

180A 40V N-Channel Enhancement Mode Power MOSFET

Description :

These N- channel enhancement mode power mosfets Used advanced split 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, ITO-220, TO-263, TO-262, TO-251, TO-252 Package

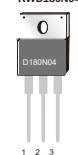
Application :

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

Product Summary			
V_{DS}	$R_{DS(on)}$ (m Ω) Typ	I_D (A)	Q_g (Typ)
40V	2.0 @ 10V	180	59.4nc

TO-220

KWD180N04



ITO-220

KWD180N04F



TO-263

KWD180N04D



TO-262

KWD180N04E



TO-251

KWD180N04N



TO-252

KWD180N04M



Ordering Information

Part No.	Package Type	Package	Quality(box)
KWD180N04	TO-220	Tube	1000
KWD180N04F	ITO-220	Tube	1000
KWD180N04D	TO-263	Tape & Reel	800
KWD180N04E	TO-262	Tube	1000
KWD180N04N	TO-251	Tube	1000
KWD180N04M	TO-252	Tape & Reel	3000

Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

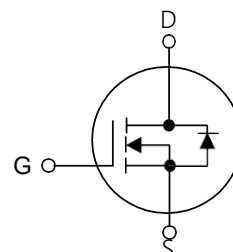


Table1 Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

Parameter		Symbol	KWD180N04 / KWD180N04D / KWD180N04E / KWD180N04M / KWD180N04N	KWD180N04F	Unit
Drain-Source Voltage		V_{DS}	40		V
Gate-Source Voltage		V_{GS}	± 20		V
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	180		A
	$T_C=100^{\circ}\text{C}$		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}	$-55 \sim +175$		$^{\circ}\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	KWD180N04 / KWD180N04D / KWD180N04E / KWD180N04M / KWD180N04N	KWD180N04F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	75	$^{\circ}\text{C/W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.964	4.29	$^{\circ}\text{C/W}$

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	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	1.0	1.9	3.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =90A	-	2.0	2.5	mΩ
			V _{GS} =4.5V,I _D =90A	-	3.0	3.6	
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =20V,V _{GS} =0V,f=1MHz	-	3565	-	pF
Output Capacitance		C _{OSS}		-	1646	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	73	-	pF
Gate Resitance		R _G	V _{DD} =0V,V _{GS} =0V,f=1MHz	-	2.3	-	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	V _{DD} =20V,I _D =90A, V _{GS} =10V	-	101	-	ns
Total Gate Charge		Q _G		-	39.4	-	nC
Gate-Source Charge		Q _{GS}		-	17.7	-	nC
Gate-Drain Charge		Q _{GD}		-	10.3	-	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		t _{rr}	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

