



# 74LVTH125

## Low Voltage Quad Buffer with 3-STATE Outputs

### Features

- Input and output interface capability to systems at 5V  $V_{CC}$
- Bushold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power Up/Down high impedance provides glitch-free bus loading
- Outputs source/sink  $-32\text{mA}/+64\text{mA}$
- Functionally compatible with the 74 series 125
- Latch-up performance exceeds 500mA
- ESD performance:
  - Human-body model > 2000V
  - Machine model > 200V
  - Charged-device model > 1000V

### General Description


The LVTH125 contains four independent non-inverting buffers with 3-STATE outputs.

These buffers are designed for low-voltage (3.3V)  $V_{CC}$  applications, but with the capability to provide a TTL interface to a 5V environment. The LVTH125 is fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining a low power dissipation.

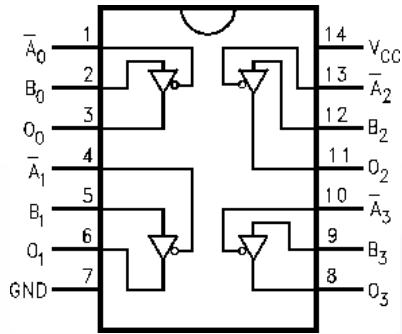
### Ordering Information

Order Number	Package Number	Package Description
74LVTH125M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LVTH125SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVTH125MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

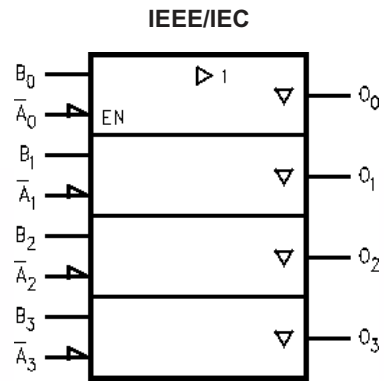
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

### Connection Diagram



### Logic Symbol



### Pin Description

Pin Names	Description
$\bar{A}_n, B_n$	Inputs
$O_n$	3-STATE Outputs

### Truth Table

Inputs		Output
$\bar{A}_n$	$B_n$	$O_n$
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Z = HIGH Impedance

## 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	Rating
$V_{CC}$	Supply Voltage	-0.5V to +4.6V
$V_I$	DC Input Voltage	-0.5V to +7.0V
$V_O$	DC Output Voltage Output in 3-STATE	-0.5V to +7.0V
	Output in HIGH or LOW State <sup>(1)</sup>	-0.5V to +7.0V
$I_{IK}$	DC Input Diode Current, $V_I < GND$	-50mA
$I_{OK}$	DC Output Diode Current, $V_O < GND$	-50mA
$I_O$	DC Output Current, $V_O > V_{CC}$ Output at HIGH State	64mA
	Output at LOW State	128mA
$I_{CC}$	DC Supply Current per Supply Pin	±64mA
$I_{GND}$	DC Ground Current per Ground Pin	±128mA
$T_{STG}$	Storage Temperature	-65°C to +150°C

### Note:

- $I_O$  Absolute Maximum Rating must be observed.

## 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	Min	Max	Units
$V_{CC}$	Supply Voltage	2.7	3.6	V
$V_I$	Input Voltage	0	5.5	V
$I_{OH}$	HIGH-Level Output Current		-32	mA
$I_{OL}$	LOW-Level Output Current		64	mA
$T_A$	Free-Air Operating Temperature	-40	85	°C
$\Delta t / \Delta V$	Input Edge Rate, $V_{IN} = 0.8V-2.0V$ , $V_{CC} = 3.0V$	0	10	ns/V

## DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = -40°C to +85°C			Units	
				Min.	Typ. <sup>(2)</sup>	Max.		
V <sub>IK</sub>	Input Clamp Diode Voltage	2.7	I <sub>I</sub> = -18mA			-1.2	V	
V <sub>IH</sub>	Input HIGH Voltage	2.7-3.6	V <sub>O</sub> ≤ 0.1V or	2.0			V	
V <sub>IL</sub>	Input LOW Voltage	2.7-3.6	V <sub>O</sub> ≥ V <sub>CC</sub> - 0.1V			0.8	V	
V <sub>OH</sub>	Output HIGH Voltage	2.7-3.6	I <sub>OH</sub> = -100μA	V <sub>CC</sub> - 0.2			V	
		2.7	I <sub>OH</sub> = -8mA	2.4				
		3.0	I <sub>OH</sub> = -32mA	2.0				
V <sub>OL</sub>	Output LOW Voltage	2.7	I <sub>OL</sub> = 100μA			0.2	V	
			I <sub>OL</sub> = 24mA			0.5		
		3.0	I <sub>OL</sub> = 16mA			0.4		
			I <sub>OL</sub> = 32mA			0.5		
			I <sub>OL</sub> = 64mA			0.55		
I <sub>I(HOLD)</sub>	Bushold Input Minimum Drive	3.0	V <sub>I</sub> = 0.8V	75			μA	
			V <sub>I</sub> = 2.0V	-75				
I <sub>I(OD)</sub>	Bushold Input Over-Drive Current to Change State	3.0	<sup>(3)</sup>	500			μA	
			<sup>(4)</sup>	-500				
I <sub>I</sub>	Input Current	3.6	V <sub>I</sub> = 5.5V			10	μA	
		Control Pins	3.6	V <sub>I</sub> = 0V or V <sub>CC</sub>			±1	
		Data Pins	3.6	V <sub>I</sub> = 0V			-5	
				V <sub>I</sub> = V <sub>CC</sub>			1	
I <sub>OFF</sub>	Power Off Leakage Current	0	0V ≤ V <sub>I</sub> or V <sub>O</sub> ≤ 5.5V			±100	μA	
I <sub>PU/PD</sub>	Power up/down 3-STATE Output Current	0-1.5	V <sub>O</sub> = 0.5V to 3.0V, V <sub>I</sub> = GND or V <sub>CC</sub>			±100	μA	
I <sub>OZL</sub>	3-STATE Output Leakage Current	3.6	V <sub>O</sub> = 0.5V			-5	μA	
I <sub>OZH</sub>	3-STATE Output Leakage Current	3.6	V <sub>O</sub> = 3.0V			5	μA	
I <sub>OZH+</sub>	3-STATE Output Leakage Current	3.6	V <sub>CC</sub> < V <sub>O</sub> ≤ 5.5V			10	μA	
I <sub>CCH</sub>	Power Supply Current	3.6	Outputs HIGH			0.19	mA	
I <sub>CCL</sub>	Power Supply Current	3.6	Outputs LOW			5	mA	
I <sub>CCZ</sub>	Power Supply Current	3.6	Outputs Disabled			0.19	mA	
I <sub>CCZ+</sub>	Power Supply Current	3.6	V <sub>CC</sub> ≤ V <sub>O</sub> ≤ 5.5V, Outputs Disabled			0.19	mA	
ΔI <sub>CC</sub>	Increase in Power Supply Current <sup>(5)</sup>	3.6	One Input at V <sub>CC</sub> - 0.6V, Other Inputs at V <sub>CC</sub> or GND			0.2	mA	

**Notes:**

- All typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = 25°C.
- An external driver must source at least the specified current to switch from LOW-to-HIGH.
- An external driver must sink at least the specified current to switch from HIGH-to-LOW.
- This is the increase in supply current for each input that is at the specified voltage level rather than V<sub>CC</sub> or GND.

## Dynamic Switching Characteristics(6)

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = 25°C			Units
			C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500Ω	Min.	Typ.	Max.	
V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	3.3	(7)		0.8		V
V <sub>OLV</sub>	Quiet Output Minimum Dynamic V <sub>OL</sub>	3.3	(7)		-0.8		V

### Notes:

6. Characterized in SOIC package. Guaranteed parameter, but not tested.  
 7. Max number of outputs defined as (n). n-1 data inputs are driven 0V to 3V. Output under test held LOW.

