



DESCRIPTION

$V_{DS}@ T_{J,max} = 650V$

$V_{GS} = \pm 30V$

$I_D(A) = 11A$

$R_{DS(ON)} = 0.32\Omega$ (Typ.) @ $V_{GS} = 10V$

The AM60R380F is available in TO-220, TO-220F, TO-251, TO-252 and TO-263 packages.

ORDERING INFORMATION

Package Type	Part Number	
TO-220	T3	AM60R380FT3U
		AM60R380FT3VU
TO-220F	T3F	AM60R380FT3FU
		AM60R380FT3FVU
TO-251	TS3	AM60R380FTS3U
		AM60R380FTS3VU
TO-252	D	AM60R380FDR
		AM60R380FDVR
TO-263	S2	AM60R380FS3R
		AM60R380FS3VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

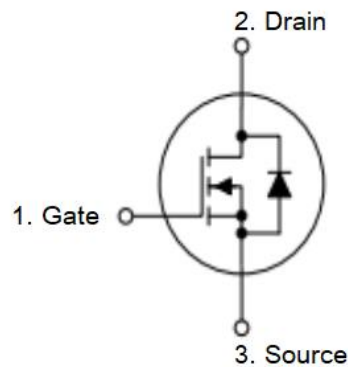
FEATURES

- Fast Switching
- 100% avalanche tested
- Improved dv/dt capability
- Available in TO-220, TO-220F, TO-251, TO-252 and TO-263 packages

APPLICATIONS

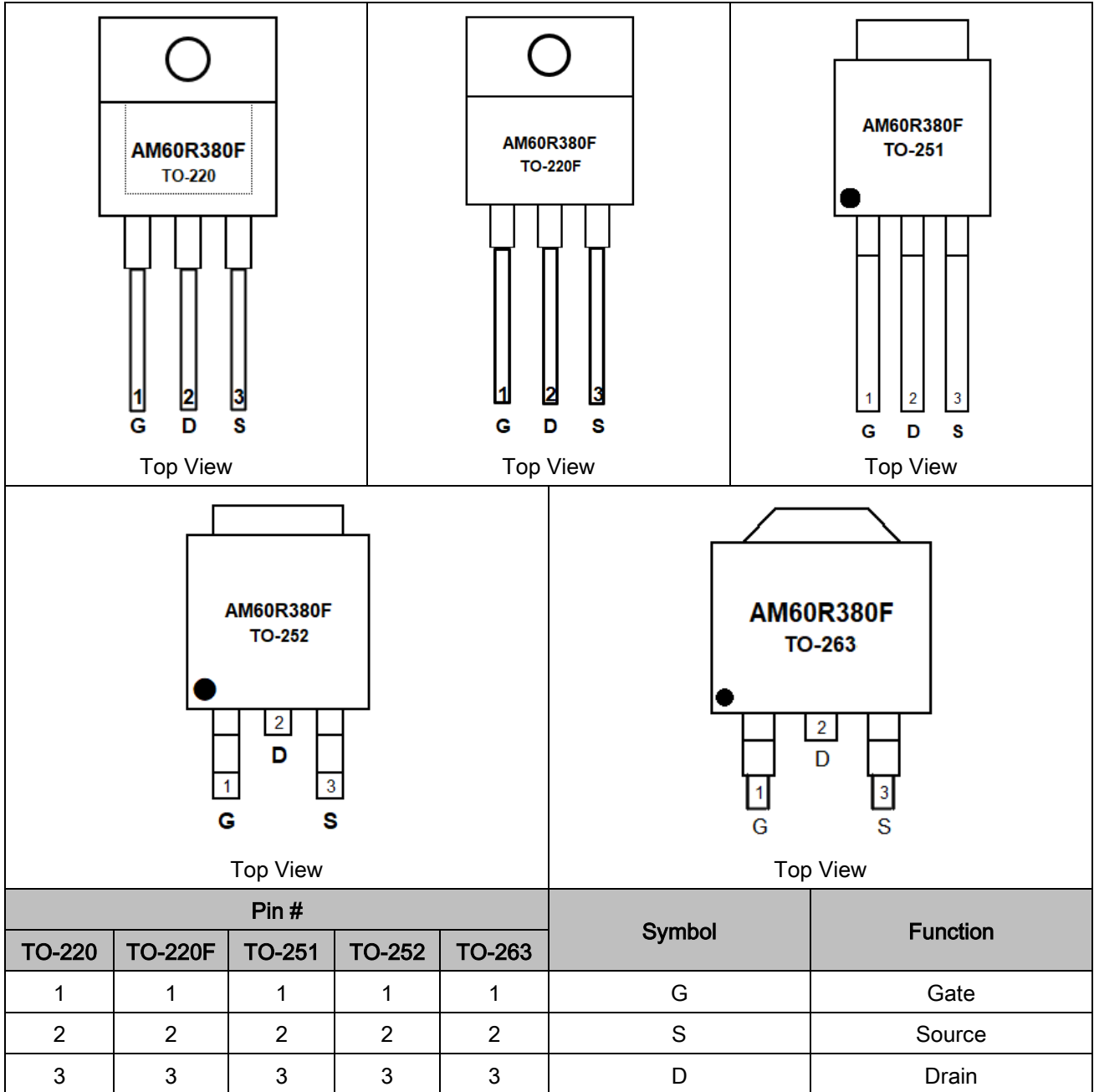
- High frequency switching mode power supply