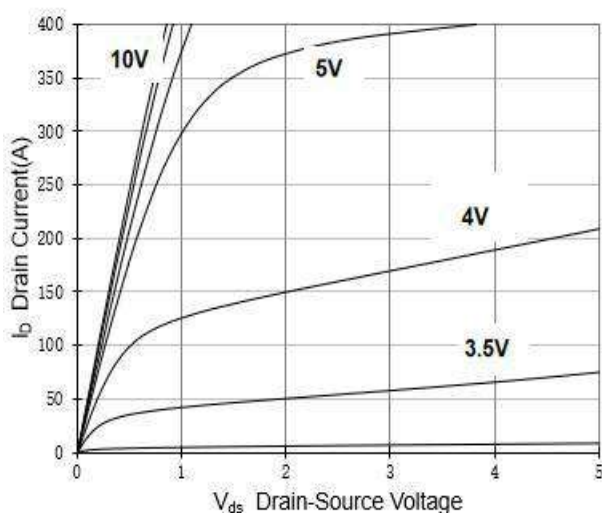


Fig 1. Output Characteristics

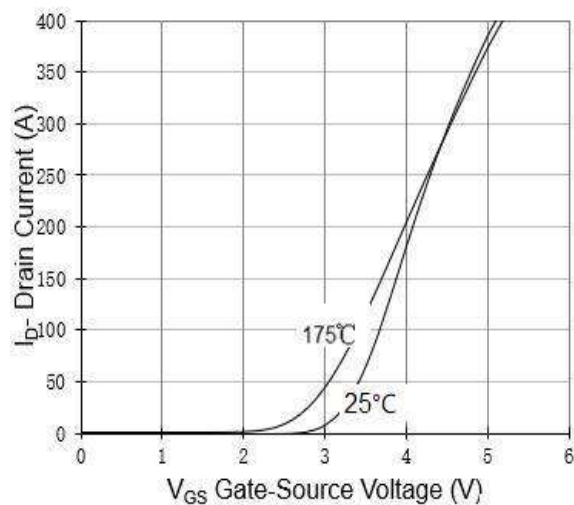


Fig 2. Transfer Characteristics

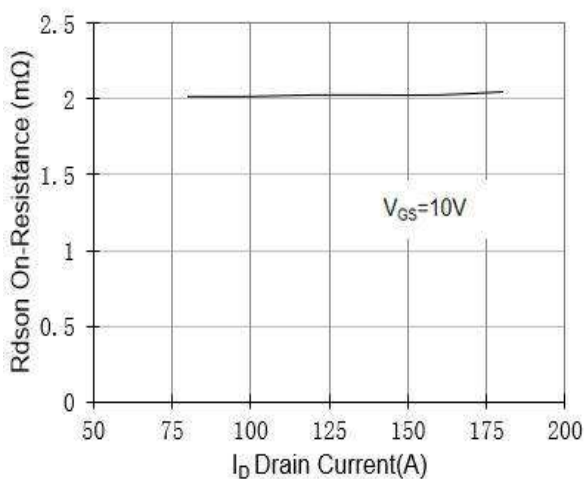


Fig 3. Rdson-Drain Current

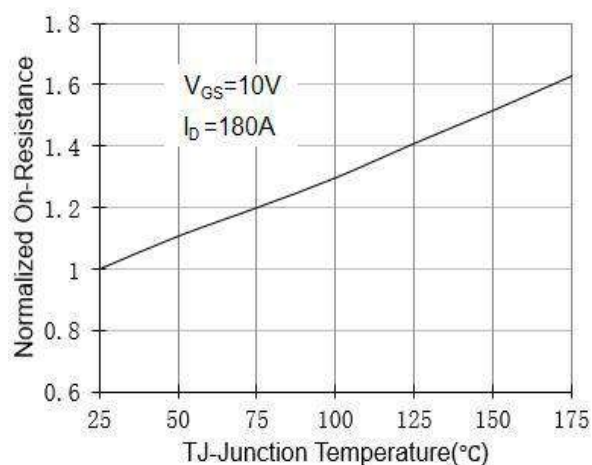


Fig 4. Rdson-Junction Temperature

