CROSSVOLT™

Low-Voltage Logic Selection Guide

3.3V

2.5V

1.8V

FAIRCHILD

SEMICONDUCTOR™

Fairchild Low-Voltage Logic Families

CROSSVOLT **Low-Voltage Logic: Easy to Choose and Easy to Use**

Easy to Choose

Fairchild Semiconductor developed the *CROSSVOLT* Logic Series to deliver a comprehensive product portfolio with solutions for every low-voltage design need. Fairchild's low-voltage family offerings include VCX™, LCX, LVT, LVX, Dual Supply Translators and TinyLogic™ devices to provide optimal solutions across the widest variety of applications. *CROSSVOLT* delivers maximum design flexibility, shortens time to market, and comes with all the selection tools you need to define the right product quickly.

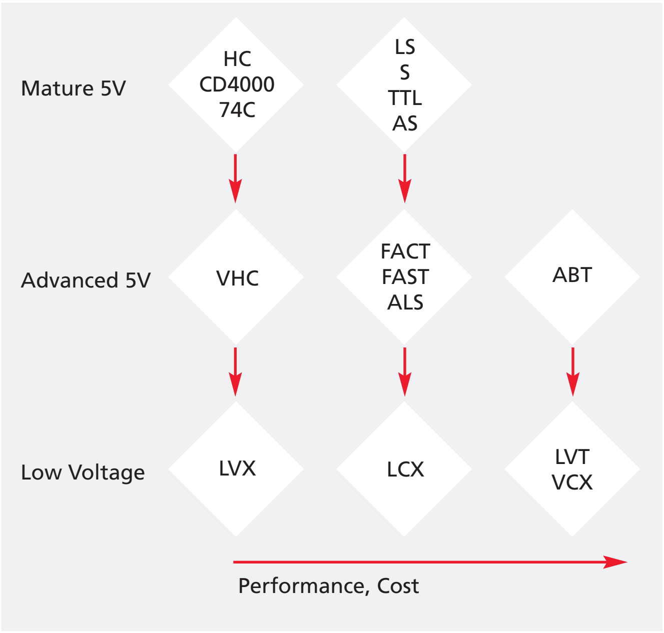
Easy to Use

Select the right *CROSSVOLT* device for your application today, and you can be confident that as supply voltages continue to drop *CROSSVOLT* will ensure fast, safe and easy migration into new designs without having to select new logic families.

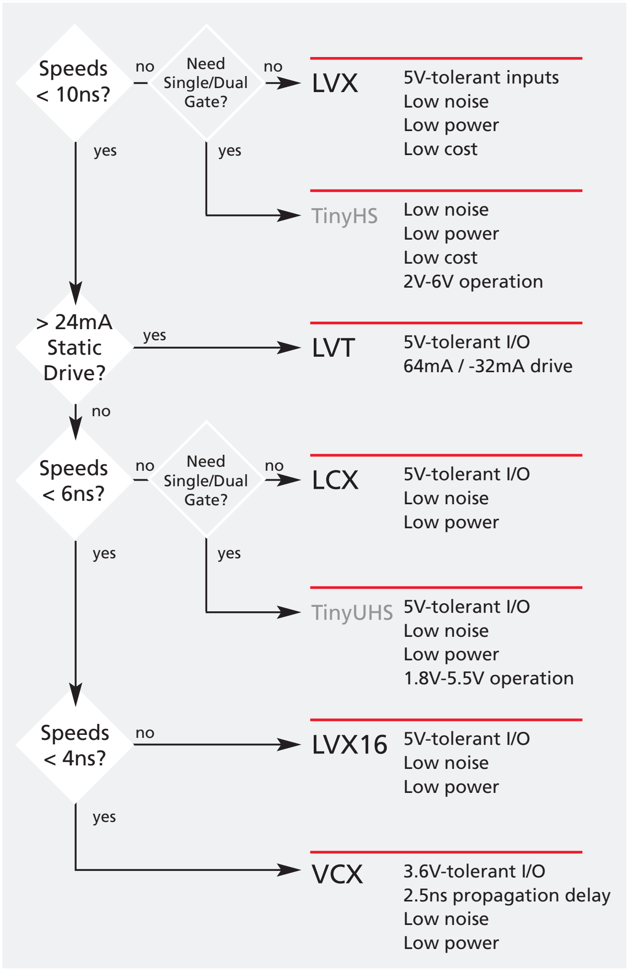
To use the *CROSSVOLT* Low-Voltage Selection Guide, select the performance attribute that is most important to your design—speed, dynamic power, capacitive derating, noise, etc.—and note the comparative family data. Then fine-tune your selection with the other criteria provided.

