

MDP12N50F/MDF12N50F

N-Channel MOSFET 500V, 11.5A, 0.75Ω

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

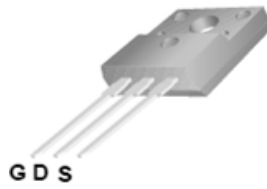
- $V_{DS} = 500V$
- $I_D = 11.5A$ @ $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.75\Omega$ @ $V_{GS} = 10V$

Applications

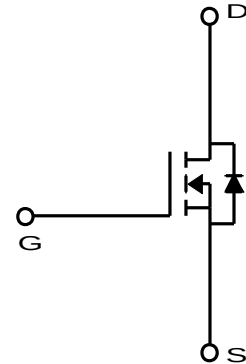
- Power Supply
- PFC
- High Current, High Speed Switching



TO-220
MDP Series



TO-220F
MDF Series



Absolute Maximum Ratings ($T_a = 25^\circ C$)

Characteristics		Symbol	MDP12N50	MDF12N50	Unit
Drain-Source Voltage		V_{DSS}	500		V
Gate-Source Voltage		V_{GSS}	± 30		V
Continuous Drain Current	$T_C = 25^\circ C$	I_D	11.5	11.5*	A
	$T_C = 100^\circ C$		7.0	7.0*	A
Pulsed Drain Current ⁽¹⁾		I_{DM}	46	46*	A
Power Dissipation	$T_C = 25^\circ C$	P_D	165	42	W
	Derate above $25^\circ C$		1.33	0.32	W/ $^\circ C$
Repetitive Avalanche Energy ⁽¹⁾		E_{AR}	16.5		mJ
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}	$-55 \sim 150$		$^\circ C$

* I_D limited by maximum junction temperature

Thermal Characteristics

Characteristics	Symbol	MDP12N50	MDF12N50	Unit
Thermal Resistance, Junction-to-Ambient ⁽¹⁾	$R_{\theta JA}$	62.5	62.5	$^\circ C/W$
Thermal Resistance, Junction-to-Case ⁽¹⁾	$R_{\theta JC}$	0.75	3.0	

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDP12N50FTH	-55~150°C	TO-220	Tube	Halogen Free
MDF12N50FTH	-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 = 250μA, V _{GS} = 0V	500	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	2.5	-	4.5	
Drain Cut-Off Current	I _{DSS}	V _{DS} = 500V, V _{GS} = 0V	-	-	10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±30V, V _{DS} = 0V	-	-	100	nA
Drain-Source ON Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 5.75A		0.59	0.75	Ω
Forward Transconductance	g _{fs}	V _{DS} = 30V, I _D = 5.75A	-	5	-	S
Dynamic Characteristics						
Total Gate Charge	Q _g	V _{DS} = 400V, I _D = 11.5A, V _{GS} = 10V ⁽³⁾	-	20	26	nC
Gate-Source Charge	Q _{gs}		-	7.0	-	
Gate-Drain Charge	Q _{gd}		-	7.5	-	
Input Capacitance	C _{iss}	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	-	1010	1300	pF
Reverse Transfer Capacitance	C _{rss}		-	2.7	4.0	
Output Capacitance	C _{oss}		-	125	165	
Turn-On Delay Time	t _{d(on)}	V _{GS} = 10V, V _{DS} = 250V, I _D = 11.5A, R _G = 25Ω ⁽³⁾	-	47	100	ns
Rise Time	t _r		-	35	80	
Turn-Off Delay Time	t _{d(off)}		-	55	120	
Fall Time	t _f		-	28	60	
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/μs ⁽³⁾	-	100		ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	2.61		μC

