



# FPF1C2P5BF07A

## F1 Module solution for PV-Application

### General Description

Fairchild's brand-new DC-DC module is designed for a power stage that needs more compact design. And the Press-fit technology provides simple and reliable mounting. This module is optimized for the application such as solar inverter where a high efficiency and robust design are needed.

### Electrical Features

- High Efficiency
- Low Conduction and Switching losses
- Low  $R_{DS(ON)}$  : 90 m $\Omega$  max.
- Fast Recovery Body Diode
- Built-in NTC for temperature monitoring

### Mechanical Features

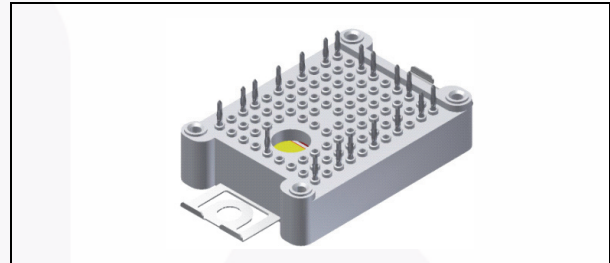
- Compact size : F1 Package
- Press-fit contact technology

### Applications

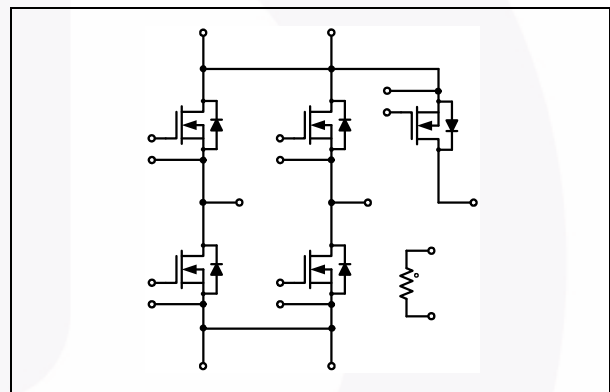
- Solar Inverter

### Certification

- UL approved (E209204)



Package Code: F1



Internal Circuit Diagram

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

Symbol	Description	Rating	Units	
$V_{DSS}$	Drain-Source Voltage	650	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V	
$I_D$	Continuous Drain Current	@ $T_C = 25^\circ\text{C}$	36	A
		@ $T_C = 80^\circ\text{C}$	27	A
$I_{DM}$	Pulsed Drain Current	Limited by $T_J$ max.	156	A
$I_S$	Continuous Source-Drain Forward Current	36	A	
$I_{SM}$	Maximum Pulsed Source-Drain Forward Current	156	A	
$P_D$	Maximum Power Dissipation	@ $T_C = 25^\circ\text{C}$	250	W
$T_J$	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$	

**Absolute Maximum Ratings**  $T_C = 25^\circ\text{C}$  unless otherwise noted. (Continued)

Symbol	Description	Rating	Units
<b>Module</b>			
T <sub>STG</sub>	Storage Temperature	-40 to +125	°C
V <sub>ISO</sub>	Isolation Voltage @ AC 1 <sub>MIN</sub>	2500	V
Iso._Material	Internal Isolation Material	Al <sub>2</sub> O <sub>3</sub>	
F <sub>MOUNT</sub>	Mounting Force per Clamp	20 to 50	N
Weight	Typ.	22	g
Creepage	Terminal to Heatshink	11.5	mm
	Terminal to Terminal	6.3	mm
Clearance	Terminal to Heatshink	10.0	mm
	Terminal to Terminal	5.0	mm

**Package Marking and Ordering Information**

Device	Device Marking	Package	Packing Type	Quantity / Tray
FPF1C2P5BF07A	FPF1C2P5BF07A	F1	Tray	22



