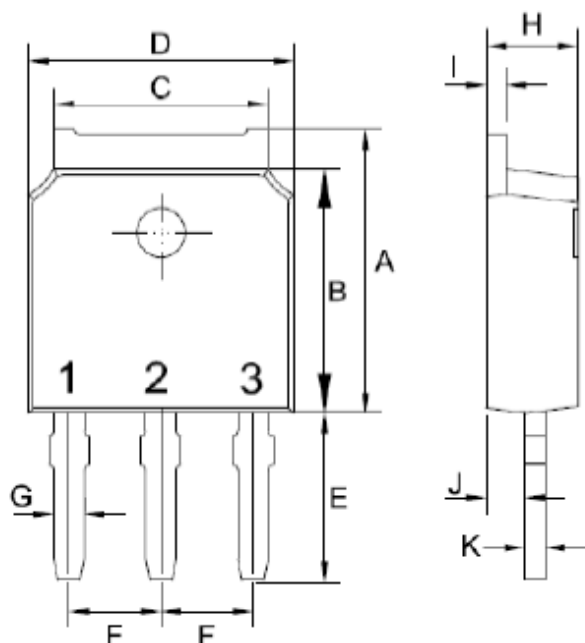
TO-247 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.0772	0.0812
b2	2.96	3.06	0.117	0.121
c	0.59	0.66	0.0232	0.0260
D	20.90	21.10	0.8235	0.8313
D1	16.25	16.85	0.6403	0.6639
E	15.70	15.90	0.6186	0.6265
E1	13.10	13.50	0.5161	0.5319
e	5.44		0.2143	
L	19.80	20.10	0.7801	0.7919
ΦP	3.50	3.70	0.1379	0.1458
ΦP1	0	7.30	0	0.2876

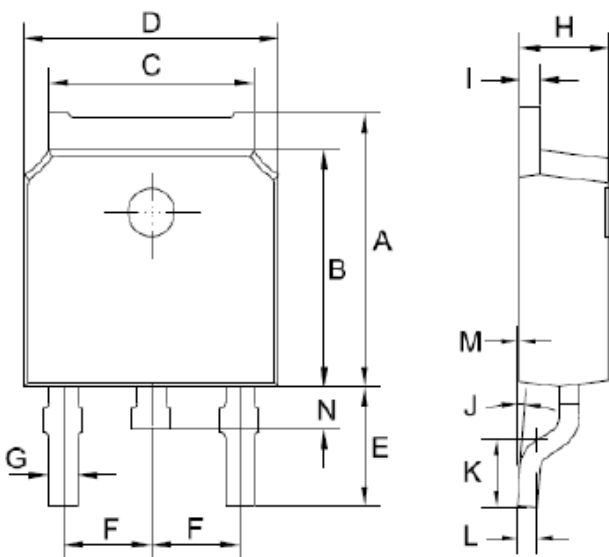
Dimensions

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	0.85	0.016	0.033
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