

# MDP15N60G / MDF15N60G

## N-Channel MOSFET 600V, 15A, 0.40Ω

### General Description

These N-channel MOSFET are produced using advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

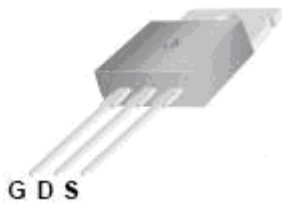
These devices are suitable device for SMPS, high Speed switching and general purpose applications.

### Features

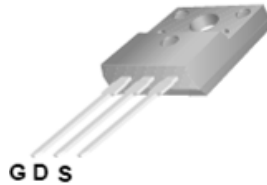
- $V_{DS} = 600V$
- $I_D = 15A$  @  $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.40\Omega$  @  $V_{GS} = 10V$

### Applications

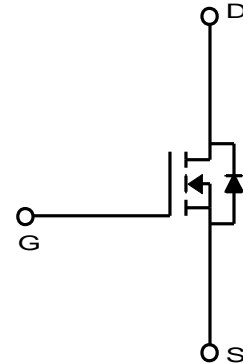
- Power Supply
- PFC
- High Current, High Speed Switching



TO-220  
MDP Series



TO-220F  
MDF Series



### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	MDP15N60G	MDF15N60G	Unit
Drain-Source Voltage		$V_{DSS}$	600		V
Gate-Source Voltage		$V_{GSS}$	±30		V
Continuous Drain Current	$T_C=25^\circ C$	$I_D$	15	15*	A
	$T_C=100^\circ C$		9.5	9.5*	A
Pulsed Drain Current <sup>(2)</sup>		$I_{DM}$	60	60*	A
Power Dissipation	$T_C=25^\circ C$	$P_D$	231.4	36.7	W
	Derate above 25°C		1.85	0.29	W/°C
Repetitive Avalanche Energy <sup>(2)</sup>		$E_{AR}$	23.1		mJ
Peak Diode Recovery $dv/dt$ <sup>(3)</sup>		$dv/dt$	4.5		V/ns
Single Pulse Avalanche Energy <sup>(4)</sup>		$E_{AS}$	511		mJ
Junction and Storage Temperature Range		$T_J, T_{stg}$	-55~150		°C

\* Id limited by maximum junction temperature

### Thermal Characteristics

Characteristics	Symbol	MDP15N60G	MDF15N60G	Unit
Thermal Resistance, Junction-to-Ambient <sup>(1)</sup>	$R_{\theta JA}$	62.5	62.5	°C/W
Thermal Resistance, Junction-to-Case <sup>(1)</sup>	$R_{\theta JC}$	0.54	3.4	

## Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDP15N60GTH	-55~150°C	TO-220	Tube	Halogen Free
MDF15N60GTH	-55~150°C	TO-220F	Tube	Halogen Free

## Electrical Characteristics (Ta =25°C)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250\mu A, V_{GS} = 0V$	600	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	-	5.0	
Drain Cut-Off Current	$I_{DSS}$	$V_{DS} = 600V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 7.5A$	-	0.34	0.40	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 30V, I_D = 7.5A^{(2)}$	-	11.5	-	S
<b>Dynamic Characteristics</b>						
Total Gate Charge	$Q_g$	$V_{DS} = 480V, I_D = 15.0A, V_{GS} = 10V^{(2)}$	-	49.0	-	nC
Gate-Source Charge	$Q_{gs}$		-	15.0	-	
Gate-Drain Charge	$Q_{gd}$		-	19.1	-	
Input Capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$	-	2311	-	pF
Reverse Transfer Capacitance	$C_{riss}$		-	10.8	-	
Output Capacitance	$C_{oss}$		-	258	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10V, V_{DS} = 300V, I_D = 15.0A, R_g = 25\Omega^{(2)}$	-	57	-	ns
Rise Time	$t_r$		-	86	-	
Turn-Off Delay Time	$t_{d(off)}$		-	137	-	
Fall Time	$t_f$		-	47	-	
<b>Drain-Source Body Diode Characteristics</b>						
Maximum Continuous Drain to Source Diode Forward Current	$I_S$		-	15	-	A
Source-Drain Diode Forward Voltage	$V_{SD}$	$I_S = 15.0A, V_{GS} = 0V$	-	-	1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 15.0A, di/dt = 100A/\mu s$	-	382	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	4.47	-	$\mu C$

