



# NC7WV07

## TinyLogic® ULP-A Inverter (Open-Drain Output)

### Description

The NC7WV07 is a dual buffer with open drain output from Fairchild's Ultra Low Power-A series of TinyLogic® ULP-A is ideal for applications that require extreme high speed, high drive and low power. This product is designed for a wide low voltage operating range (0.9V to 3.6V  $V_{CC}$ ) and applications that require more drive and speed than the TinyLogic ULP series, but still offer best in class low power operation.

The NC7WV07 is uniquely designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

### Features

- 0.9V to 3.6V  $V_{CC}$  Supply Operation
- 3.6V Over-Voltage Tolerant I/Os at  $V_{CC}$  from 0.9V to 3.6V
- Extremely High Speed  $t_{PD}$ 
  - 1.0ns: Typical for 2.7V to 3.6V  $V_{CC}$
  - 1.2ns: Typical for 2.3V to 2.7V  $V_{CC}$
  - 2.0ns: Typical for 1.65V to 1.95V  $V_{CC}$
  - 3.2ns: Typical for 1.4V to 1.6V  $V_{CC}$
  - 6.0ns: Typical for 1.1V to 1.3V  $V_{CC}$
  - 13.0ns: Typical for 0.9V  $V_{CC}$
- Power-Off High-Impedance Inputs and Outputs
- High Static Drive ( $I_{OH}/I_{OL}$ )
  - $\pm 24$ mA at 3.00V  $V_{CC}$
  - $\pm 18$ mA at 2.30V  $V_{CC}$
  - $\pm 6$ mA at 1.65V  $V_{CC}$
  - $\pm 4$ mA at 1.4V  $V_{CC}$
  - $\pm 2$ mA at 1.1V  $V_{CC}$
  - $\pm 0.1$ mA at 0.9V  $V_{CC}$
- Uses Proprietary Quiet Series™ Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Ultra-Low Dynamic Power

### Ordering Information

Part Number	Top Mark	Package	Packing Method
NC7WV07P6X	V07	6-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7WV07L6X	BC	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel

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## Battery Life

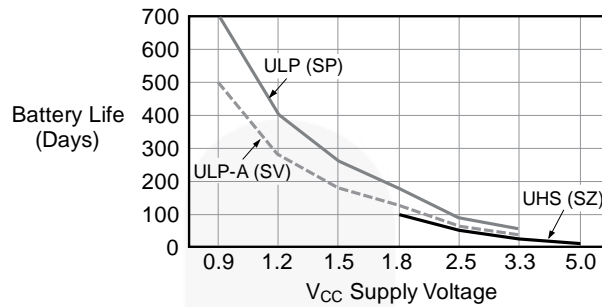


Figure 1. Battery Life vs. V<sub>CC</sub> Supply Voltage

### Notes:

1. TinyLogic® ULP and ULP-A with up to 50% less power consumption can extend battery life significantly.  

$$\text{Battery Life} = (V_{\text{battery}} \cdot I_{\text{battery}} \cdot 0.9) / (P_{\text{device}}) / 24 \text{hrs/day}$$
 where,  $P_{\text{device}} = (I_{\text{CC}} \cdot V_{\text{CC}}) + (C_{\text{PD}} + C_{\text{L}}) \cdot V_{\text{CC}}^2 \cdot f$ .
2. Assumes ideal 3.6V Lithium Ion battery with current rating of 900mAH and derated 90% and device frequency at 10MHz, with C<sub>L</sub>=15pF load.

## Pin Configurations

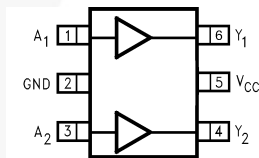


Figure 2. SC70 (Top View)

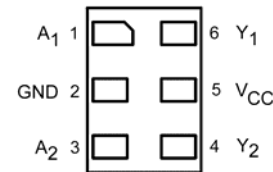


Figure 3. MicroPak (Top Through View)

## Pin Definitions

Pin # SC70	Pin # MicroPak	Name	Description
1	1	A <sub>1</sub>	Data Inputs
2	2	GND	Ground
3	3	A <sub>2</sub>	Data Inputs
4	4	Y <sub>2</sub>	Output
5	5	V <sub>CC</sub>	Supply Voltage
6	6	Y <sub>1</sub>	Output

## Function Table

Inputs	Output
A	Y
L	L
H	*H

H=HIGH Logic Level

L=LOW Logic Level

\*H=HIGH Impedance Output Status (Open Drain)

