WEITRON

4N60

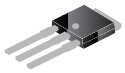
Surface Mount N-Channel Power MOSFET

Lead(Pb)-Free

DRAIN CURRENT
4 AMPERES
DRAIN SOURCE VOLTAGE
600 VOLTAGE

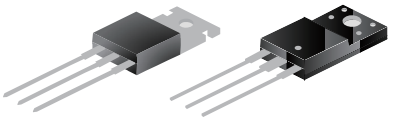
Description:

The WEITRON 4N60 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.



D-PAK3/(TO-251)

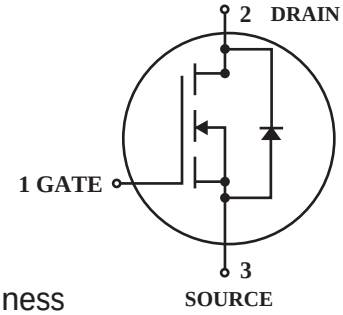
D-PAK/(TO-252)



TO-220 **TO-220F**

Features:

* $R_{DS(ON)}$ =2.5 Ohms @V_{GS} =10V
* Ultra low gate charge
* Low reverse transfer Capacitance
* Fast switching capability
* Avalanche energy Specified
* Improved dv/dt capability, high ruggedness



Maximum Ratings (T_A=25 °C Unless Otherwise Specified)

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	600	V
Gate-Source Voltage	V_{GSS}	±30	
Avalanche Current - (Note 1)	I_{AR}	4.4	A
Continuous Drain Current @ T_C=25˚C @ T_C=100˚C	I_D	4.0 2.8	
Pulsed Drain Current, T_P Limited by T_{JMAX} - (Note 1)	I_{DM}	16	
Avalanche Energy, Single Pulsed (Note 2)	E_{AS}	276	mJ
Avalanche Energy, Repetitive, Limited by T_{JMAX}	E_{AR}	10.6	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns
Total Power Dissipation 4N60P(T_C=25˚C) 4N60F(T_C=25˚C) 4N60I/D(T_C=25˚C) 4N60P(Derate above25˚C) 4N60F(Derate above25˚C) 4N60I/D(Derate above25˚C)	P_D	 100 33 77 0.8 0.26 0.69	W
Operating Junction and Storage Temperature Range	TJ,Tstg	-55~+150	˚C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

Electrical Characteristics (T_A = 25℃ Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Static					
Drain-Source Breakdown Voltage @V_{GS}=0,I_D=250μA	BV_{DSS}	600	-	-	V
Gate Threshold Voltage @V_{DS}=V_{GS},I_D=250μA	$V_{GS(Th)}$	2.0	-	4.0	V
Gate-Source Leakage current Forward@V_{GS}=30V,V_{DS}=0V ReVerse@V_{GS}=-30V,V_{DS}=0V	I_{GSS}	- -	- -	100 -100	nA
Drain-SourceLeakage Current(Tj=25˚C) @V_{DS}=600V,V_{GS}=0 Drain-SourceLeakage Current(Tj=125˚C) @V_{DS}=480V,V_{GS}=0	I_{DSS}	- -	- -	10 100	μA
Drain-Source On-State Resistance @V_{GS}=10V,I_D=2.0A	$R_{DS(on)}$	-	-	2.5	Ω
Forward Transconductance @V_{DS}=50V,I_D=2.2A(Note 4)	gfs	-	4.0	-	S
Breakdown Voltage Temperature Coefficient I_D =250 μA, Referenced to 25°C	ΔBV_{DSS} /ΔT_J	-	0.6	-	V/˚C
Dynamic					
Input Capacitance @V_{GS}=0V,V_{DS}=25V,f=1.0MHz	C_{iss}	-	672	-	pF
Output Capacitance @V_{GS}=0V,V_{DS}=25V,f=1.0MHz	C_{oss}	-	66	-	pF
Reverse Transfer Capacitance @V_{GS}=0V,V_{DS}=25V,f=1.0MHz	C_{rss}	-	4.7	11	pF
Switching					
Turn-on Delay Time V_{DD}=300V,I_D =4.4A,R_G=25Ω(Note 4, 5)	$t_{d(on)}$	-	27	-	ns
Turn-on Rise Time V_{DD}=300V,I_D =4.4A,R_G=25Ω(Note 4, 5)	t_r	-	19	-	ns
Turn-off Delay Time V_{DD}=300V,I_D =4.4A,R_G=25Ω(Note 4, 5)	$t_{d(off)}$	-	160	-	ns
Turn-off Fall Time V_{DD}=300V,I_D =4.4A,R_G=25Ω(Note 4, 5)	t_f	-	22	-	ns
Total Gate Charge V_{DS}=480V,V_{GS}=10V,I_D=4.4(Note 4, 5)	Q_g	-	19.8	-	nC
Gate-Source Charge V_{DS}=480V,V_{GS}=10V,I_D=4.4(Note 4, 5)	Q_{gs}	-	4.0	-	nC
Gate-Drain Change V_{DS}=480V,V_{GS}=10V,I_D=4.4(Note 4, 5)	Q_{gd}	-	7.2	-	nC

