

FGA50N100BNTD

1000 V NPT Trench IGBT

General Description

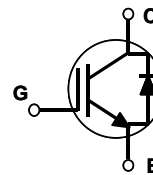
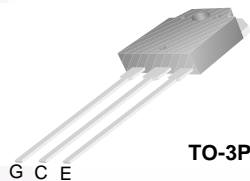
Using Fairchild's proprietary trench design and advanced NPT technology, the 1000V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device offers the optimum performance for hard switching application such as UPS, welder applications.

Features

- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)} = 2.5 \text{ V @ } I_C = 60 \text{ A}$
- High Input Impedance
- Built-in Fast Recovery Diode

Application

UPS, Welder, Induction Heating, Microwave Oven



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Description	Rated	Unit
V_{CES}	Collector-Emitter Voltage	1000	V
V_{GES}	Gate-Emitter Voltage	± 25	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	50	A
	Collector Current @ $T_C = 100^\circ\text{C}$	35	A
$I_{CM(1)}$	Pulsed Collector Current	100	A
I_F	Diode Continuous Forward Current @ $T_C = 25^\circ\text{C}$	30	A
	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	15	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	156	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	63	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temp. for soldering	300	$^\circ\text{C}$
	Purposes, 1/8" from case for 5 seconds		

Notes :

(1) Repetitive rating : Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction-to-Case	--	0.8	$^\circ\text{C/W}$
$R_{\theta JC}(\text{DIODE})$	Thermal Resistance, Junction-to-Case	--	2.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	25	$^\circ\text{C/W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGA50N100BNTDTU	FGA50N100BNTD	TO-3P	Rail / Tube	N/A	N/A	30

Electrical Characteristics of IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
--------	-----------	-----------------	------	------	------	------

Off Characteristics

BV_{CES}	Collector Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	1000	--	--	V
I_{CES}	Collector Cut-Off Current	$V_{CE} = 1000\text{ V}, V_{GE} = 0\text{ V}$	--	--	1.0	mA
I_{GES}	G-E Leakage Current	$V_{GE} = \pm 25\text{ V}, V_{CE} = 0\text{ V}$	--	--	± 500	nA

On Characteristics

$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 60\text{ mA}, V_{CE} = V_{GE}$	4.0	5.0	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$	--	1.5	1.8	V
		$I_C = 60\text{ A}, V_{GE} = 15\text{ V}$	--	2.5	2.9	V

Dynamic Characteristics

C_{ies}	Input Capacitance	$V_{CE} = 10\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$	--	6000	--	pF
C_{oes}	Output Capacitance		--	260	--	pF
C_{res}	Reverse Transfer Capacitance		--	200	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_C = 60\text{ A},$ $R_G = 51\ \Omega, V_{GE} = 15\text{ V},$ Resistive Load, $T_C = 25^\circ\text{C}$	--	140	--	ns
t_r	Rise Time		--	320	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	630	--	ns
t_f	Fall Time		--	130	250	ns
Q_g	Total Gate Charge	$V_{CE} = 600\text{ V}, I_C = 60\text{ A},$ $V_{GE} = 15\text{ V}, T_C = 25^\circ\text{C}$	--	275	350	nC
Q_{ge}	Gate-Emitter Charge		--	45	--	nC
Q_{gc}	Gate-Collector Charge		--	95	--	nC

Electrical Characteristics of DIODE T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{FM}	Diode Forward Voltage	$I_F = 15\text{ A}$	--	1.2	1.7	V
		$I_F = 60\text{ A}$	--	1.8	2.1	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 60\text{ A}, di_F/dt = 20\text{ A/us}$	--	1.2	1.5	us
I_R	Instantaneous Reverse Current	$V_{RRM} = 1000\text{ V}$	--	0.05	2	uA

