

General Description

The MDF12N50 uses advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

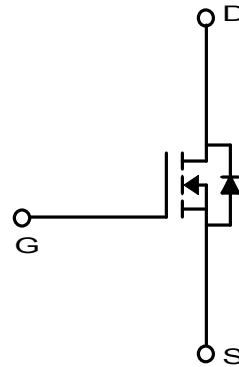
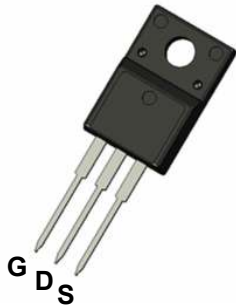
MDF12N50 is suitable device for SMPS, high Speed switching and general purpose applications.

Features

- $V_{DS} = 500V$
- $I_D = 11.5A$ @ $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.65\Omega$ @ $V_{GS} = 10V$

Applications

- Power Supply
- PFC
- High Current, High Speed Switching



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-Source Voltage	V_{DSS}	500	V
Gate-Source Voltage	V_{GSS}	±30	V
Continuous Drain Current (*)	I_D	$T_C=25^\circ C$	11.5 A
		$T_C=100^\circ C$	7.0 A
Pulsed Drain Current ⁽¹⁾	I_{DM}	46	A
Power Dissipation	P_D	$T_C=25^\circ C$	42 W
		Derate above 25 °C	0.32 W/°C
Peak Diode Recovery dv/dt ⁽³⁾	Dv/dt	4.5	V/ns
Single Pulse Avalanche Energy ⁽⁴⁾	E_{AS}	460	mJ
Junction and Storage Temperature Range	T_J, T_{stg}	-55~150	°C

* Id limited by maximum junction temperature

Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal Resistance, Junction-to-Ambient ⁽¹⁾	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction-to-Case ⁽¹⁾	$R_{\theta JC}$	3.0	

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDF12N50TH	-55~150°C	TO-220F	Tube	Halogen Free

Electrical Characteristics (Ta =25°C)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 250\mu A, V_{GS} = 0V$	500	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	-	5.0	
Drain Cut-Off Current	I_{DSS}	$V_{DS} = 500V, V_{GS} = 0V$	-	-	1	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 5.75A$		0.55	0.65	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 30V, I_D = 5.75A$	-	15	-	S
Dynamic Characteristics						
Total Gate Charge	Q_g	$V_{DS} = 400V, I_D = 11.5A, V_{GS} = 10V^{(3)}$	-	22.7	-	nC
Gate-Source Charge	Q_{gs}		-	7.7	-	
Gate-Drain Charge	Q_{gd}		-	8.7	-	
Input Capacitance	C_{iss}	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$	-	1030		pF
Reverse Transfer Capacitance	C_{rss}		-	5		
Output Capacitance	C_{oss}		-	121		
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10V, V_{DS} = 250V, I_D = 11.5A, R_G = 25\Omega^{(3)}$	-	25		ns
Rise Time	t_r		-	50		
Turn-Off Delay Time	$t_{d(off)}$		-	40		
Fall Time	t_f		-	30		
Drain-Source Body Diode Characteristics						
Maximum Continuous Drain to Source Diode Forward Current	I_S		-	11.5	-	A
Source-Drain Diode Forward Voltage	V_{SD}	$I_S = 11.5A, V_{GS} = 0V$	-		1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 11.5A, di/dt = 100A/\mu s^{(3)}$	-	310		ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	2.6		

Note :

1. Pulse width is based on $R_{\theta JC}$ & $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C.
2. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ C$.
3. $I_{SD} \leq 11.5A$, $di/dt \leq 200A/\mu s$, $V_{DD}=50V$, $R_g = 25\Omega$, Starting $T_J=25^\circ C$
4. $L=6.3mH$, $I_{AS}=11.5A$, $V_{DD}=50V$, $R_g = 25\Omega$, Starting $T_J=25^\circ C$

