FAIRCHILD SEMICONDUCTOR®

FQU20N06L

N-Channel QFET® MOSFET

60 V, 17.2 A, 42 mΩ

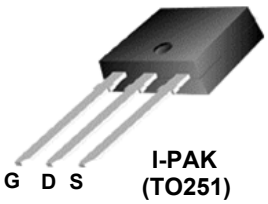
July 2013

Description

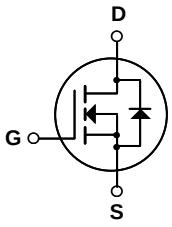
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

Features

- 17.2 A, 60 V, $R_{DS(on)}$=42 mΩ(Max.)@V_{GS}=10 V, I_D=8.6A
- Low Gate Charge (Typ. 9.5 nC)
- Low C_{rss} (Typ. 35 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



I-PAK
(TO251)



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		FQU20N06L	Unit
V_{DSS}	Drain-Source Voltage		60	V
I_D	Drain Current - Continuous (T_C = 25°C)		17.2	A
	- Continuous (T_C = 100°C)		10.9	A
I_{DM}	Drain Current - Pulsed	(Note 1)	68.8	A
V_{GSS}	Gate-Source Voltage		± 20	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	170	mJ
I_{AR}	Avalanche Current	(Note 1)	17.2	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	3.8	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	7.0	V/ns
P_D	Power Dissipation (T_A = 25°C) *		2.5	W
	Power Dissipation (T_C = 25°C)		38	W
	- Derate above 25°C		0.30	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FQU20N06L	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.28	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max. *	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	110	°C/W

* When mounted on the minimum pad size recommended (PCB Mount)

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Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	60	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.06	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 48 V, T_C = 125°C	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	1.0	--	2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 8.6 A	--	0.046	0.06	Ω
		V_{GS} = 5 V, I_D = 8.6 A	--	0.057	0.075	
g_{FS}	Forward Transconductance	V_{DS} = 25 V, I_D = 8.6 A	--	11	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	480	630	pF
C_{oss}	Output Capacitance		--	175	230	pF
C_{rss}	Reverse Transfer Capacitance		--	35	45	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 10.5 A, R_G = 25 Ω (Note 4)	--	10	30	ns
t_r	Turn-On Rise Time		--	165	340	ns
$t_{d(off)}$	Turn-Off Delay Time		--	35	80	ns
t_f	Turn-Off Fall Time		--	70	150	ns
Q_g	Total Gate Charge	V_{DS} = 48 V, I_D = 21 A, V_{GS} = 5 V (Note 4)	--	9.5	13	nC
Q_{gs}	Gate-Source Charge		--	2.5	--	nC
Q_{gd}	Gate-Drain Charge		--	5.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	17.2	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	68.8	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 17.2 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_F = 21 A, dI_F / dt = 100 A/μs	--	54	--	ns
Q_{rr}	Reverse Recovery Charge		--	75	--	nC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 670μH, I_{AS} = 17.2A, V_{DD} = 25V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 21A, di/dt ≤ 300A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially independent of operating temperature