Electrical Characteristics (T_A = 25℃ Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit

Source-Drain Diode Characteristics

Drain-Source Diode Forward Voltage @V_{GS}=0V,I_S=4.0A	V_{SD}	-	-	1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S	-	-	4.4	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	-	-	16.0	A
Reverse Recovery Time @V_{GS}=0V,I_S=4A,dI$_F$/dt=100A/μs (Note 4)	T_{rr}	-	300	-	ns
Reverse Recovery Charge @V_{GS}=0V,I_S=4A,dI$_F$/dt=100A/μs(Note 4)	Q_{rr}	-	3.4	-	μC

Thermal Data

Junction-to-Ambient	4N60P 4N60F 4N60I/D	θ_{JA}	-	-	62.5 120 112	°C/W
Junction-to-Case	4N60P 4N60F 4N60I/D	θ_{JC}	-	-	1.25 3.79 2.2	°C/W

Note: 1. Repetitive Rating : Pulse width limited by T_J
2. L = 30mH, I_{AS} = 3.81A, V_{DD} = 175V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 4.4A, di/dt ≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Ordering Information

Order Number	Package	Pin Assignment			Packing
		1	2	3	
4N60P	TO-220	G	D	S	Tube
4N60F	TO-220F	G	D	S	Tube
4N60I	D-PAK3/TO-251	G	D	S	Tube
4N60D	D-PAK/TO-252	G	D	S	Tube