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.  $I_{SD} \leq 15A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} \leq BV_{dss}$ ,  $R_g = 25\Omega$ , Starting  $T_J = 25^\circ C$
4.  $L = 7.9mH$ ,  $I_{AS} = 15.0A$ ,  $V_{DD} = 50V$ ,  $R_g = 25\Omega$ , Starting  $T_J = 25^\circ C$ ,

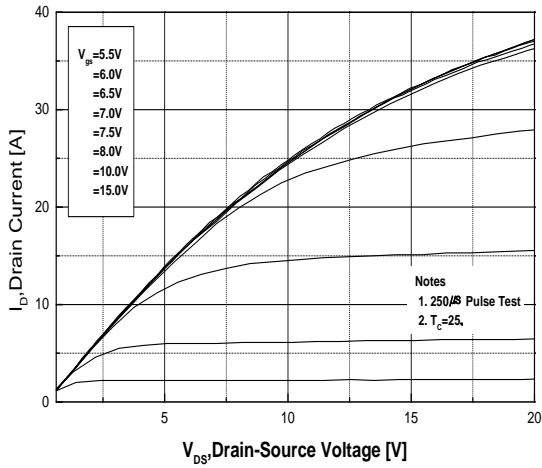


Fig.1 On-Region Characteristics

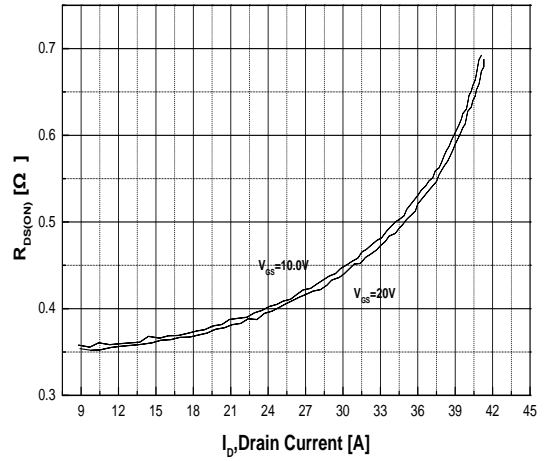


