FAIRCHILD SEMICONDUCTOR®

November 2013

FDB5800

N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

Features

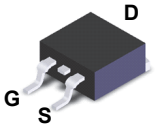
- $R_{DS(on)}$ = 4.6 mΩ (Typ.), V_{GS} = 10 V, I_D = 80 A
- High Performance Trench Technology for Extermly Low $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handing Capability
- RoHs Compliant

Description

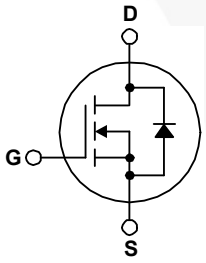
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Power tools
- Motor drives and Uninterruptible Power Supplies



D^2-PAK



Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter	FDB5800	Unit
V_{DSS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current - Continuous (T_C < 102°C, V_{GS} = 10 V)	80	A
	- Continuous (T_C < 90°C, V_{GS} = 5 V)	80	A
	- Continuous (T_{amb} = 25°C, V_{GS} = 10V, with $R_{\theta JA}$ = 43°C/W)	14	A
	- Pulsed	Figure 4	A
E_{AS}	Single Pulse Avalanche Energy (Note 1)	652	mJ
P_D	- Power Dissipation	242	W
	- Derate above 25°C	1.61	W/°C
T_J, T_{STG}	- Operating and Storage Temperature	-55 to 175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case TO-263, Max.	0.62	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, Max. (Note 2)	62.5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, 1in² copper pad area	43	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB5800	FDB5800	D^2-PAK	Tape and Reel	330 mm	24 mm	800 units

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 48 V, V_{GS} = 0 V, T_C = 150°C	-	-	250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V	-	-	±100	nA
On Characteristics						
$V_{GS(TH)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.0	-	2.5	V
$r_{DS(ON)}$	Drain to Source On Resistance	I_D = 80 A, V_{GS} = 10 V	-	4.6	6.0	mΩ
		I_D = 80 A, V_{GS} = 4.5 V	-	5.8	7.2	
		I_D = 80 A, V_{GS} = 5 V	-	5.5	7.0	
		I_D = 80 A, V_{GS} = 10 V, T_J = 175°C	-	10	12.6	
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	-	6625	-	pF
C_{OSS}	Output Capacitance		-	628	-	pF
C_{RSS}	Reverse Transfer Capacitance		-	262	-	pF
R_G	Gate Resistance	V_{GS} = 0.5 V, f = 1 MHz	-	1.4	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0 V to 10 V, V_{DD} = 30 V, I_D = 80 A, I_g = 1.0 mA	-	104	135	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0 V to 5 V	-	55	72	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 V to 1 V	-	6.0	-	nC
Q_{gs}	Gate to Source Gate Charge		-	18.4	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	12.5	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	20.1	-	nC
Switching Characteristics (V_{GS} = 5V)						
t_{ON}	Turn-On Time	V_{DD} = 30 V, I_D = 80 A, V_{GS} = 5 V, R_{GS} = 2 Ω	-	-	62.1	ns
$t_{d(ON)}$	Turn-On Delay Time		-	20.3	-	ns
t_r	Rise Time		-	22.0	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	27.1	-	ns
t_f	Fall Time		-	12.1	-	ns
t_{OFF}	Turn-Off Time		-	-	59.0	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 80 A	-	-	1.25	V
		I_{SD} = 40 A	-	-	1.0	V
t_r	Reverse Recovery Time	I_{SD} = 60 A, dI_{SD}/dt = 100 A/μs	-	-	44	ns
Q_{RR}	Reverse Recovered Charge	I_{SD} = 60 A, dI_{SD}/dt = 100 A/μs	-	-	57	nC

Notes:
1: Starting T_J = 25°C, L = 1mH, I_{AS} = 36A, V_{DD} = 54V, V_{GS} = 10V.
2: Pulse width = 100s.

