

180A 40V N-Channel Enhancement Mode Power MOSFET

Description :

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

Features :

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

Mechanical Data :

- Case:TO-220, TO-263, TO-263-7L, ITO-220, TO-252 Package

Application :

- Synchronous rectification in SMPS Hard
- switching and high speed circuit Power
- tools
- UPS
- Motor control

Ordering Information

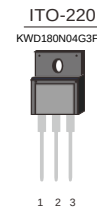
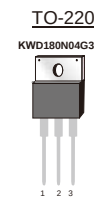
Part No.	Package Type	Package	Quality(box)
KWD180N04G3	TO-220	Tube	1000
KWD180N04G3M	TO-252	Tape & Reel	3000
KWD180N04G3D	TO-263	Tape & Reel	800
KWD180N04G3D7	TO-263-7L	Tape & Reel	800
KWD180N04G3F	ITO-220	Tube	1000

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

Parameter	Symbol	KWD180N04G3 / KWD180N04G3D/ KWD180N04G3D7 / KWD180N04G3M	KWD180N04G3F	Unit
Drain-Source Voltage	V_{DS}	40		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current	$T_c=25^\circ\text{C}$	180	180 ※	A
	$T_c=100^\circ\text{C}$	126	126 ※	
Pulsed Drain Current (Note 1)	I_{DM}	720		A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	576		mJ
Power Dissipation $T_c=25^\circ\text{C}$	P_D	156	35	W
Operating Junction and Storage Temperature	T_J/T_{STG}	-55~+175		$^\circ\text{C}$

※ limited by maximum junction temperature

Product Summary			
V_{DS}	$R_{DS(on)}$ (m Ω) Typ	I_D (A)	Q_g (Typ)
40V	2.0 @ 10V	180	96.7nc



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

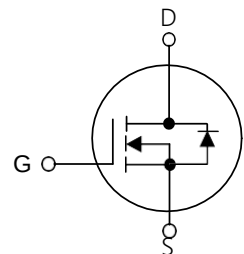


Table 2. Thermal Characteristics

Parameter	Symbol	KWD180N04G3/KWD180N04G3D KWD180N04G3D7/KWD180N04G3M	KWD180N04G3F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.964	4.29	$^{\circ}\text{C}/\text{W}$

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	40	-	-	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =40V,V _{GS} =0V	-	-	1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =20V,V _{DS} =0V	-	-	100	nA
	Reverse		V _{GS} = -20V,V _{DS} =0V	-	-	-100	nA
On Characteristics(Note 4)							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250μA	2.0	3.0	4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =90A	-	2.0	2.5	mΩ
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =20V,V _{GS} =0V,f=1MHz	-	5746	-	pF
Output Capacitance		C _{OSS}		-	847	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	535	-	pF
Gate Resisistance		R _G	V _{DD} =0V,V _{GS} =0V,f=1MHz	-	3.7	-	Ω
Switching Characteristics (Note 5)							
Turn-On Delay Time		t _{d (on)}	V _{DD} =20V,I _D =90A V _{GS} =10V,R _{GEN} =1.6Ω,	-	11	-	ns
Turn-On Rise Time		t _R		-	90	-	ns
Turn-Off Delay Time		t _{d(off)}		-	39	-	ns
Turn-Off Fall Time		t _f		-	101	-	ns
Total Gate Charge		Q _G	V _{DD} =20V,I _D =90A, V _{GS} =10V	-	96.7	-	nC
Gate-Source Charge		Q _{GS}		-	27.3	-	nC
Gate-Drain Charge		Q _{GD}		-	18.2	-	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =30A	-	-	1.2	V
Maximum Continuous Drain-Source Diode Forward Current		I _S		-	-	180	A
Reverse Recovery Time		trr	V _{GS} =0V, I _F =50A	-	33	-	ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs (Note 1)	-	16.4	-	nC

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

$L=0.5\text{mH}, I_D=48A, V_{DD}=32V, V_G=10V$, 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