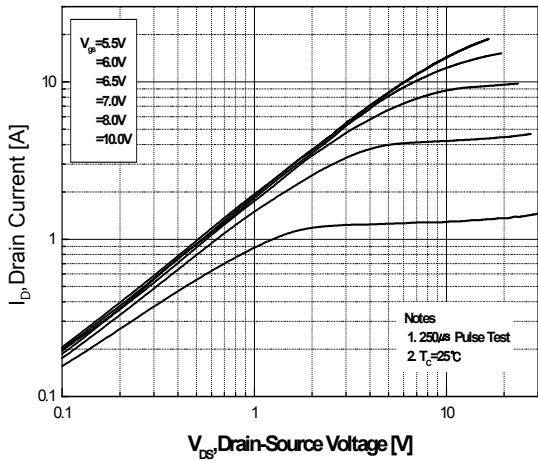


Fig.1 On-Region Characteristics

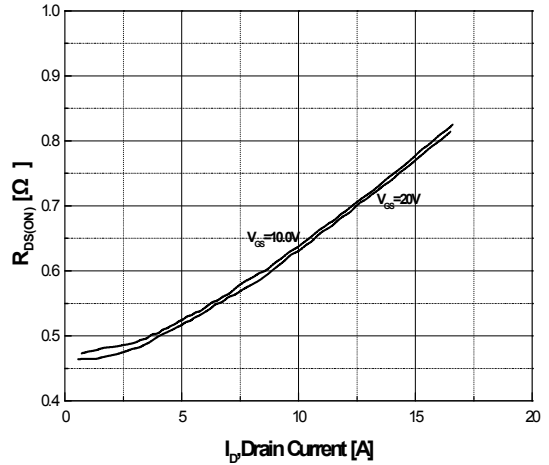


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

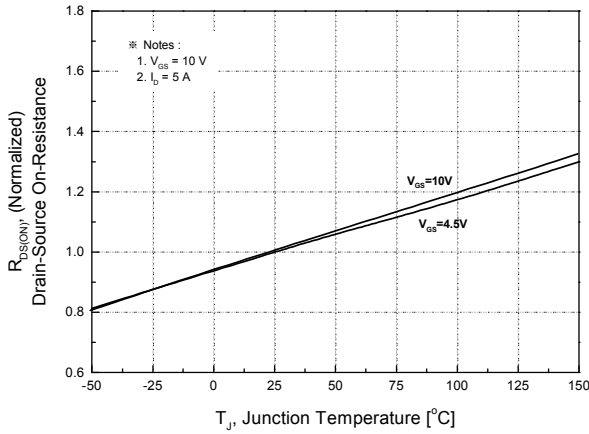


Fig.3 On-Resistance Variation with Temperature