Typical Characteristics T_C = 25°C unless otherwise noted

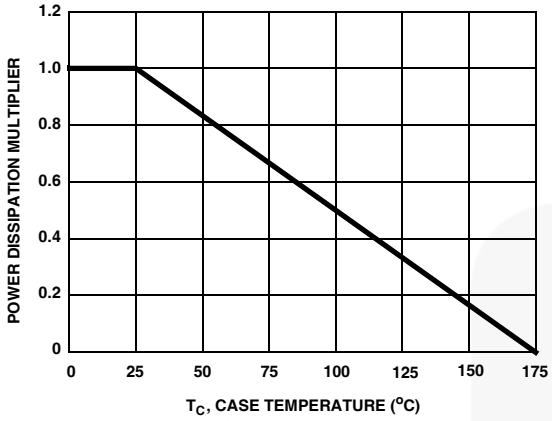


Figure 1. Normalized Power Dissipation vs Case Temperature

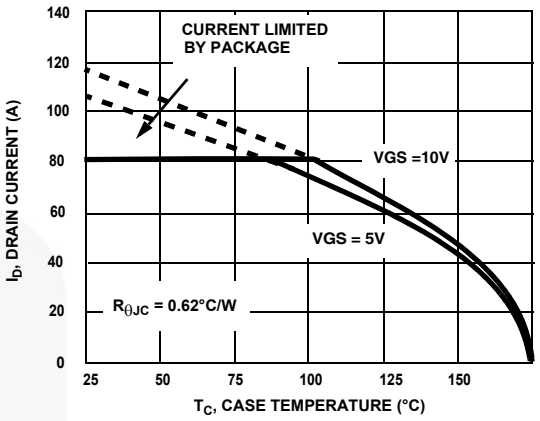


Figure 2. Maximum Continuous Drain Current vs Case Temperature

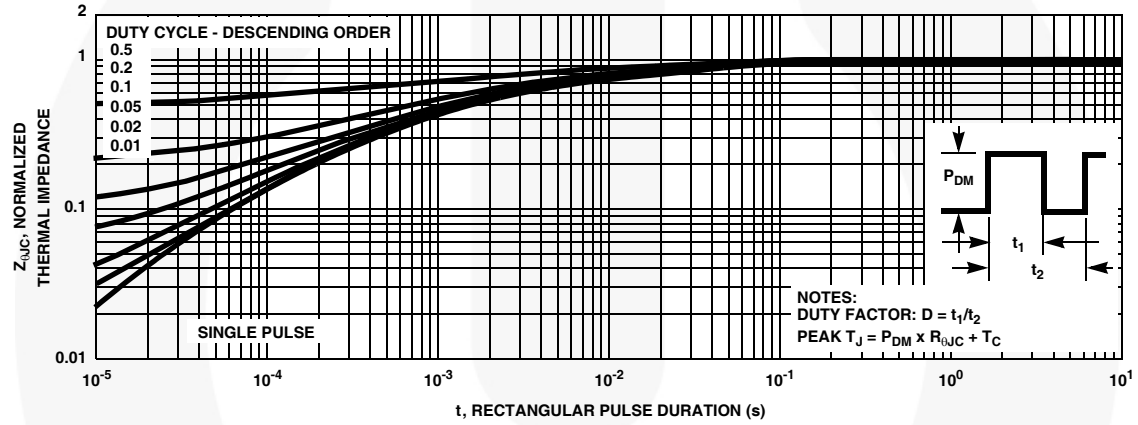