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

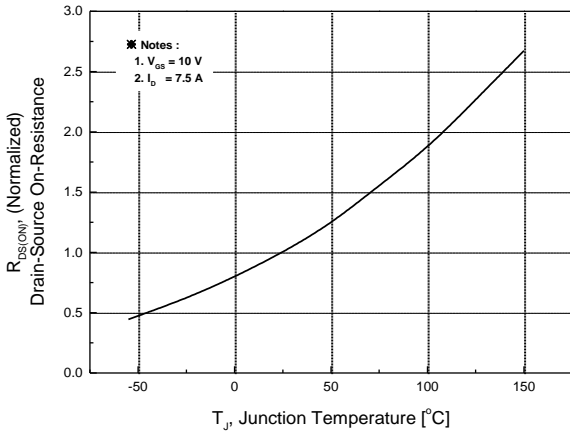


Fig.3 On-Resistance Variation with Temperature

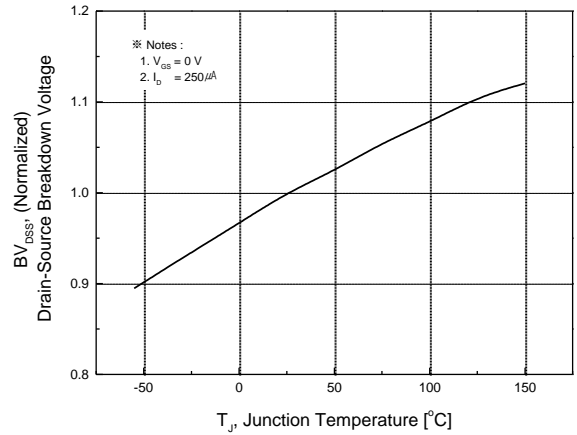


Fig.4 Breakdown Voltage Variation vs. Temperature

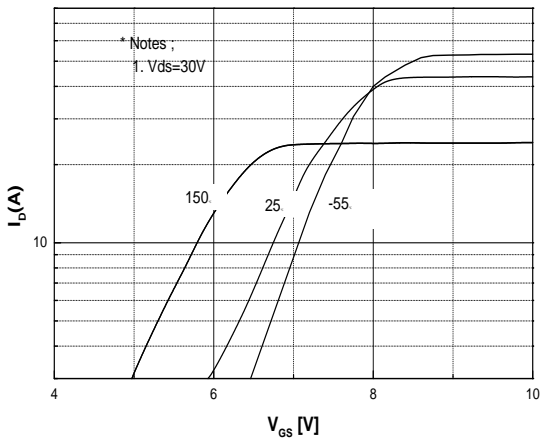


Fig.5 Transfer Characteristics

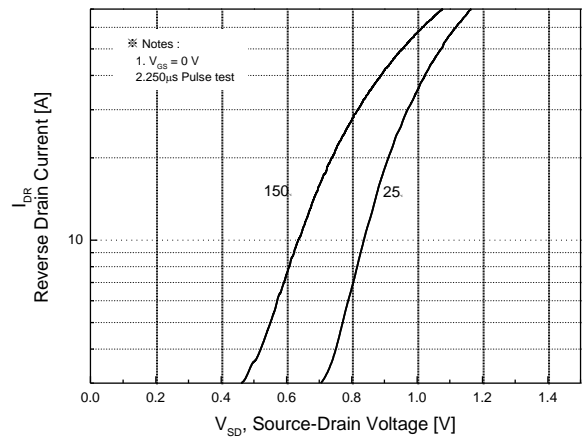


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

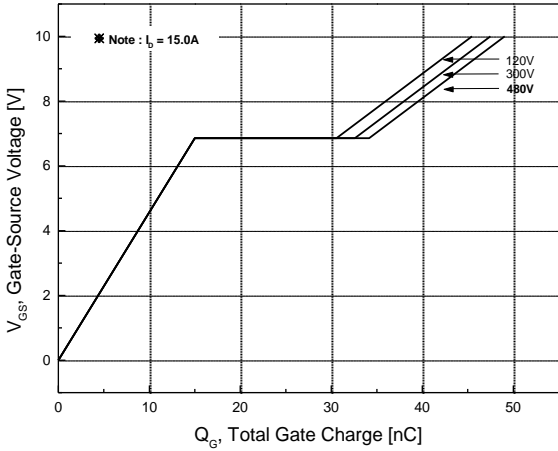


