FAIRCHILD SEMICONDUCTOR®

January 2013

FDFMA3P029Z

Integrated P-Channel PowerTrench® MOSFET and Schottky Diode

–30 V, –3.3 A, 87 mΩ

Features

MOSFET

- Max $r_{DS(on)}$ = 87 mΩ at V_{GS} = –10 V, I_D = –3.3 A
- Max $r_{DS(on)}$ = 152 mΩ at V_{GS} = –4.5 V, I_D = –2.3 A
- HBM ESD protection level > 2 KV typical (Note 3)

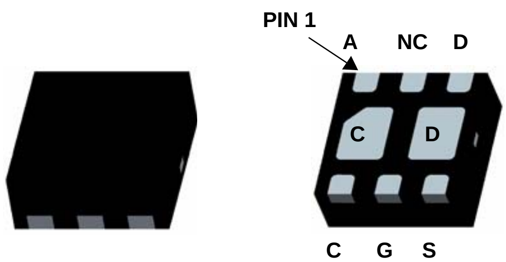
Schottky

- V_F < 0.37 V @ 500 mA
- Low profile - 0.8 mm maximum - in the new package MicroFET 2x2 mm
- RoHS Compliant

General Description

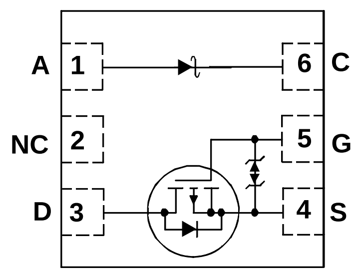
This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features a MOSFET with very low on-state resistance and an independently connected low forward voltage schottky diode allows for minimum conduction losses.

The MicroFET 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.



Top   Bottom

MicroFET 2x2



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		–30	V
V_{GS}	Gate to Source Voltage		±25	V
I_D	Drain Current -Continuous	(Note 1a)	–3.3	A
	-Pulsed		-15	
P_D	Power Dissipation	(Note 1a)	1.4	W
		(Note 1b)	0.7	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +150	°C
V_{RRM}	Schottky Repetitive Peak Reverse Voltage		20	V
I_O	Schottky Average Forward Current		2	A

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	86	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	173	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	86	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	173	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
3P2	FDFMA3P029Z	MicroFET 2X2	7 ”	8 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = –250 μA, V_{GS} = 0 V	–30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 μA, referenced to 25 °C		–22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –24 V, V_{GS} = 0 V			–1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±25 V, V_{DS} = 0 V			±10	μA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = –250 μA	–1	–1.9	–3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = –250 μA, referenced to 25 °C		5		mV/°C
$r_{DS(on)}$	Static Drain to Source On-Resistance	V_{GS} = –10 V, I_D = –3.3 A		69	87	mΩ
		V_{GS} = –4.5 V, I_D = –2.3 A		108	152	
		V_{GS} = –10 V, I_D = –3.3 A, T_J =125 °C		97	122	
g_{FS}	Forward Transconductance	V_{DS} = –5 V, I_D = –3.3 A		6		S
R_g	Gate Resistance			12		Ω

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = –15 V, V_{GS} = 0 V, f = 1 MHz		324	435	pF
C_{oss}	Output Capacitance			59	80	pF
C_{rss}	Reverse Transfer Capacitance			53	80	pF

Switching Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = –15 V, I_D = –3.3 A, V_{GS} = –10 V, R_{GEN} = 6 Ω			5.2	11	ns
t_r	Rise Time				3	10	ns
$t_{d(off)}$	Turn-Off Delay Time				17	31	ns
t_f	Fall Time				11	25	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to –10 V	V_{DD} = –15 V, I_D = –3.3 A		7.2	10	nC
	Total Gate Charge	V_{GS} = 0 V to –5 V			4.1	6	
Q_{gs}	Gate to Source Gate Charge				1.0		nC
Q_{gd}	Gate to Drain "Miller" Charge				1.9		nC

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = –3.3 A (Note 2)		–0.94	–1.3	V
t_{rr}	Reverse Recovery Time	I_F = –3.3 A, di/dt = 100 A/μs		20	32	ns
Q_{rr}	Reverse Recovery Charge			10	18	nC