For additional literature and technical information on a specific product or family, call your local Fairchild Sales Office or visit us on line at: **www.fairchildsemi.com/logic/lowvolt**

Logic Migration and Low-Voltage Transition



Low-Voltage Decision Tree



CROSSVOLT™ Product Portfolio and Description

	Buffers / Line Drivers	Transceivers	Registers / Flip-Flops	Latches	Counters	Multiplexers	Decoders / Demultiplexers	Gates	Dual Supply Translators	26Ω Series Resistor Options	Bushold Options	16 / 18 / 32 bit Functions	8 / 10 / 12 bit Functions	
CMOS														
VCX	●	●	●	●				●		●	●	●	●	High-speed CMOS enables interoperability between 3.3V and 2.5V systems, with 3.6V-tolerant inputs and outputs.
LCX	●	●	●	●		●	●	●		●		●	●	Offers 5V-tolerant inputs and outputs. Ideal for 3.3V applications requiring balanced drive capability, high speed, and low noise.
LVX	●	●	●	●	●	●	●	●	●			●	●	Offers 5V input tolerance that allows 5V CMOS to interface with 3.3V systems. Includes specialized dual-voltage translators.
BiCMOS														
LVT	●	●	●	●						●	●	●	●	High-speed, high-drive logic for 3.3V applications.
TinyLogic	●		●	●				●						Low-voltage, smallest footprint board space solutions in single- and dual-function logic.

Family Specification Comparison

	Specified Power Supply	Compatibility Input‡	Output ‡‡	Input Current †	Drive ††	Supply Current †	Speed †
	V_{CC} ± 10%	V_{IL} / V_{IH}	V_{OL} / V_{OH}	I_{IL} / I_{IH}	I_{OL} / I_{OH}	I_{CC}	T_{PD}
CMOS							
VCX (16bit)◊	3.3V / 2.5 / 1.8	TTL, CMOS	TTL, CMOS	-5µA / 5µA	24mA / -24mA	20µA	2.5 / 3.2ns
LCX (8bit)	3.3V / 2.5	TTL, CMOS	TTL, CMOS	-5µA / 5µA	24mA / -24mA	10µA	6.5ns
LCX (16bit)	3.3V / 2.5	TTL, CMOS	TTL, CMOS	-5µA / 5µA	24mA / -24mA	20µA	4.5ns
LVX (8bit)	3.3V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	4mA / -4mA	40µA	12.0ns
BiCMOS							
LVT (8bit)	3.3V	TTL, CMOS	TTL, CMOS	-5µA / 1µA	64mA / -32mA	5mA	3.5ns
LVT (16bit)	3.3V	TTL, CMOS	TTL, CMOS	-5µA / 1µA	64mA / -32mA	5mA	3.5ns
TinyHS**	2.0/3.0/4.5/6V *	CMOS	TTL,CMOS	-1µA / 1µA	2.6mA / -2.6mA	10µA	21ns
TinyUHS**	1.8/2.5/3.3/5.5V	CMOS	TTL,CMOS	-10µA / 10µA	32mA / -32mA	20µA	4.5ns

‡ input levels recognized by the device

‡‡ input levels the device is capable of driving

† maximum specification at maximum specified V_{CC}

†† at maximum specified V_{CC}

◊ C_{LOAD}=30pF

* not ±10%

** NAND Gate

Over-Voltage Tolerance

Over-voltage tolerance (OVT) allows a semiconductor device to accommodate input and output voltages that are higher than its operating voltage with no damage to the device or to signal integrity.

OVT is especially important in mixed-voltage design environments. OVT enables you to combine the features and benefits of devices with different performance attributes for more versatile and valuable system performance characteristics.