N CHANNEL MOSFET





PIN DESCRIPTION





ABSOLUTE MAXIMUM RATINGS

at $T_C = 25^\circ\text{C}$, unless otherwise specified

V_{DSS} , Drain-to-Source Voltage	600V
I_D , Continuous Drain Current	11A
Continuous Drain Current ($T_C=100^\circ\text{C}$)	6.93A
I_{DM} , Pulsed Drain Current ^{NOTE1}	33A
V_{GS} , Gate-to-Source Voltage	$\pm 30\text{V}$
E_{AS} , Single Pulse Avalanche Energy ^{NOTE2}	250mJ
dv/dt , Peak Diode Recovery dv/dt ^{NOTE3}	15V/ns
P_D , Power Dissipation TO-251\TO-252\TO-220\TO-263	100W
Derating Factor above 25°C	$0.8\text{W}/^\circ\text{C}$
P_D , Power Dissipation TO-220F	31W
Derating Factor above 25°C	$0.25\text{W}/^\circ\text{C}$
T_J, T_{STG} , Operating Junction and Storage Temperature Range	$150, -55^\circ\text{C} \sim 150^\circ\text{C}$
T_L , Maximum Temperature for Soldering	300°C

Stress beyond above listed "Absolute Maximum Ratings" may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL CHARACTERISTICS

TO-251\TO-252\TO-220\TO-263

Parameter	Symbol	Ratings	Units
Junction-to-Case	$R_{\theta JC}$	1.25	$^\circ\text{C}/\text{W}$
Junction-to-Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$

TO-220F

Parameter	Symbol	Ratings	Units
Junction-to-Case	$R_{\theta JC}$	4	$^\circ\text{C}/\text{W}$
Junction-to-Ambient	$R_{\theta JA}$	80	$^\circ\text{C}/\text{W}$



ELECTRICAL CHARACTERISTICS

at $T_C = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Units
OFF Characteristics						
Drain to Source Breakdown Voltage	V_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
BV_{DSS} Temperature Coefficient	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	$I_D=250\mu A$, Reference 25°C	-	0.7	-	$V/^\circ\text{C}$
Drain to Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$, $T_J=25^\circ\text{C}$	-	-	10	μA
		$V_{DS}=480V, V_{GS}=0V$, $T_J=125^\circ\text{C}$	-	-	500	
Gate to Source Forward Leakage	$I_{GSS(F)}$	$V_{GS}=+30V$	-	-	100	nA
Gate to Source Reverse Leakage	$I_{GSS(R)}$	$V_{GS}=-30V$	-	-	-100	nA
ON Characteristics						
Drain-to-Source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.8A$ ^{NOTE4}	-	0.32	0.38	Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$ ^{NOTE4}	3.0	-	5.0	V
Dynamic Characteristics						
Gate resistance	R_g	$f = 1.0\text{MHz}$	-	10	-	Ω
Input Capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V$, $f=1.0\text{MHz}$	-	780	-	pF
Output Capacitance	C_{oss}		-	550	-	
Reverse Transfer Capacitance	C_{rss}		-	26	-	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$I_D=4.8A, V_{DD}=400V$, $V_{GS}=10V, R_G=5\Omega$	-	11	-	ns
Rise Time	t_r		-	9	-	
Turn-off Delay Time	$t_{d(off)}$		-	38	-	
Fall Time	t_f		-	8	-	
Total Gate Charge	Q_g	$I_D=4.8A, V_{DD}=480V$, $V_{GS}=10V$	-	21.1	-	nC
Gate to Source Charge	Q_{gs}		-	4.3	-	
Gate to Drain ("Miller") Charge	Q_{gd}		-	7.9	-	
Source-Drain Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	$T_C=25^\circ\text{C}$	-	-	11	A
Maximum Pulsed Current (Body Diode)	I_{SM}		-	-	33	A
Diode Forward Voltage	V_{SD}	$I_S=4.8A, V_{GS}=0V$ ^{NOTE4}	-	-	0.9	V
Reverse Recovery Time	t_{rr}	$I_S=11A, T_J = 25^\circ\text{C}$ $di_f/dt=100A/\mu s, V_{GS}=0V$	-	80	-	ns
Reverse Recovery Charge	Q_{rr}		-	260	-	nC
Reverse Recovery Current	I_{rrm}		-	6.5	-	A

