FAIRCHILD SEMICONDUCTOR®

September 2013

FDMC6683PZ

P-Channel PowerTrench® MOSFET
-20 V, -14 A, 8.4 mΩ

Features

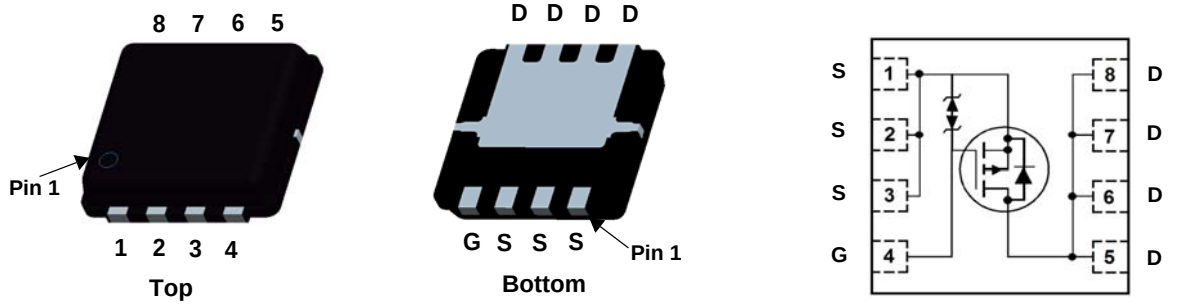
- Max $r_{DS(on)}$ = 8.4 mΩ at V_{GS} = -4.5 V, I_D = -14 A
- Max $r_{DS(on)}$ = 13 mΩ at V_{GS} = -2.5 V, I_D = -11 A
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- Termination is Lead-free and RoHS Compliant
- HBM ESD capability level > 3.6 KV typical (Note 4)

General Description

This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been optimized for $r_{DS(ON)}$, switching performance and ruggedness.

Applications

- Battery Management
- Load Switch



MLP 3.3x3.3

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			-20	V
V_{GS}	Gate to Source Voltage			±12	V
I_D	Drain Current -Continuous	T_C = 25 °C		-40	A
	-Continuous	T_A = 25 °C	(Note 1a)	-14	
	-Pulsed			-50	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	38	mJ
P_D	Power Dissipation	T_C = 25 °C		26	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.9	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Package Marking and Ordering Information

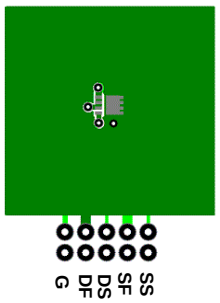
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
22BK	FDMC6683PZ	MLP 3.3X3.3	13 ”	12 mm	3000 units

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 = -250 μA, V_{GS} = 0 V	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		-19		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -16 V, V_{GS} = 0 V			-1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12 V, V_{DS} = 0 V			±10	μA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250 μA	-0.6	-0.9	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = -4.5 V, I_D = -14 A		5.9	8.4	mΩ
		V_{GS} = -2.5 V, I_D = -11 A		8.2	13	
		V_{GS} = -4.5 V, I_D = -14 A, T_J = 125 °C		8.3	13	
g_{FS}	Forward Transconductance	V_{DS} = -5 V, I_D = -14 A		85		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz		5710	7995	pF
C_{oss}	Output Capacitance			1215	1700	pF
C_{rss}	Reverse Transfer Capacitance			1170	1640	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -10 V, I_D = -14 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω		26	42	ns
t_r	Rise Time			52	83	ns
$t_{d(off)}$	Turn-Off Delay Time			96	154	ns
t_f	Fall Time			81	130	ns
Q_g	Total Gate Charge	V_{DD} = -10 V, I_D = -14 A, V_{GS} = -4.5 V		53	74	nC
Q_{gs}	Gate to Source Charge			9.4		nC
Q_{gd}	Gate to Drain “Miller” Charge			18		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = -14 A (Note 2)		-0.8	-1.3	V
		V_{GS} = 0 V, I_S = -2 A (Note 2)		-0.7	-1.2	
t_{rr}	Reverse Recovery Time	I_F = -14 A, di/dt = 100 A/μs		39	62	ns
Q_{rr}	Reverse Recovery Charge			17	31	nC

Notes:

1: $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 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. 53 °C/W when mounted on a 1 in^2 pad of 2 oz copper.

b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

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

3: E_{AS} of 38 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = -16 A, V_{DD} = -18 V, V_{GS} = -10 V.

