FAIRCHILD SEMICONDUCTOR®

January 2007

FDMC5614P
P-Channel PowerTrench® MOSFET
-60V, -13.5A, 100mΩ

Features

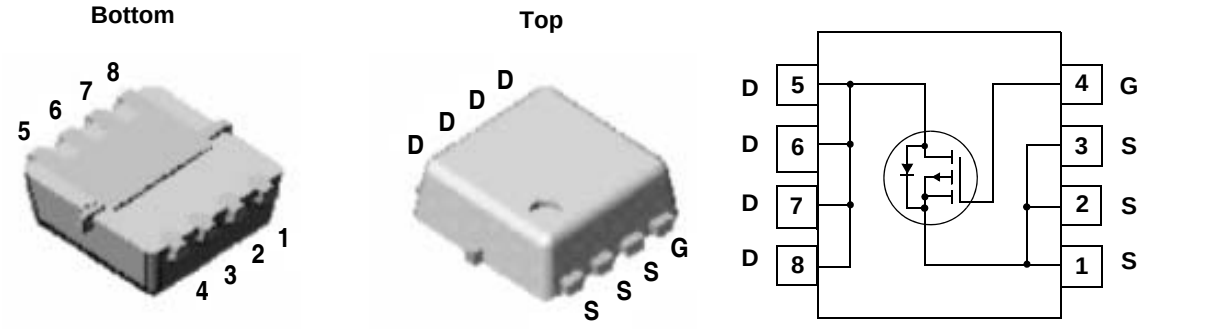
- Max $r_{DS(on)}$ = 100mΩ at V_{GS} = -10V, I_D = -5.7A
- Max $r_{DS(on)}$ = 135mΩ at V_{GS} = -4.5V, I_D = -4.4A
- Low gate charge
- Fast switching speed
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability
- RoHS Compliant

General Description

This P-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench® process. It has been optimized for power management applications requiring a wide range of gate drive voltage ratings (4.5V-20V).

Application

- Power management
- Load switch
- Battery protection



Power 33

MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			-60	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25°C		-13.5	A
	-Continuous (Silicon limited)	T_C = 25°C		-14	
	-Continuous	T_A = 25°C	(Note 1a)	-5.7	
	-Pulsed			-23	
P_D	Power Dissipation	T_C = 25°C		42	W
	Power Dissipation	T_A = 25°C	(Note 1a)	2.1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
5614P	FDMC5614P	Power 33	7”	8mm	3000 units

Electrical Characteristics T_J = 25°C unless otherwise noted

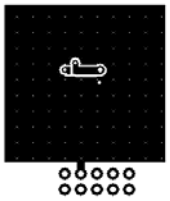
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = -250μA, V_{GS} = 0V	-60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250μA, referenced to 25°C		-54		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -48V, V_{GS} = 0V			-1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250μA	-1	-1.95	-3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250μA, referenced to 25°C		4.7		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = -10V, I_D = -5.7A		84	100	mΩ
		V_{GS} = -4.5V, I_D = -4.4A		108	135	
		V_{GS} = -10V, I_D = -5.7A , T_J = 125°C		140	168	
g_{FS}	Forward Transconductance	V_{DS} = -15V, I_D = -5.7A		11		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -30V, V_{GS} = 0V, f = 1MHz		795	1055	pF
C_{oss}	Output Capacitance			140	185	pF
C_{rss}	Reverse Transfer Capacitance			60	90	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -30V, I_D = -1A, V_{GS} = -10V, R_{GEN} = 6Ω		10	21	ns
t_r	Rise Time			11	23	ns
$t_{d(off)}$	Turn-Off Delay Time			32	65	ns
t_f	Fall Time			11	22	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = -10V, V_{DD} = -30V, I_D = -5.7A		15	20	nC
Q_{gs}	Gate to Source Gate Charge			1.6	2.1	nC
Q_{gd}	Gate to Drain “Miller” Charge			2.7	3.5	nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = -3.2A		-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	I_F = -3.2A, di/dt = 100A/μs			36	ns
Q_{rr}	Reverse Recovery Charge				29	nC

Notes:

1: $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

(a)$R_{\theta JA}$ = 60°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5'x1.5'x0.062' thick PCB.