Test Circuits And Waveforms

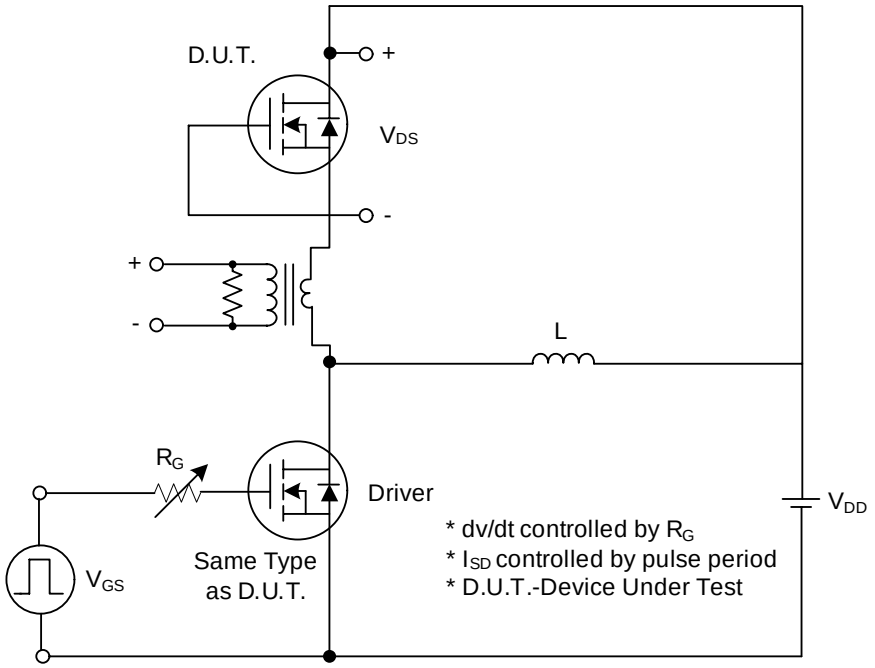


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

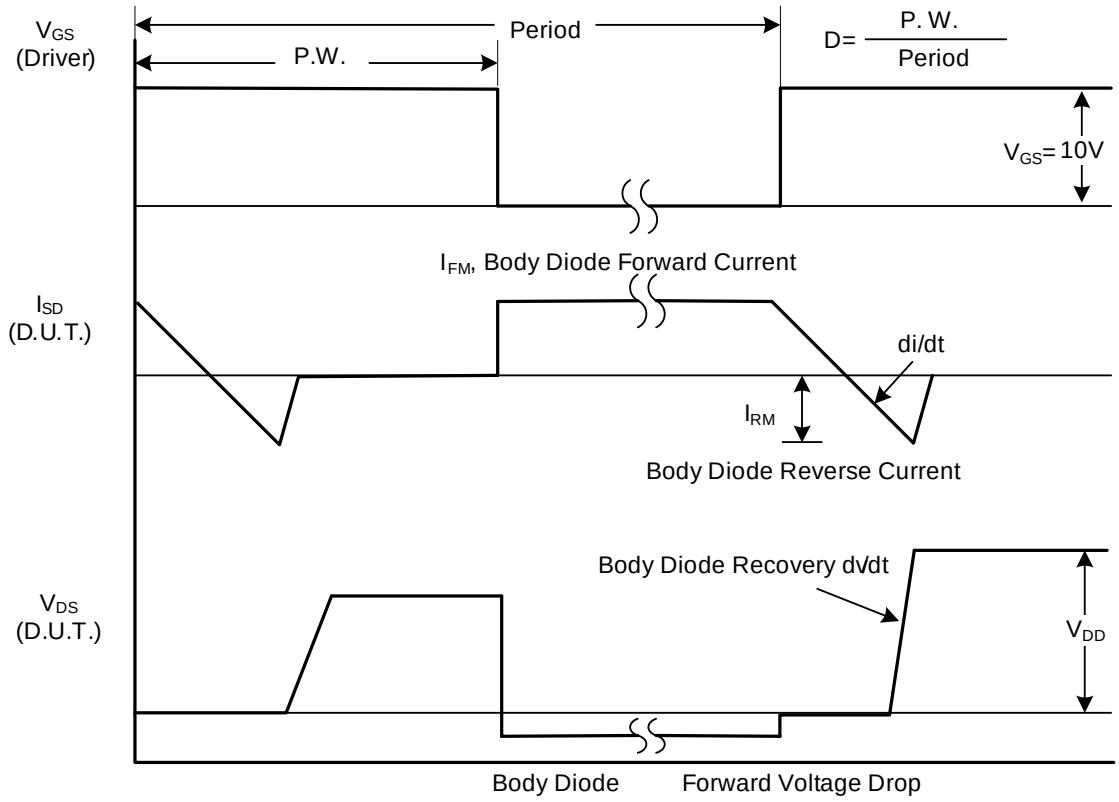


Fig. 1B Peak Diode Recovery dv/dt Waveforms

Test Circuits And Waveforms(cont.)