4: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics T_J = 25 °C unless otherwise noted

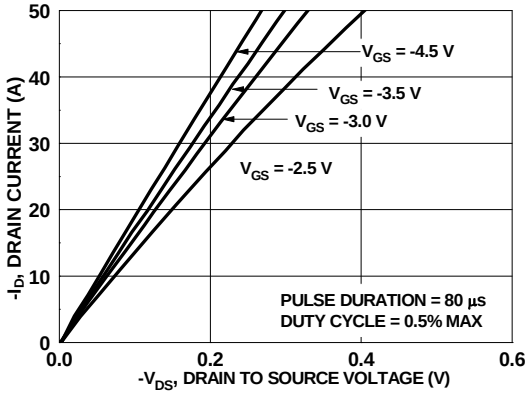


Figure 1. On-Region Characteristics

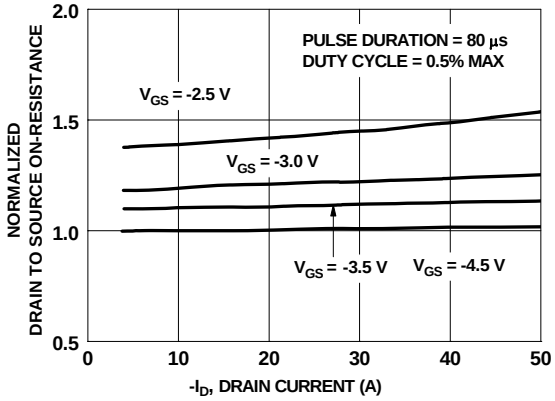


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

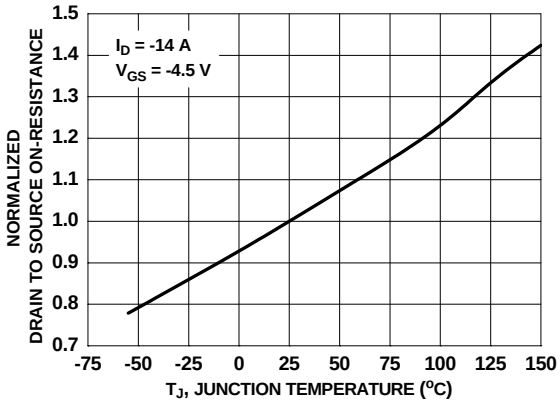


Figure 3. Normalized On-Resistance vs Junction Temperature

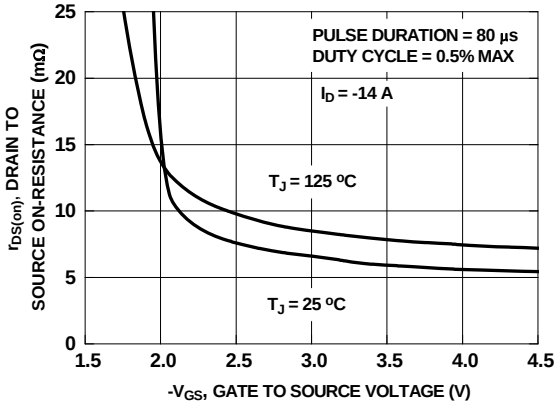


Figure 4. On-Resistance vs Gate to Source Voltage

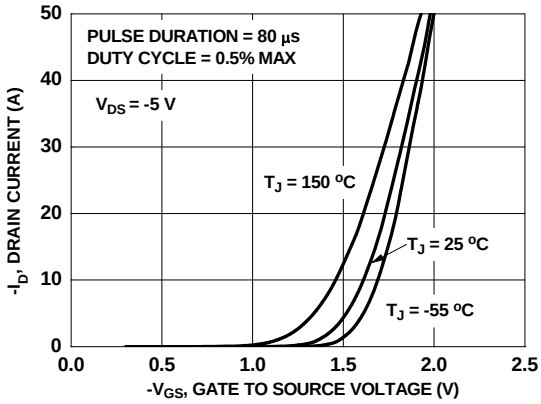


Figure 5. Transfer Characteristics

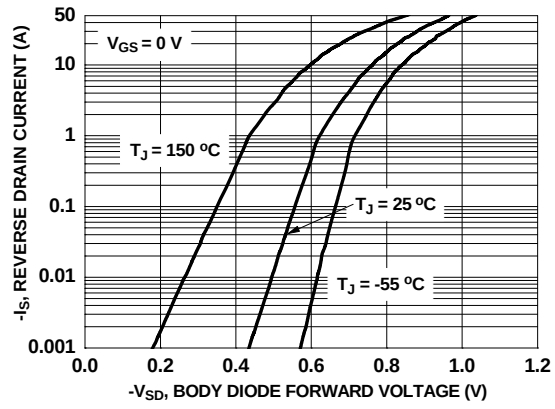


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