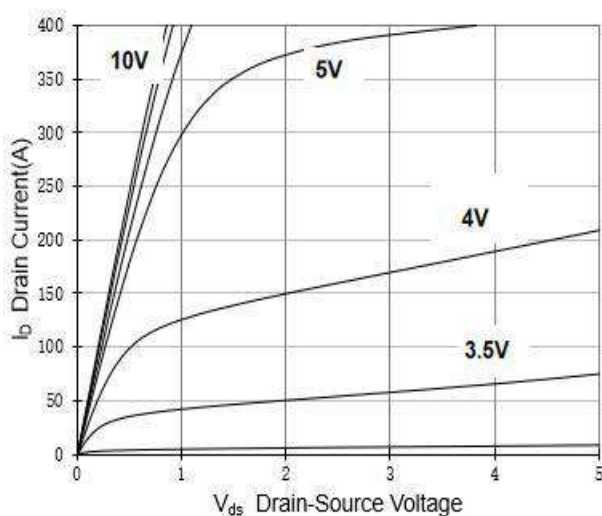


Fig 1. Output Characteristics

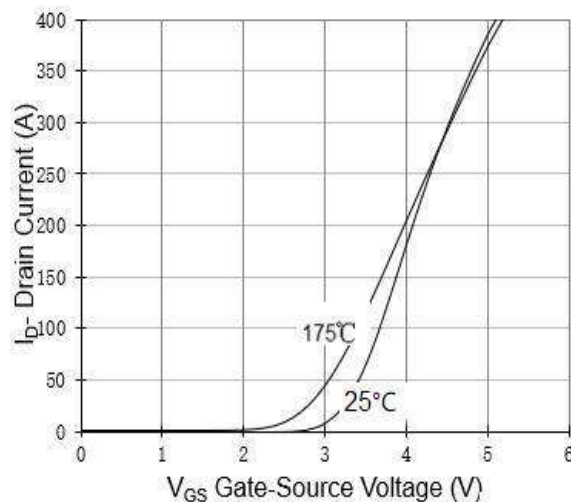


Fig 2. Transfer Characteristics

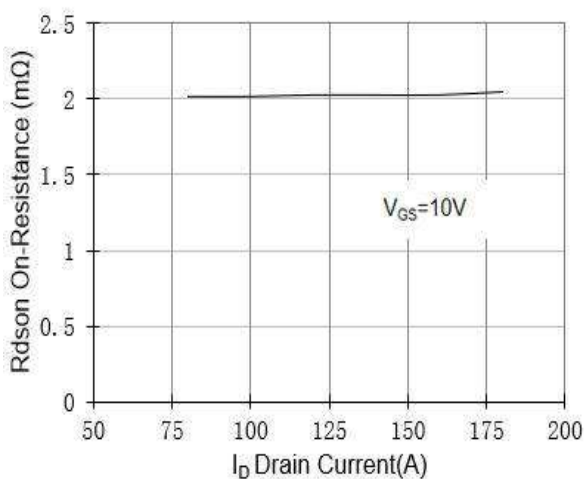


Fig 3. Rdson-Drain Current