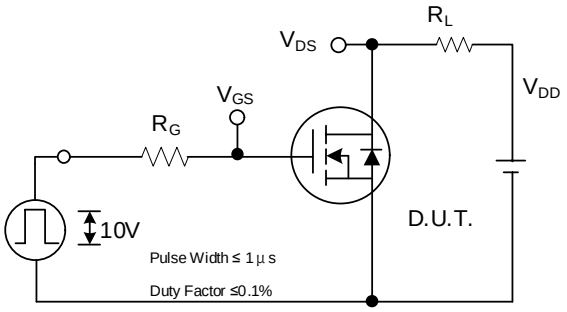


Fig. 2A Switching Test Circuit

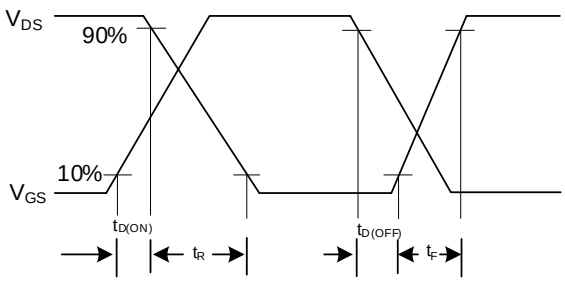


Fig. 2B Switching Waveforms

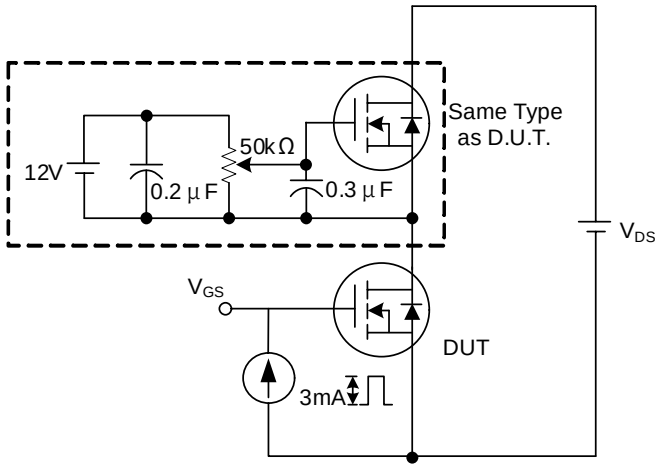


Fig. 3A Gate Charge Test Circuit

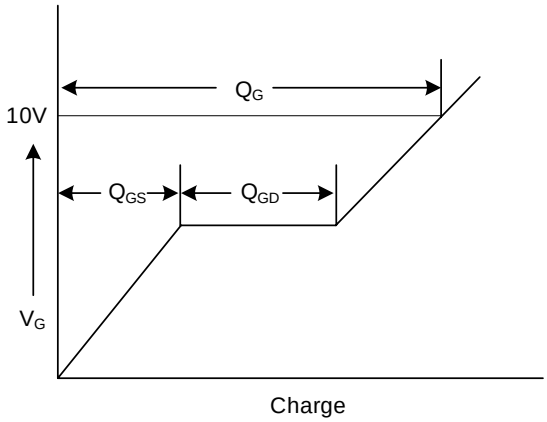


Fig. 3B Gate Charge Waveform

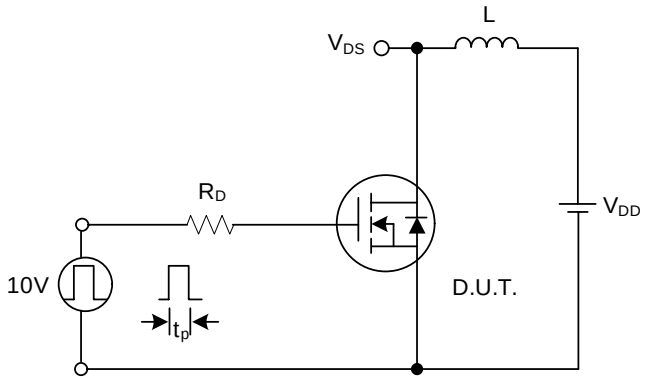