Over-Voltage Specifications

	I_I	I_{OFF}	I_{OZ}
CMOS			
VCX	5µA	10µA	10µA
LCX	5µA	10µA	5µA
LVX*	1µA	—	2.5µA
BiCMOS			
LVT	10µA	100µA	5µA

* 244 function

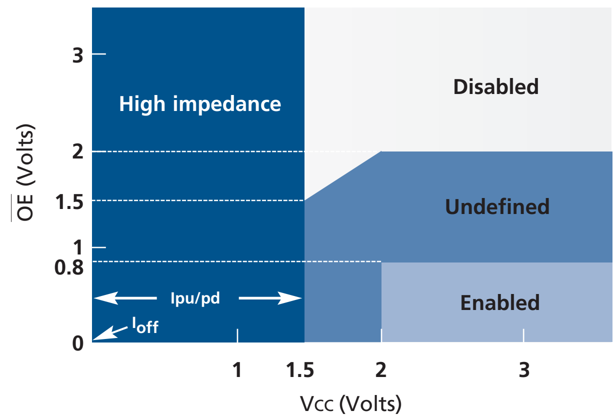
Note: All values pertain to ‘16244 function except LVX, which is a ‘244 function.

Power-Up / Power-Down

The power-up/power-down state diagram defines the stages that a device steps through when ramping up or ramping down VCC. Each area represents a state that is controlled by internal power up/down gate sequencing, or by the Output Enable ($\overline{OE}$) pin.

High impedance—the initial state during power up—represents the conditions of device outputs due to internal gate sequencing. Generally, a high impedance state is maintained up to a VT threshold for CMOS devices (~0.8V), or up to two times VBE for bipolar or BiCMOS devices(~1.5V). This state can also be represented by the IOFF and IPU/PD specifications.

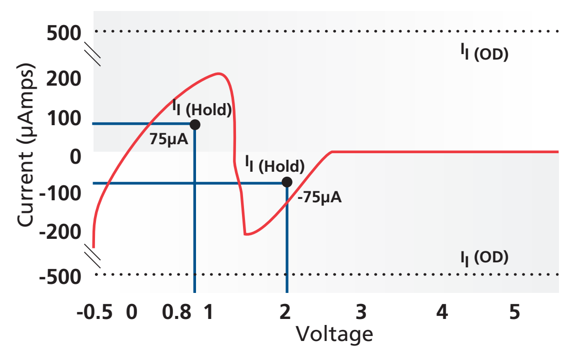
LVT products guarantee high impedance during power-up and power-down, allowing hot insertion capability.



Bushold

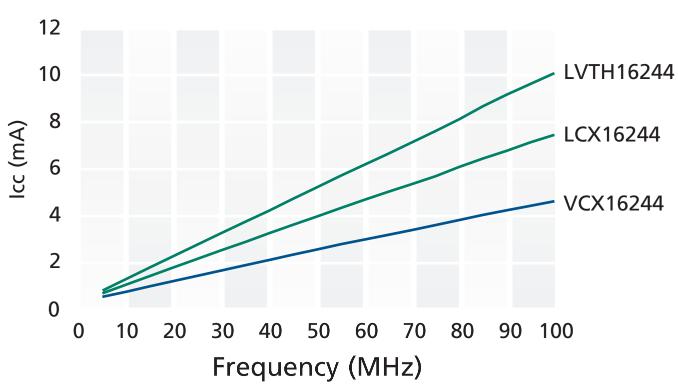
Devices featuring bushold will 'hold' the last known valid state of the input whenever a bus starts to float. This feature eliminates the need for external pullup or pulldown resistors. Devices with bushold may save space on a printed circuit board area and reduce cost.

Fairchild Semiconductor provides two types of bushold specifications. $I_{I(HOLD)}$ is the bushold input minimum drive and is specified at +/- 75µA. This is the minimum amount of current the circuit is capable of supplying. $I_{I(OD)}$ is the bushold input over-drive current to change state and is specified at +/-500 µA. This is the minimum amount of current that is necessary to overcome the bushold circuit, and cause the input to change states.



16 bit Dynamic Power

(typical process comparison, multiple outputs switching)

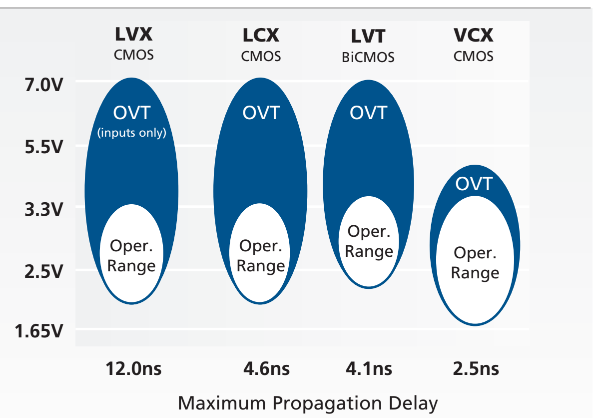


All figures represent typical performance values.