NOTE1: Pulse width limited by maximum junction temperature

NOTE2: $L=20\text{mH}, V_{DS}=50V$, Start $T_J=25^\circ\text{C}$

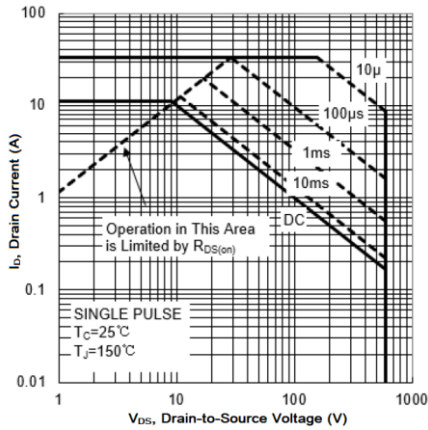
NOTE3: $I_{SD} = 11A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}$, Start $T_J=25^\circ\text{C}$

NOTE4: Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$

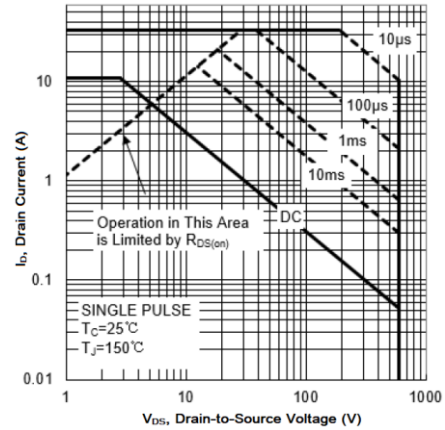


TYPICAL ELECTRICAL CHARACTERISTICS

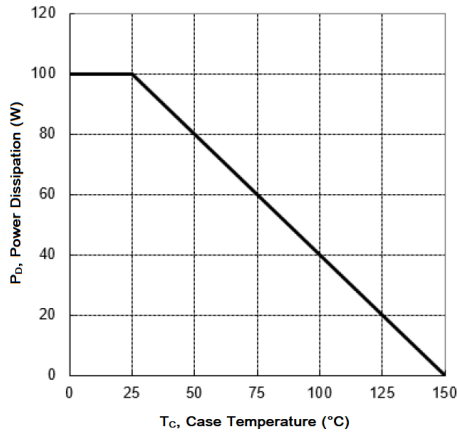
1. Safe Operating Area (No FullPAK)



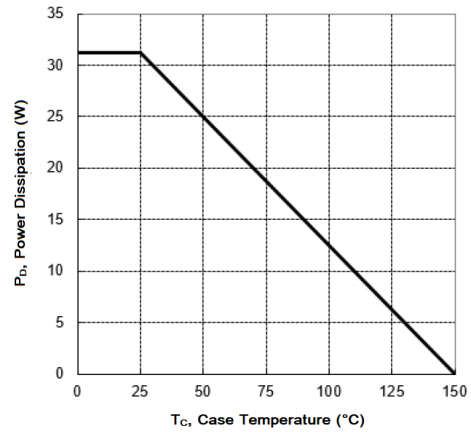
2. Safe Operating Area (FullPAK)



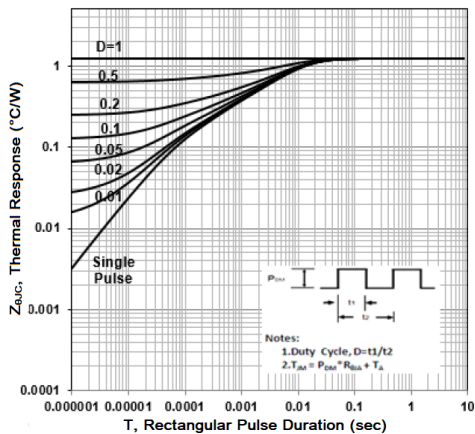
3. Power Dissipation (No FullPAK)



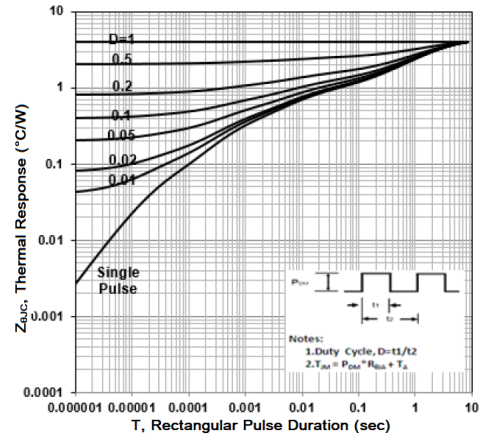
4. Power Dissipation (FullPAK)