Fig. 4A Unclamped Inductive Switching Test Circuit

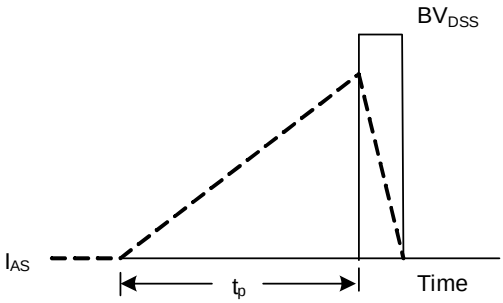
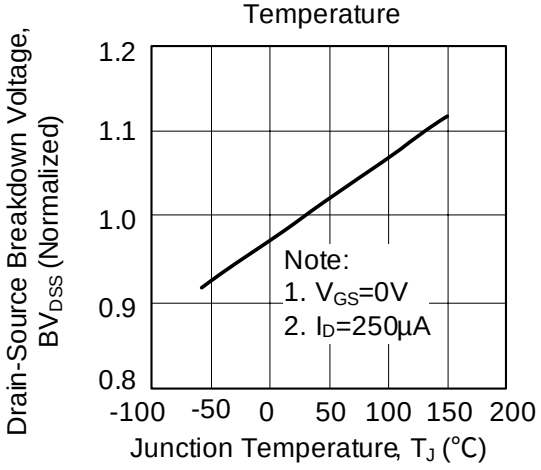


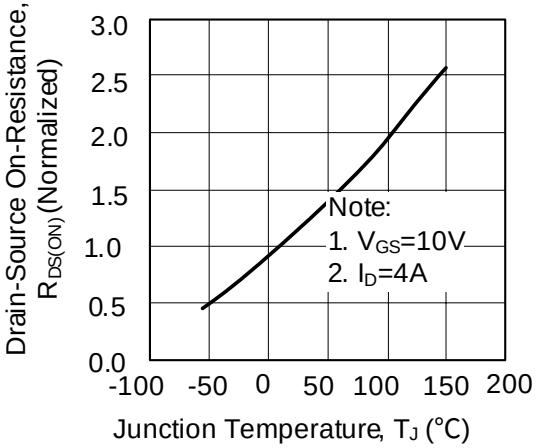
Fig. 4B Unclamped Inductive Switching Waveforms

Typical Characteristics

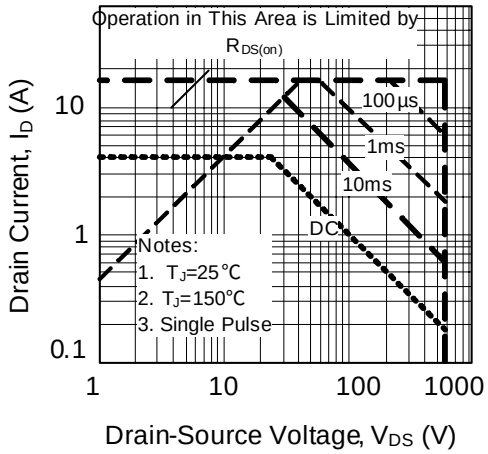
Breakdown Voltage Variation vs Temperature