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Typical Characteristics

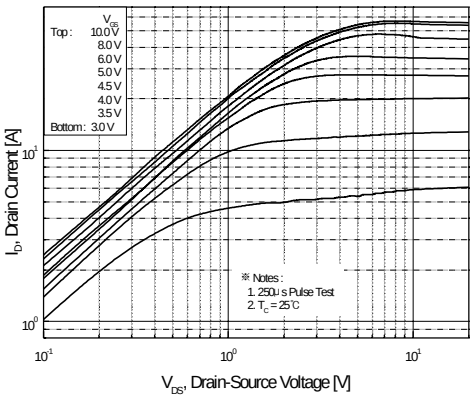


Figure 1. On-Region Characteristics

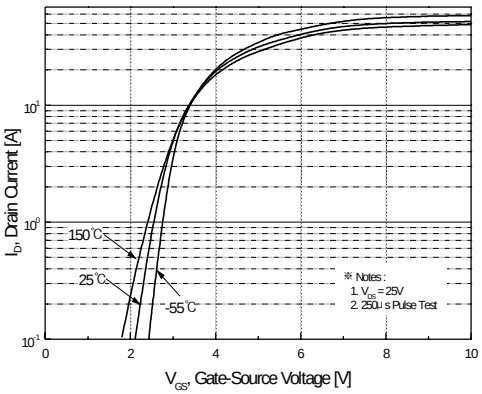


Figure 2. Transfer Characteristics

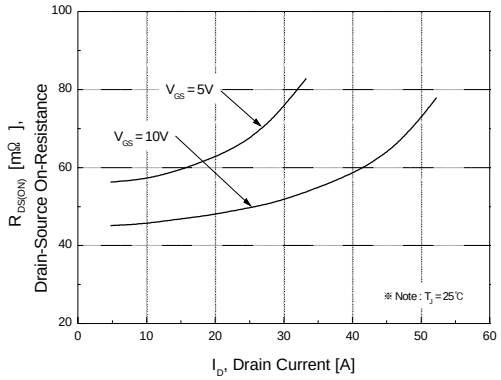


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

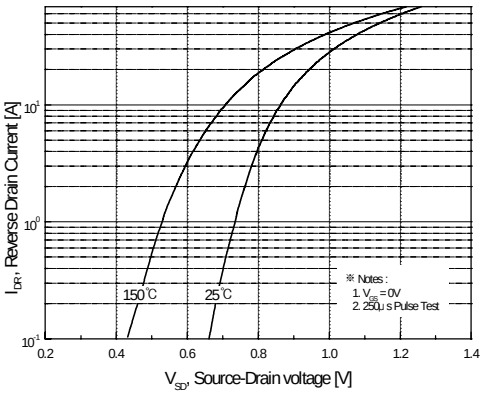


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

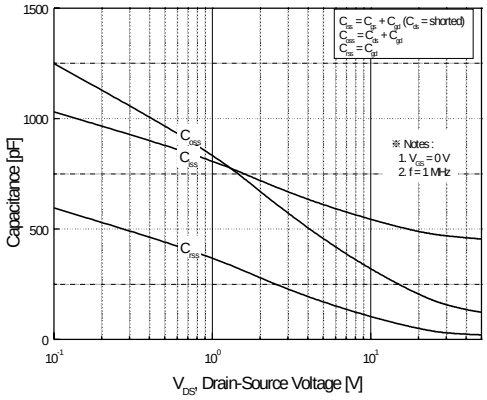


Figure 5. Capacitance Characteristics

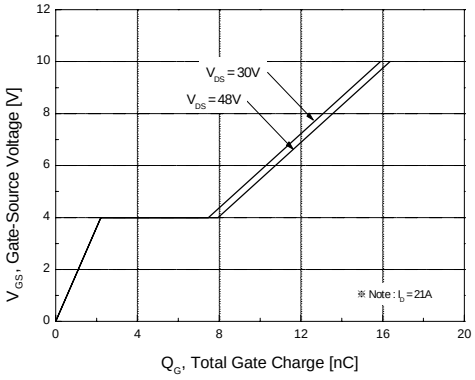


Figure 6. Gate Charge Characteristics

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Typical Characteristics (Continued)