5. Max Thermal Impedance (No FullPAK)

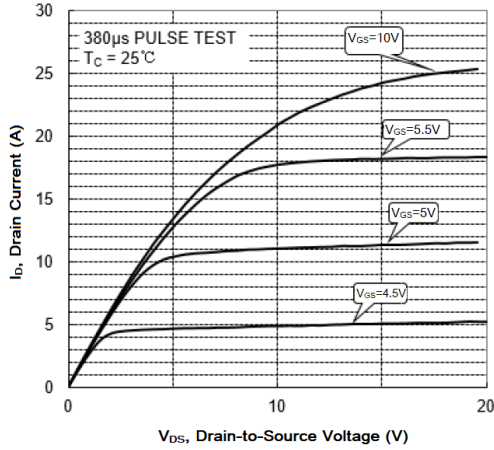


6. Max Thermal Impedance (FullPAK)

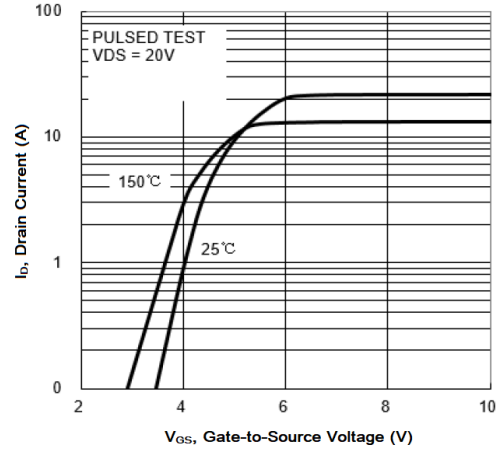




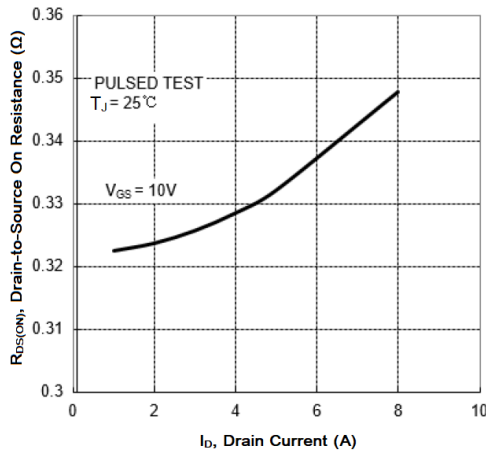
7. Typical Output Characteristics



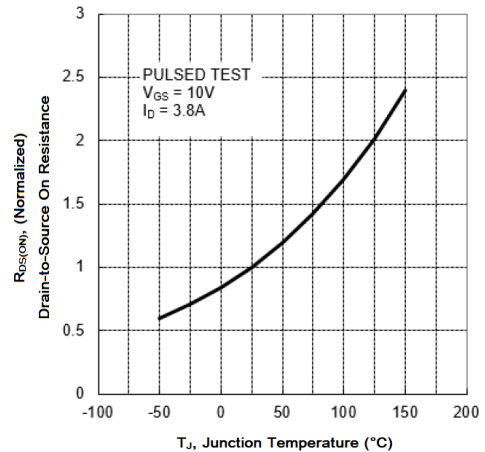
8. Typical Transfer Characteristics



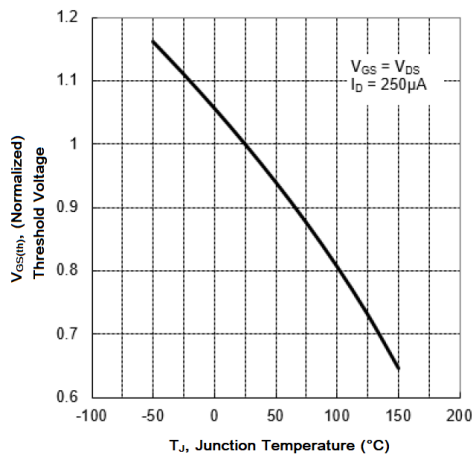
9. Typical Drain to Source ON Resistance vs Drain Current



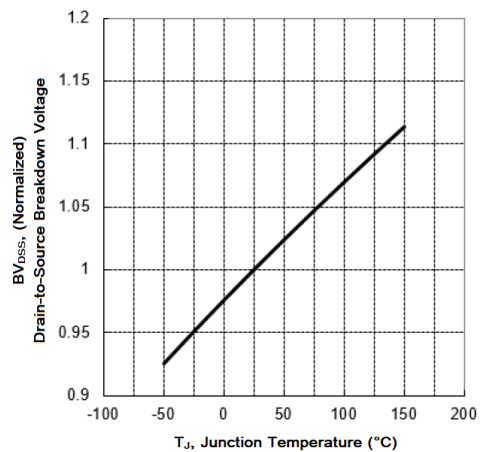
10. Typical Drain to Source on Resistance vs Junction Temperature