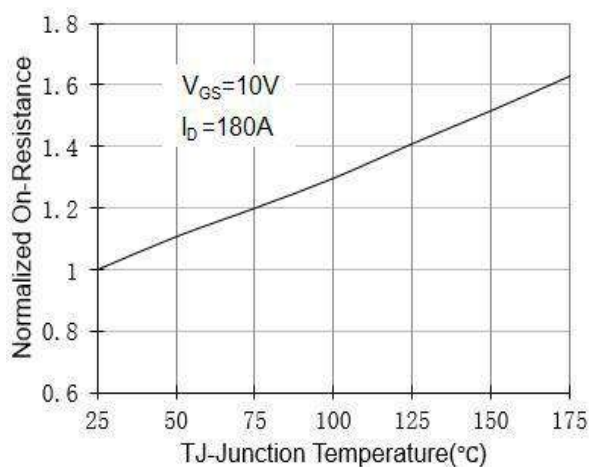


Fig 4. Rdson-Junction Temperature

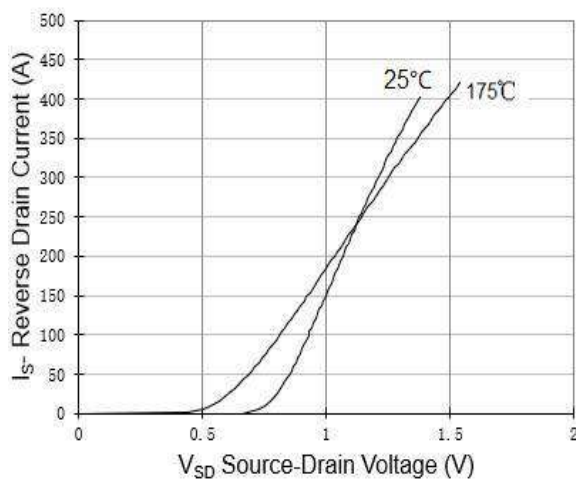


Fig 5. Source-Drain Diode Forward

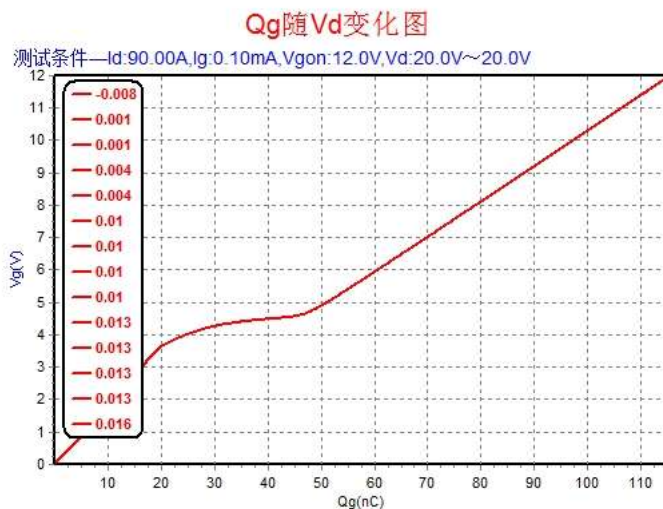


Figure 6 Gate Charge