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 $T_J=25^\circ C$,

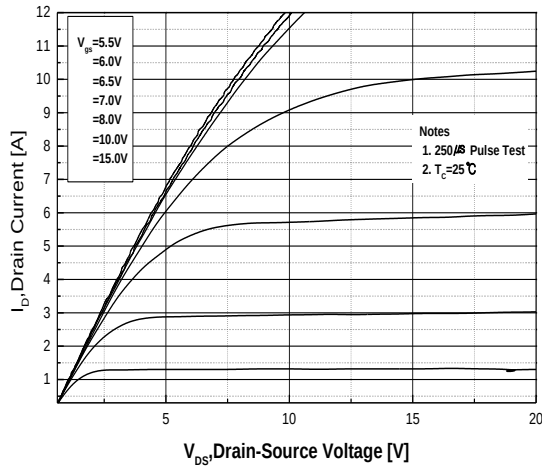


Fig.1 On-Region Characteristics

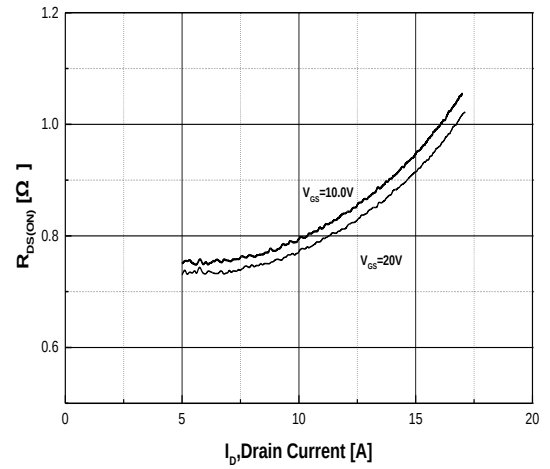


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

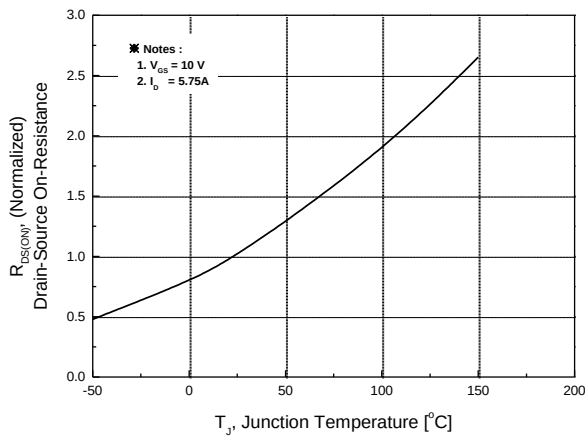


Fig.3 On-Resistance Variation with Temperature

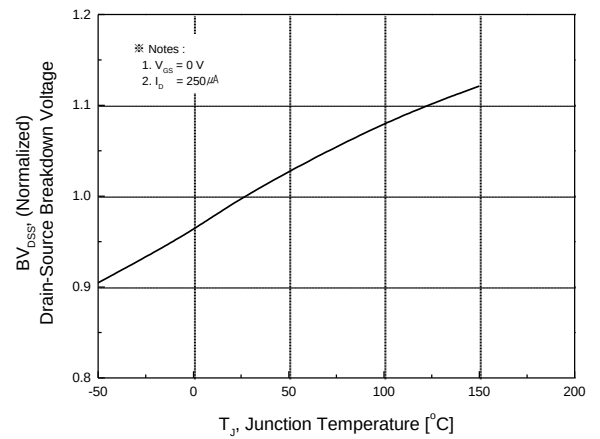


Fig.4 Breakdown Voltage Variation vs. Temperature