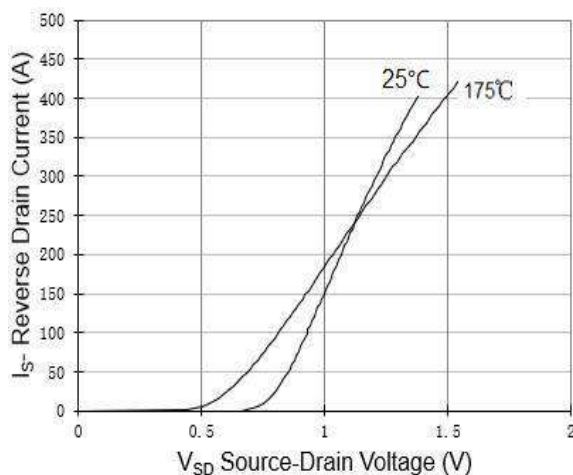


Fig 5. Source-Drain Diode Forward

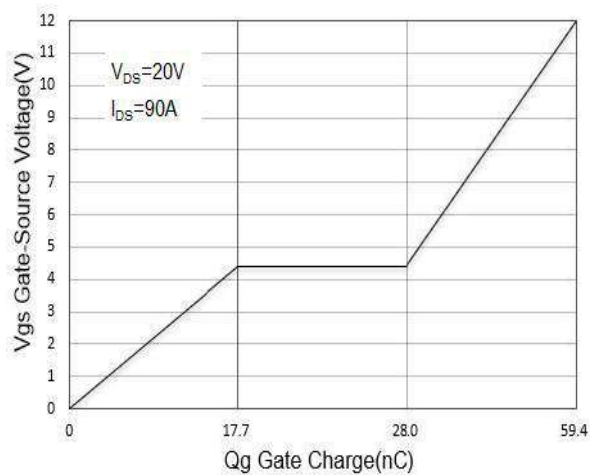


Figure 6 Gate Charge

Typical Characteristics Diagrams

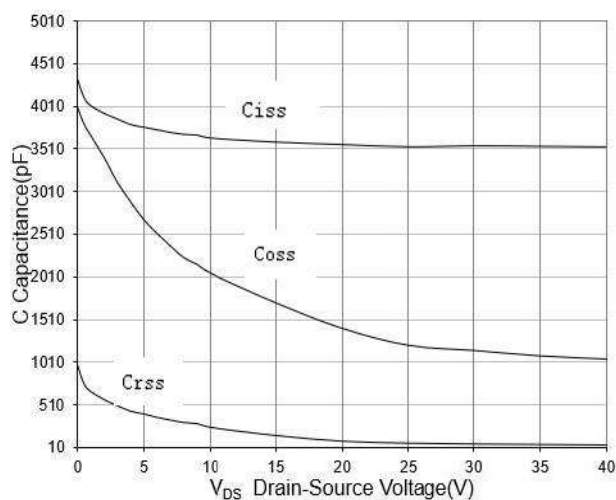


Fig 7. Capacitance vs Vds

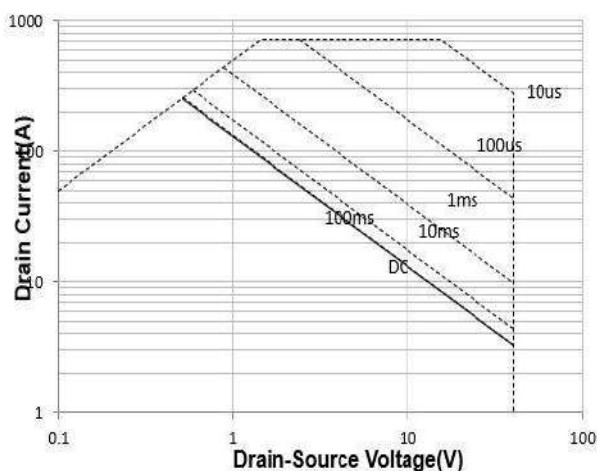