Typical Characteristics Diagrams

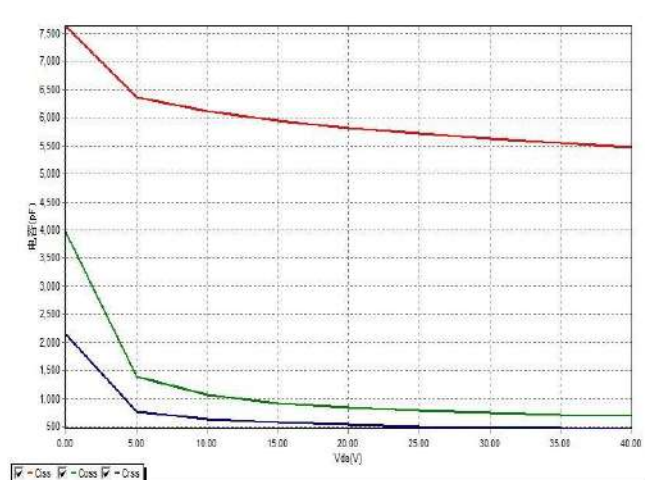


Fig 7. Capacitance vs Vds

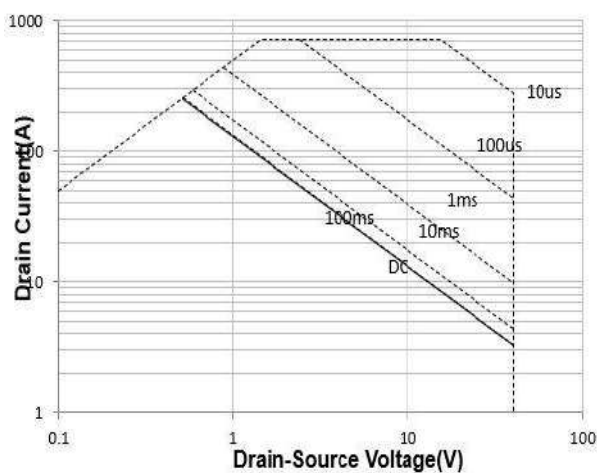


Fig 8. Safe Operation Area

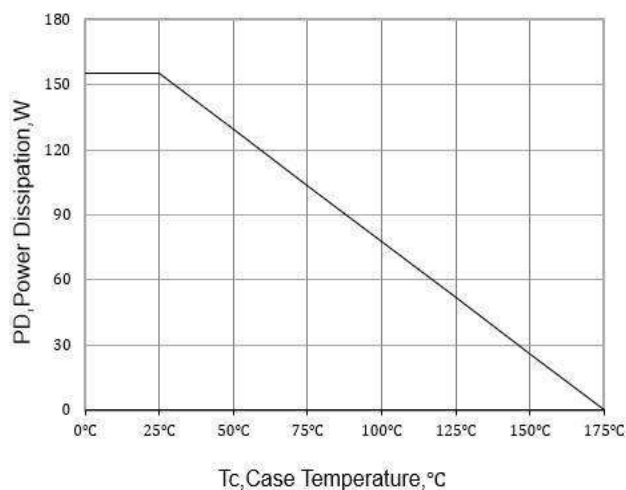