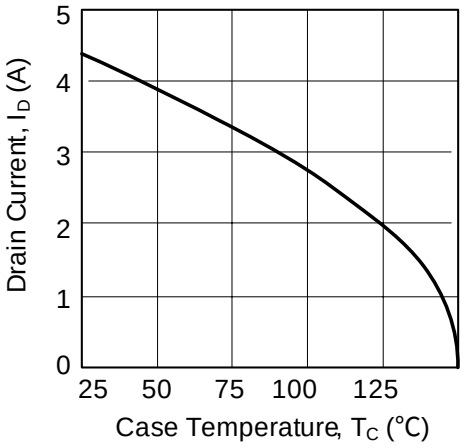
On-Resistance Junction Temperature



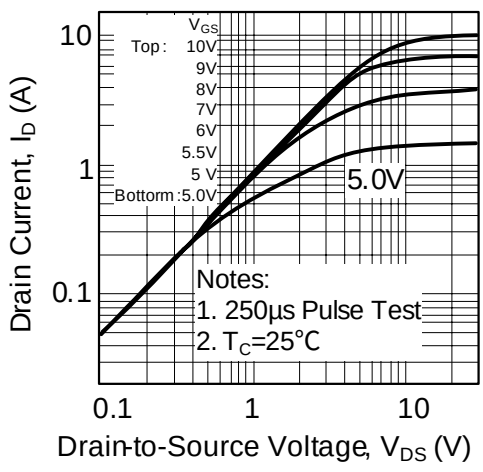
Maximum Safe Operating Area



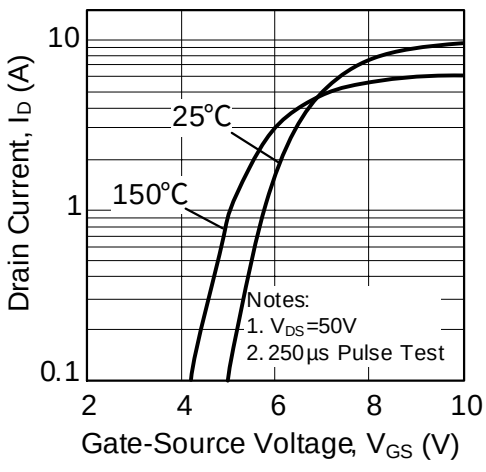
Maximum Drain Current vs. Case Temperature



On-State Characteristics

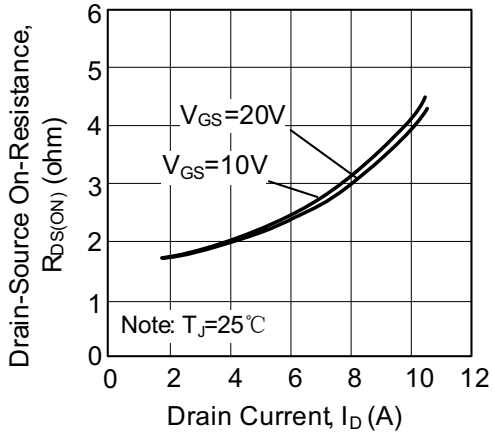


Transfer Characteristics

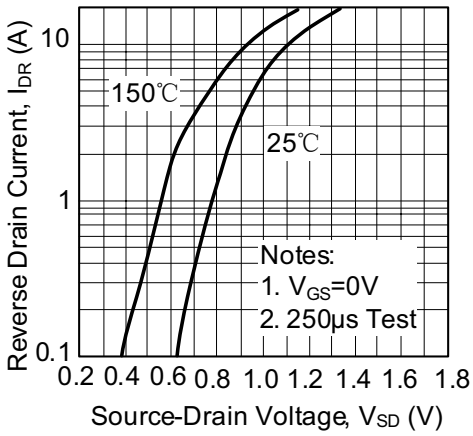


Typical Characteristics

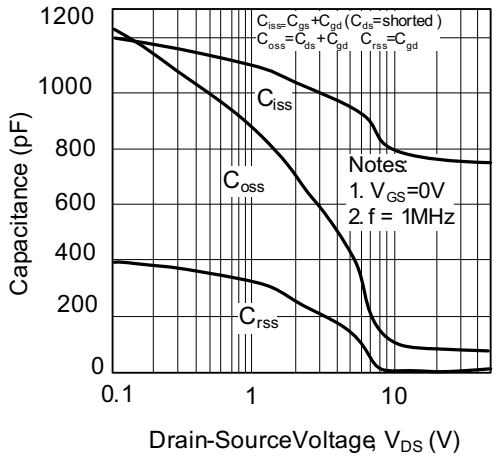
On-Resistance Variation vs Drain Current and Gate Voltage