Dynamic Power (mA)

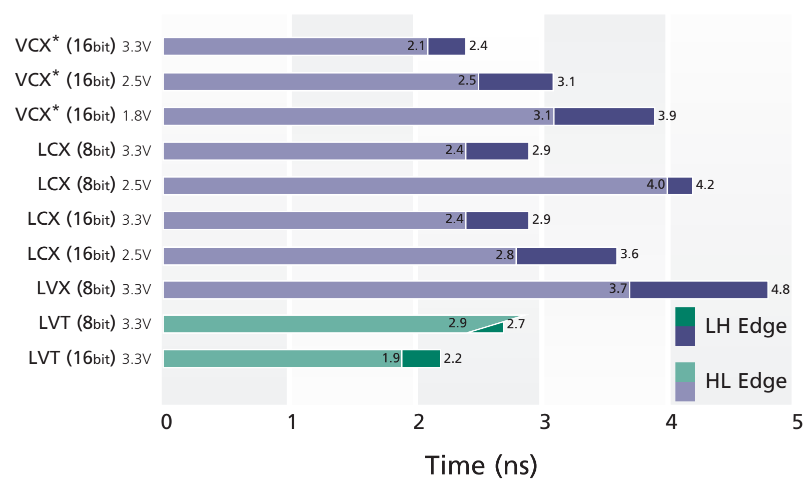
	5MHz	10MHz	35MHz	70MHz	90MHz
CMOS					
VCX (16bit)	0.23	0.46	1.61	3.15	4.02
LCX (16bit)	0.38	0.76	2.62	5.16	6.62
LCX (8bit)	0.36	0.72	2.47	4.92	6.18
LVX (8bit)	0.18	0.38	1.36	2.63	3.02
BiCMOS					
LVT (16bit)	0.50	1.01	3.52	6.99	9.08
LVT (8bit)	0.50	1.51	6.98	14.93	19.89

Single output switching @ 0pF, CLOAD
All figures represent typical performance values.
VCC=3.3V



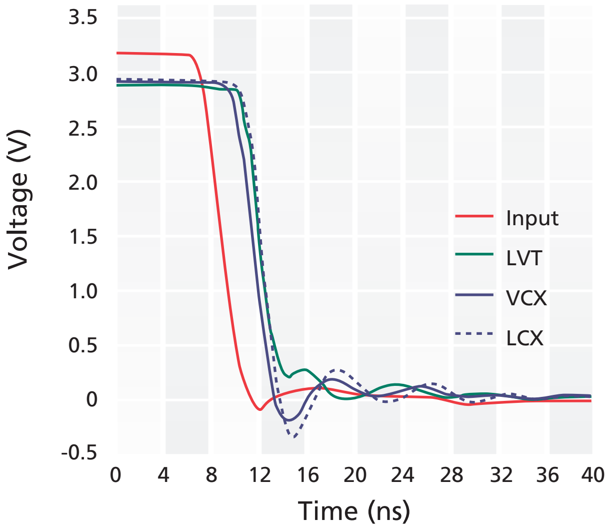
Output Rise and Fall Time

CLOAD=50pF,
*CLOAD=30pF



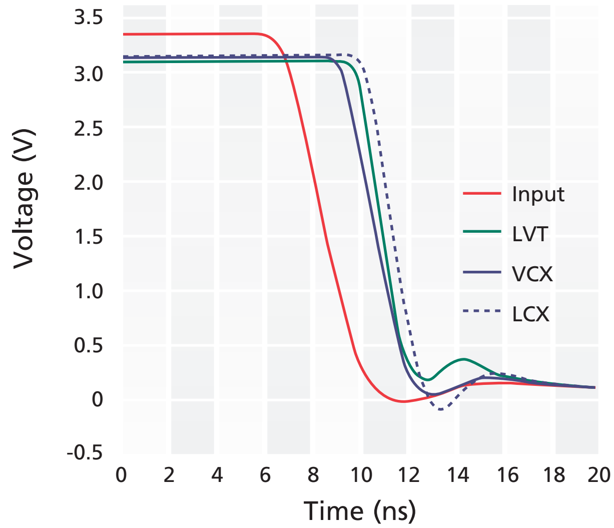
Note: All values pertain to '16244 function except LVX, which is a '244 function.