Fig 9. Power De-rating

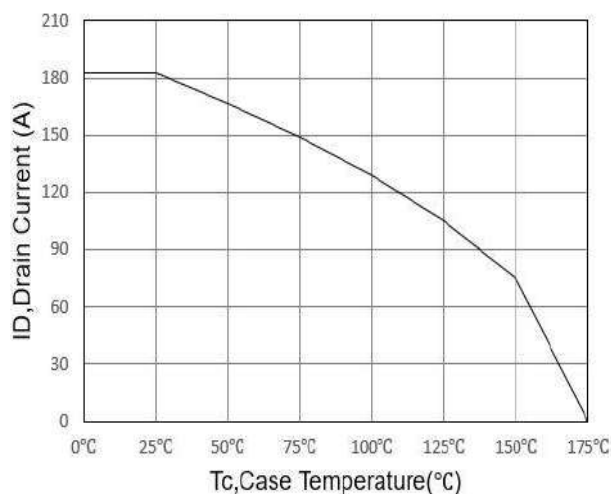


Fig 10. Current De-rating

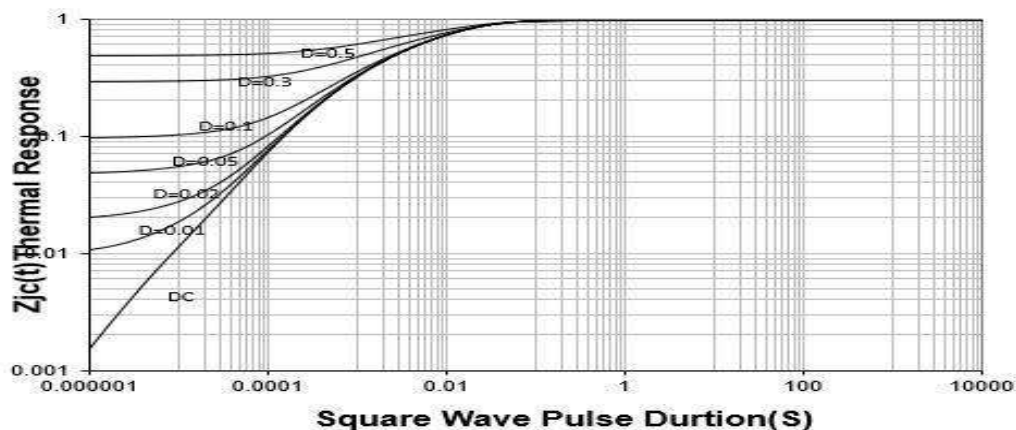
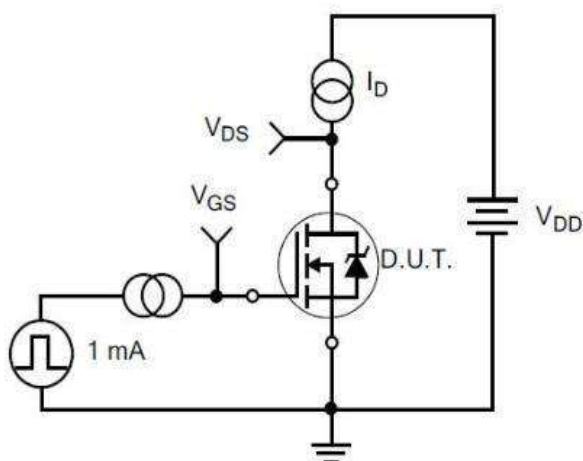
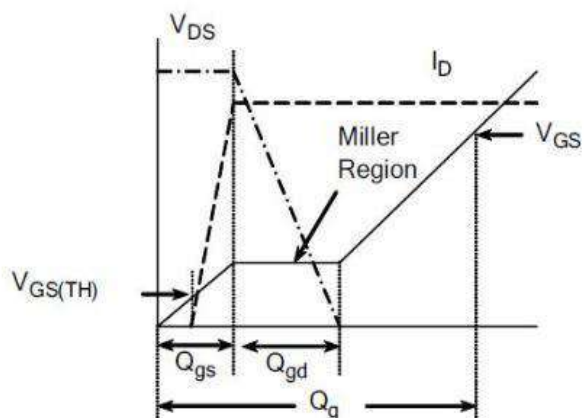