Schottky Diode Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
V_R	Reverse Voltage	I_R = 1 mA	T_J = 25 °C	20			V
I_R	Reverse Leakage	V_R = 20 V	T_J = 25 °C		30	300	μA
			T_J = 125 °C		10	45	mA
V_F	Forward Voltage	I_F = 500 mA	T_J = 25 °C		0.32	0.37	V
			T_J = 125 °C		0.21	0.26	
		I_F = 1 A	T_J = 25 °C		0.37	0.435	
			T_J = 125 °C		0.28	0.33	

Notes:

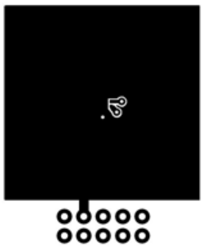
1: $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

(a) MOSFET $R_{\theta JA}$ = 86 °C/W when mounted on a 1in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB

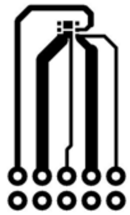
(b) MOSFET $R_{\theta JA}$ = 173 °C/W when mounted on a minimum pad of 2 oz copper

(c) Schottky $R_{\theta JA}$ = 86 ^{o}C/W when mounted on a 1in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.

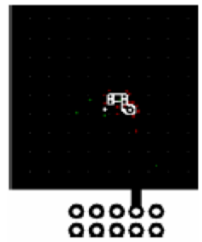
(d) Schottky $R_{\theta JA}$ = 173 ^{o}C/W when mounted on a minimum pad of 2 oz copper.



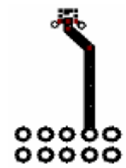
a)86 ^{o}C/W when mounted on a 1in^2 pad of 2 oz copper.



b)173 ^{o}C/W when mounted on a minimum pad of 2 oz copper.



c)86 ^{o}C/W when mounted on a 1in^2 pad of 2 oz copper.



d)173 ^{o}C/W when mounted on a minimum pad of 2 oz copper.