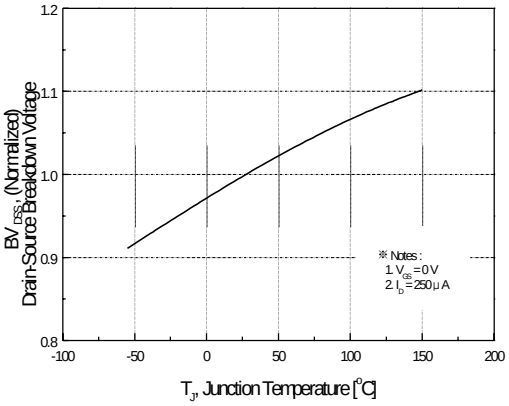


Figure 7. Breakdown Voltage Variation vs. Temperature

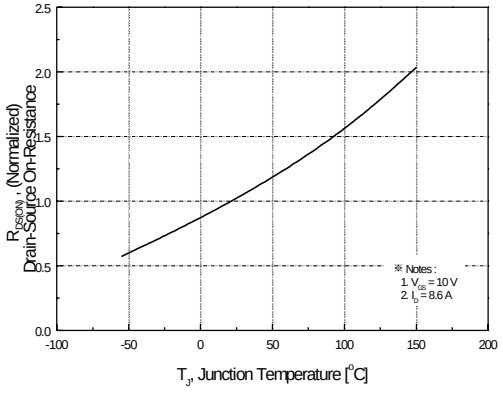


Figure 8. On-Resistance Variation vs. Temperature

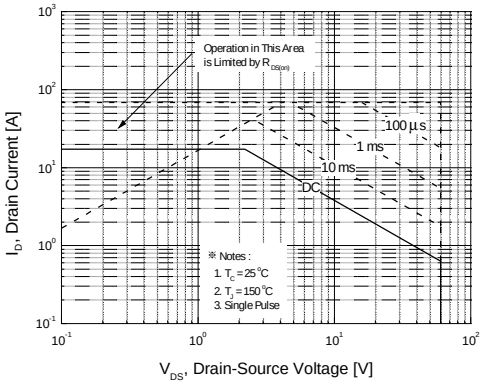


Figure 9. Maximum Safe Operating Area

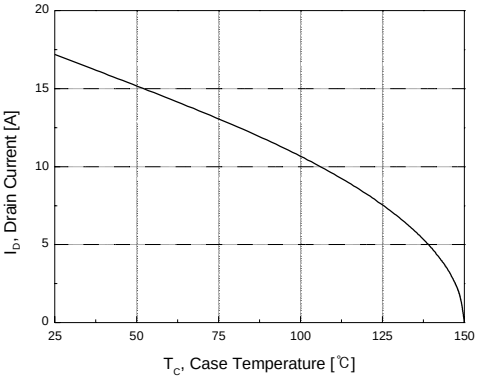


Figure 10. Maximum Drain Current vs. Case Temperature

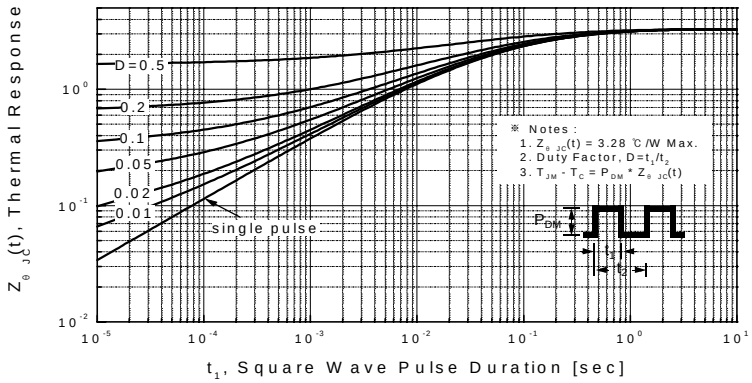
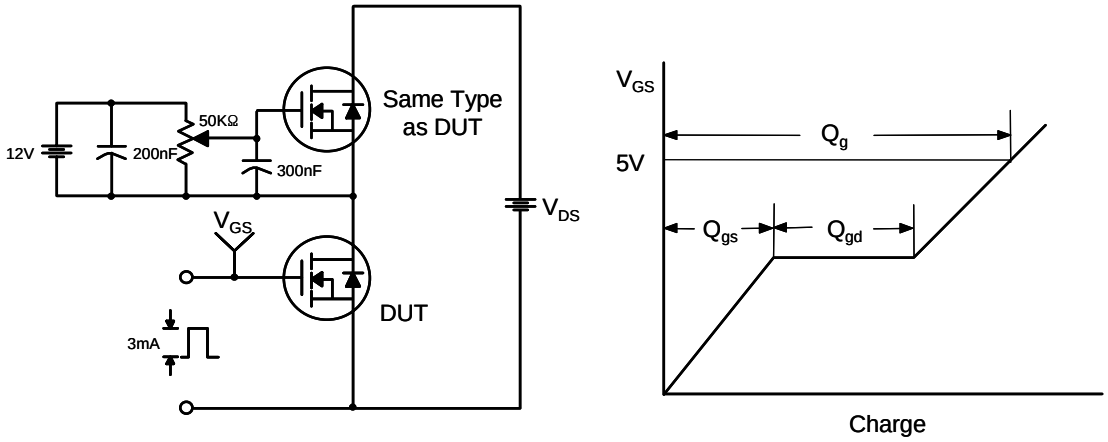
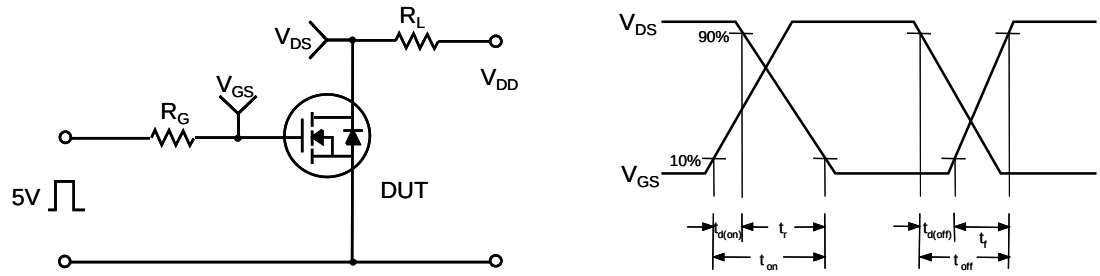