Fig 8. Safe Operation Area

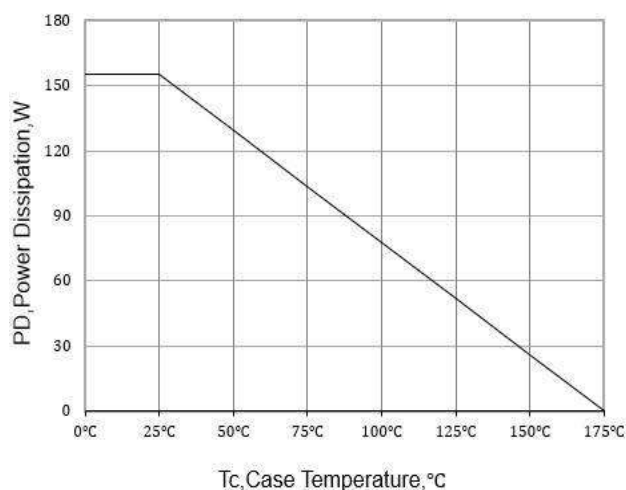


Fig 9. Power De-rating

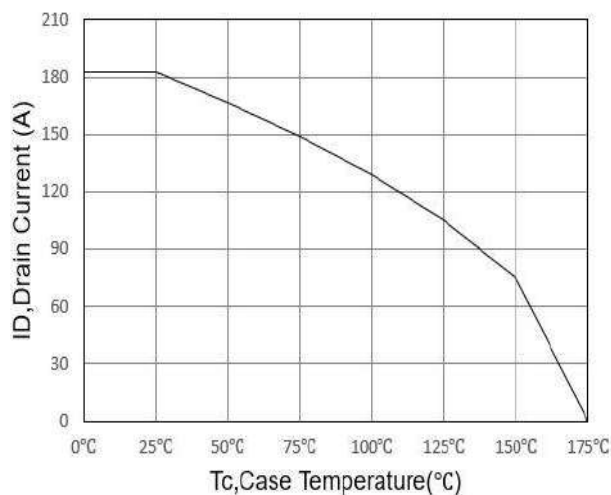


Fig 10. Current De-rating

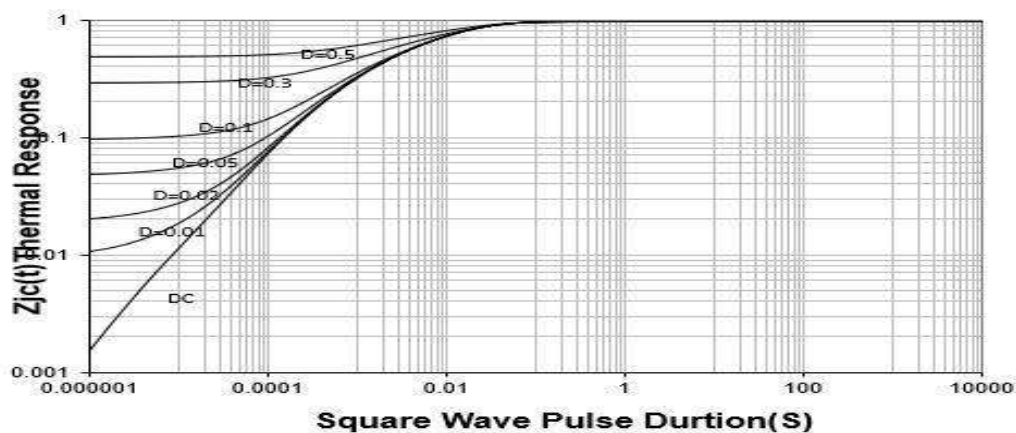
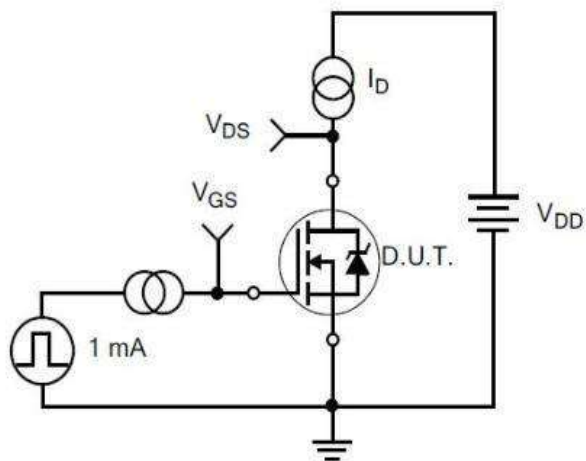
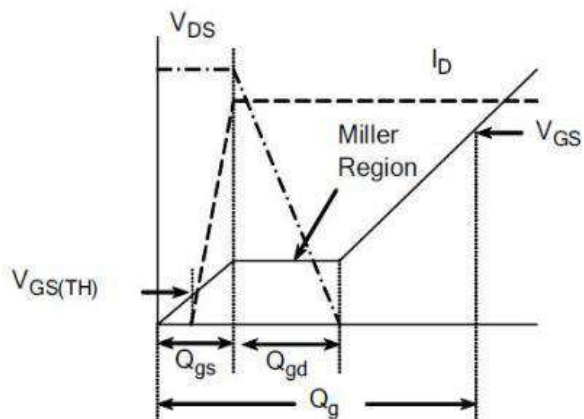