## AC Electrical Characteristics

Symbol	Parameter	T <sub>A</sub> = -40°C to +85°C, C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω					Units
		V <sub>CC</sub> = 3.3V ± 0.3V			V <sub>CC</sub> = 2.7V		
		Min.	Typ. <sup>(8)</sup>	Max.	Min.	Max.	
t <sub>PLH</sub>	Propagation Delay, Data to Output	1.0		3.5	1.0	4.5	ns
t <sub>PHL</sub>		1.0		3.9	1.0	4.9	
t <sub>PZH</sub>	Output Enable Time	1.0		4.0	1.0	5.5	ns
t <sub>PZL</sub>		1.1		4.0	1.1	5.4	
t <sub>PHZ</sub>	Output Disable Time	1.5		4.5	1.5	5.7	ns
t <sub>PLZ</sub>		1.3		4.5	1.3	4.0	
t <sub>OSSL</sub> , t <sub>OSHL</sub>	Output to Output Skew <sup>(9)</sup>			1.0		1.0	ns

### Notes:

8. All typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = 25°C.  
 9. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t<sub>OSSL</sub>) or LOW-to-HIGH (t<sub>OSHL</sub>).

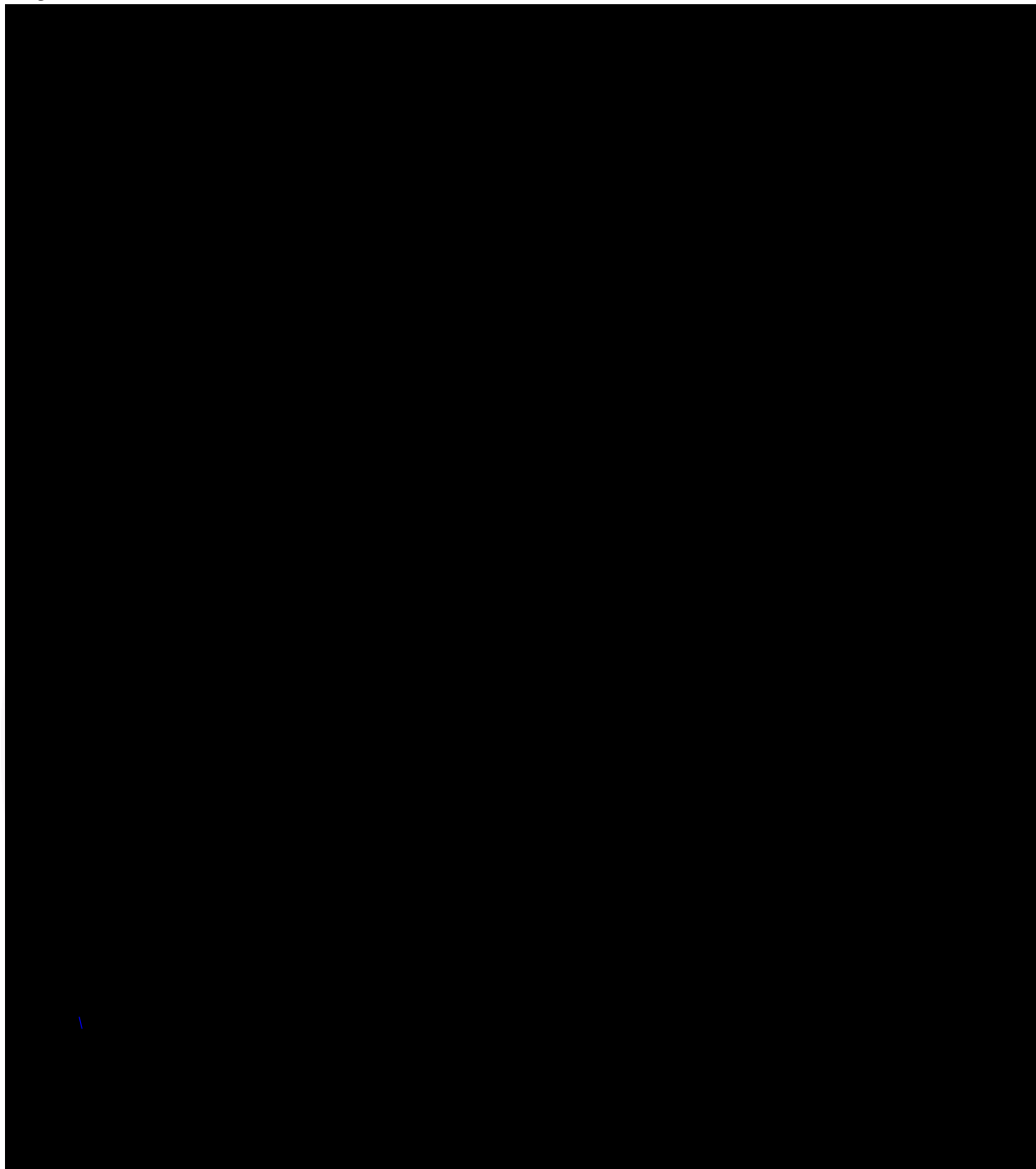
## Capacitance<sup>(10)</sup>

Symbol	Parameter	Conditions	Typical	Units
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 0V, V <sub>I</sub> = 0V or V <sub>CC</sub>	4	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 3.0V, V <sub>O</sub> = 0V or V <sub>CC</sub>	8	pF

### Note:

10. Capacitance is measured at frequency f = 1MHz, per MIL-STD-883B, Method 3012.

## Physical Dimensions



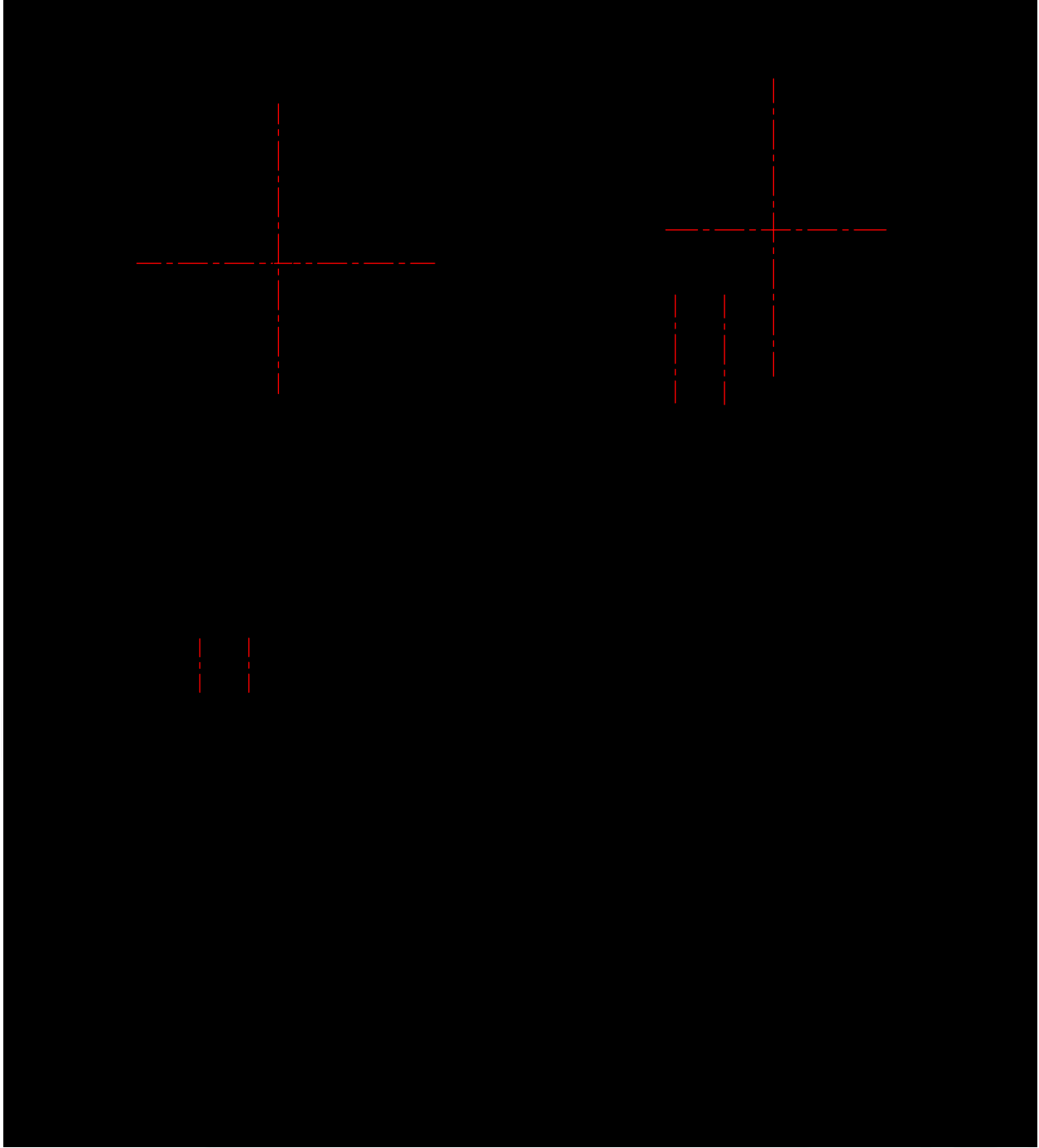
**Figure 1. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow**