Figure 11. Transient Thermal Response Curve

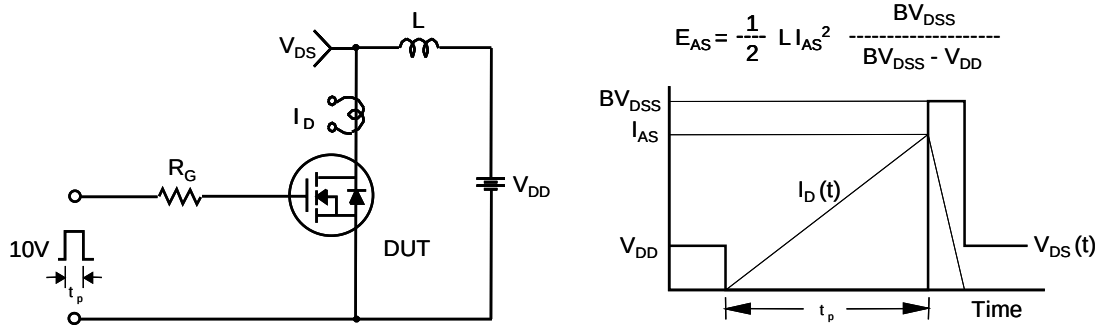
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

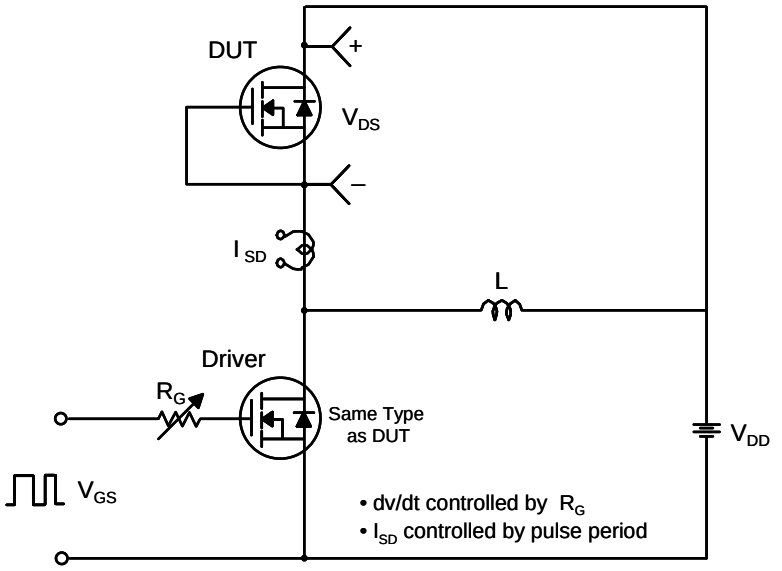


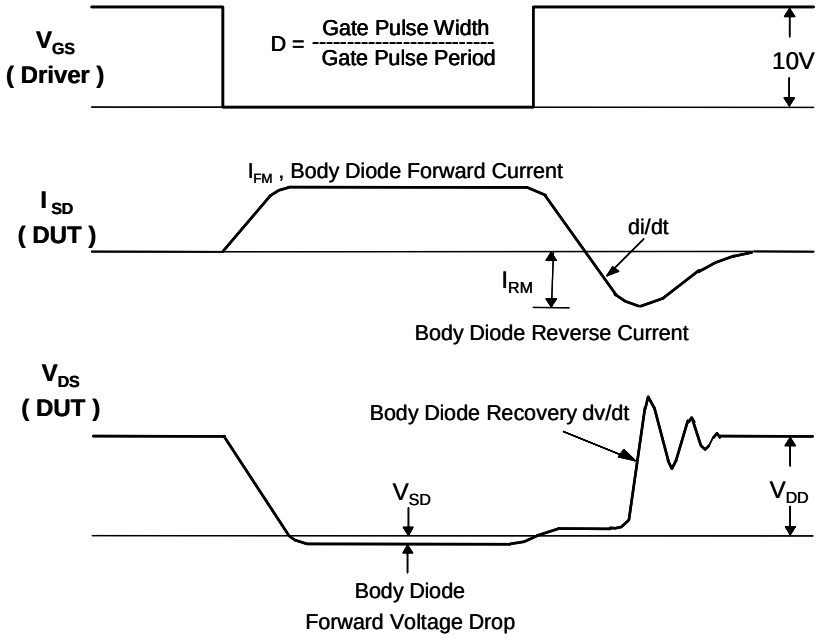
Unclamped Inductive Switching Test Circuit & Waveforms