11. Typical Threshold Voltage vs Junction Temperature

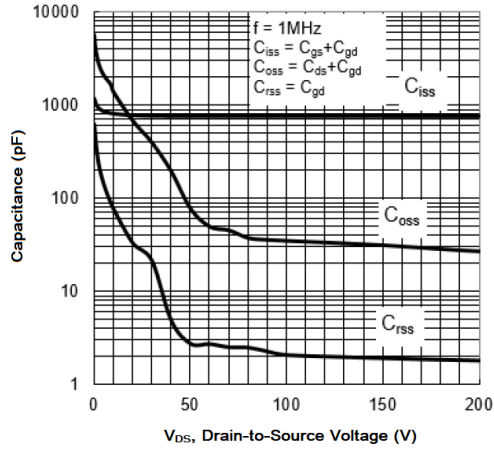


12. Typical Breakdown Voltage vs Junction Temperature

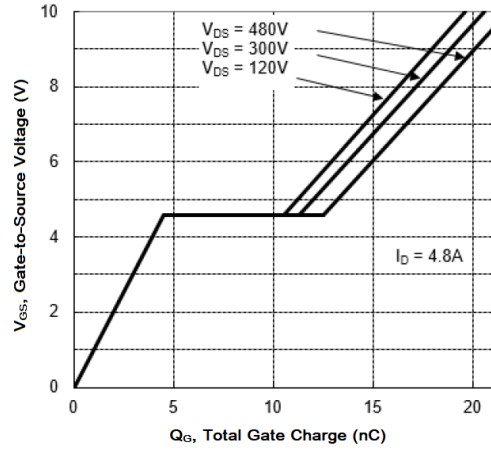




13. Typical Capacitance vs Drain to Source Voltage



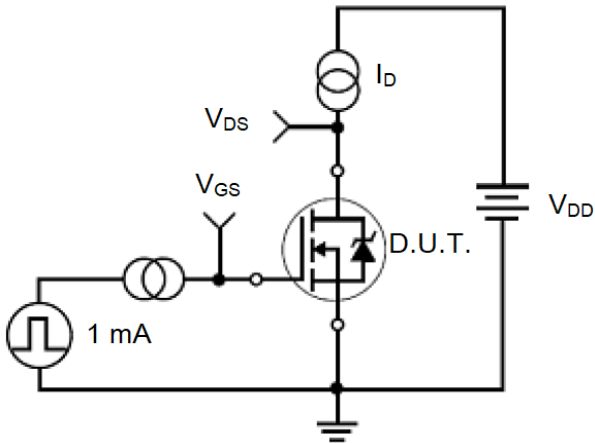
14. Typical Gate Charge vs Gate to Source Voltage