Figure 3. Normalized Maximum Transient Thermal Impedance

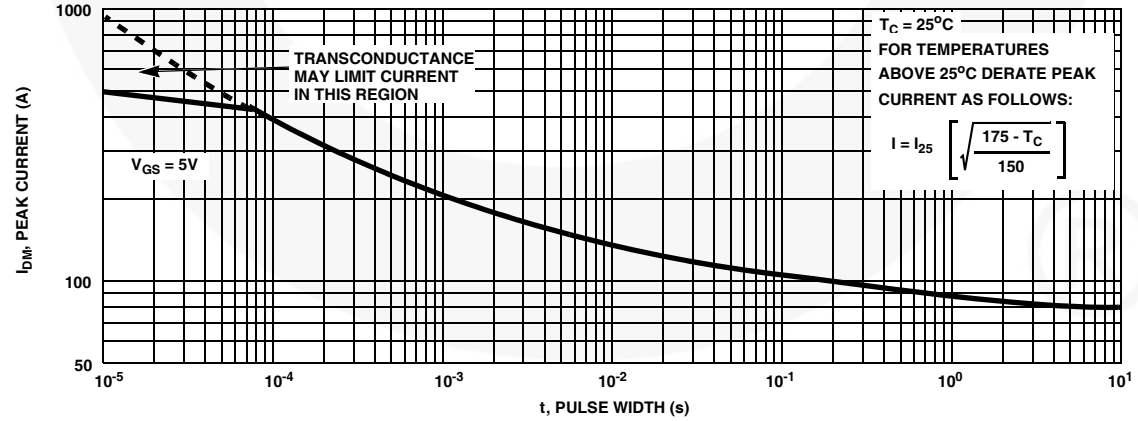


Figure 4. Peak Current Capability

Typical Characteristics T_C = 25°C unless otherwise noted

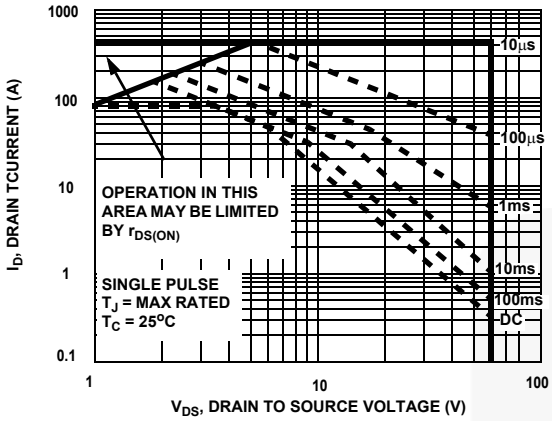
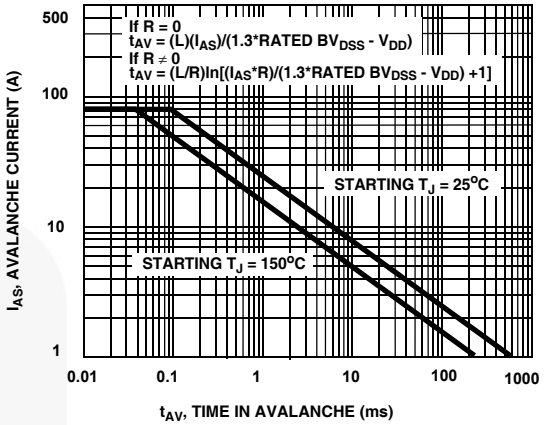