Fig 11. Normalized Maximum Transient Thermal Impedance

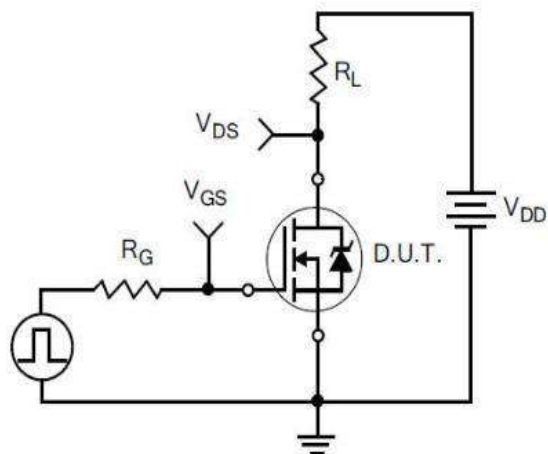
Typical Test Circuit



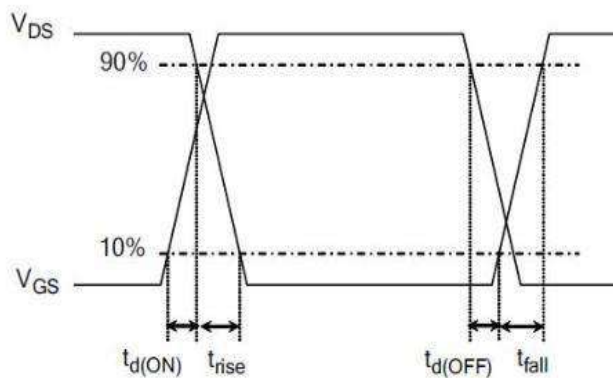
1) Gate Charge Test Circuit



2) Gate Charge Waveform

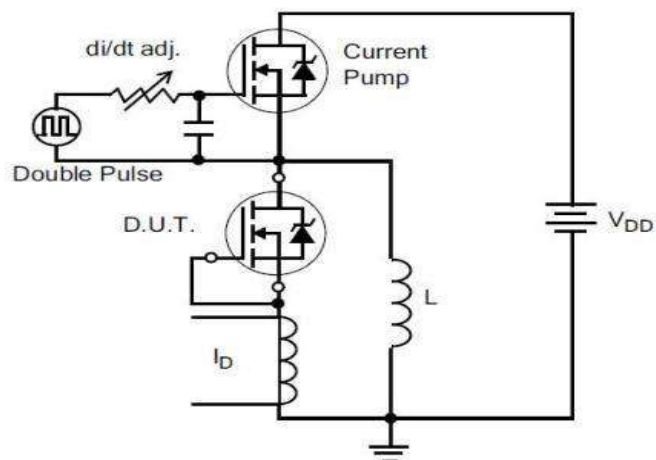


3) Resistive Switching Test Circuit

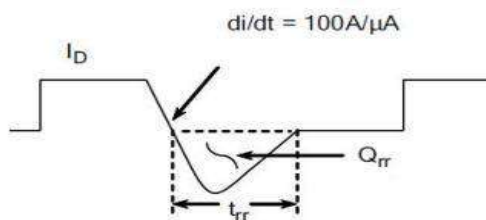


4) Resistive Switching Waveforms

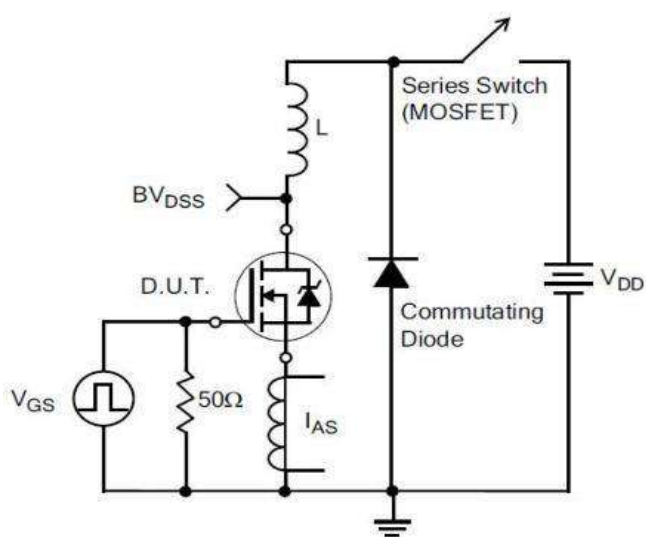
Typical Test Circuit



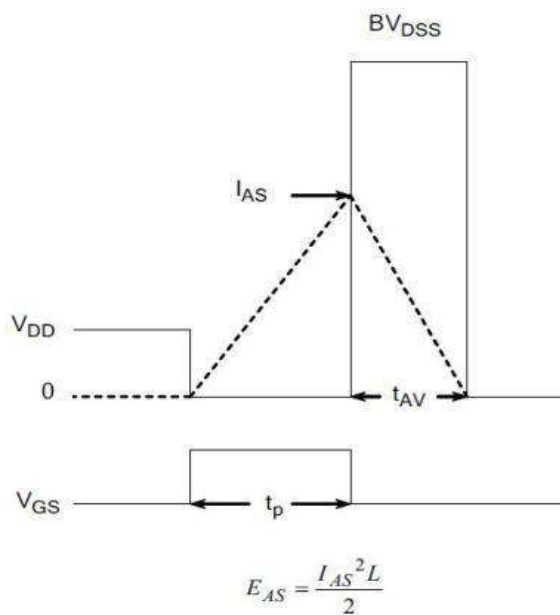
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