**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	650	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	-	25	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	2.5	$\mu\text{A}$
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	-	3.8	-	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D = 27\text{ A}, V_{GS} = 10\text{ V}$	-	-	90	$\text{m}\Omega$
		$I_D = 27\text{ A}, V_{GS} = 10\text{ V} @ T_C = 125^\circ\text{C}$	-	135	-	$\text{m}\Omega$
		$I_D = 47\text{ A}, V_{GS} = 10\text{ V}$	-	76	-	$\text{m}\Omega$
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 380\text{ V}$ $I_D = 27\text{ A}$ $V_{GS} = 10\text{ V}$ $R_{G(ON)} = 51\text{ }\Omega$ $R_{G(OFF)} = 3\text{ }\Omega$ Inductive Load $T_C = 25^\circ\text{C}$	-	192	-	ns
$t_r$	Rise Time		-	75	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	140	-	ns
$t_f$	Fall Time		-	13	-	ns
$E_{ON}$	Turn-On Switching Loss per Pulse		-	2.29	-	mJ
$E_{OFF}$	Turn-Off Switching Loss per Pulse		-	58	-	$\mu\text{J}$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 380\text{ V}$ $I_D = 27\text{ A}$ $V_{GS} = 10\text{ V}$ $R_{G(ON)} = 51\text{ }\Omega$ $R_{G(OFF)} = 3\text{ }\Omega$ Inductive Load $T_C = 125^\circ\text{C}$	-	159	-	ns
$t_r$	Rise Time		-	82	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	156	-	ns
$t_f$	Fall Time		-	13	-	ns
$E_{ON}$	Turn-On Switching Loss per Pulse		-	4.06	-	mJ
$E_{OFF}$	Turn-Off Switching Loss per Pulse		-	65	-	$\mu\text{J}$
$Q_{g(total)}$	Total Gate Charge	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{V}...+10\text{ V},$ $I_D = 27\text{ A}$	-	155	-	nC
$R_{\theta JC}$	Thermal Resistance of Junction to Case	per Chip	-	-	0.5	$^\circ\text{C}/\text{W}$
<b>Switching Characteristics : Body Diode</b>						
$V_{SD}$	Source-Drain Diode Forward Voltage	$I_{SD} = 27\text{ A}, V_{GS} = 0\text{ V}$	-	-	1.5	V
		$I_{SD} = 47\text{ A}, V_{GS} = 0\text{ V}$	-	1.3	-	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 27\text{ A}$ $di_F/dt = 364\text{ A}/\mu\text{s}$	-	109	-	ns
$I_{rr}$	Reverse Recovery Current		-	39	-	A
$Q_{rr}$	Reverse Recovery Charge		-	2000	-	nC
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 27\text{ A}$ $di_F/dt = 320\text{ A}/\mu\text{s} @ T_C = 125^\circ\text{C}$	-	179	-	ns
$I_{rr}$	Reverse Recovery Current		-	55	-	A
$Q_{rr}$	Reverse Recovery Charge		-	4802	-	nC
<b>NTC</b>						
$R_{NTC}$	Rated Resistance	$T_C = 25^\circ\text{C}$	-	10	-	k $\Omega$
		$T_C = 100^\circ\text{C}$	-	936	-	$\Omega$
	Tolerance	$T_C = 25^\circ\text{C}$	-3	-	+3	%
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	-	-	20	mW
$B_{Value}$	B-Constance	$B_{25/50}$	-	3450	-	K
		$B_{25/100}$	-	3513	-	K