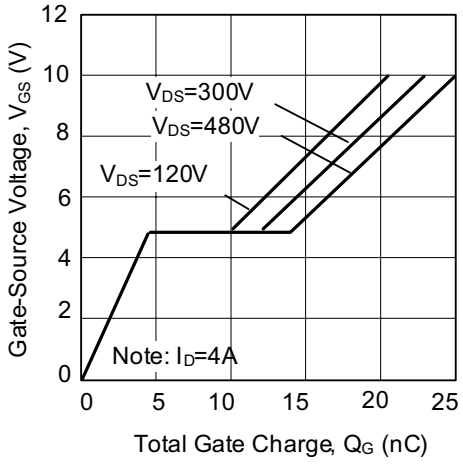
On State Current vs. Allowable Case Temperature



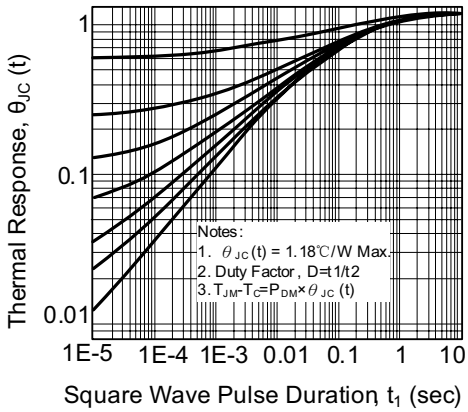
Capacitance Characteristics (Non-Repetitive)