Fig 11. Normalized Maximum Transient Thermal Impedance

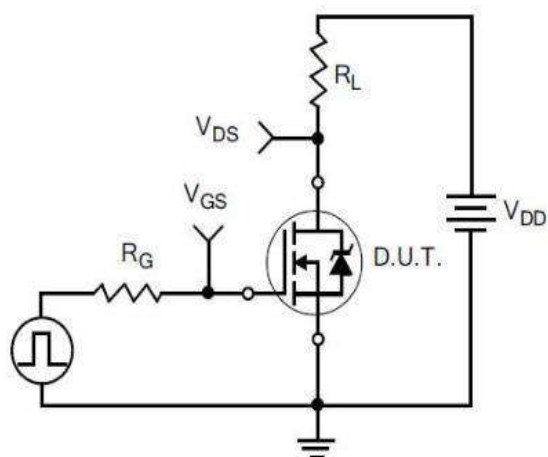
Typical Test Circuit



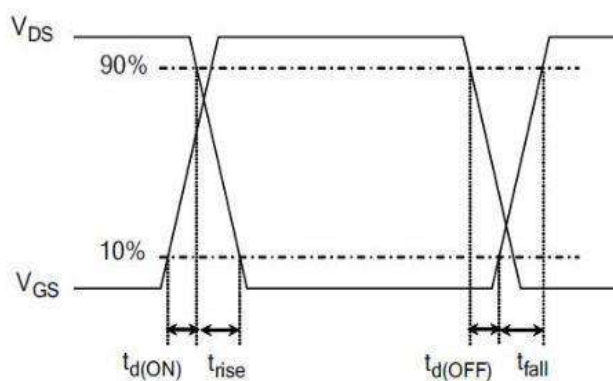
1) Gate Charge Test Circuit



2) Gate Charge Waveform

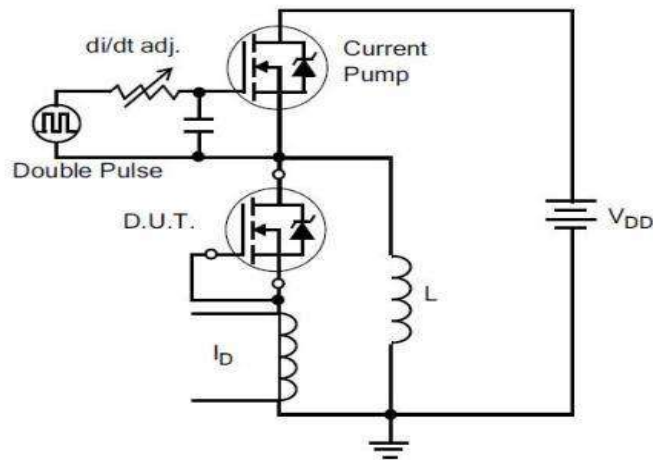


3) Resistive Switching Test Circuit

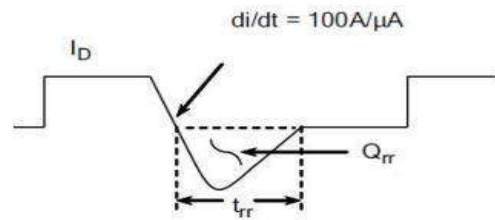


4) Resistive Switching Waveforms

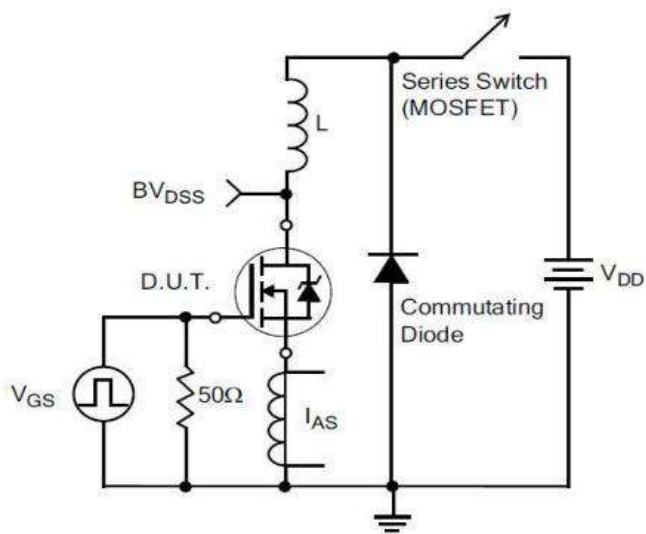
Typical Test Circuit



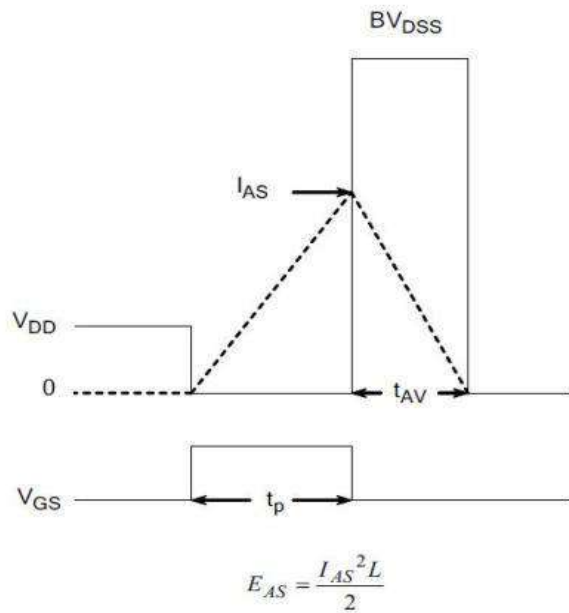
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