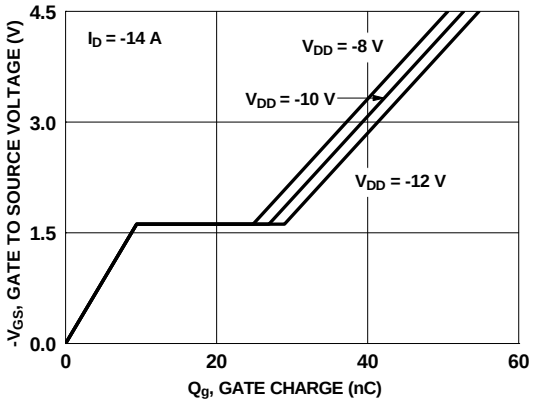


Figure 7. Gate Charge Characteristics

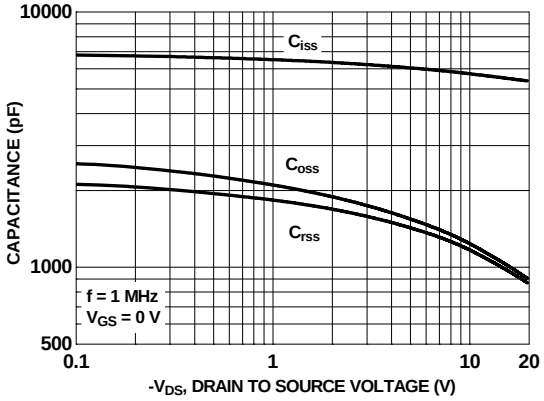


Figure 8. Capacitance vs Drain to Source Voltage

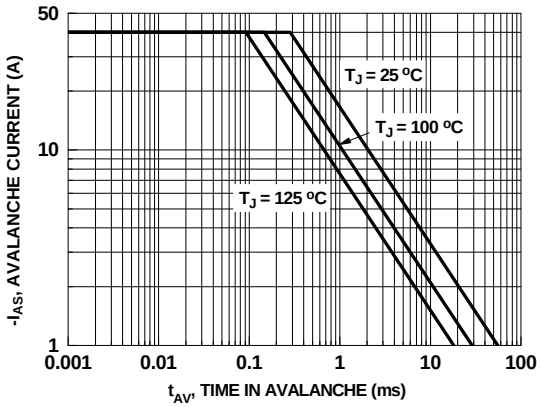


Figure 9. Unclamped Inductive Switching Capability

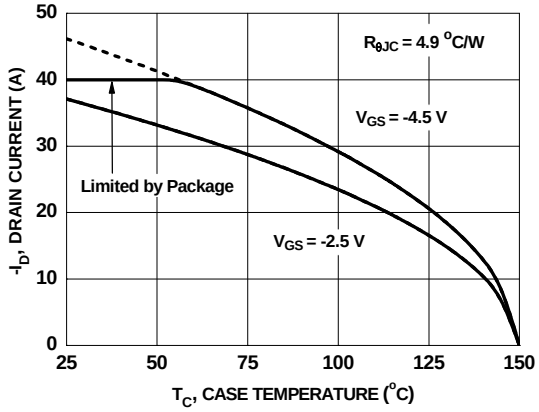


Figure 10. Maximum Continuous Drain Current vs Case Temperature

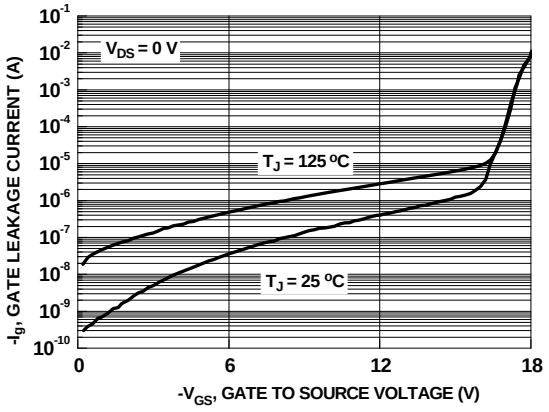


Figure 11. Gate Leakage Current vs Gate to Source Voltage

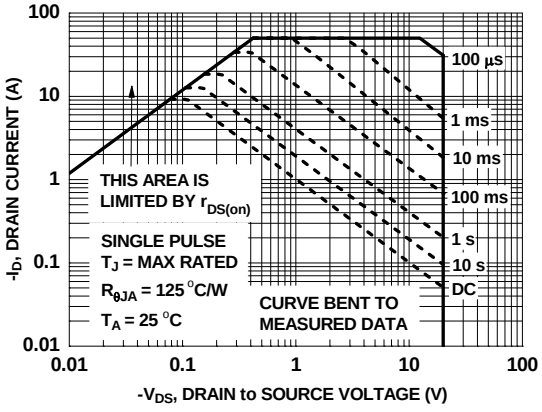


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics T_J = 25 °C unless otherwise noted