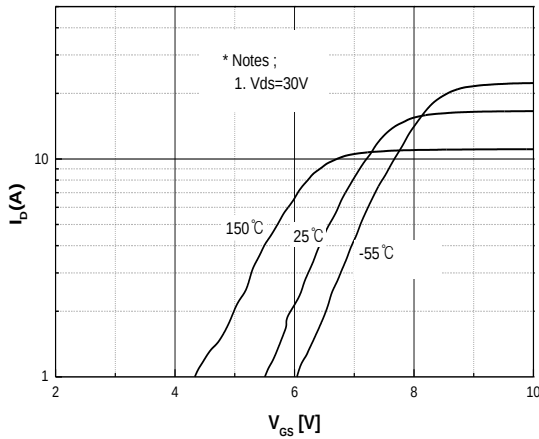


Fig.5 Transfer Characteristics

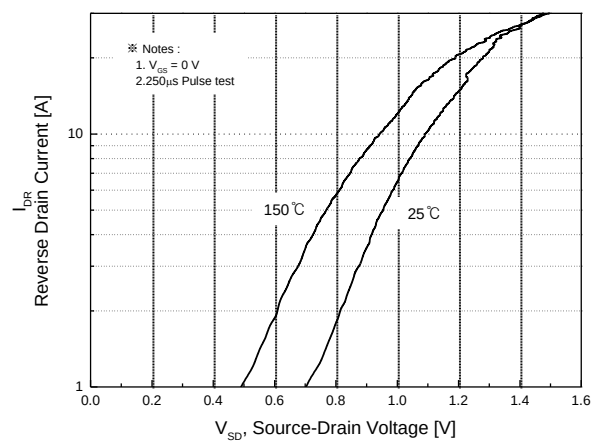


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

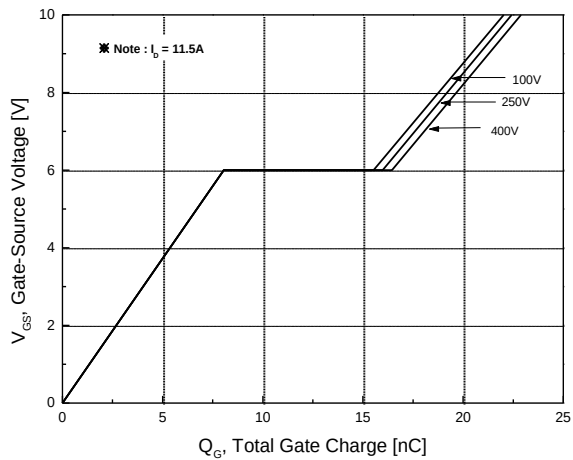


Fig.7 Gate Charge Characteristics

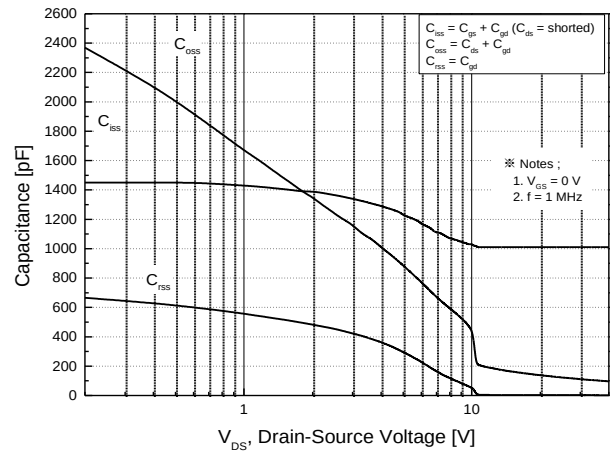


Fig.8 Capacitance Characteristics

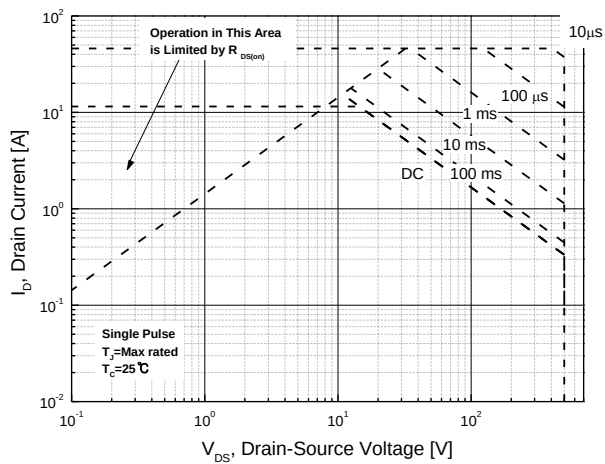


**Fig.9 Maximum Safe Operating Area
MDP12N50F(TO-220)**