## Typical Performance Characteristic

Fig 1. On-Region Characteristics

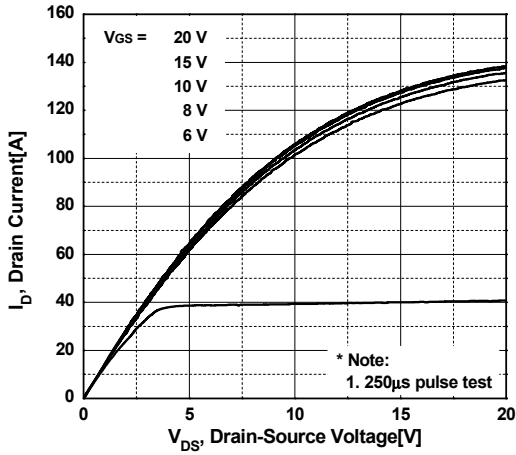


Fig 2. On-Resistance Variation vs. Drain Current and Gate Voltage

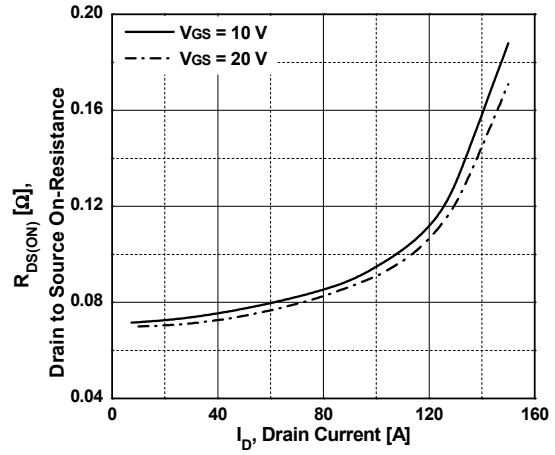


Fig 3. On-Resistance Variation vs. Temperature

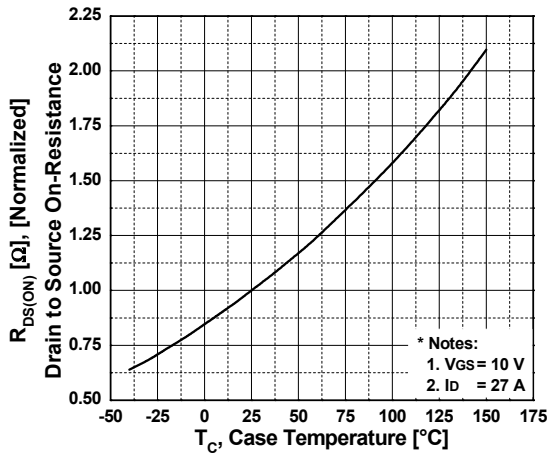


Fig 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

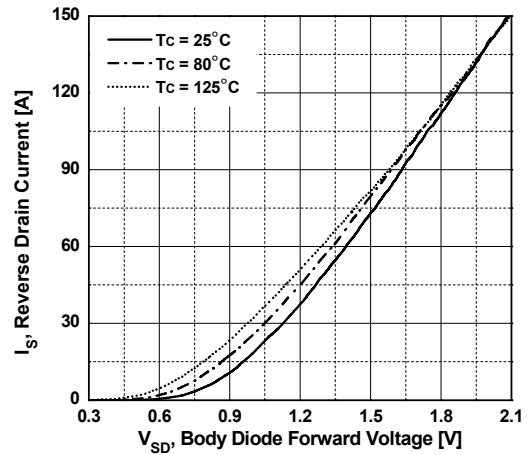


Fig 5. Turn-Off Loss vs. Drain Current

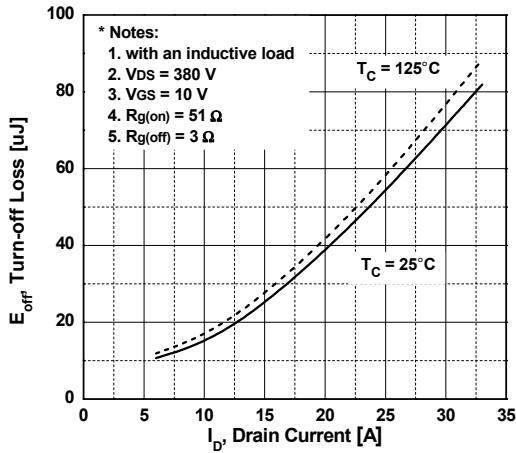
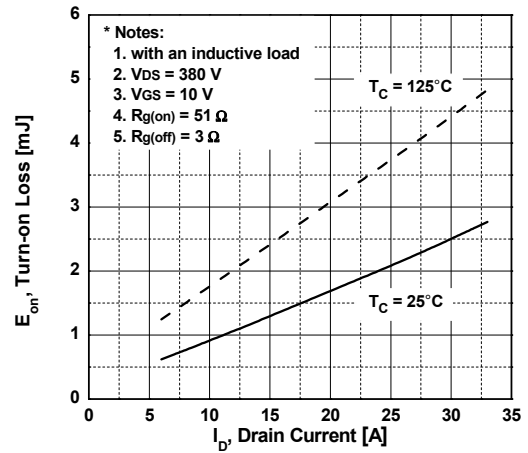
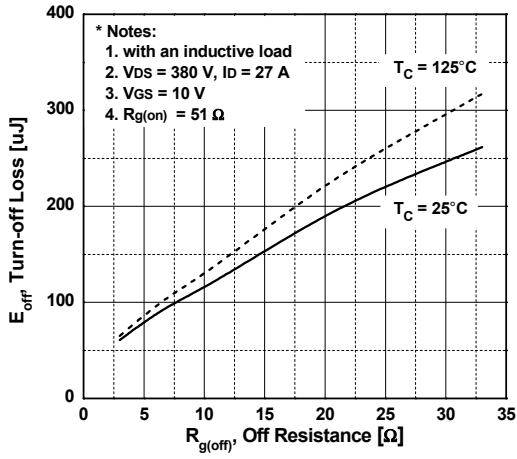