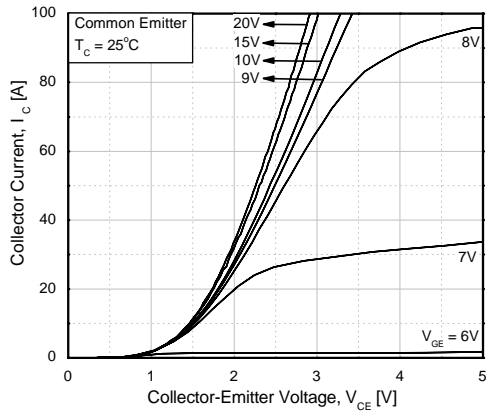


Fig 1. Typical Output Characteristics

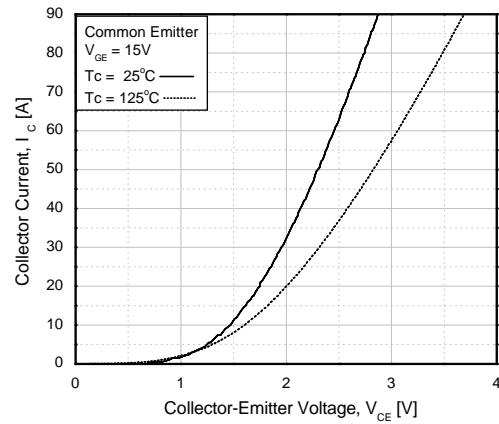


Fig 2. Typical Saturation Voltage Characteristics

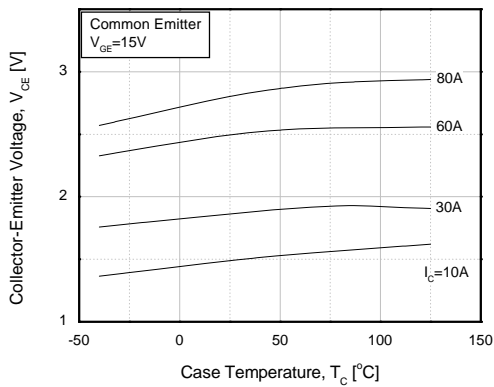


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

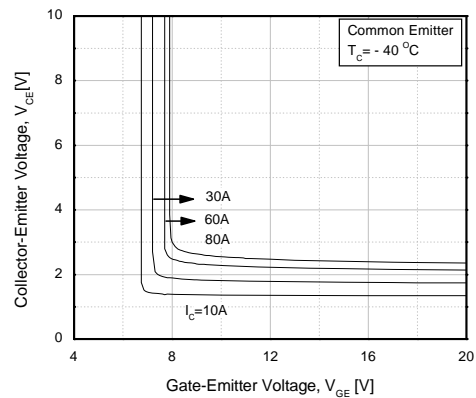


Fig 4. Saturation Voltage vs. V_{GE}

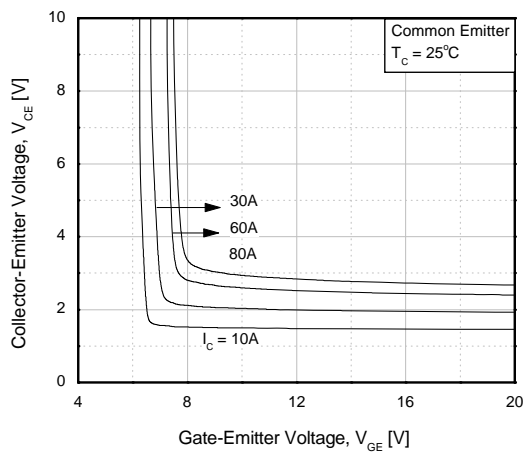


Fig 5. Saturation Voltage vs. V_{GE}

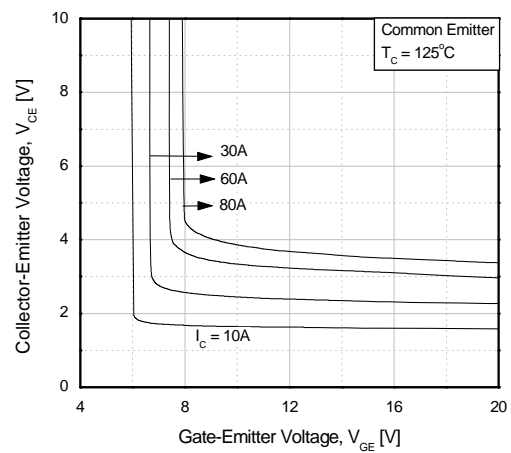


Fig 6. Saturation Voltage vs. V_{GE}

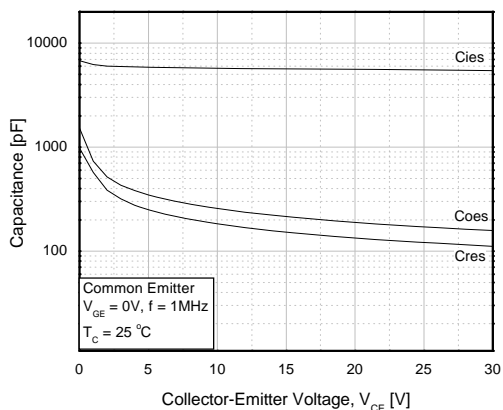


Fig 7. Capacitance Characteristics

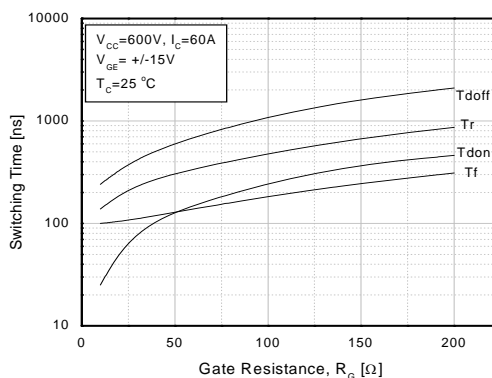


Fig 8. Switching Characteristics vs. Gate Resistance

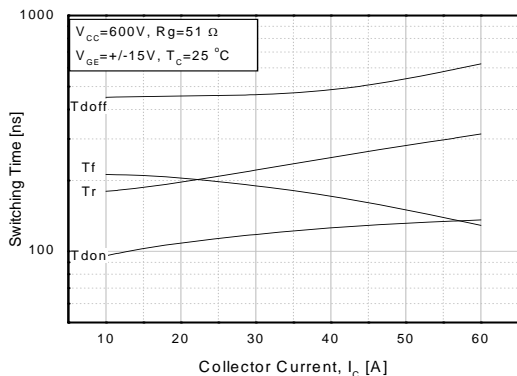


Fig 9. Switching Characteristics vs. Collector Current

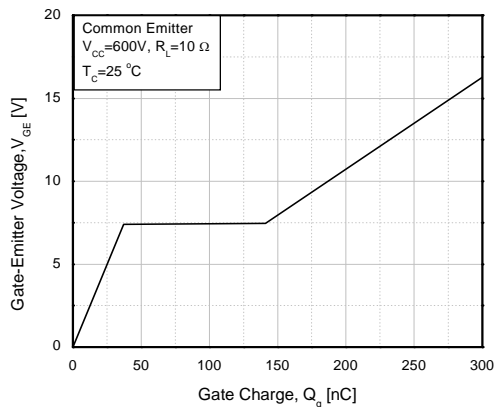