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

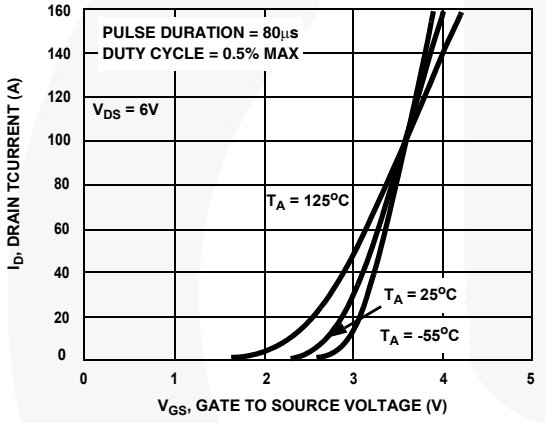


Figure 7. Transfer Characteristics

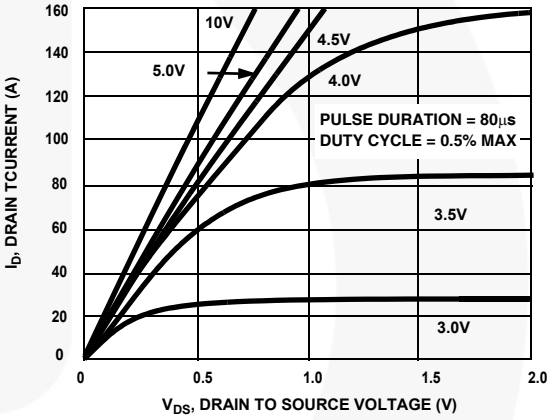


Figure 8. Saturation Characteristics

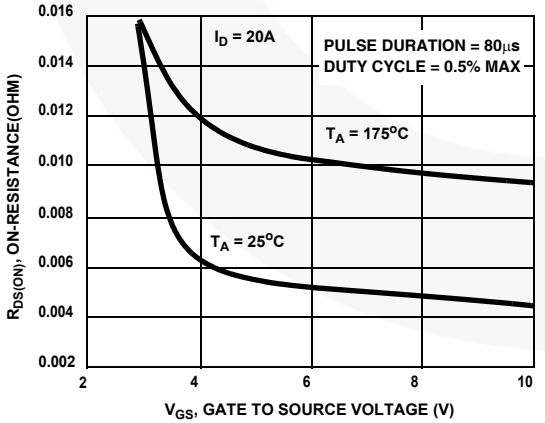


Figure 9. On-Resistance Variation vs Gate-to-

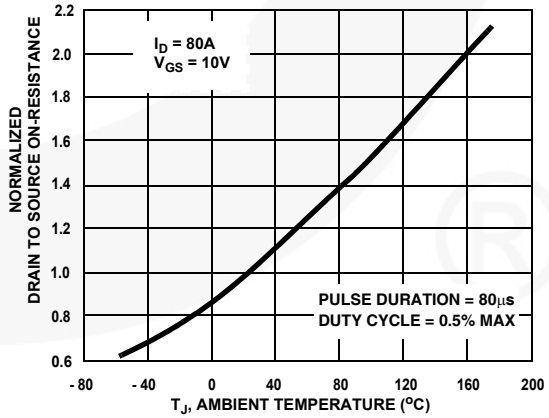


Figure 10. Normalized Drain to Source On

Typical Characteristics T_C = 25°C unless otherwise noted

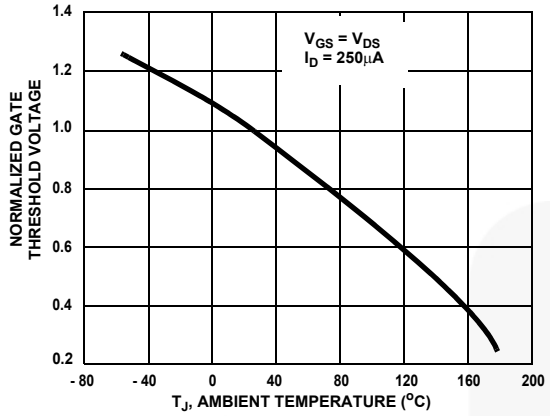


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

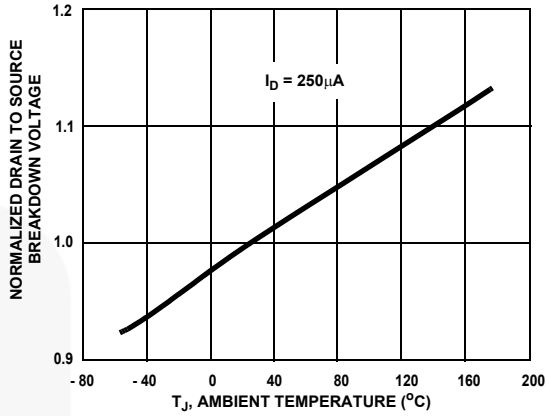


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

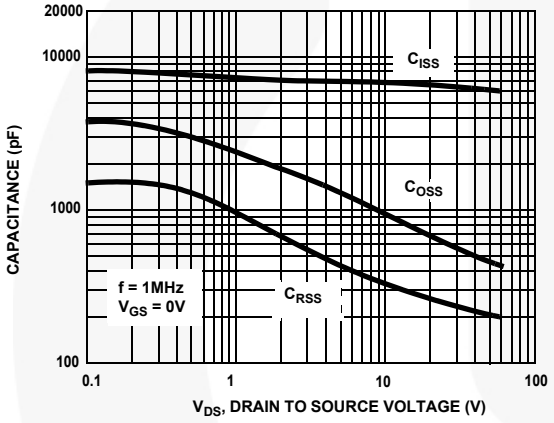


Figure 13. Capacitance vs Drain to Source Voltage

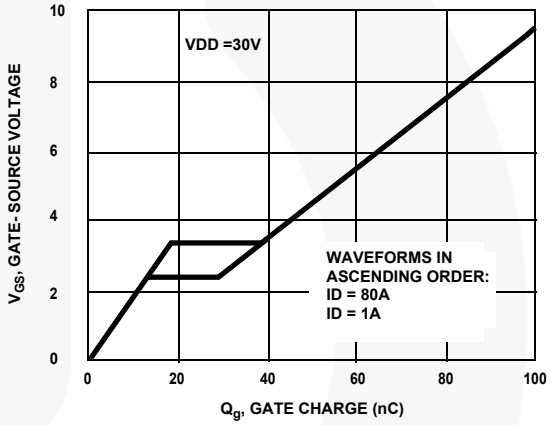