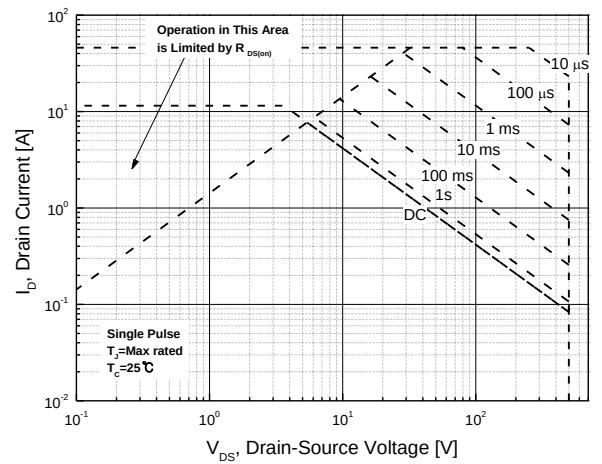


**Fig.10 Maximum Safe Operating Area
MDF12N50F(TO-220F)**

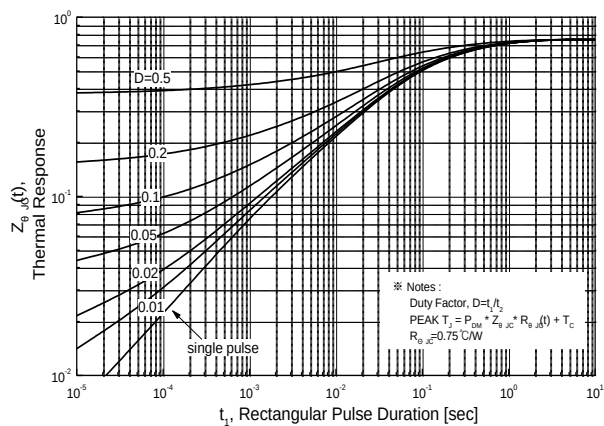


**Fig.11 Transient Thermal Response Curve
MDP12N50F(TO-220)**

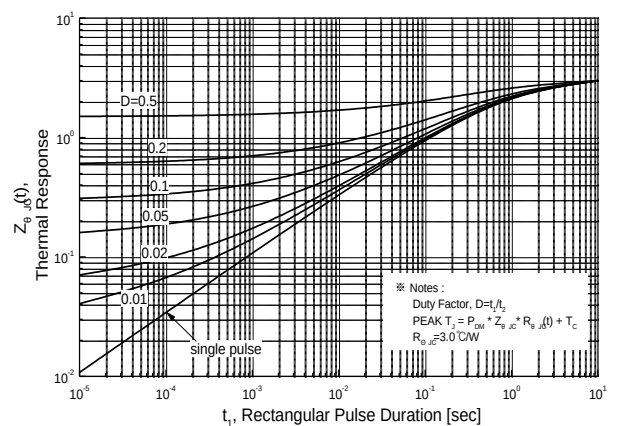


**Fig.12 Transient Thermal Response Curve
MDF12N50F(TO-220F)**

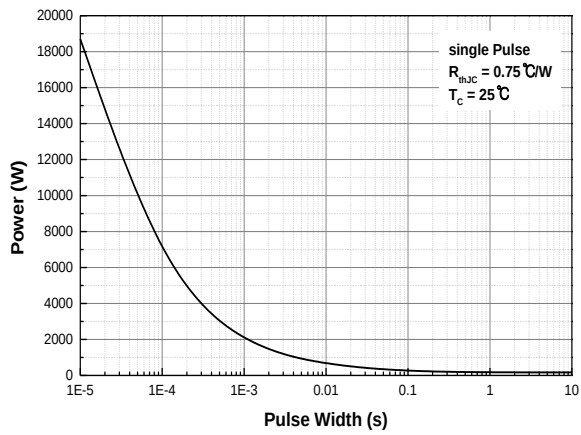


Fig.13 Single Pulse Maximum Power Dissipation MDP12N50F(TO-220)