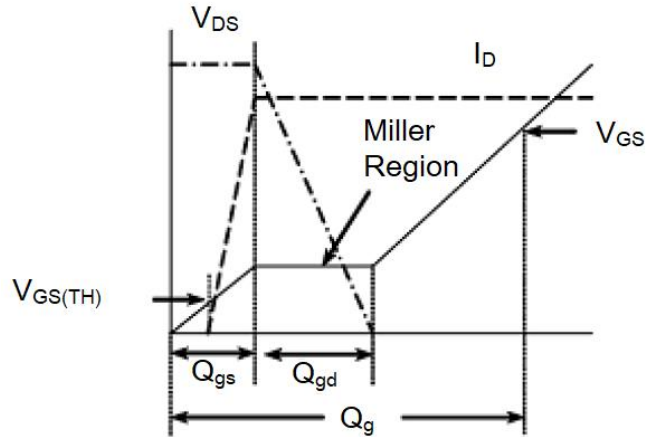


TEST CIRCUIT

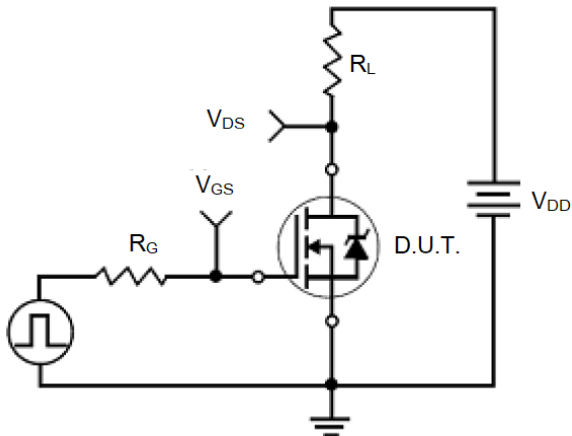
1. Gate Charge Test Circuit



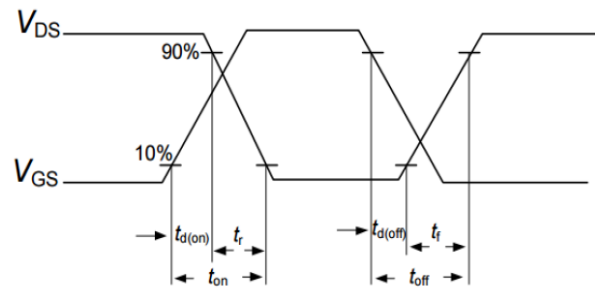
2. Gate Charge Waveforms



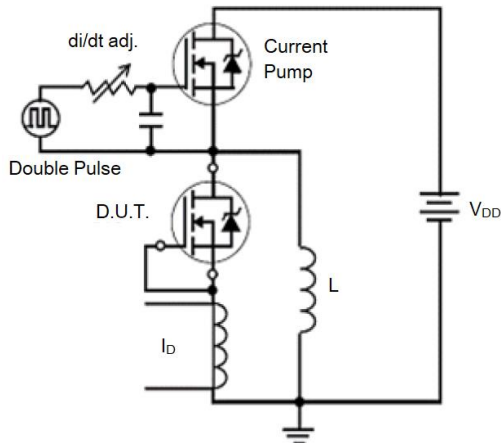
3. Resistive Switching Test Circuit



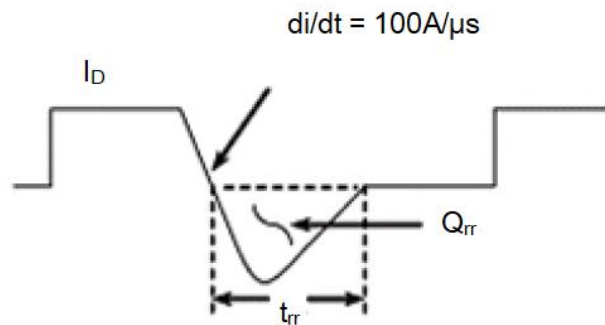
4. Resistive Switching Waveforms



5. Diode Reverse Recovery Test Circuit

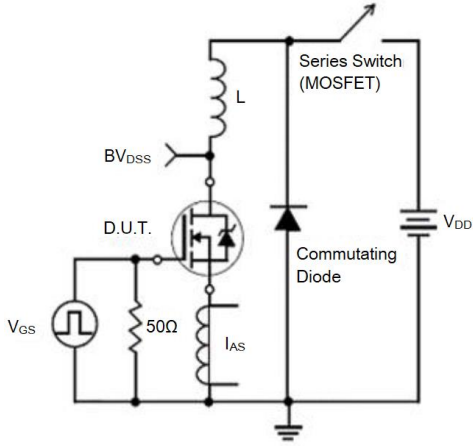


6. Diode Reverse Recovery Waveform

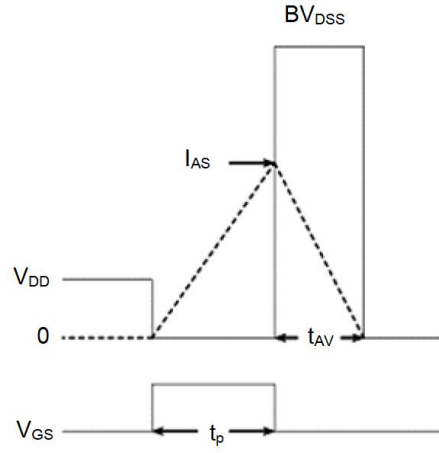




7. Unclamped Inductive Switching Test Circuit



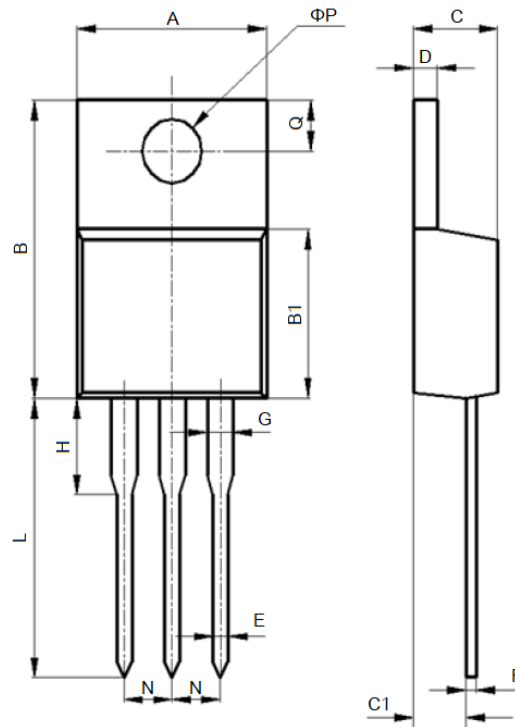
8. Unclamped Inductive Switching Waveform