Fig.7 Gate Charge Characteristics

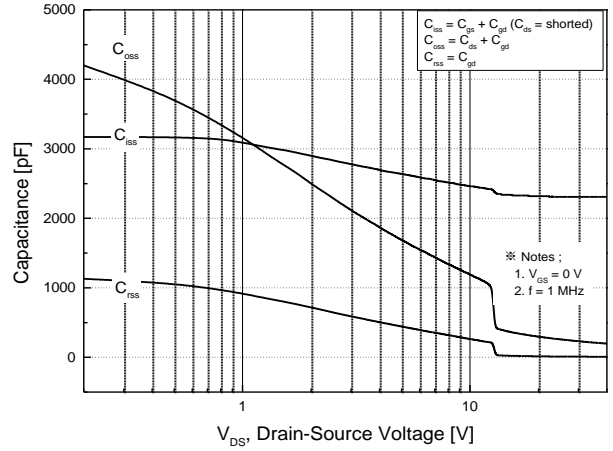


Fig.8 Capacitance Characteristics

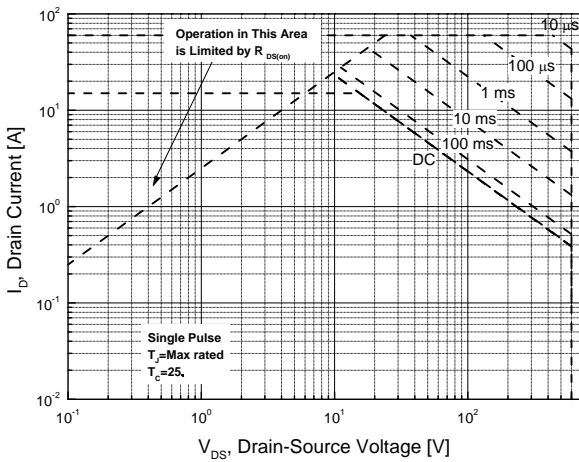


Fig.9 Maximum Safe Operating Area MDP15N60G(TO-220)

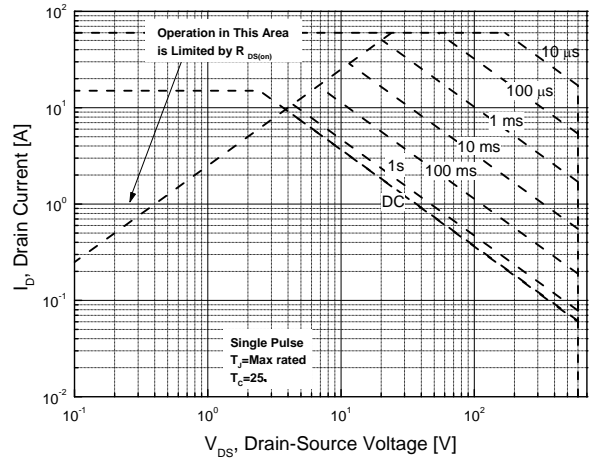


Fig.10 Maximum Safe Operating Area MDF15N60G(TO-220F)

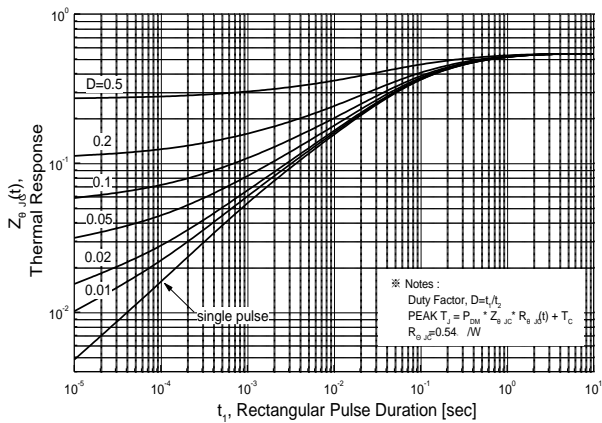


Fig.11 Transient Thermal Response Curve MDP15N60G(TO-220)