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

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

Typical Characteristics T_J = 25 °C unless otherwise noted

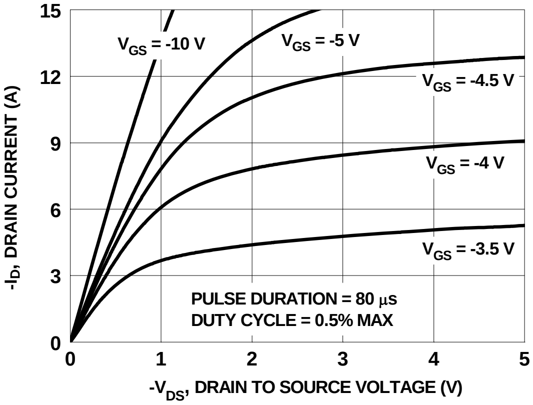


Figure 1. On-Region Characteristics

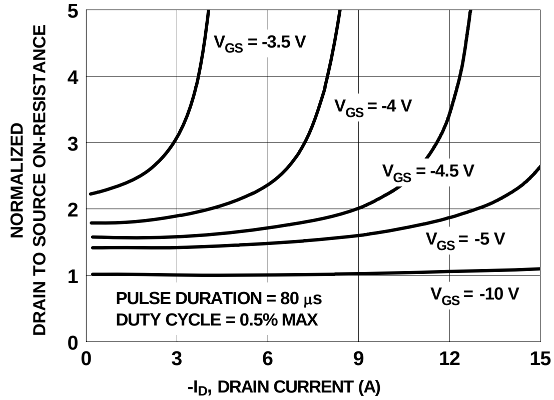


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

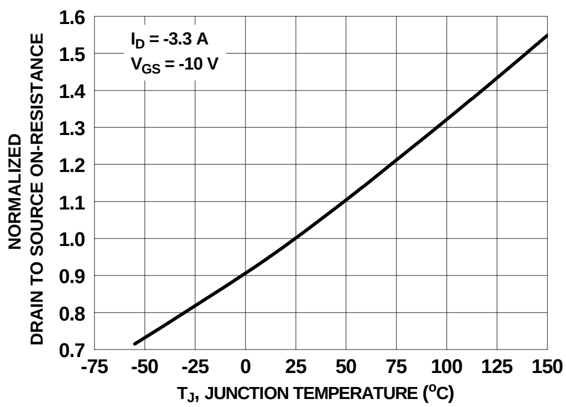


Figure 3. Normalized On-Resistance vs Junction Temperature

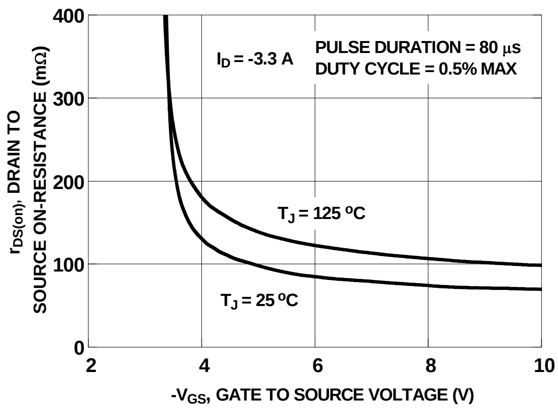


Figure 4. On-Resistance vs Gate to Source Voltage

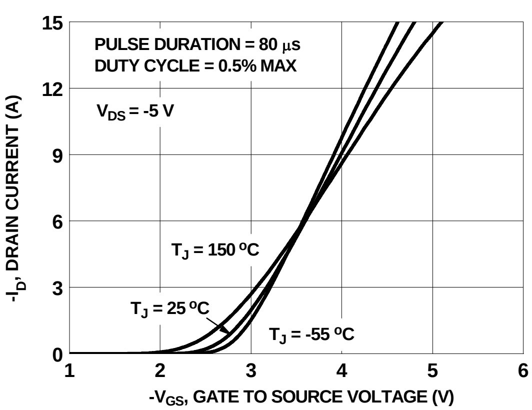


Figure 5. Transfer Characteristics

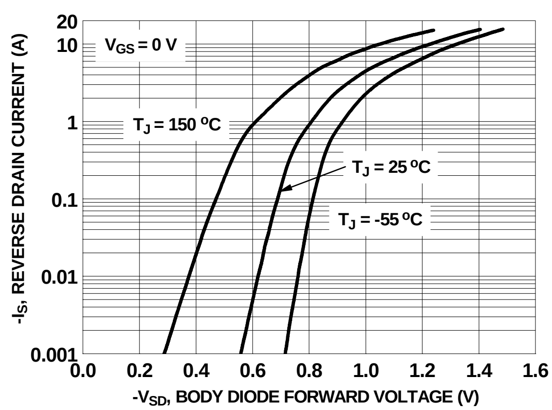


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

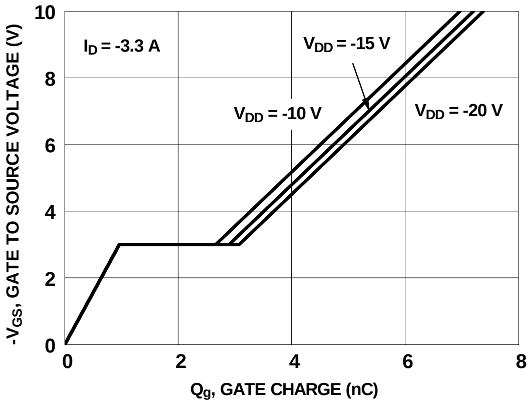


Figure 7. Gate Charge Characteristics

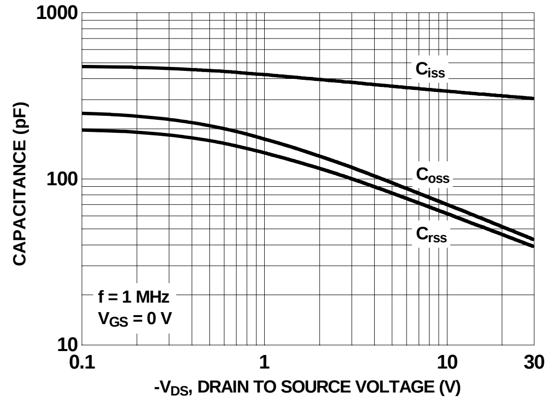


Figure 8. Capacitance vs Drain to Source Voltage

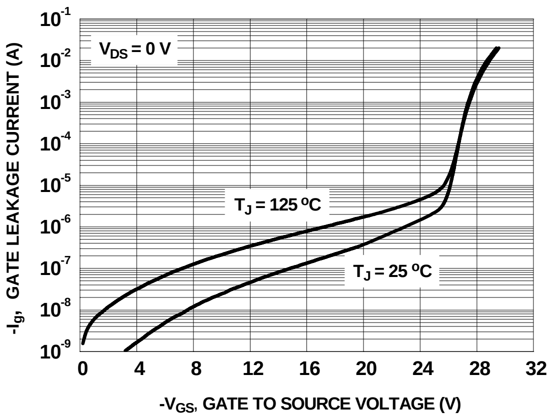