Product Names Rules

X X X N E X X X-X X X

Process Type:
 VDMOS:default
 Super junction:SJ
 Low Voltage trench:D

Rdson Code
 2 Ω :2D0
 9.5m Ω :9M5

Rated Current Code
 With 1-2 Digital,
 For Example:
 4A:4,
 10A:10,
 0.8A:08

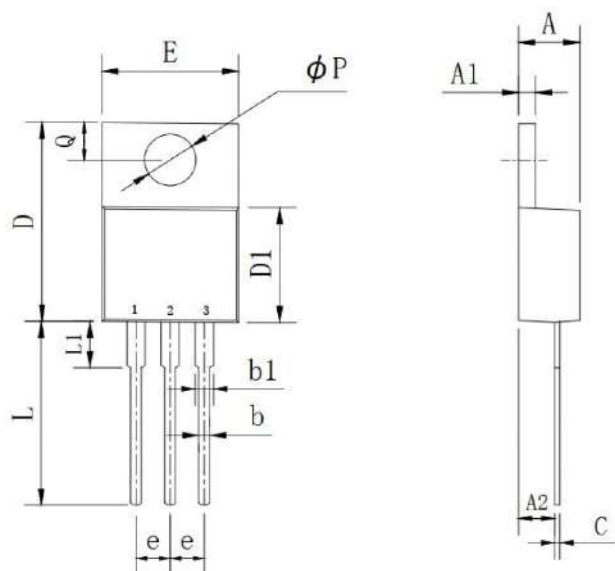
Package Code
 TO-220:Default
 ITO-220:F
 TO-262:E
 TO-263:D
 TO-252:M
 TO-251:N
 TO-263-7L:D7

Rated Voltage Code
 With 2 Digital,For Example:
 600V:60
 60V:06

Channel Code
 N channel:N
 P channel:P

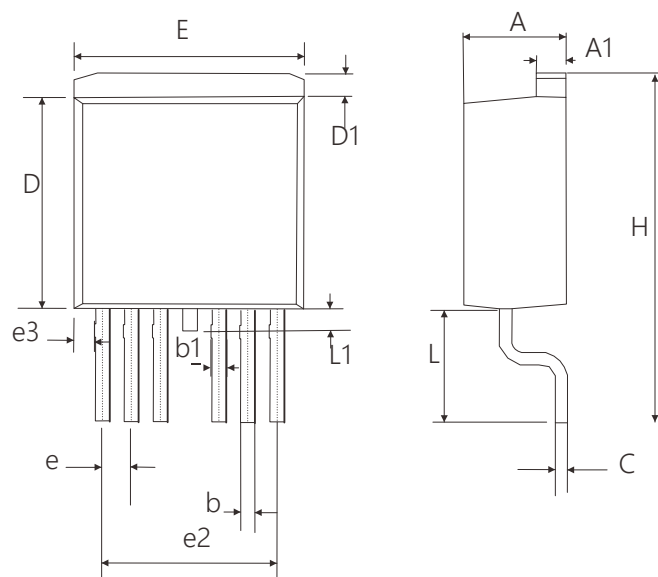
Special Function Code
 G-S ESD Protection:E
 No Protection:Default

TO-220 PACKAGE OUTLINE DIMENSIONS



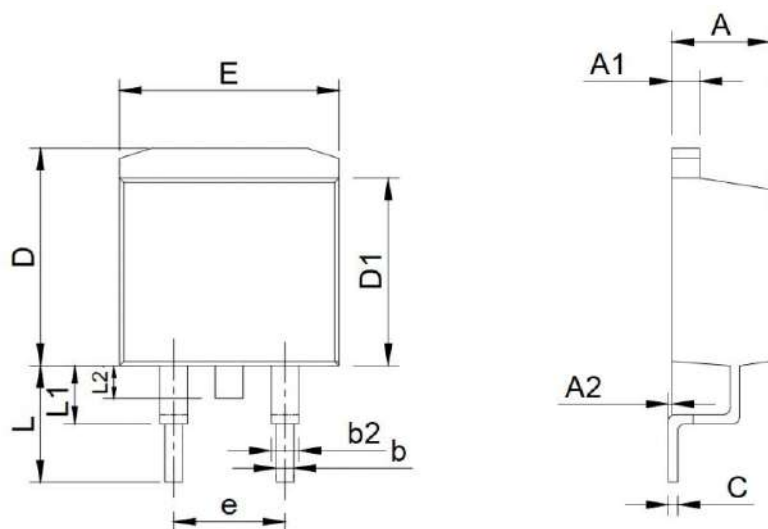
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74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