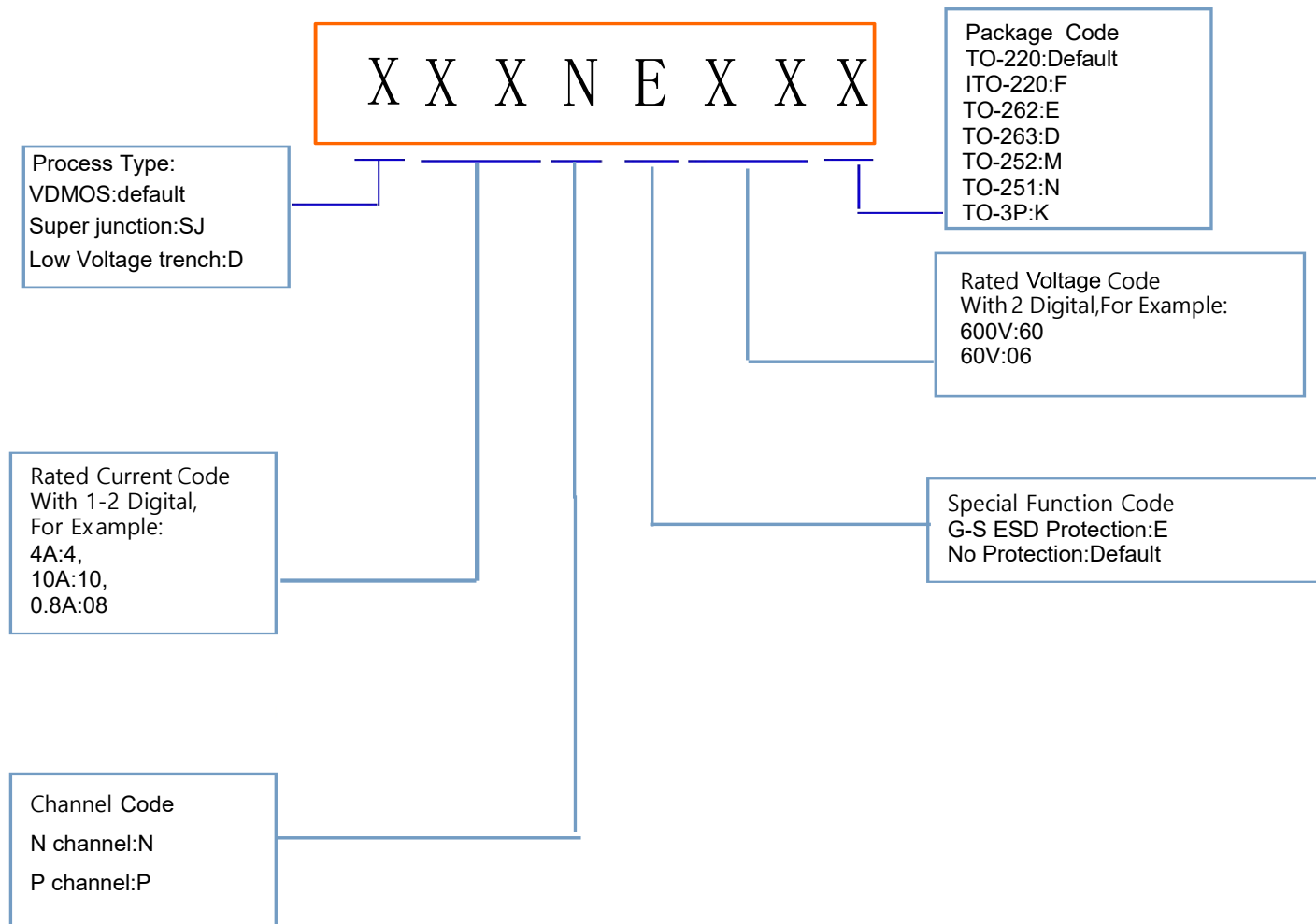


7) . Unclamped Inductive Switching Test Circuit

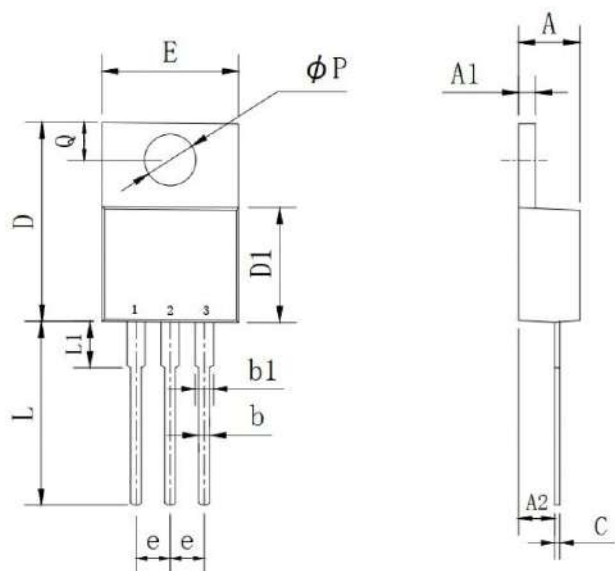


8) Unclamped Inductive Switching Waveforms

Product Names Rules