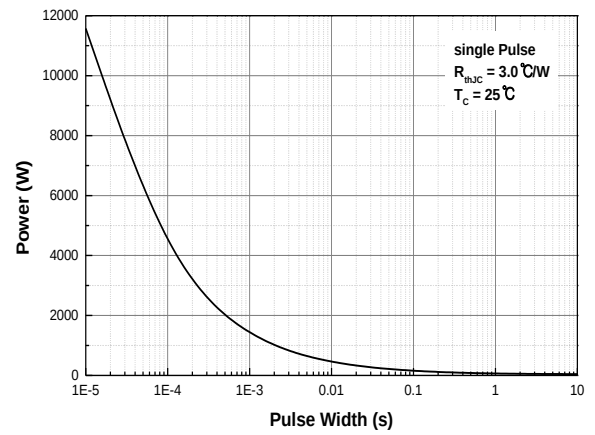


Fig.14 Single Pulse Maximum Power Dissipation MDF12N50F(TO-220F)

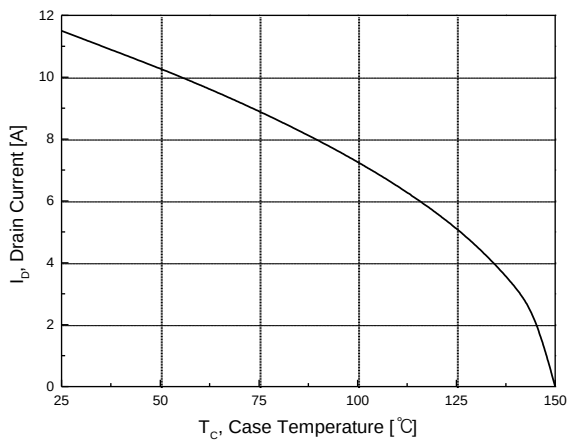
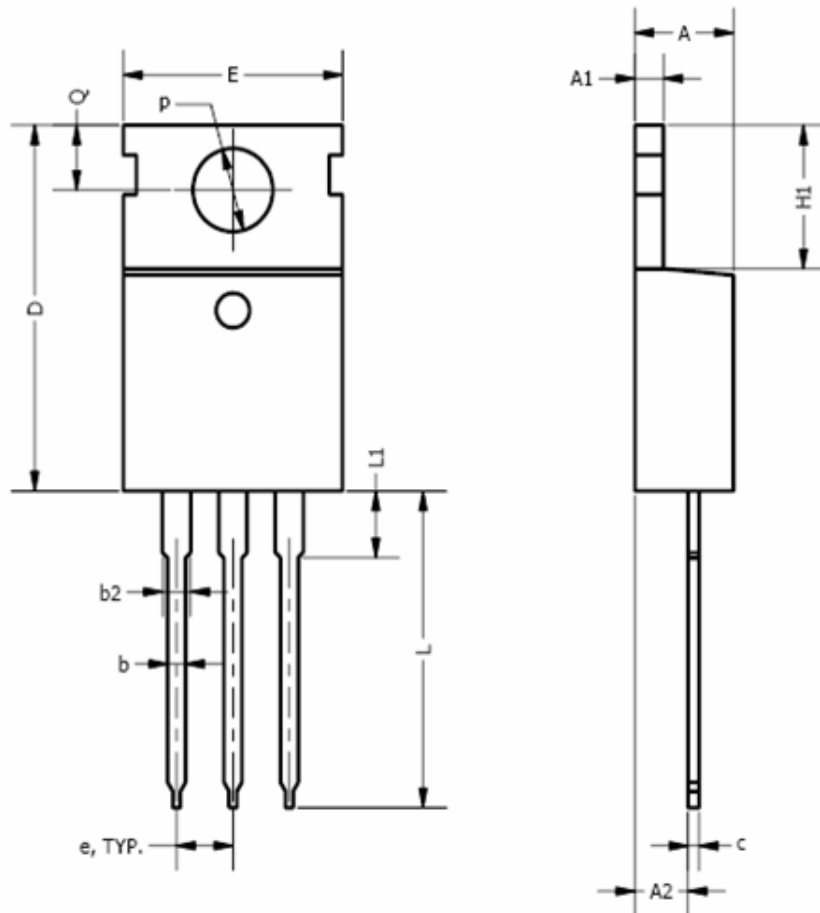