TO-263-7L PACKAGE OUTLINE DIMENSIONS



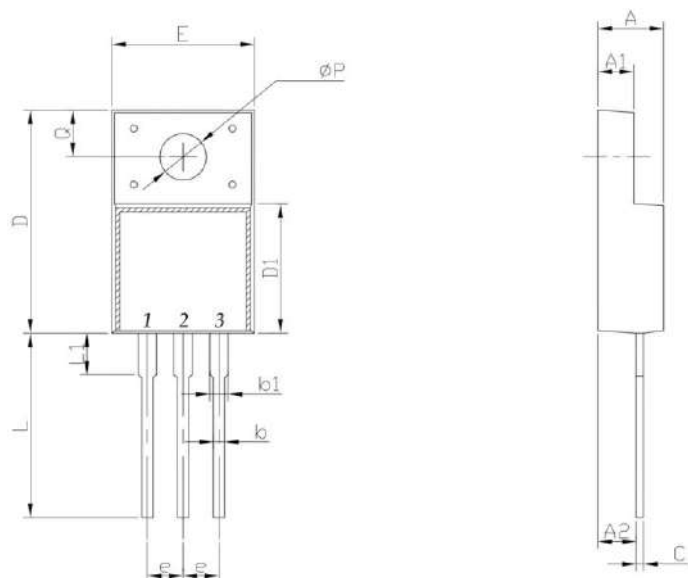
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.75	0.167	0.187
A1	1.2	1.4	0.047	0.055
b	0.5	0.7	0.020	0.028
b1	0.5	0.9	0.020	0.035
C	0.4	0.6	0.016	0.024
D	9.05	9.45	0.356	0.372
D1	0.7	1.3	0.028	0.051
E	9.8	10.2	0.386	0.402
e	1.07	1.47	0.042	0.058
e2	7.32	7.92	0.288	0.312
e3	0.64	1.04	0.025	0.041
H	14.65	15.65	0.577	0.616
L	4.47	5.47	0.176	0.215
L1	0.90	1.50	0.035	0.059

TO-263 PACKAGE OUTLINE DIMENSIONS



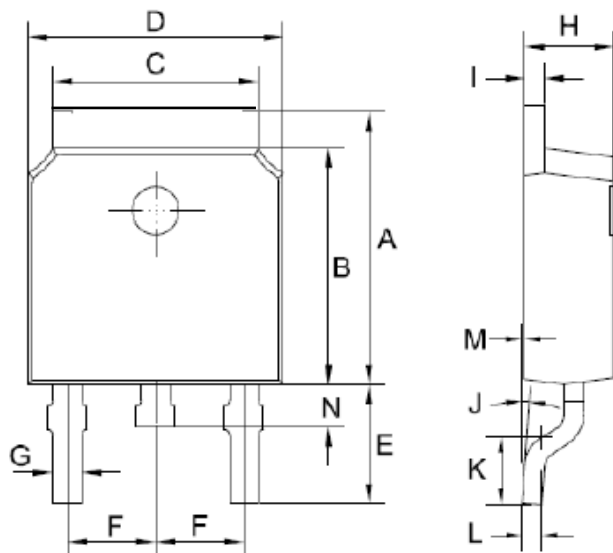
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	0	0.25	0.000	0.010
b	0.61	1.01	0.024	0.040
b1	1.2	1.34	0.047	0.053
C	0.3	0.6	0.012	0.024
D	9.48	10.84	0.373	0.427
D1	8.49	9.3	0.334	0.366
E	9.7	10.31	0.382	0.406
e	4.88	5.28	0.192	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

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-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	0.4	0.8	0.016	0.031
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