Fig 6. Turn-On Loss vs. Drain Current

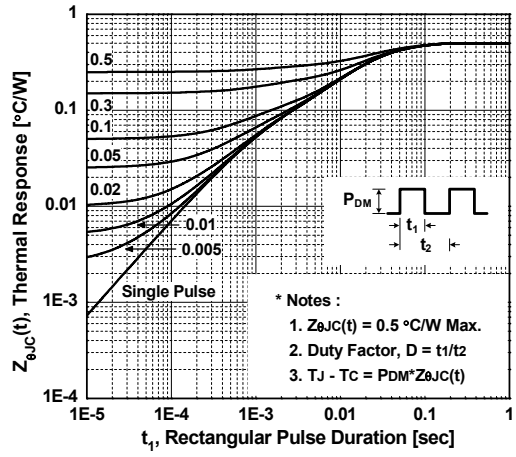


**Typical Performance Characteristic** (Continued)

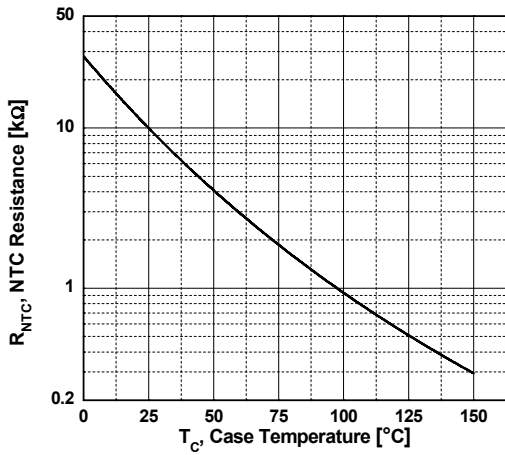
**Fig 7. Turn-Off Loss vs. Turn-Off Gate Resistor Values**



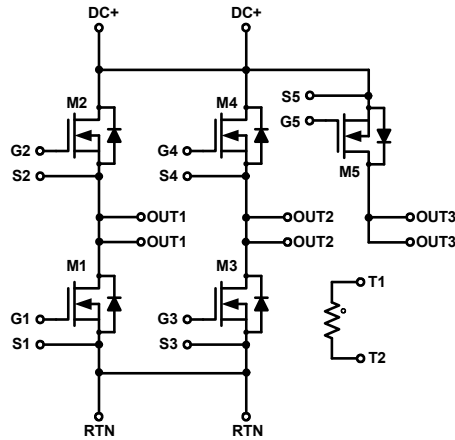
**Fig 8. Transient Thermal Response Curve**



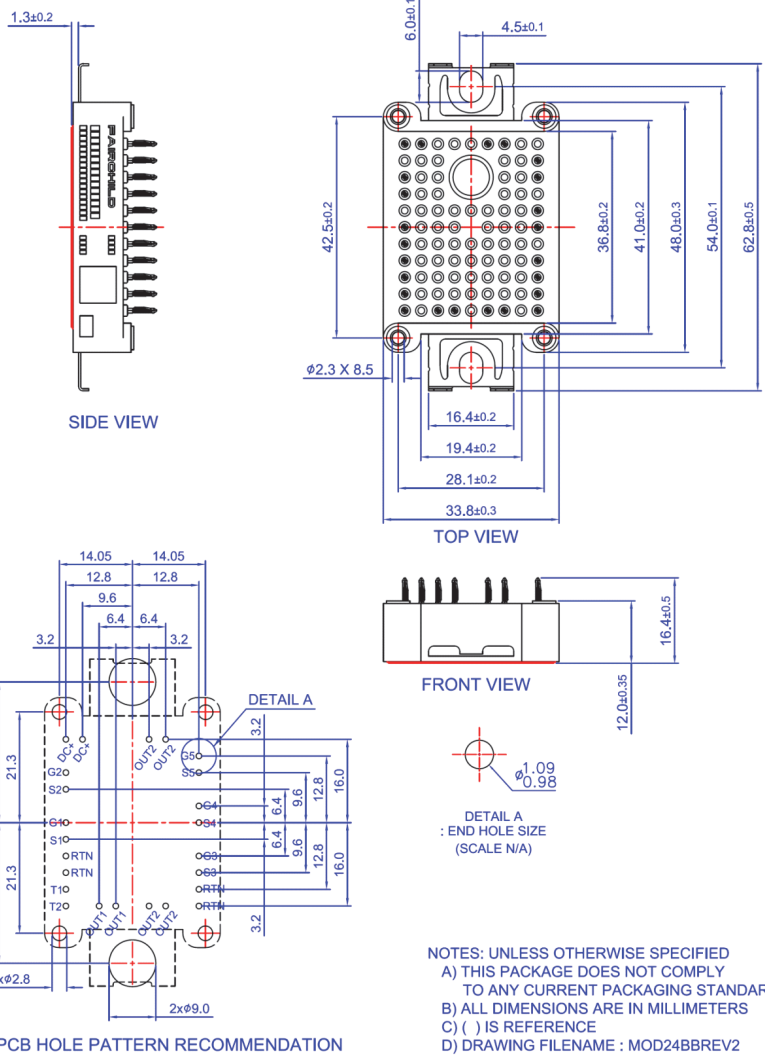
**Fig 9. Typical NTC Value vs. Temperature**



### Internal Circuit Diagram



### Package Outlines [mm]








- PIN-GRID 3.2mm  
 - TOLERANCE OF PCB HOLE PATTERN  $\pm \varnothing 0.1$





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

\* 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 herein:

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](http://www.fairchildsemi.com), under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers 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 applications, 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 any 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. 166