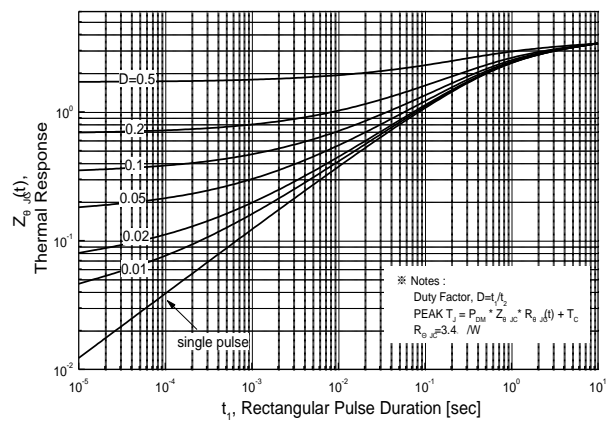
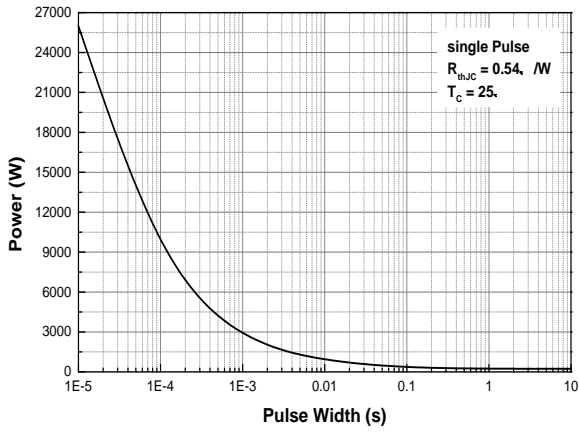
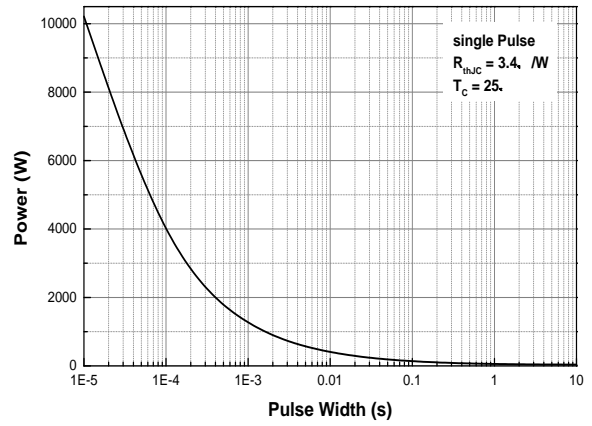


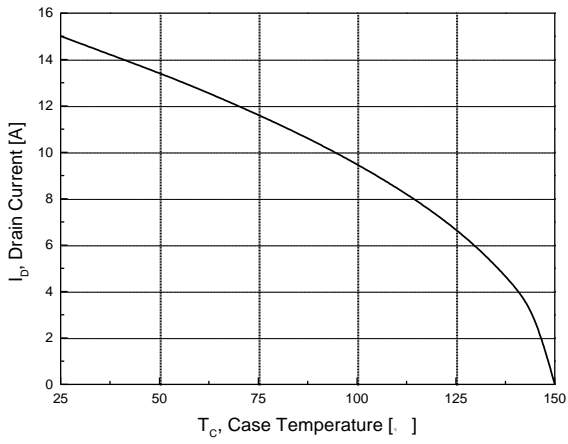
Fig.12 Transient Thermal Response Curve MDF15N60G(TO-220F)