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
$V_{CC}$	Supply Voltage		-0.5	4.6	V
$V_{IN}$	DC Input Voltage		-0.5	4.6	V
$V_{OUT}$	DC Output Voltage		-0.5	4.6	V
$I_{IK}$	DC Input Diode Current	$V_{IN} < 0V$		-50	mA
$I_{OK}$	DC Output Diode Current	$V_{OUT} < 0V$		-50	mA
$I_{OL}$	DC Output Sink Current			+50	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current per Supply Pin			$\pm 50$	mA
$T_{STG}$	Storage Temperature Range		-65	+150	$^{\circ}C$
$T_J$	Junction Temperature Under Bias			+150	$^{\circ}C$
$T_L$	Junction Lead Temperature, Soldering 10 Seconds			+260	$^{\circ}C$
$P_D$	Power Dissipation at +85 $^{\circ}C$	SC70-5		150	mW
		MicroPak-6		130	
		MicroPak2-6		120	
ESD	Human Body Model, JEDEC:JESD22-A114			4000	V
	Charge Device Model, JEDEC:JESD22-C101			2000	

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Conditions	Min.	Max.	Unit
$V_{CC}$	Supply Voltage		0.9	3.6	V
$V_{IN}$	Input Voltage		0	3.6	V
$V_{OUT}$	Output Voltage		0	3.6	V
$I_{OL}$	Output Current in $I_{OL}$	$V_{CC}=3.0V$ to 3.6V		+24.0	mA
		$V_{CC}=2.3V$ to 3.6V		+18.0	
		$V_{CC}=1.65V$ to 1.95V		+6.0	
		$V_{CC}=1.4V$ to 1.6V		+4.0	
		$V_{CC}=1.1V$ to 1.3V		+2.0	
		$V_{CC}=0.9V$		+0.1	
$T_A$	Operating Temperature, Free Air		-40	+85	$^{\circ}C$
$\Delta t/\Delta V$	Minimum Input Edge Rate	$V_{IN}=0.8V$ to 2.0, $V_{CC}=3.0V$		10	ns/V
$\theta_{JA}$	Thermal Resistance	SC70-5		425	$^{\circ}C/W$
		MicroPak-6		500	

**Note:**

- Unused inputs must be held HIGH or LOW. They may not float.

### DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =25°C		T <sub>A</sub> =-40 to 85°C		Units
				Min.	Max.	Min.	Max.	
V <sub>IH</sub>	HIGH Level Input Voltage	0.90		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95		.65 x V <sub>CC</sub>		.65 x V <sub>CC</sub>		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70		1.6		1.6		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60		2.0		2.0		
V <sub>IL</sub>	LOW Level Input Voltage	0.90			.35 x V <sub>CC</sub>		.35 x V <sub>CC</sub>	V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30			.35 x V <sub>CC</sub>		.35 x V <sub>CC</sub>	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60			.35 x V <sub>CC</sub>		.35 x V <sub>CC</sub>	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95			.35 x V <sub>CC</sub>		.35 x V <sub>CC</sub>	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70			0.7		0.7	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.8		0.8	
V <sub>OL</sub>	LOW Level Output Voltage	0.90	I <sub>OL</sub> =100μA		0.1		0.1	V
		1.10 ≤ V <sub>CC</sub> ≤ 1.30			0.1		0.1	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60			0.2		0.2	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95			0.2		0.2	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70			0.2		0.2	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.2		0.2	
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	I <sub>OL</sub> =2mA		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	I <sub>OL</sub> =4mA		0.25 x V <sub>CC</sub>		0.25 x V <sub>CC</sub>	
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	I <sub>OL</sub> =6mA		0.3		0.3	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OL</sub> =12mA		0.4		0.4	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.4		0.4	
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	I <sub>OL</sub> =18mA		0.6		0.6	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60			0.4		0.4	
		2.70 ≤ V <sub>CC</sub> ≤ 3.60	I <sub>OL</sub> =24mA		0.55		0.55	
I <sub>IN</sub>	Input Leakage Current	0.90 to 3.60	0 ≤ V <sub>IN</sub> ≤ 3.60		±0.1		±0.5	μA
I <sub>OFF</sub>	Power Off Leakage Current	0	0 ≤ (V <sub>IN</sub> , V <sub>O</sub> ) ≤ 3.60		0.5		0.5	μA
I <sub>CC</sub>	Quiescent Supply Current	0.90 to 3.60	V <sub>IN</sub> =V <sub>CC</sub> , or GND		0.9		0.9	μA
			V <sub>CC</sub> ≤ V <sub>IN</sub> ≤ 3.6V				±0.9	

### AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> =25°C			T <sub>A</sub> =-40 to 85°C		Units	Figure
				Min.	Typ.	Max.	Min.	Max.		
t <sub>PZL</sub> , t <sub>PLZ</sub>	Propagation Delay	0.90	C <sub>L</sub> =15pF, R <sub>U</sub> =R <sub>D</sub> =1MΩ		13				ns	Figure 4 Figure 5
		1.10 ≤ V <sub>CC</sub> ≤ 1.30	C <sub>L</sub> =15pF, R <sub>U</sub> =R <sub>D</sub> =2kΩ	2.0	6.0	15.0	1.0	18.6		
		1.40 ≤ V <sub>CC</sub> ≤ 1.60	C <sub>L</sub> =15pF, R <sub>U</sub> =R <sub>D</sub> =2kΩ	1.0	3.2	8.7	1.0	9.7		
		1.65 ≤ V <sub>CC</sub> ≤ 1.95	C <sub>L</sub> =15pF, R <sub>U</sub> =R <sub>D</sub> =2kΩ	1.0	2.0	6.0	1.0	6.8		
		2.30 ≤ V <sub>CC</sub> ≤ 2.70	C <sub>L</sub> =30pF, R <sub>U</sub> =R <sub>D</sub> =500Ω	0.7	1.2	3.6	0.6	4.7		
		2.70 ≤ V <sub>CC</sub> ≤ 3.60	C <sub>L</sub> =30pF, R <sub>U</sub> =R <sub>D</sub> =500Ω	0.5	1.0	3.3	0.4	4.0		
C <sub>IN</sub>	Input Capacitance	0			2				pF	
C <sub>OUT</sub>	Output Capacitance	0			6.5					
C <sub>PD</sub>	Power Dissipation Capacitance	0.90 to 3.60	V <sub>IN</sub> =0V or V <sub>CC</sub> , f=10MHz		10					pF

### AC Loadings and Waveforms

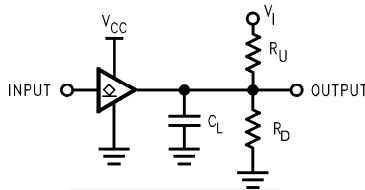


Figure 4. AC Test Circuit

Test	Switch
t <sub>PZL</sub> , t <sub>PLZ</sub>	6V at V <sub>CC</sub> =3.3±0.3V; V <sub>CC</sub> x 2 at V <sub>CC</sub> =0.9-2.7V

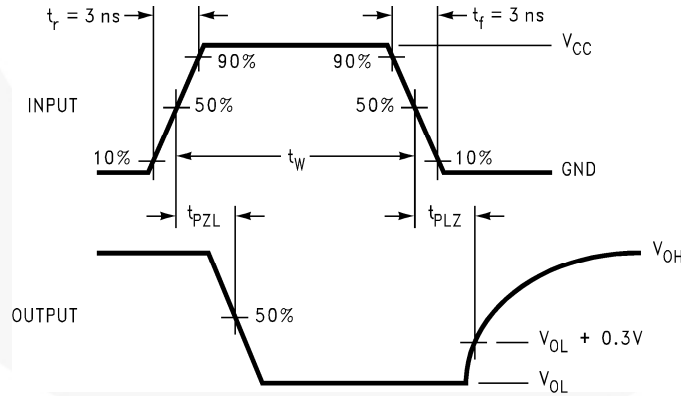
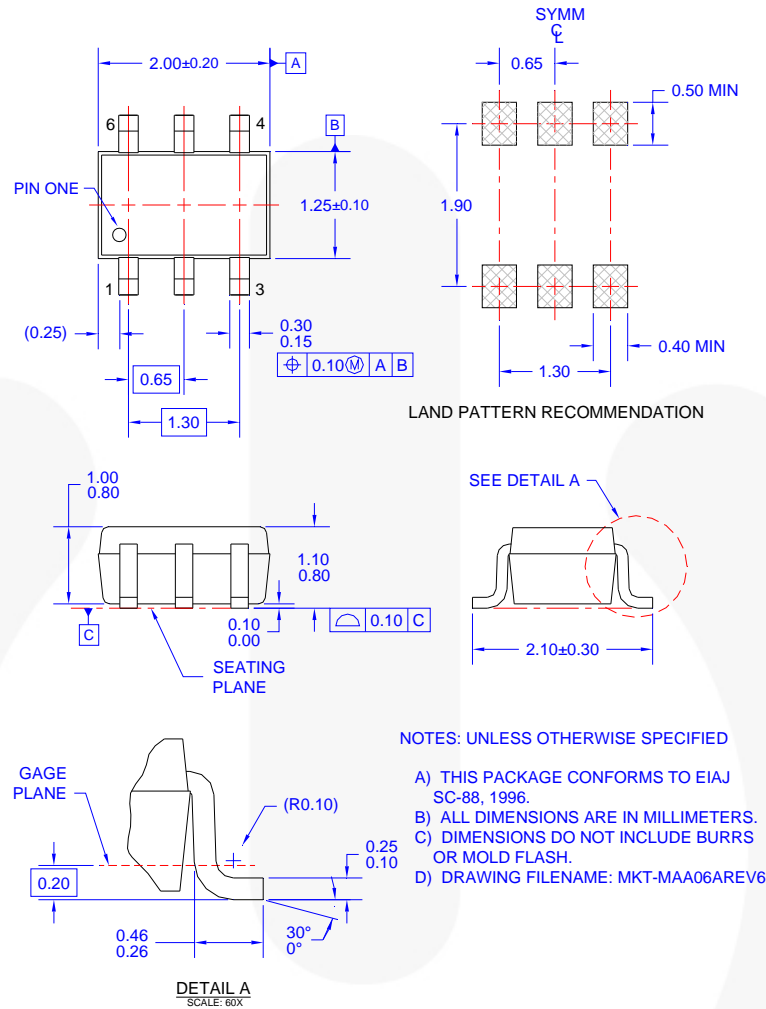