PACKAGE INFORMATION

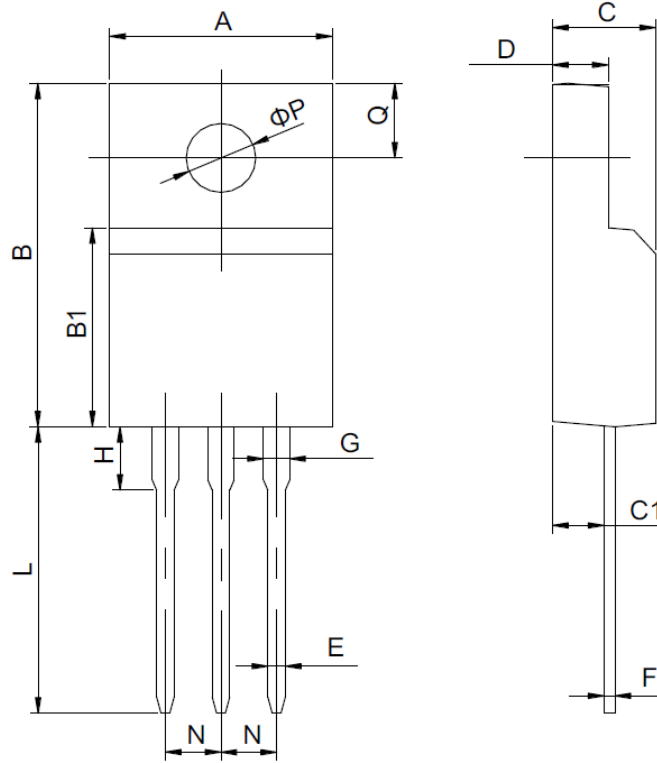
Dimension in TO-220 Package (Unit: mm)



Symbol	Min.	Max.
A	9.60	10.6
B	15.0	16.0
B1	8.90	9.50
C	4.30	4.80
C1	2.30	3.10
D	1.20	1.40
E	0.70	0.90
F	0.30	0.60
G	1.17	1.37
H	2.70	3.80
L	12.6	14.8
N	2.34	2.74
Q	2.40	3.00
ΦP	3.50	3.90



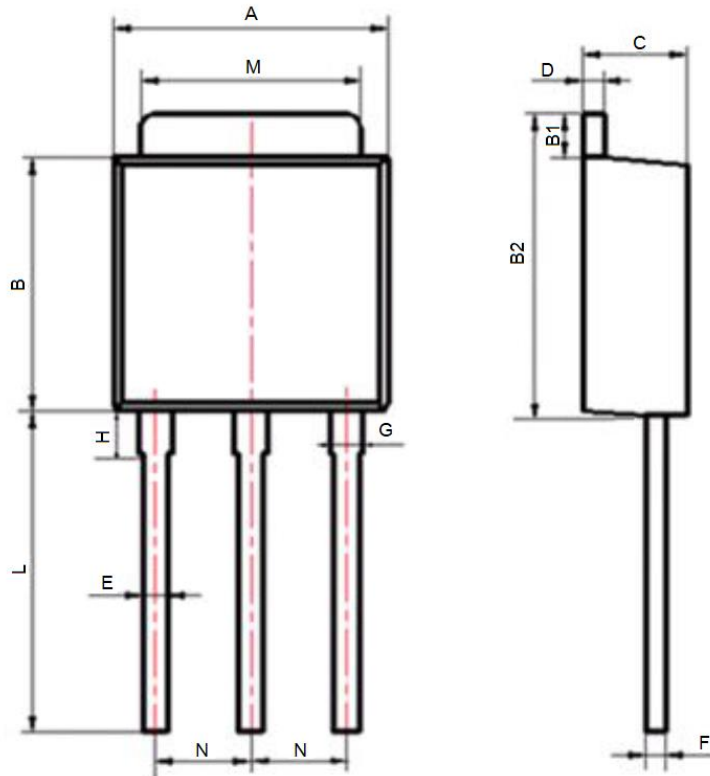
Dimension in TO-220F Package (Unit: mm)



Symbol	Min.	Max.
A	9.60	10.4
B	15.4	16.2
B1	8.90	9.50
C	4.30	4.90
C1	2.10	3.00
D	2.40	3.00
E	0.60	1.00
F	0.30	0.60
G	1.12	1.42
H	3.40	3.80
L	12.0	14.0
N	2.34	2.74
Q	3.15	3.55
ΦP	2.90	3.30