Figure 14. Gate Charge Waveforms for Constant Gate Current

Mechanical Dimensions

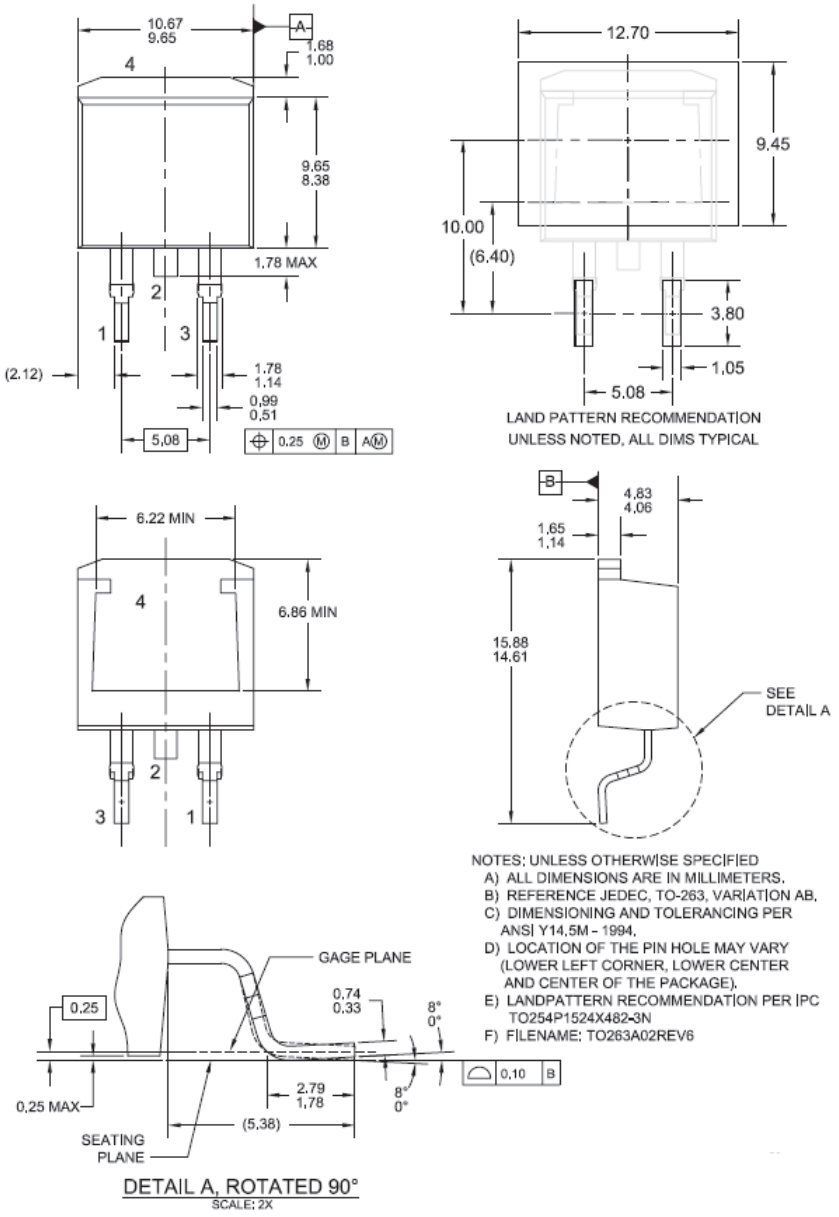


Figure 15. TO263 (D^2PAK), Molded, 2-Lead, Surface Mount

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TT263-002

FAIRCHILD SEMICONDUCTOR®

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.

AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficentMax™
ESBC™
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
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™
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 ®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
µSerDes™
µSerDes™
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. I66

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Fairchild Semiconductor:

FDB5800 FDB5800_F085