Figure 5. AC Waveforms for Inverting and Non-Inverting Functions

Symbol	V <sub>CC</sub>					
	3.3V ± 0.3V	2.5V ± 0.2V	1.8V ± 0.15V	1.5V ± 0.1V	1.2V ± 0.1V	0.9V
V <sub>mi</sub>	1.5V	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2	V <sub>CC</sub> /2
V <sub>mo</sub>	V <sub>OL</sub> + 0.30V	V <sub>OL</sub> + 0.15V	V <sub>OL</sub> + 0.15V	V <sub>OL</sub> + 0.10V	V <sub>OL</sub> + 0.10V	V <sub>OL</sub> + 0.10V

## Physical Dimensions



**Figure 6. 6-Lead, SC70, EIAJ SC-88a, 1.25mm Wide**

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.

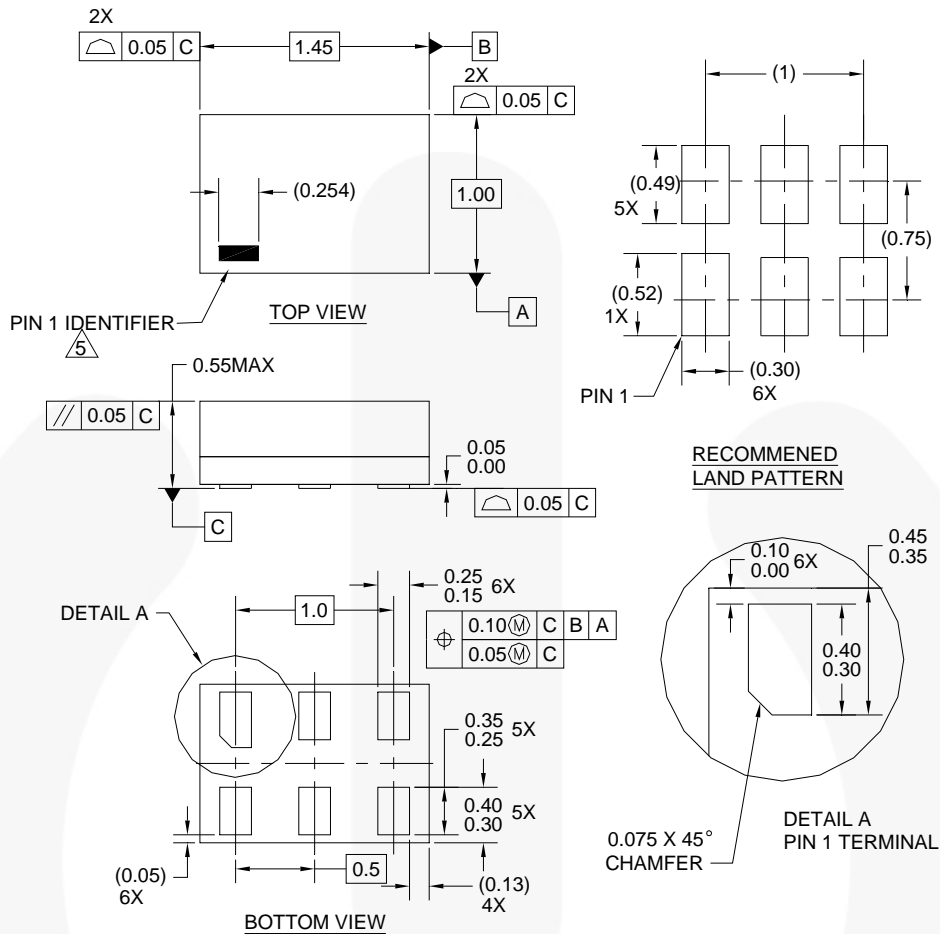
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## Tape and Reel Specification