Fig.15 Maximum Drain Current vs. Case Temperature

■ Physical Dimension

3 Leads, TO-220

Dimensions are in millimeters unless otherwise specified

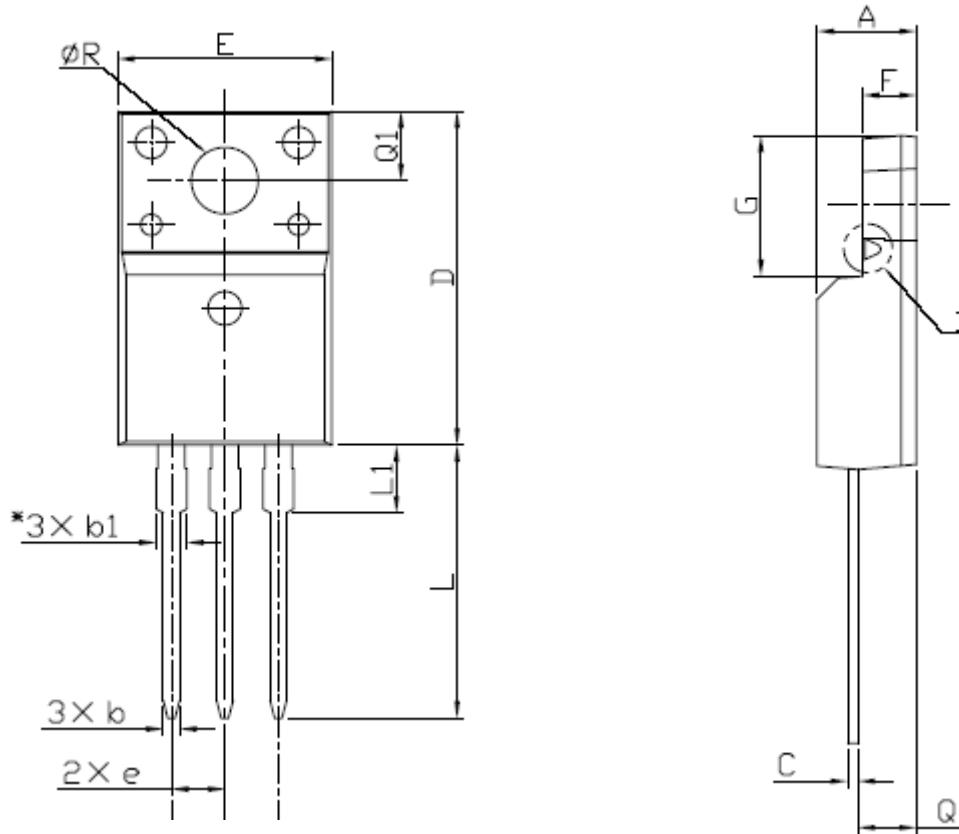


Symbol	Min	Nom	Max
A	3.56		4.83
A1	0.50		1.40
A2	2.03		2.92
b	0.38	0.69	1.02
b2	1.14	1.45	1.78
c	0.36		0.61
D	14.22		16.51
e	2.54 TYP		
E	9.65		10.67
H1	5.84		6.86
L	12.70		14.73
L1			6.35
φP	3.53		4.09
Q	2.54		3.43

■ Physical Dimension

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
ØR	3.00		3.55

DISCLAIMER:

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