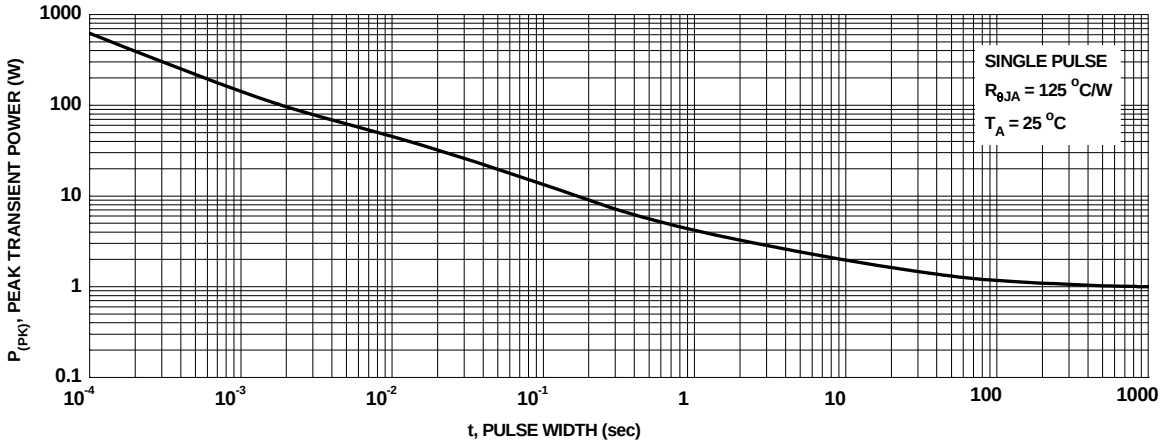


Figure 13. Single Pulse Maximum Power Dissipation

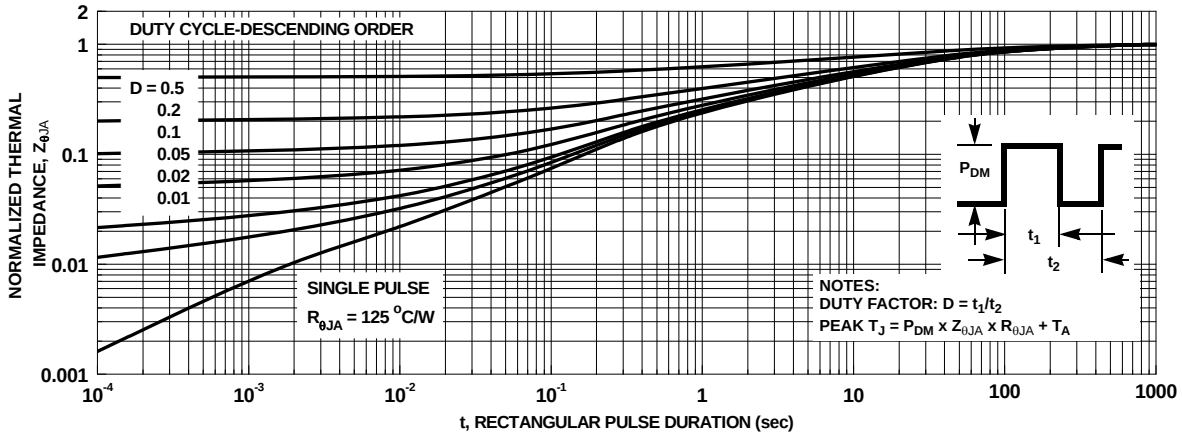
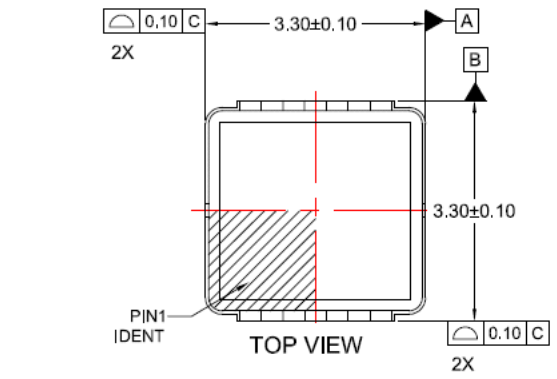
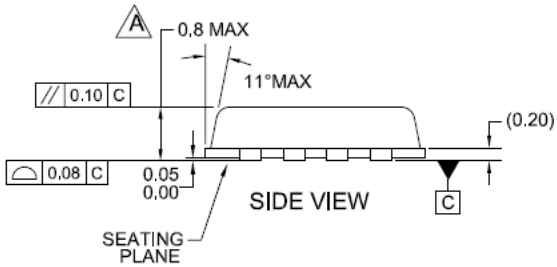
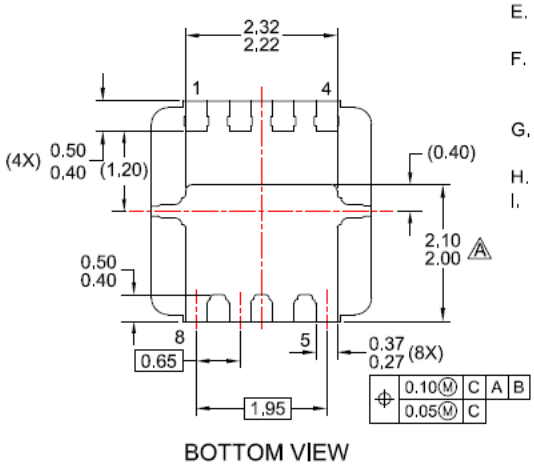


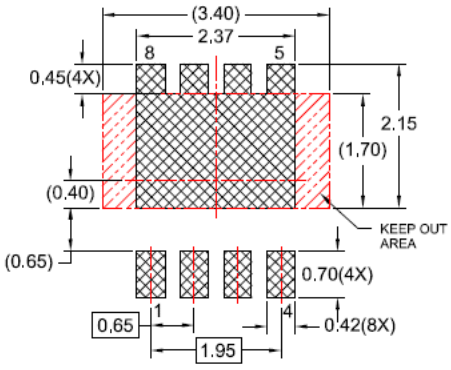
Figure 14. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout









RECOMMENDED LAND PATTERN

NOTES:

A. EXCEPT AS NOTED, PACKAGE CONFORMS TO JEDEC REGISTRATION MO-240 VARIATION BA.,
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
D. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
E. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.
F. FLANGE DIMENSIONS INCLUDE INTERTERMINAL FLASH OR PROTRUSION. INTERTERMINAL FLASH OR PROTRUSION SHALL NOT EXCEED 0.25MM PER SIDE.
G. IT IS RECOMMENDED TO HAVE NO TRACES OR VIA WITHIN THE KEEP OUT AREA.
H. DRAWING FILENAME: MKT-MLP08Trev1.
I. GENERAL RADII FOR ALL CORNERS SHALL BE 0.20MM MAX.

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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