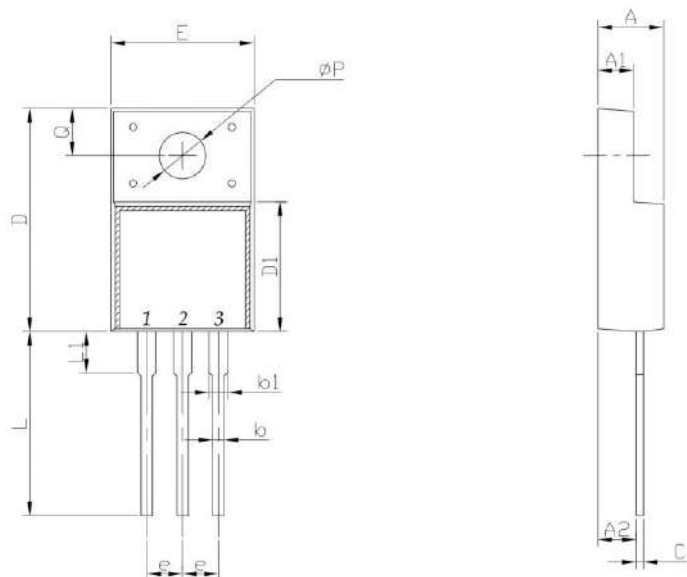


TO-220 PACKAGE OUTLINE DIMENSIONS



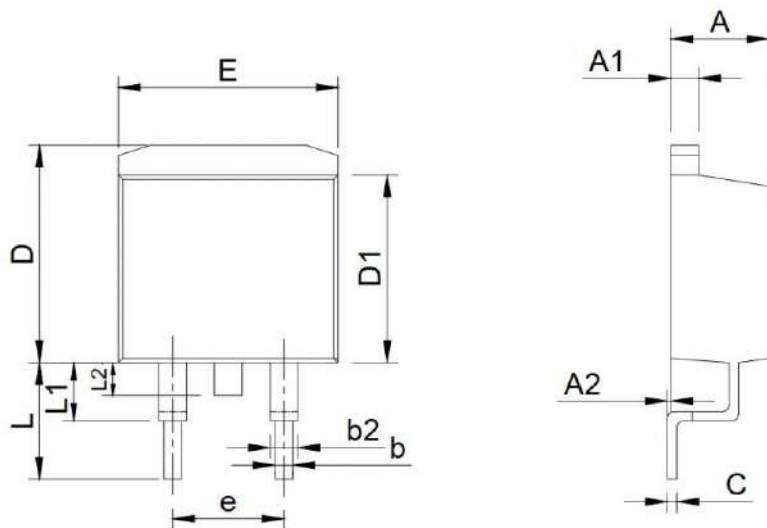
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74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