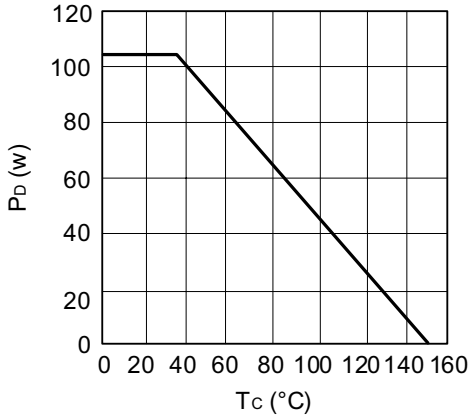
Gate Charge Characteristics



Transient Thermal Response Curve

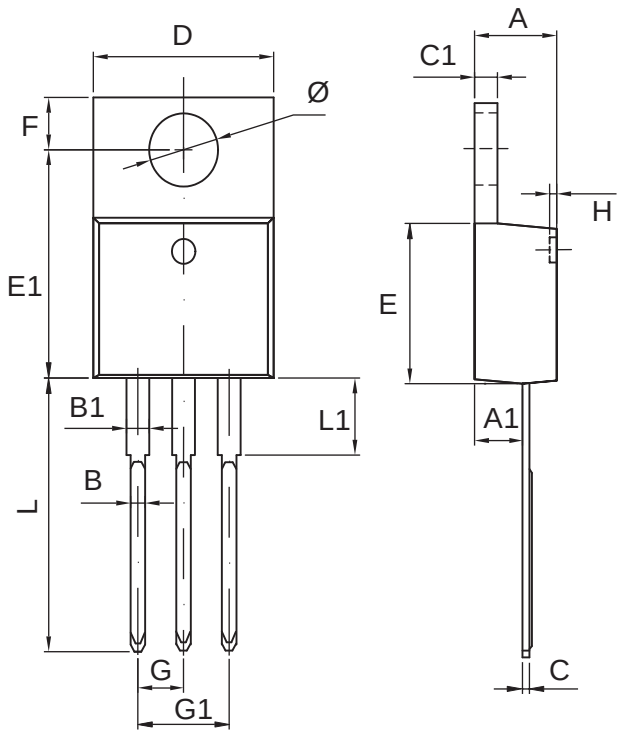


Power Dissipation



TO-220 Outline Dimensions

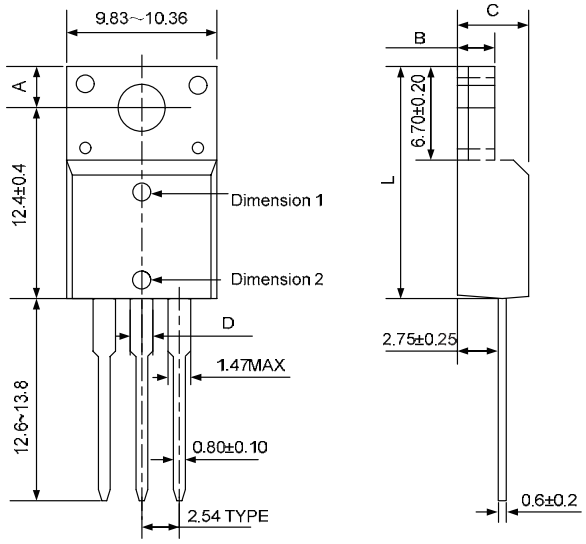
Unit:mm



TO-220		
Dim	Min	Max
A	4.47	4.67
A1	2.52	2.82
B	0.71	0.91
B1	1.17	1.37
C	0.31	0.53
C1	1.17	1.37
D	10.01	10.31
E	8.50	8.90
E1	12.06	12.446
G	2.54 TYP	
G1	4.98	5.18
F	2.59	2.89
H	0.00	0.30
L	13.4	13.8
L1	3.56	3.96
Φ	3.73	3.93

TO-220F Outline Dimensions

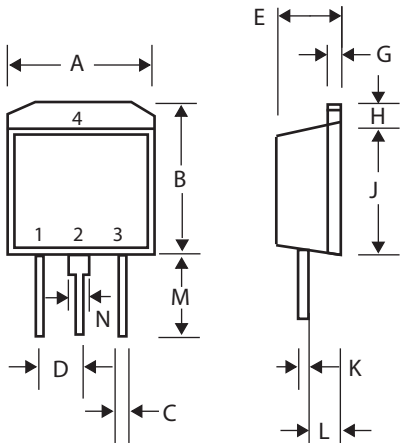
Unit:mm



TO-220F		
Symbol	Dimension 1	Dimension 2
A	3.3±0.15	2.70±0.75
B	2.55±0.20	3.0±0.20
C	4.72±0.2	4.5±0.20
D	1.47MAX	1.75MAX
L	15.75±0.30	15±0.30

TO-251 Outline Dimensions

unit:mm

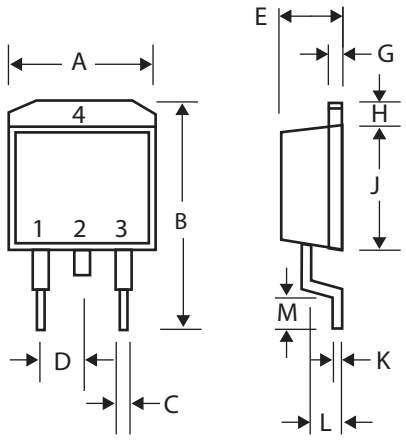


TO-251		
Dim	Min	Max
A	6.40	6.80
B	6.80	7.20
C	0.50	0.80
D	-	2.30
E	2.20	2.50
G	0.45	0.55
H	1.00	1.60
J	5.40	5.80
K	0.45	0.69
L	0.90	1.50
M	6.50	-
N	-	0.90

1. Emitter
2. Base
3. Collector

TO-252 Outline Dimensions

unit:mm



TO-252		
Dim	Min	Max
A	6.40	6.80
B	9.00	10.00
C	0.50	0.80
D	-	2.30
E	2.20	2.50
G	0.45	0.55
H	1.00	1.60
J	5.40	5.80
K	0.30	0.64
L	0.70	1.70
M	0.90	1.50