(b)$R_{\theta JA}$ = 135°C/W when mounted on a minimum pad of 2 oz copper.



a. 60°C/W when mounted on a 1 in^2 pad of 2 oz copper

b.135°C/W when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

Typical Characteristics T_J = 25°C unless otherwise noted

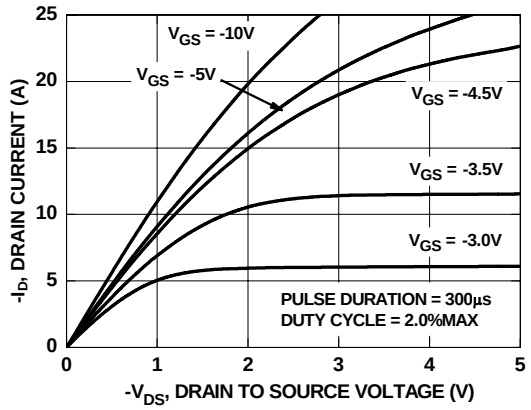


Figure 1. On-Region Characteristics

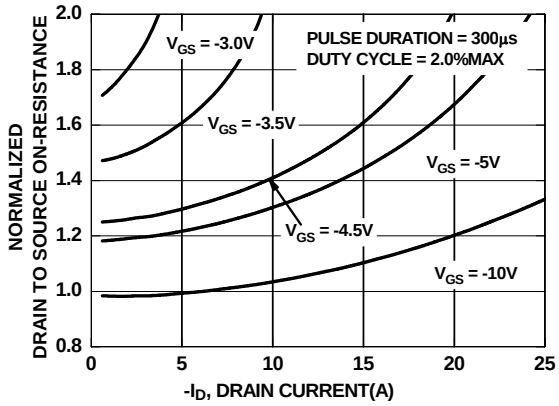