**Fig.13 Single Pulse Maximum Power Dissipation MDP15N60G(TO-220)**



**Fig.14 Single Pulse Maximum Power Dissipation MDF15N60G(TO-220F)**

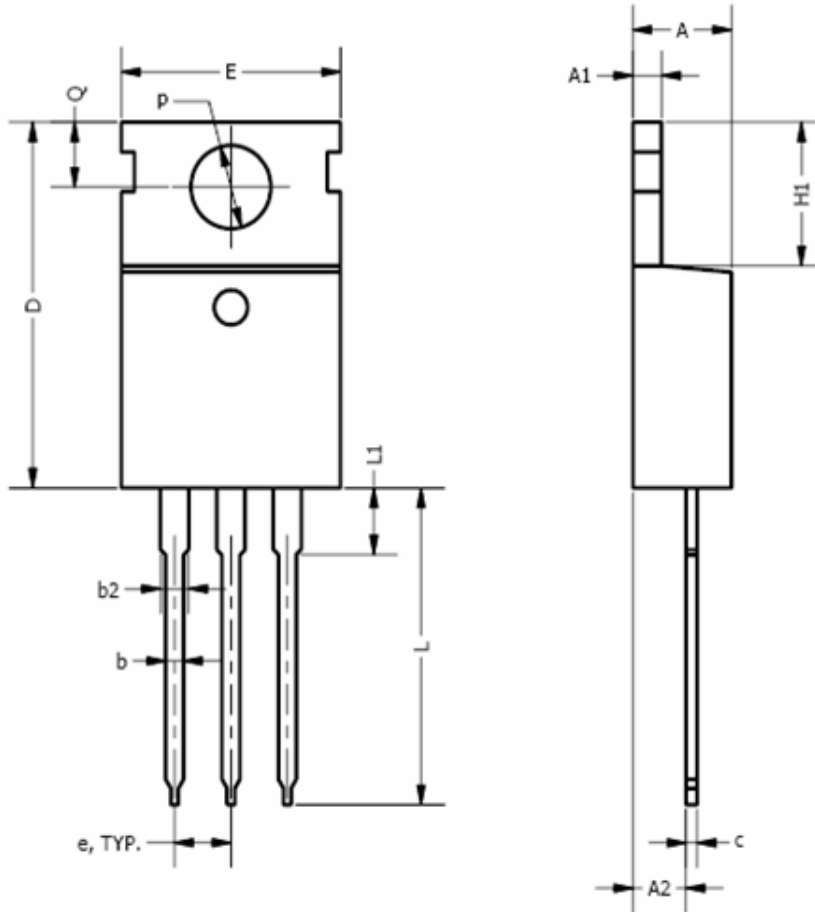


**Fig.15 Maximum Drain Current vs. Case Temperature**

## Physical Dimensions

### 3 Leads, TO-220

Dimensions are in millimeters unless otherwise specified

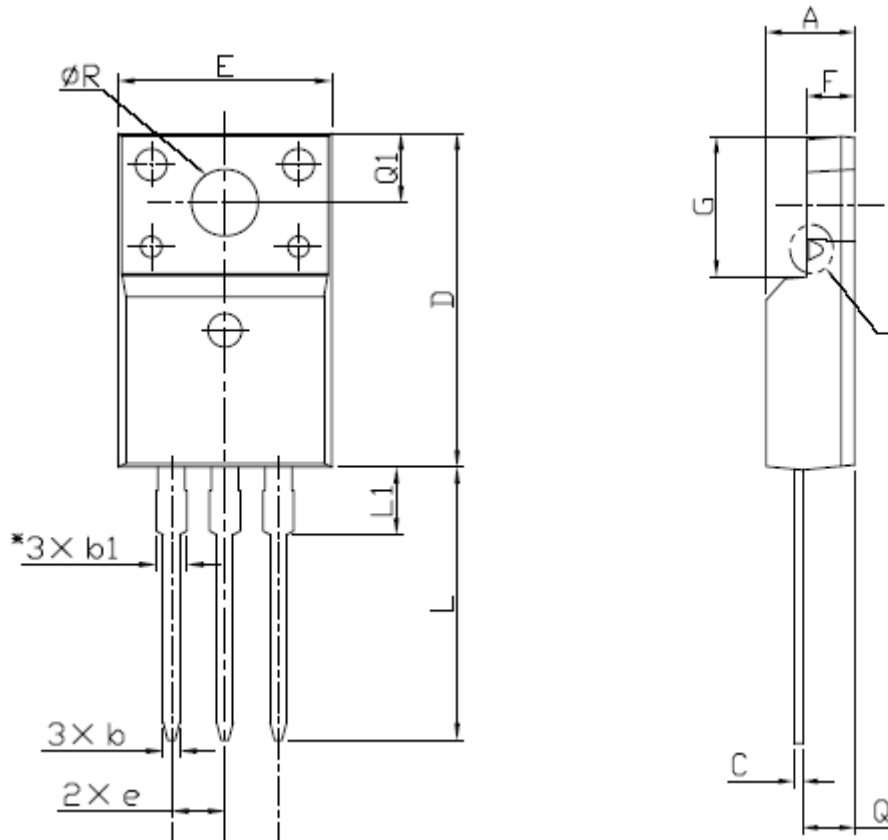


Symbol	Min	Nom	Max
A	3.56		4.83
A1	0.50		1.40
A2	2.03		2.92
b	0.38	0.69	1.02
b2	1.14	1.45	1.78
c	0.36		0.61
D	14.22		16.51
e	2.54 TYP		
E	9.65		10.67
H1	5.84		6.86
L	12.70		14.73
L1			6.35
$\phi P$	3.53		4.09
Q	2.54		3.43

**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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