Active Edge Rate High-to-Low Multiple Outputs Switching*



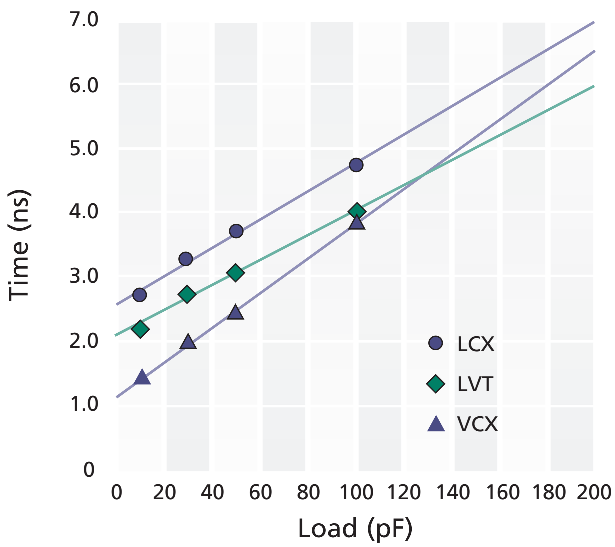
*16244 function, VCC=3.3V

Active Edge Rate High-to-Low Single Output Switching*



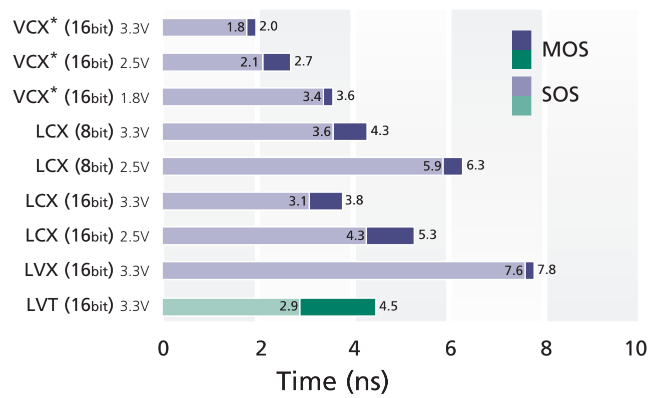
*16244 function, VCC=3.3V

Capacitive Derating*



*16244 function, VCC=3.3V

Single Output Switching & Multiple Outputs Switching Data



CLOAD=50pF
*CLOAD=30pF

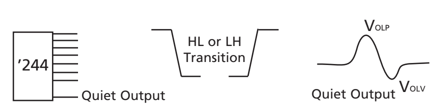
Package Availability

	VCX	LCX	LVX	LVT
	CMOS			BiCMOS
TSSOP (48/56 pin)	●	●	●	●
SSOP (48/56 pin)		●	●	●
TSSOP Type I	●	●	●	●
SSOP Type II (20/24 pin)		●		●
QSOP (20/24 pin)			Note 1	
SOIC JEDEC	●	●	●	●
SOIC EIAJ		●	●	●

Note 1: LVX3245, LVX4245, LVXC3245, LVXC4245

Noise

	VOLP (V)	VOLV (V)
CMOS		
VCX* (16bit) 3.3V	0.4	-0.4
VCX* (16bit) 2.5V	0.3	-0.3
VCX* (16bit) 1.8V	0.2	-0.2
LCX (8bit) 3.3V	0.7	-0.7
LCX (8bit) 2.5V	0.5	-0.5
LCX (16bit) 3.3V	0.4	-0.5
LCX (16bit) 2.5V	0.3	-0.3
LVX (8bit) 3.3V	0.3	-0.3
BiCMOS		
LVT (16bit) 3.3V	0.2	-0.2
LVT (8bit) 3.3V	0.5	-0.5
LVTH (16bit) 2.5V	9.8	-6.3



CLOAD= 50pF, minimum input skew, typical values
*CLOAD=30pF

Note: All values pertain to '16244 function except LVX, which is a '244 function.