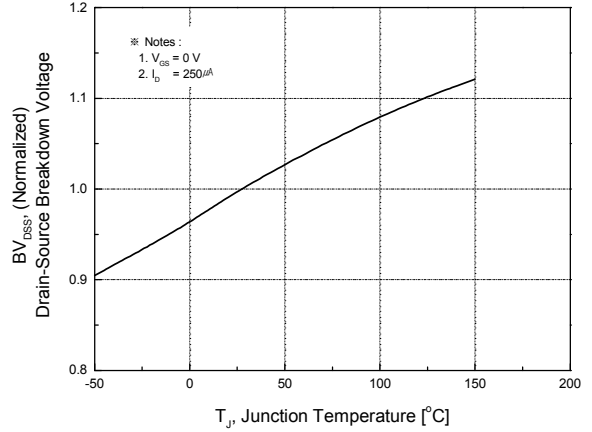


Fig.4 Breakdown Voltage Variation vs. Temperature

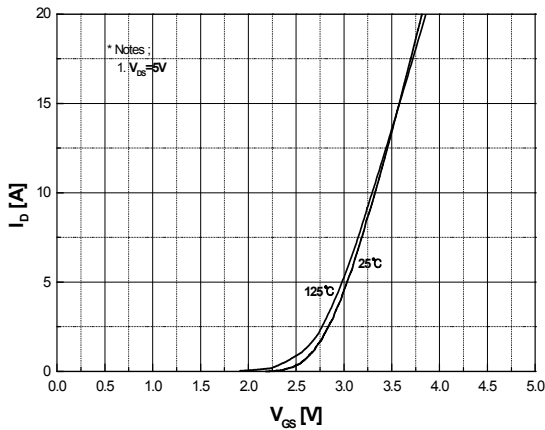


Fig.5 Transfer Characteristics

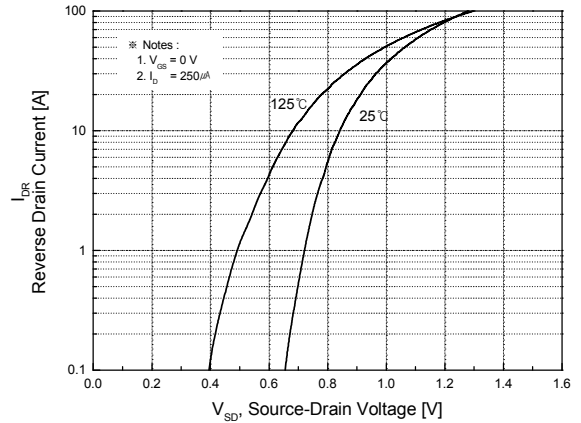
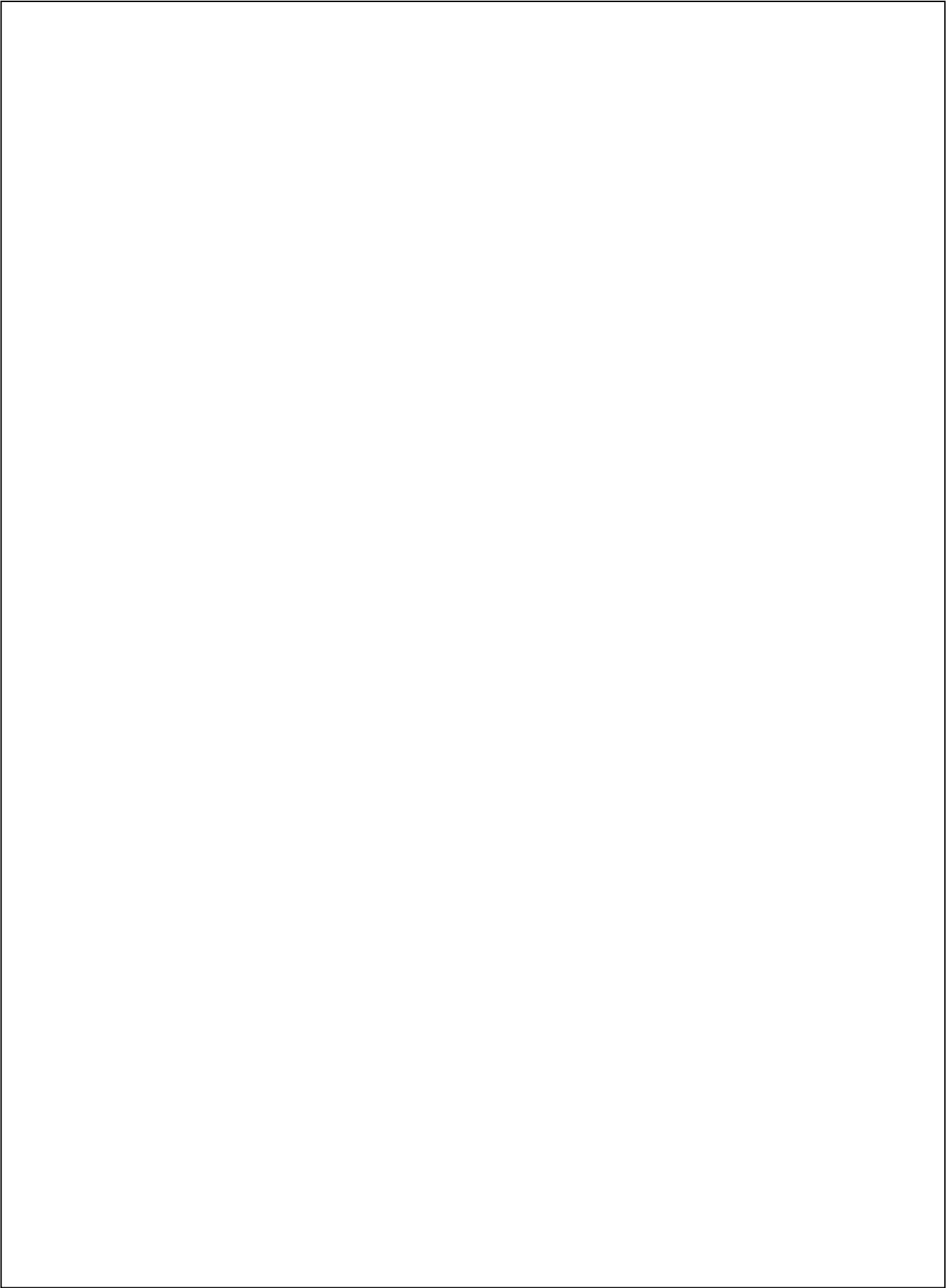