*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/packaging/>

## Physical Dimensions (Continued)

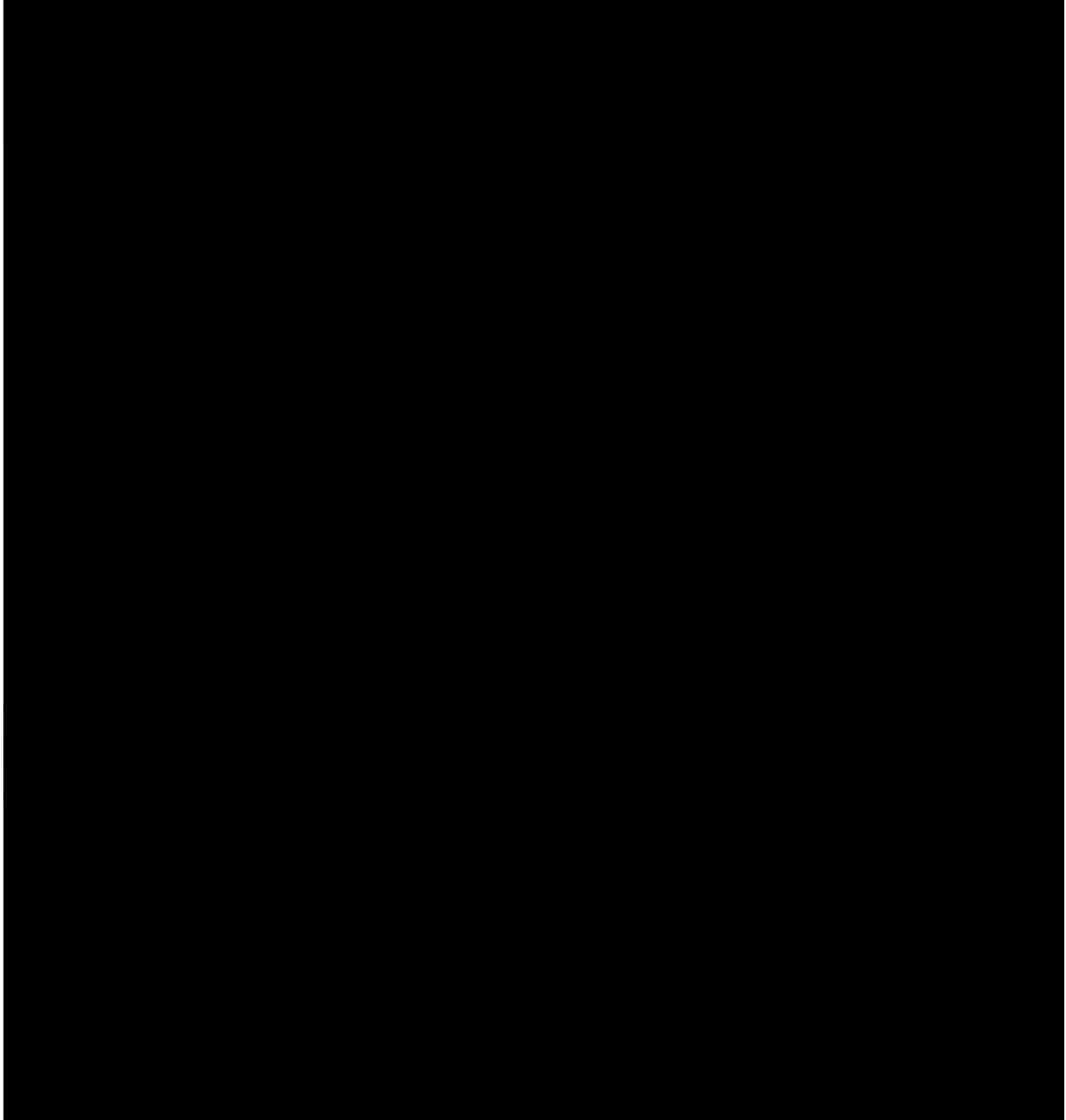


**Figure 2. 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide**

*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.*

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

<http://www.fairchildsemi.com/packaging/>

**Physical Dimensions** (Continued)

**Figure 3. 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm 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.*



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

<http://www.fairchildsemi.com/packaging/>





subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |   |  |  |                                  |
|---|--|--|----------------------------------|
| ACE <sup>®</sup>  | FPS <sup>™</sup>                             | PDP-SPM <sup>™</sup>                   | SupreMOS <sup>™</sup>            |
| Build it Now <sup>™</sup>   | FRFET <sup>®</sup>                           | Power220 <sup>®</sup>                  | SyncFET <sup>™</sup>             |
| CorePLUS <sup>™</sup>   | Global Power Resource <sup>SM</sup>          | POWEREDGE <sup>®</sup>                 | SYSTEM <sup>®</sup>              |
| CROSSVOLT <sup>™</sup>  | Green FPS <sup>™</sup>                       | Power-SPM <sup>™</sup>                 | GENERAL                          |
| CTL <sup>™</sup>  | Green FPS <sup>™</sup> e-Series <sup>™</sup> | PowerTrench <sup>®</sup>               | The Power Franchise <sup>®</sup> |
| Current Transfer Logic <sup>™</sup>   | GTO <sup>™</sup>                             | Programmable Active Droop <sup>™</sup> | the                              |
| EcoSPARK <sup>®</sup>   | i-Lo <sup>™</sup>                            | QFET <sup>®</sup>                      | <b>power</b>                     |