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

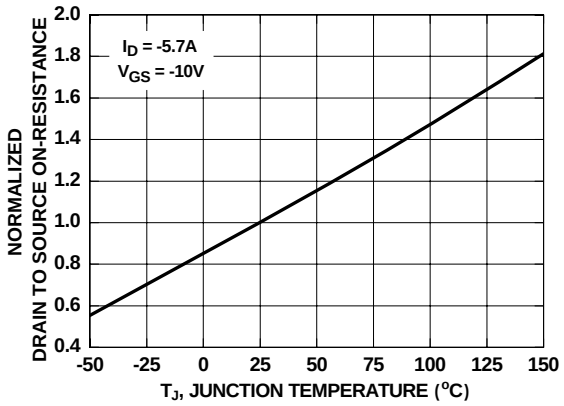


Figure 3. Normalized On-Resistance vs Junction Temperature

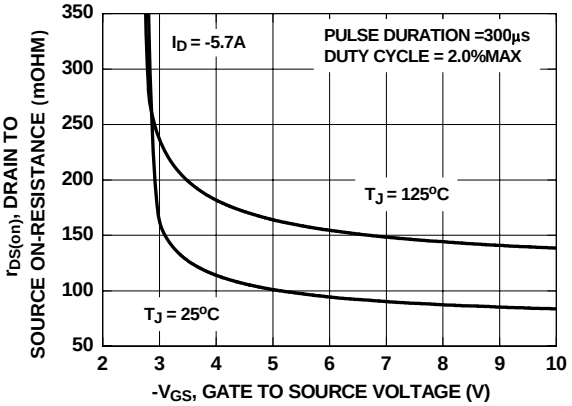


Figure 4. On-Resistance vs Gate to Source Voltage

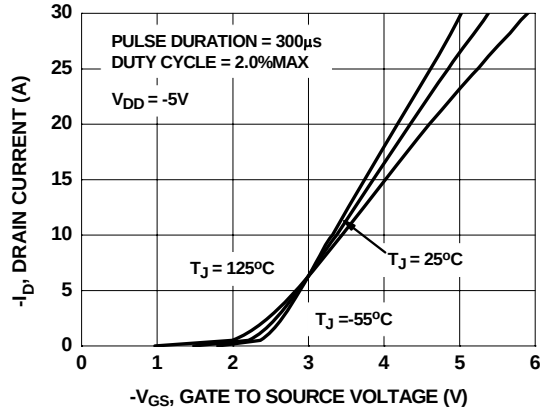


Figure 5. Transfer Characteristics

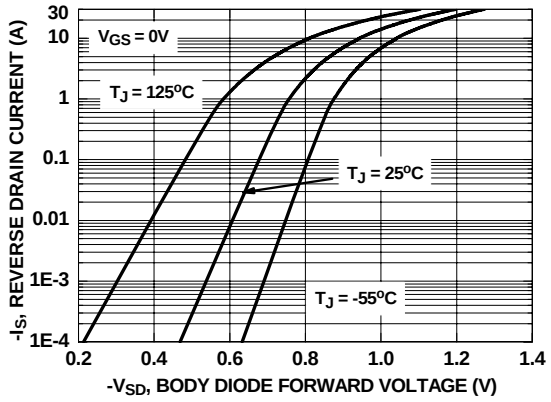


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