Figure 9. Gate Leakage Current vs Gate to Source Voltage

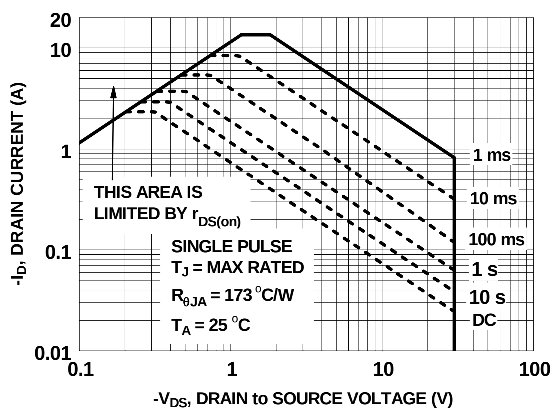


Figure 10. Forward Bias Safe Operating Area

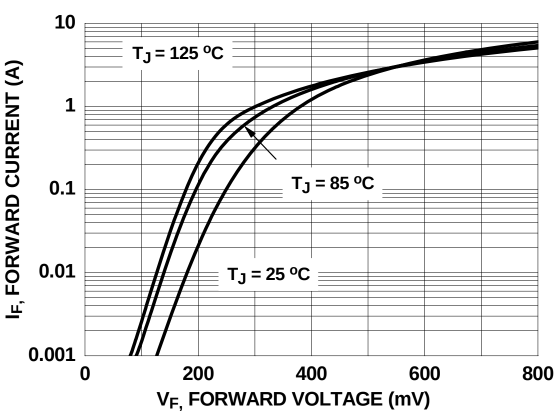


Figure 11. Schottky Diode Forward Voltage

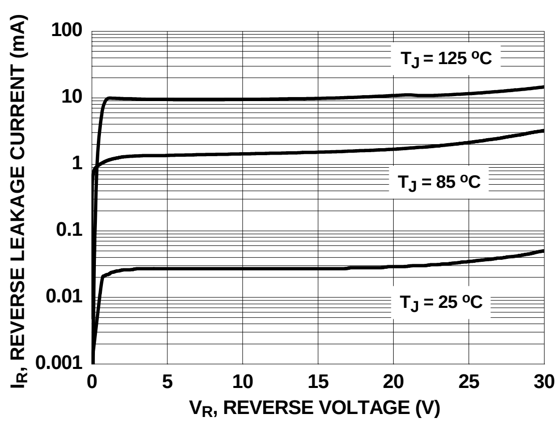


Figure 12. Schottky Diode Reverse Current

Typical Characteristics T_J = 25 °C unless otherwise noted

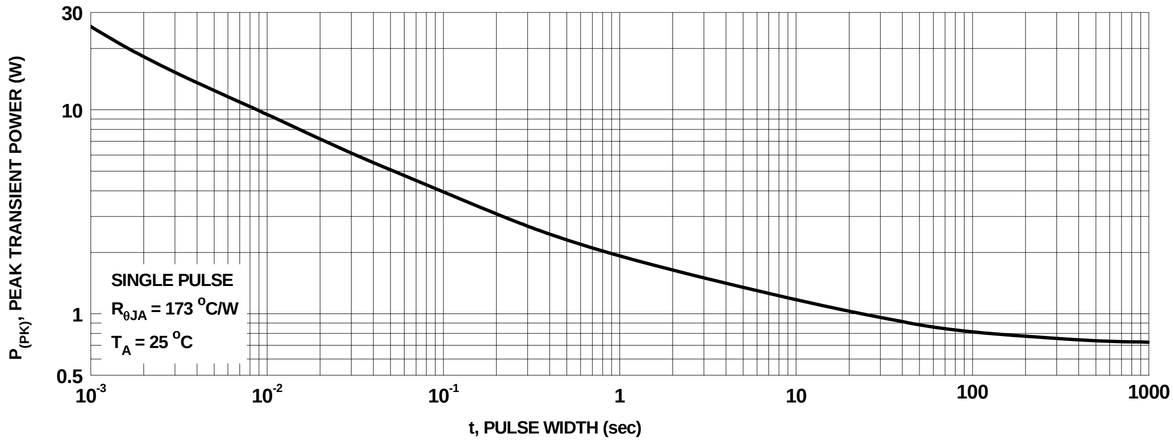


Figure 13. Single Pulse Maximum Power Dissipation

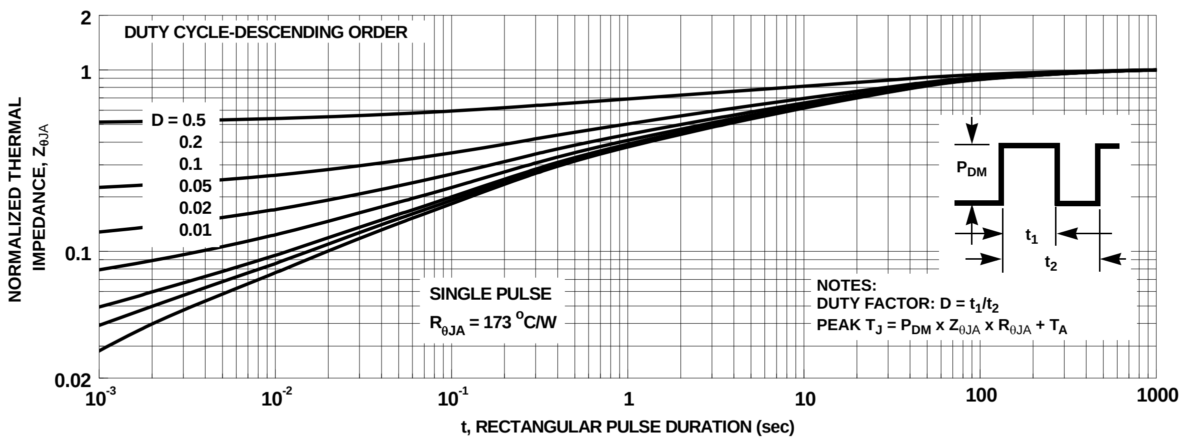
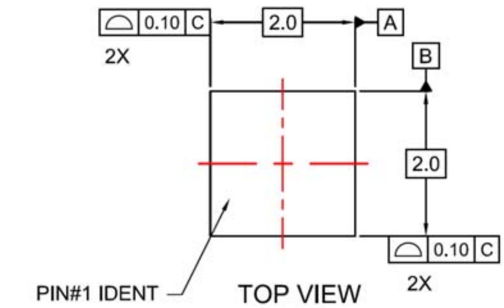
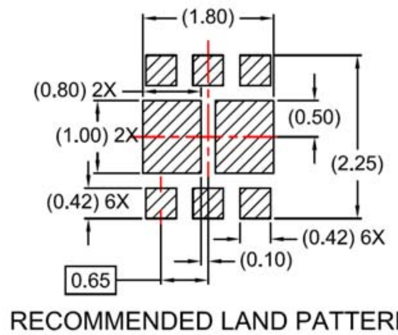
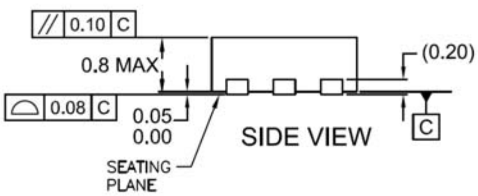


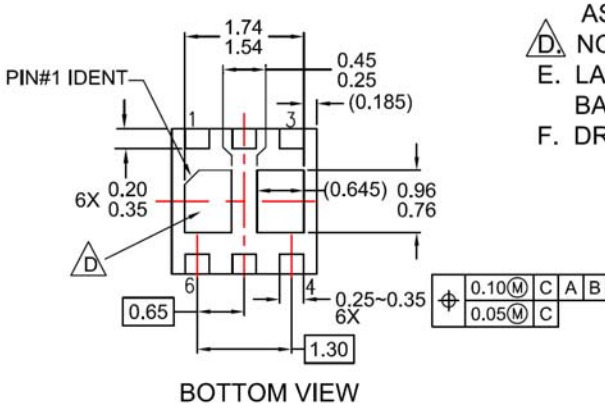
Figure 14. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout









NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION VCCC EXCEPT AS NOTED.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. NON-JEDEC DUAL DAP

E. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY.

F. DRAWING FILENAME: MKT-MLP06Jrev3.

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

2Cool™
AccuPower™
AX-CAP™*
BitSiC®
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficentMax™
ESBC™
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter® *
FPS™

F-PFS™
FRFET®
Global Power Resource℠
Green Bridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Marking Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
Motion-SPM™
mWSaver™
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
®

PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL ®*

The Power Franchise®
the power franchise ®
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC®
TriFault Detect™
TRUECURRENT®*
µSerDes™
SerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used here in:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handing and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS
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.

Rev. I61