Fig 10. Gate Charge Characteristics

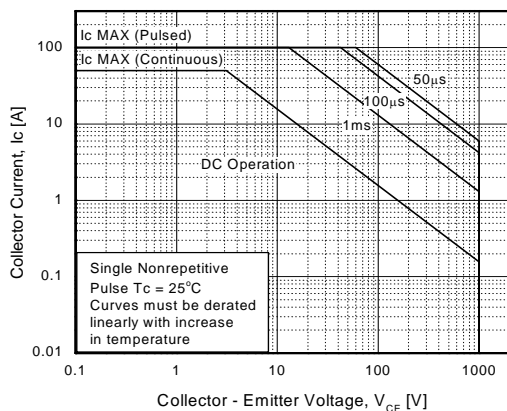


Fig 11. SOA Characteristics

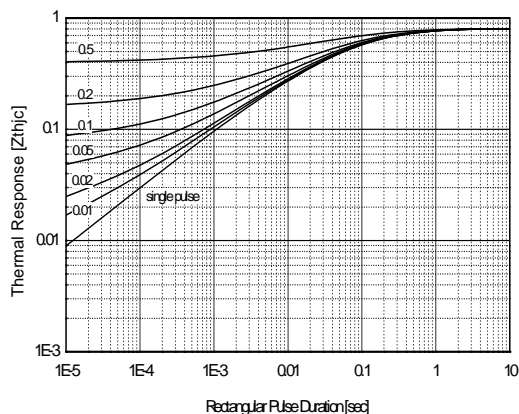


Fig 12. Transient Thermal Impedance of IGBT

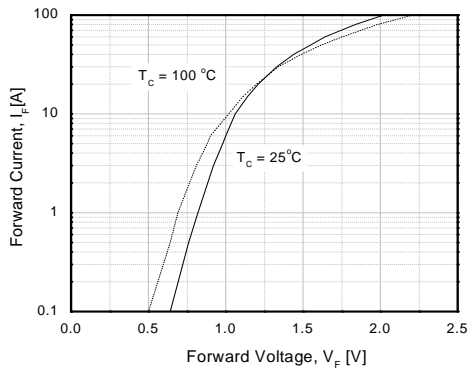


Fig 13. Forward Characteristics

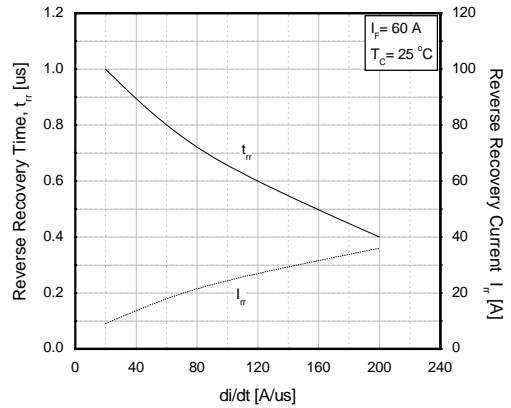


Fig 14. Reverse Recovery Characteristics vs. di/dt

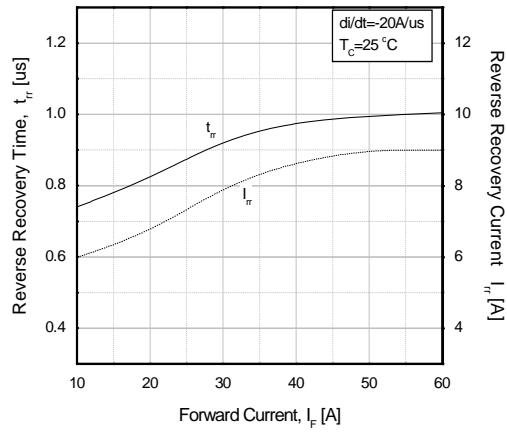


Fig 15. Reverse Recovery Characteristics vs. Forward Current

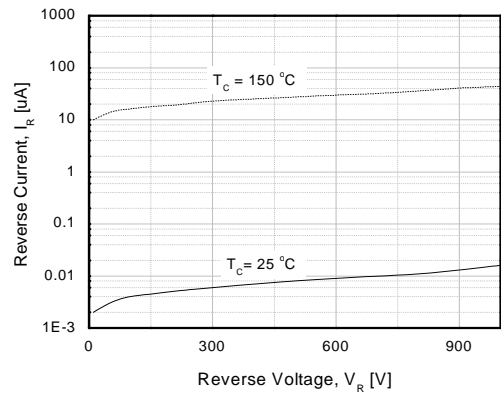


Fig 16. Reverse Current vs. Reverse Voltage

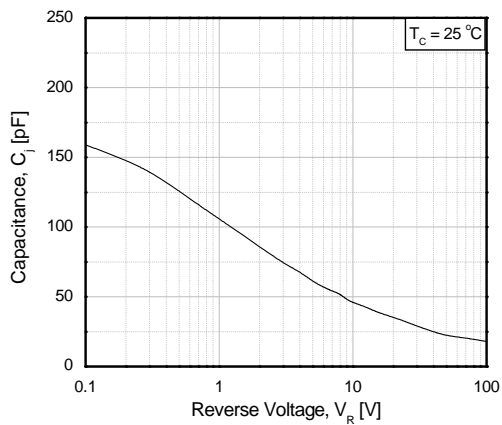
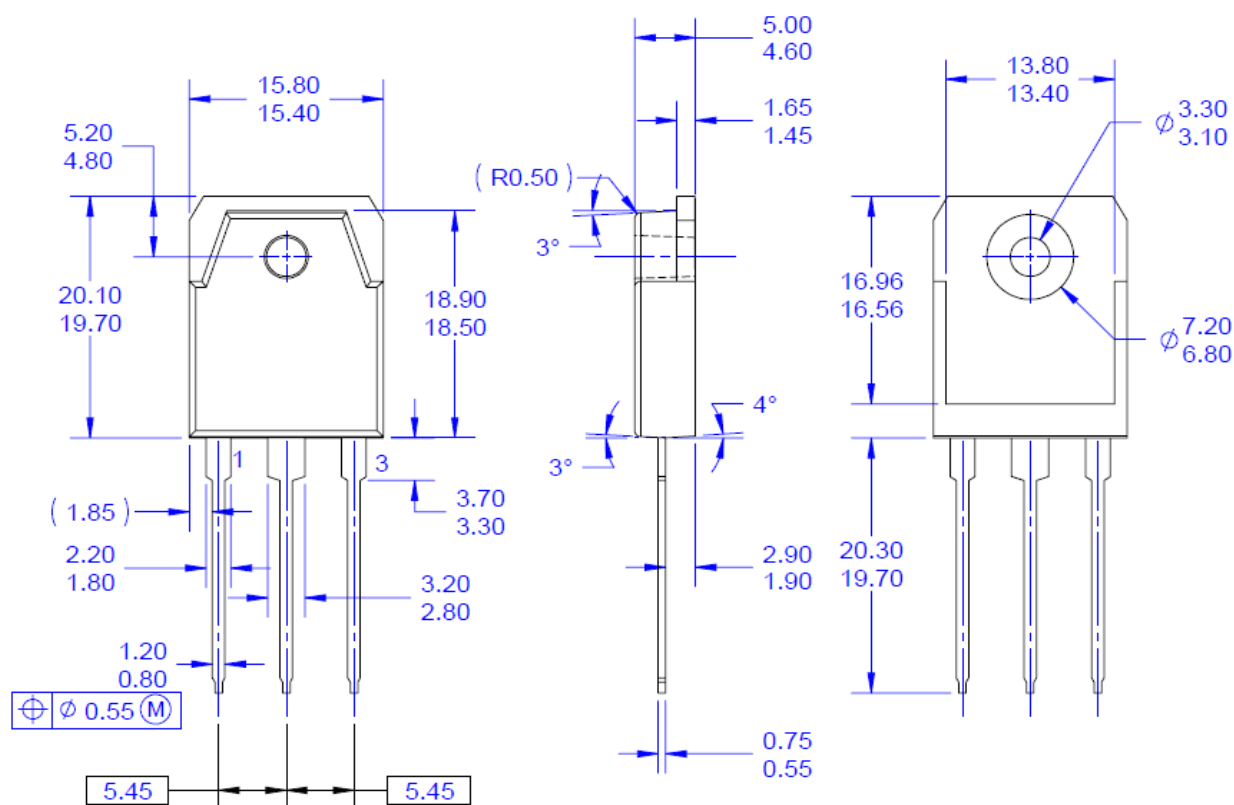


Fig 17. Junction capacitance

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) THIS PACKAGE IS INTENDED ONLY FOR T03PN.
- F) DRAWING FILE NAME: T03P03AREV4.