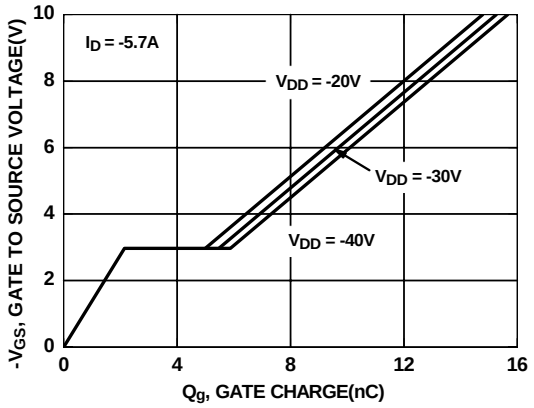


Figure 7. Gate Charge Characteristics

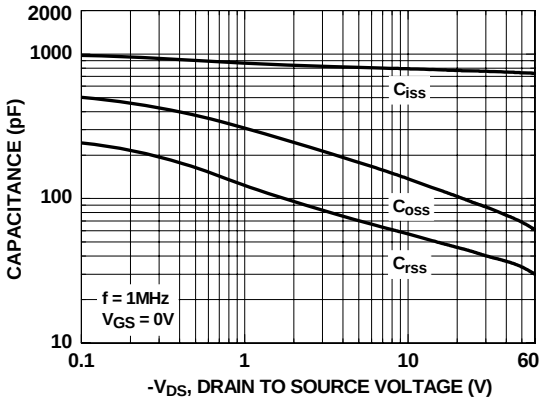


Figure 8. Capacitance vs Drain to Source Voltage

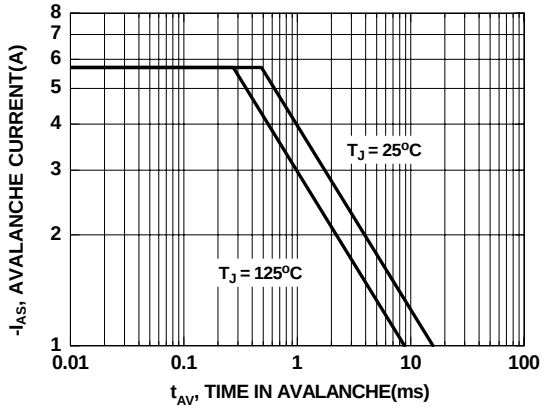


Figure 9. Unclamped Inductive Switching Capability

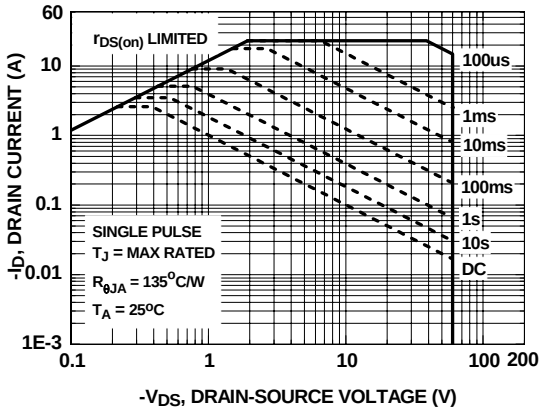


Figure 10. Forward Bias Safe Operating Area