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature



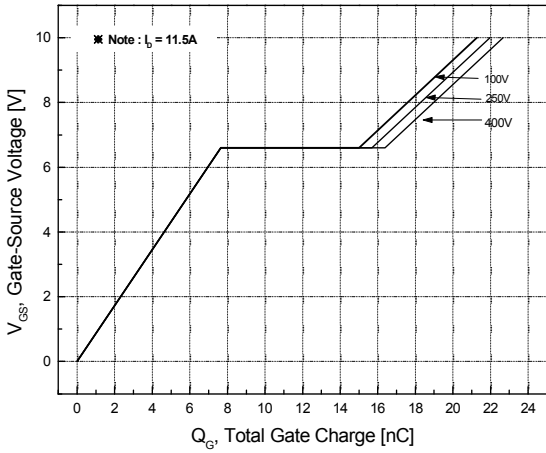


Fig.7 Gate Charge Characteristics

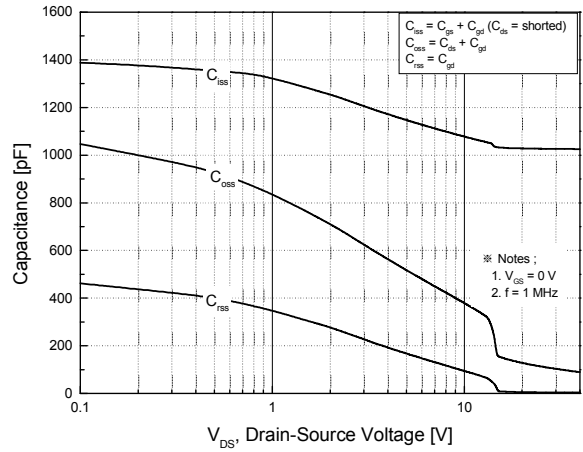


Fig.8 Capacitance Characteristics

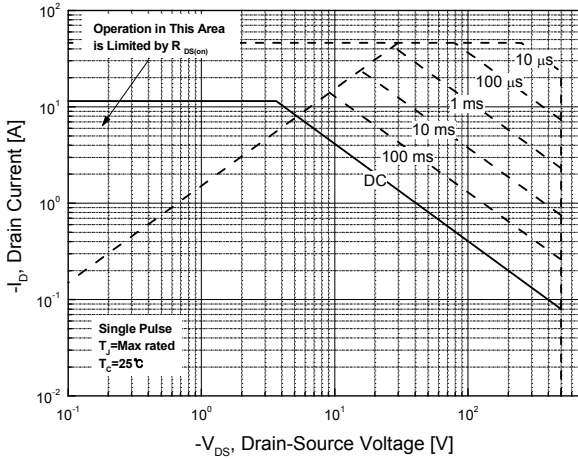


Fig.9 Maximum Safe Operating Area

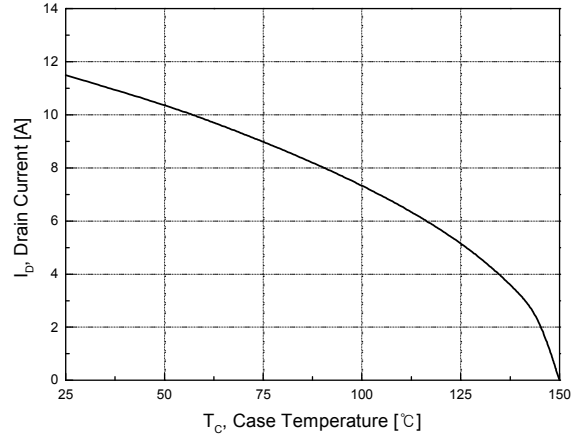


Fig.10 Maximum Drain Current vs. Case Temperature

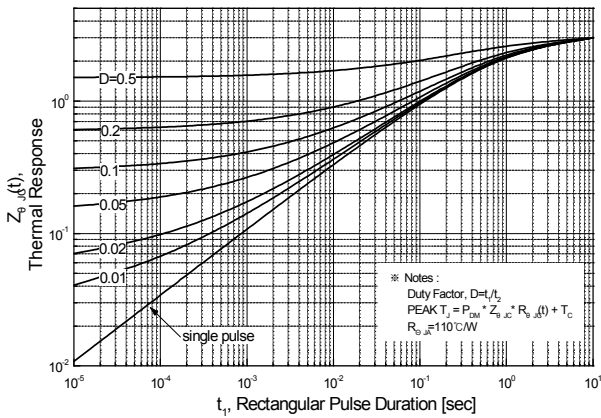


Fig.11 Transient Thermal Response Curve