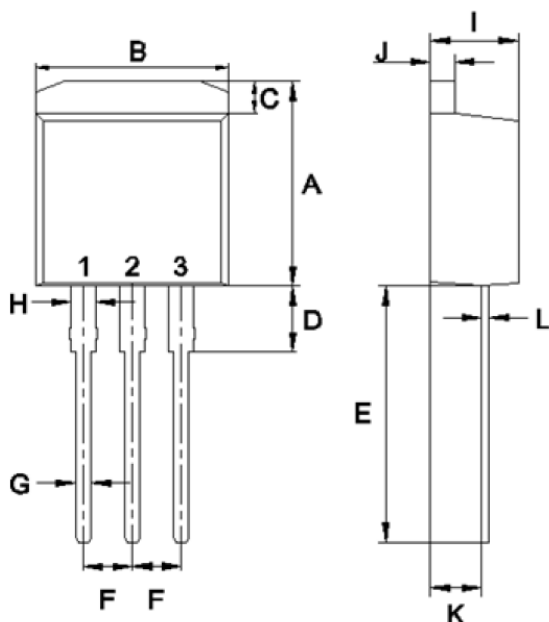
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108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



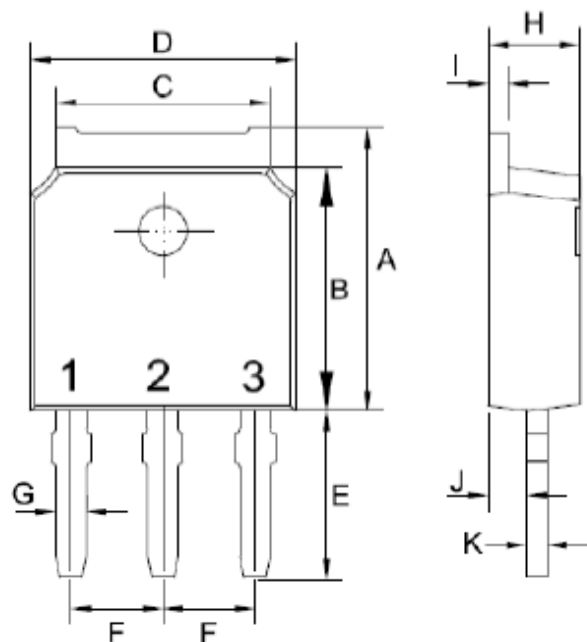
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	0	0.25	0.000	0.010
b	0.61	1.01	0.024	0.040
b1	1.2	1.34	0.047	0.053
C	0.3	0.6	0.012	0.024
D	9.48	10.84	0.373	0.427
D1	8.49	9.3	0.334	0.366
E	9.7	10.31	0.382	0.406
e	4.88	5.28	0.192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



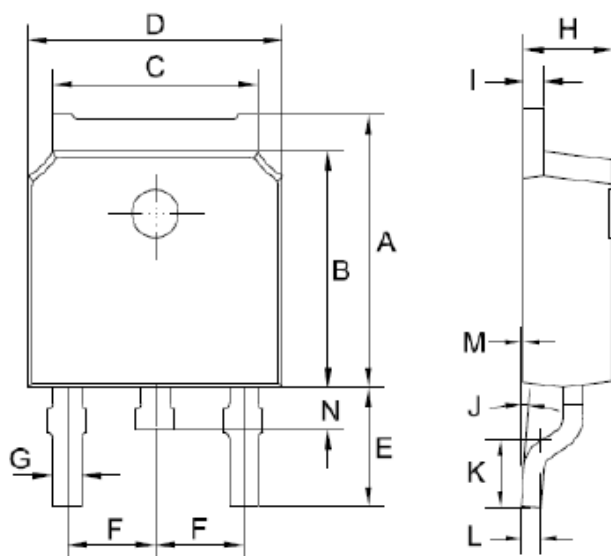
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	10.14	11.14	0.399	0.439
B	9.57	10.57	0.377	0.416
C	1.15	1.84	0.045	0.072
D	2.95	3.95	0.116	0.156
E	12.25	13.75	0.482	0.541
F	2.34	2.74	0.092	0.108
G	0.51	1.11	0.020	0.044
H	0.97	1.57	0.038	0.062
I	4.25	4.87	0.167	0.192
J	1.07	1.47	0.042	0.058
K	2.03	2.92	0.080	0.115
L	0.3	0.6	0.012	0.024

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