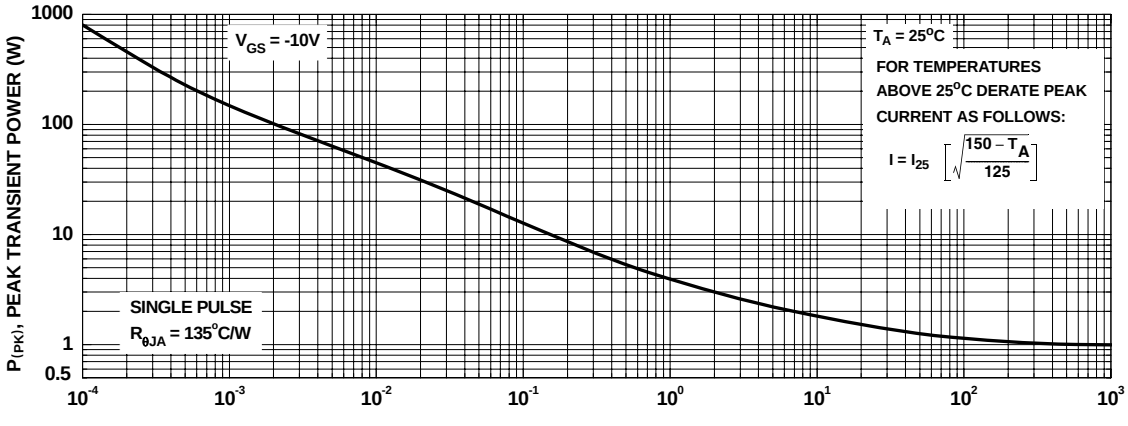


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

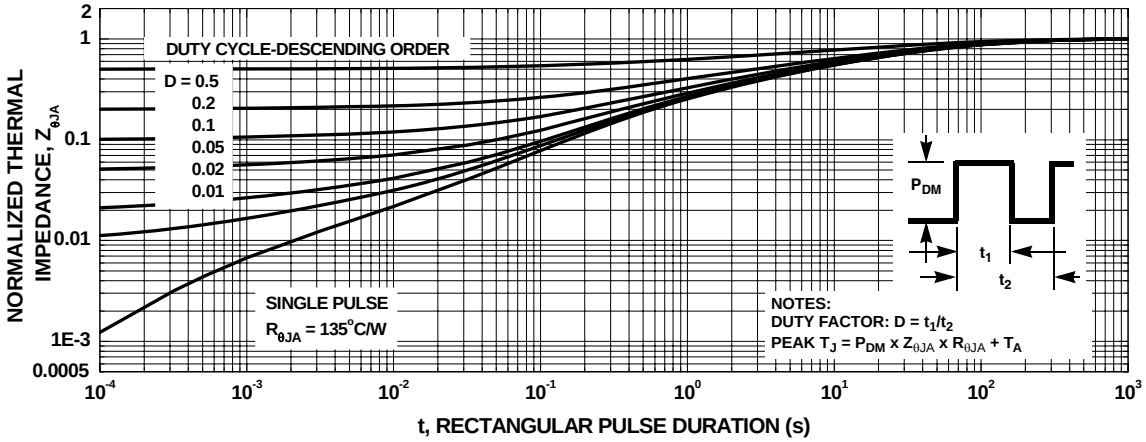
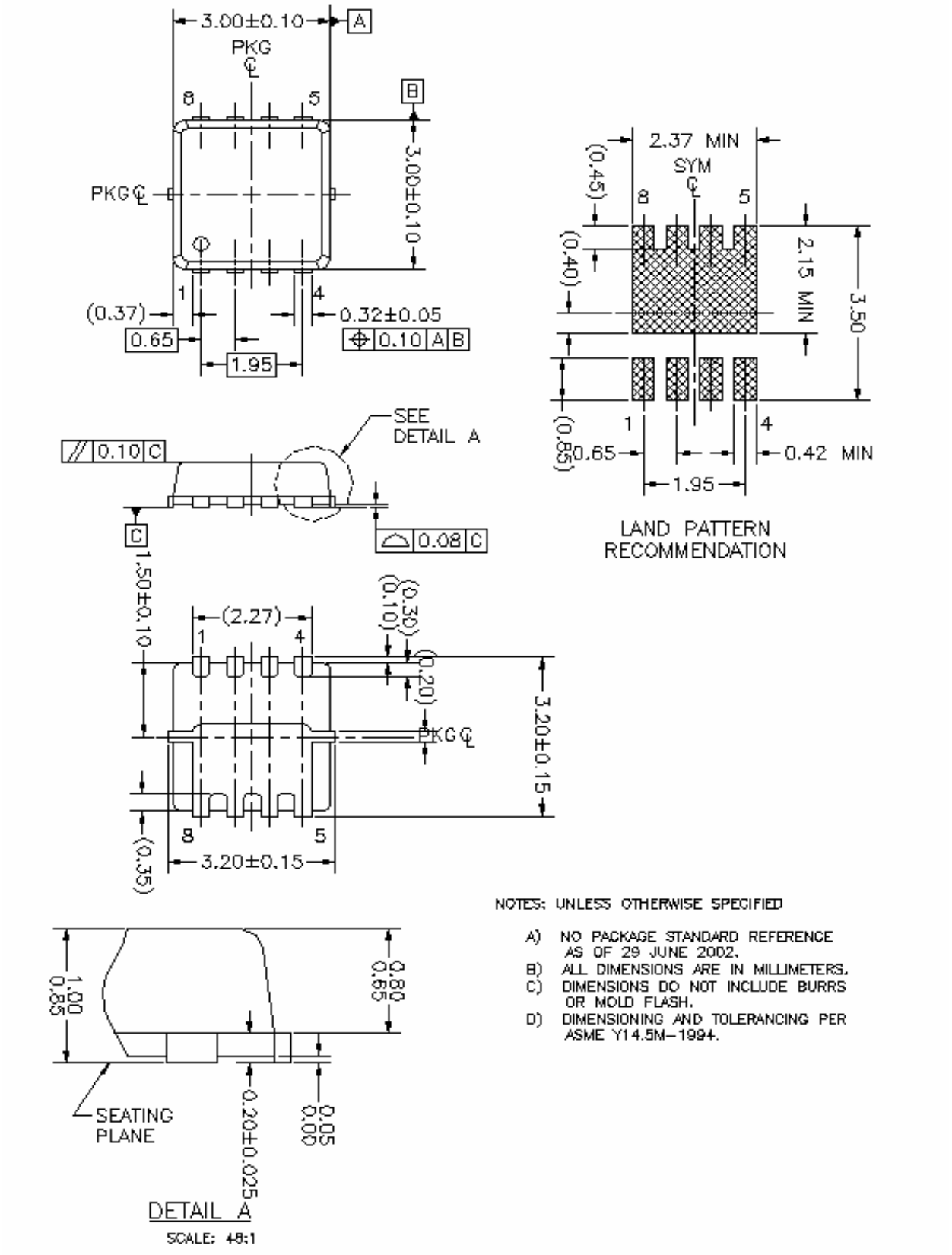


Figure 12. Transient Thermal Response Curve



NOTES: UNLESS OTHERWISE SPECIFIED

A) NO PACKAGE STANDARD REFERENCE AS OF 29 JUNE 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
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