| EZSWITCH <sup>™</sup> *   | IntelliMAX <sup>™</sup>                      | QS <sup>™</sup>                        | franchise                        |
|  | ISOPLANAR <sup>™</sup>                       | QT Optoelectronics <sup>™</sup>        | TinyBoost <sup>™</sup>           |
|  | MegaBuck <sup>™</sup>                        | Quiet Series <sup>™</sup>              | TinyBuck <sup>™</sup>            |
| Fairchild <sup>®</sup>  | MICROCOUPLER <sup>™</sup>                    | RapidConfigure <sup>™</sup>            | TinyLogic <sup>®</sup>           |
| Fairchild Semiconductor <sup>®</sup>  | MicroFET <sup>™</sup>                        | SMART START <sup>™</sup>               | TINYOPTO <sup>™</sup>            |
| FACT Quiet Series <sup>™</sup>  | MicroPak <sup>™</sup>                        | SPM <sup>®</sup>                       | TinyPower <sup>™</sup>           |
| FACT <sup>®</sup>   | MillerDrive <sup>™</sup>                     | STEALTH <sup>™</sup>                   | TinyPWM <sup>™</sup>             |
| FAST <sup>®</sup>   | Motion-SPM <sup>™</sup>                      | SuperFET <sup>™</sup>                  | TinyWire <sup>™</sup>            |
| FastvCore <sup>™</sup> *  | OPTOLOGIC <sup>®</sup>                       | SuperSOT <sup>™</sup> 3                | SerDes <sup>™</sup>              |
| FlashWriter <sup>®</sup> *  | OPTOPLANAR <sup>®</sup>                      | SuperSOT <sup>™</sup> 6                | UHC <sup>®</sup>                 |
|   |  | SuperSOT <sup>™</sup> 8                | Ultra FRFET <sup>™</sup>         |
|   |  |  | UniFET <sup>™</sup>              |
|   |  |  | VCX <sup>™</sup>                 |

\* EZSWITCH<sup>™</sup> and FlashWriter<sup>®</sup> are 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.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This 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.