To receive sales literature and technical assistance, contact the Fairchild Sales Office in your area.

Americas
Customer Response Center
Fairchild Semiconductor
222 West Las Colinas Boulevard
Suite 380
Irving, TX 75039
Tel: 888-522-5372
Fax: 972-910-8036

Finland
Fairchild Semiconductor
Itakatu D213
FIN-00930 Helsinki
Finland
Tel: 358-9-341-1266
Fax: 358-9-341-1292

France
Fairchild Semiconductor
Centre d' Affairs "Le Parc de Massy"
Z.I. De la Bonde
1 bis, Rue Marcel Paul - Bat.B
F-91742 Massy Cedex
France
Tel: 33-1-6930-3696
Fax: 33-1-6930-3693

Germany
Fairchild Semiconductor GmbH
Oskar-von-Miller-Strasse 4e
D-82256 Fürstenfeldbruck
Germany
Tel: 49-8141-61020
Fax: 49-8141-6102-100

Hong Kong
Fairchild Semiconductor
Hong Kong Ltd.
8/F, Room 808
68 Mody Road, Empire Centre
Tsimshatsui East, Kowloon
Hong Kong
Tel: 852-2722-8338
Fax: 852-2722-8383

Ireland
Fairchild Semiconductor Ltd.
Block 1
Clonskeagh Square
Clonskeagh Road
Dublin 14, Ireland
Tel: 353-1-2600022
Fax: 353-1-2830650

Italy
Fairchild Semiconductor Srl
Via Carducci, 125
20099 Sesto San Giovanni (MI)
Italy
Tel: 39-02-249111-1
Fax: 39-02-26263424

Japan
Fairchild Semiconductor Japan Ltd.
4F, Natsume Building
2-18-6, Yushima
Bunkyo-ku, Tokyo
113-0034 Japan
Tel: 81-3-3818-8840
Fax: 81-3-3818-8841

Osaka Office
Fairchild Semiconductor
Shin-Osaka-Meiko Building
8/F 4-3-12
Miyahara Yodogawa-ku
Osaka-shi 532-0003
Japan
Tel: 81-6-398-3670
Fax: 81-6-398-3680

Korea
Fairchild Korea Semiconductor Ltd.
82-3, Todang-Dong
Wonmi-Ku
Puchon-Si, Kyonggi-Do
Korea, 420-711
Tel: 82-32-680-1940-8
Fax: 82-32-680-1959

Fairchild Korea Semiconductor Ltd.
C/S Center 5F
416, Maetan-Dong, Paldal-Ku
Suwon-Si, Kyonggi-Do
Korea, 441-743
Tel: 82-331-200-8410
Fax: 82-331-200-8421

Fairchild Korea Semiconductor Ltd.
Shillim Building 5F
447-2, Songjung Dong
Kumi-Si
Kyongsangbuk-Do
Korea, 730-090
Tel: 82-546-457-2525
Fax: 82-546-457-2460

Mexico
Fairchild Semiconductor
Av. Vallarta # 6503 flr 14
Col. Cd Granjas
Zapopan Jalisco 45010
Mexico
Tel: 52-3-1101878
Fax: 52-3-1101878

Norway
Fairchild Semiconductor
Andrenbakken 21B
P.O. Box 132
N-1392 Vettre
Norway
Tel: 47-66787620
Fax: 47-66787619

Singapore
Fairchild Semiconductor
Asia Pacific Pte. Ltd.
350 Orchard Road
#20-01/03 Shaw House
Singapore 238868
Tel: 65-836-0936
Fax: 65-838-0321/3

Sweden
Fairchild Semiconductor AB
Alstromergatan 22
S-112 47 Stockholm
Sweden
Tel: 46-8-6515530
Fax: 46-8-6515505

Taiwan
Fairchild Semiconductor
Hong Kong Ltd.
Taiwan Branch
16/F, No.167
Tun Hwa North Road
Taipei, Taiwan
Tel: 886-2-2712-0500
Fax: 886-2-2716-9285

UK
Fairchild Semiconductor Ltd.
10 Interface Business Park
Wootton Bassett
Swindon SN4 8SY
United Kingdom
Tel: 44-1793-856856
Fax: 44-1793-856857

Visit our web site at www.fairchildsemi.com

FAIRCHILD
SEMICONDUCTOR™

Lit. No. 585380-002