Figure 18. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

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_TT3P0-003



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™ | F-PFST™ | PowerTrench® | Sync-Lock™ |
| AX-CAP®* | FRFET® | PowerXS™ |  SYSTEM®* |
| BitSiC™ | Global Power Resource SM | Programmable Active Droop™ | TinyBoost® |
| Build it Now™ | GreenBridge™ | QFET® | TinyBuck™ |
| CorePLUS™ | Green FPS™ | QS™ | TinyCalc™ |
| CorePOWER™ | Green FPS™ e-Series™ | Quiet Series™ | TinyLogic® |
| CROSSVOLT™ | Gmax™ | RapidConfigure™ | TINYOPTO™ |
| CTL™ | GTO™ | | TinyPower™ |
| Current Transfer Logic™ | IntelliMAX™ |  Saving our world, 1mW/W/kW at a time™ | TinyPWM™ |
| DEUXPEED® | ISOPLANAR™ | SignalWise™ | TinyWire™ |
| Dual Cool™ | Marking Small Speakers Sound Louder and Better™ | SmartMax™ | TranSiC™ |
| EcoSPARK® | MegaBuck™ | SMART START™ | TriFault Detect™ |
| EfficientMax™ | MICROCOUPLER™ | Solutions for Your Success™ | TRUECURRENT®* |
| ESBC™ | MicroFET™ | SPM® | µSerDes™ |
|  Fairchild® | MicroPak™ | STEALTH™ |  SerDes® |
| Fairchild Semiconductor® | MicroPak2™ | SuperFET® | UHC® |
| FACT Quiet Series™ | MillerDrive™ | SuperSOT™-3 | Ultra FRFET™ |
| FACT® | MotionMax™ | SuperSOT™-6 | UniFET™ |
| FAST® | mWSaver® | SuperSOT™-8 | VCX™ |
| FastvCore™ | OptoHit™ | SupreMOS® | VisualMax™ |
| FETBench™ | OPTOLOGIC® | SyncFET™ | VoltagePlus™ |
| FPS™ | OPTOPLANAR® | | 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:

- 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.
- 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 handling 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