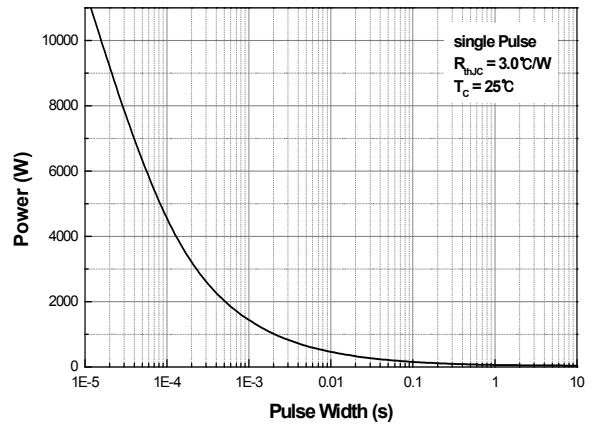
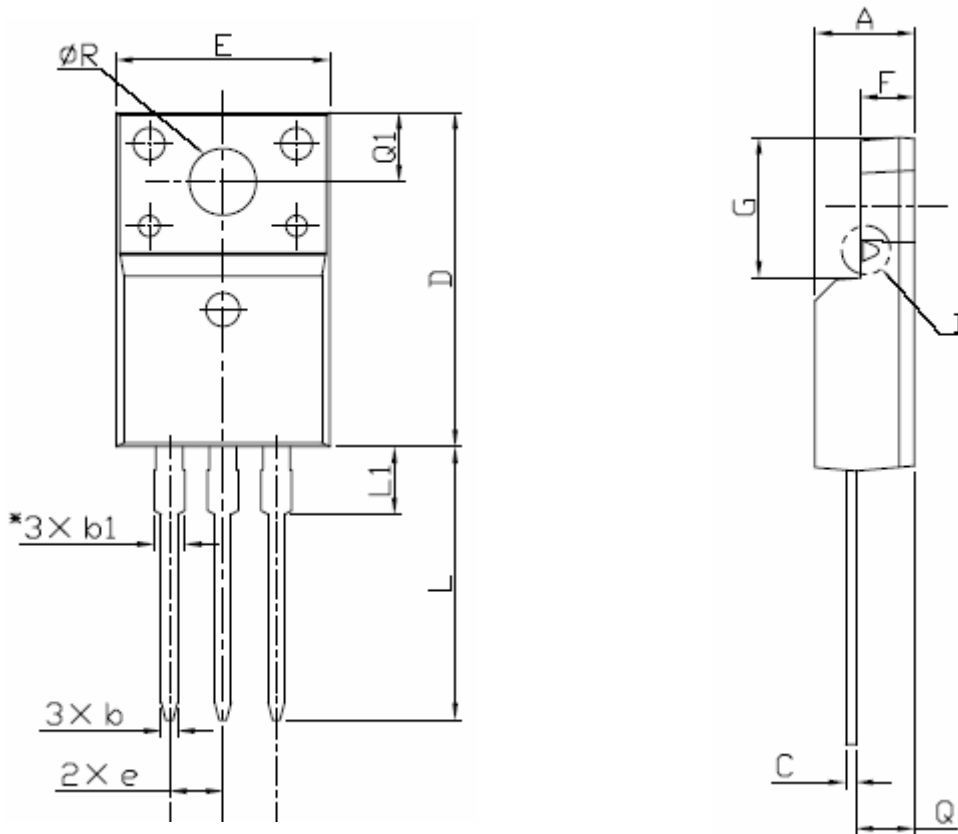


Fig.12 Single Pulse Maximum Power Dissipation

Physical Dimensions

3 Leads, TO-220F

Dimensions are in millimeters unless otherwise specified



Symbol	Min	Nom	Max
A	4.50		4.93
b	0.63		0.91
b1	1.15		1.47
C	0.33		0.63
D	15.47		16.13
E	9.60		10.71
e		2.54	
F	2.34		2.84
G	6.48		6.90
L	12.24		13.72
L1	2.79		3.67
Q	2.52		2.96
Q1	3.10		3.50
$\varnothing R$	3.00		3.55

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