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Peak Diode Recovery dv/dt Test Circuit & Waveforms

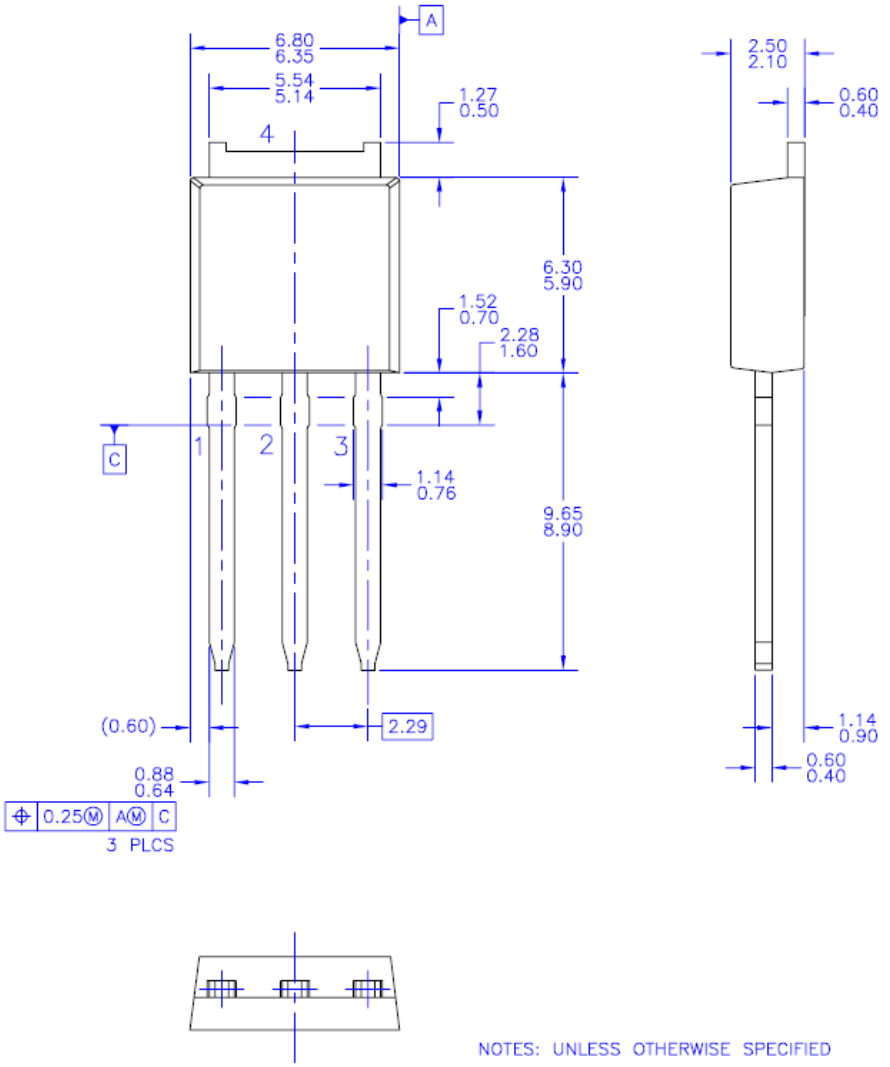




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Package Dimensions (Continued)

IPAK



NOTES: UNLESS OTHERWISE SPECIFIED

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B) THIS PACKAGE CONFORMS TO JEDEC, TO-251, ISSUE C, VARIATION AA, DATED SEP 1988.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

TO-251 (IPAK) MOLDED, 3LEAD, OPTION AA

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Dimensions in Millimeters

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