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
[http://www.fairchildsemi.com/products/analog/pdf/sc70-6\\_tr.pdf](http://www.fairchildsemi.com/products/analog/pdf/sc70-6_tr.pdf).

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
P6X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

## Physical Dimensions



**Notes:**

1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
  2. DIMENSIONS ARE IN MILLIMETERS
  3. DRAWING CONFORMS TO ASME Y14.5M-1994
  4. FILENAME AND REVISION: MAC06AREV4
- △ PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

**Figure 7. 6-Lead, MicroPak™, 1.0mm Wide**

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## Tape and Reel Specification


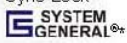
Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:  
[http://www.fairchildsemi.com/products/logic/pdf/micropak\\_tr.pdf](http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf).

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
L6X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed



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| AccuPower™                                                                                   | F-PFS™                                         | Power-SPM™                                                                                         | <b>the power franchise</b>                                                          |
| Auto-SPM™                                                                                    | FRFET®                                         | PowerTrench®                                                                                       | TinyBoost™                                                                          |
| AX-CAP™*                                                                                     | Global Power Resource™                         | PowerXS™                                                                                           | TinyBuck™                                                                           |
| BitSic®                                                                                      | Green FPST™                                    | Programmable Active Droop™                                                                         | TinyCalc™                                                                           |
| Build it Now™                                                                                | Green FPST™ e-Series™                          | QFET®                                                                                              | TinyLogic®                                                                          |
| CorePLUS™                                                                                    | Gmax™                                          | QST™                                                                                               | TINYOPTO™                                                                           |
| CorePOWER™                                                                                   | GTO™                                           | Quiet Series™                                                                                      | TinyPower™                                                                          |
| CROSSVOLT™                                                                                   | IntelliMAX™                                    | RapidConfigure™                                                                                    | TinyPWM™                                                                            |
| CTL™                                                                                         | ISOPLANAR™                                     |  ™                | TinyWire™                                                                           |
| Current Transfer Logic™                                                                      | Making Small Speakers Sound Louder and Better™ | Saving our world, 1mW/W/kW at a time™                                                              | TranSiC®                                                                            |
| DEUXPEED®                                                                                    | MegaBuck™                                      | SignalWise™                                                                                        | TriFault Detect™                                                                    |
| Dual Cool™                                                                                   | MI CROCOUPLER™                                 | SmartMax™                                                                                          | TRUECURRENT®*                                                                       |
| EcoSPARK®                                                                                    | MicroFET™                                      | SMART START™                                                                                       | µSerDes™                                                                            |
| EfficientMax™                                                                                | MicroPak™                                      | SPM®                                                                                               |  |
| ESBC™                                                                                        | MicroPak2™                                     | STEALTH™                                                                                           | UHC®                                                                                |
|  Fairchild® | MillerDrive™                                   | SuperFET®                                                                                          | Ultra FRFET™                                                                        |
| Fairchild Semiconductor®                                                                     | MotionMax™                                     | SuperSOT™-3                                                                                        | UniFET™                                                                             |
| FACT Quiet Series™                                                                           | Motion-SPM™                                    | SuperSOT™-6                                                                                        | VCM™                                                                                |
| FACT®                                                                                        | mWSaver™                                       | SuperSOT™-8                                                                                        | VisualMax™                                                                          |
| FAST®                                                                                        | OptoHit™                                       | SupreMOS®                                                                                          | VoltagePlus™                                                                        |
| FastvCore™                                                                                   | OPTOLOGIC®                                     | SyncFET™                                                                                           | XS™                                                                                 |
| FETBench™                                                                                    | OPTOPLANAR®                                    | Sync-Lock™                                                                                         |                                                                                     |
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- 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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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.
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