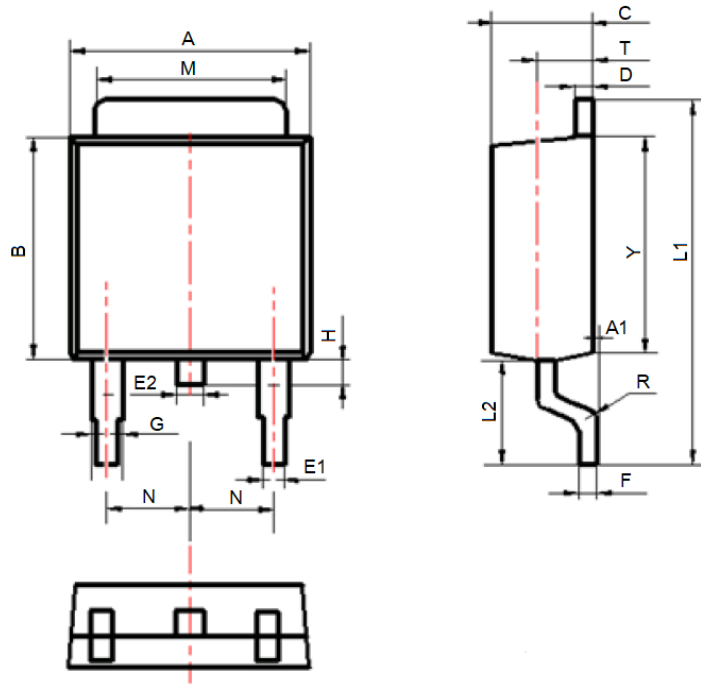
Dimension in TO-251 Package (Unit: mm)



Symbol	Min.	Max.
A	6.30	6.90
B	5.70	6.30
B1	1.00	1.20
B2	6.80	7.40
C	2.10	2.50
D	0.30	0.60
E	0.50	0.70
F	0.30	0.60
G	0.70	1.00
H	1.60	2.40
L	3.90	4.30
M	5.10	5.50
N	2.09	2.49



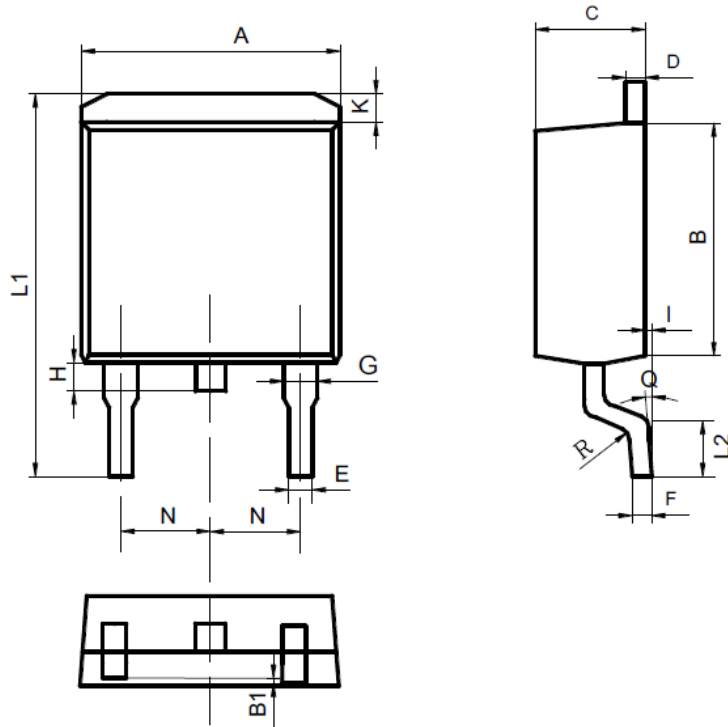
Dimension in TO-252 Package (Unit: mm)



Symbol	Min.	Max.
A	6.30	6.90
A1	0.00	0.13
B	5.70	6.30
C	2.10	2.50
D	0.30	0.60
E1	0.60	0.90
E2	0.70	1.00
F	0.30	0.60
G	0.70	1.20
L1	9.60	10.50
L2	2.70	3.10
H	0.60	1.00
M	5.10	5.50
N	2.09	2.49
R	0.30	
T	1.40	1.60
Y	5.10	6.30



Dimension in TO-263 Package (Unit: mm)



Symbol	Min.	Max.
A	9.80	10.40
B	8.90	9.50
B1	0.00	0.10
C	4.40	4.80
D	1.16	1.37
E	0.70	0.95
F	0.30	0.60
G	1.07	1.47
H	1.30	1.80
K	0.95	1.37
L1	14.50	16.50
L2	1.60	2.30
I	0.00	0.20
Q	0°	8°
R	0.40	
N	2.39	2.69



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