August 2000

FAIRCHILD
SEMICONDUCTOR ™

FDR8521L

P-Channel MOSFET With Gate Driver For Load Switch Application

General Description

This device is designed for configuration as a load switch and is particularly suited for power management in portable battery powered electronic equipment. Designed to operate from 3V to 20V input and supply up to 2.9A, the device features a small N-Channel MOSFET (Q1) together with a large P-Channel Power MOSFET (Q2) in a single SO-8 package.

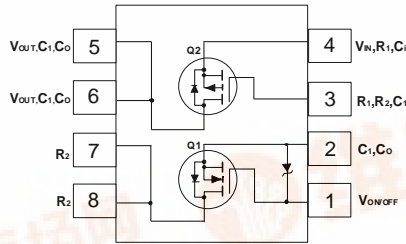### Applications

- Power management
- Load switch

Features

- V_{DROP} = 0.07 V @ V_{IN} = 12 V, I_L = 1 A. $R_{(ON)}$ = 0.07 Ω
  V_{DROP} = 0.115 V @ V_{IN} = 5 V, I_L = 1 A. $R_{(ON)}$ = 0.115 Ω.

- V_{DROP} = 0.2 V @ V_{IN} = 12 V, I_L = 2.9 A. $R_{(ON)}$ = 0.07 Ω
  V_{DROP} = 0.2 V @ V_{IN} = 5 V, I_L = 1.8 A. $R_{(ON)}$ = 0.115 Ω.

- Control MOSFET (Q1) includes Zener protection for ESD ruggedness (>6kV Human Body Model).

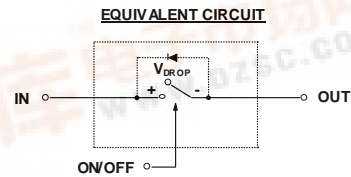- High density cell design for extremely low on-resistance.

SuperSOT™-8

pin 1
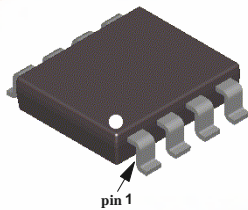
See Application Circuit

EQUIVALENT CIRCUIT

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{IN}	Input Voltage Range	(Note 1)	3 - 20	V
$V_{ON/OFF}$	On/Off Voltage Range		2.5 - 8	V
I_D	Load Current - Continuous	(Note 2)	2.9	A
	- Pulsed		8	
P_D	Maximum Power Dissipation	(Note 2)	0.8	W
T_J, T_{stg}	Operating and Storage Temperature Range		-55 to +150	°C
ESD	Electrostatic Discharge Rating MIL-STD-883D Human-Body-Model (100pf/1500 Ohm)		6	kV

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 2)	156	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 2)	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
8521L	FDR8521L	13''	12mm	3000 units

Electrical Characteristics T_A=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
OFF Characteristics						
I_{FL}	Forward Leakage Current	V_{IN} = 20 V, $V_{ON/OFF}$ = 250 μA			1	μA
ON Characteristics (Note 3)						
V_{DROP}	Conduction Voltage	V_{IN} = 12 V, $V_{ON/OFF}$ = 3.3 V, I_L = 1 A		0.053	0.070	V
		V_{IN} = 5 V, $V_{ON/OFF}$ = 3.3 V, I_L = 1 A		0.085	0.115	
		V_{IN} = 12 V, $V_{ON/OFF}$ = 3.3 V, I_L = 2.9 A			0.200	
		V_{IN} = 5 V, $V_{ON/OFF}$ = 3.3 V, I_L = 1.8 A			0.200	
$R_{(ON)}$	Q_2 - Static On-Resistance	V_{GS} = -12 V, I_D = 2.9 A		0.054	0.070	Ω
		V_{GS} = -5 V, I_D = 1.8 A		0.090	0.115	
I_L	Load Current	V_{DROP} = 0.2 V, V_{IN} = 12 V, $V_{ON/OFF}$ = 3.3 V	2.9			A
		V_{DROP} = 0.2 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 3.3 V	1.8			

Notes:

1. Range of V_{IN} can be up to 25V, but R_1 and R_2 must be scaled such that V_{GS} of Q2 does not exceed -20V.

2. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

3. Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.

FDR8521L Load Switch Application
APPLICATION CIRCUIT
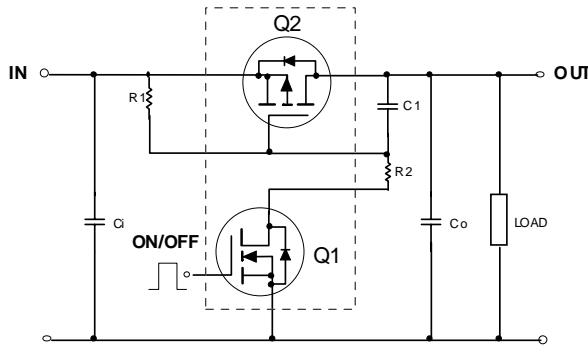
External Component Recommendation:

   For applications where Co $\leq$ 1μF.

   For slew rate control, select R2 in the range of 470 - 10kΩ .

   For additional in-rush current control,C1 $\leq$ 1000pF can be added.

   Select R1 so that the R1/R2 ratio ranges from 10 - 100. R1 is required to turn Q2 off.
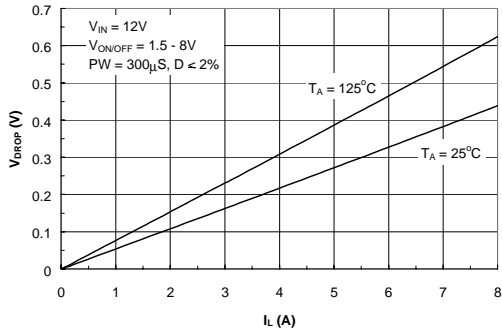
Typical Characteristics (continued)

**Figure 1. Conduction Voltage Drop
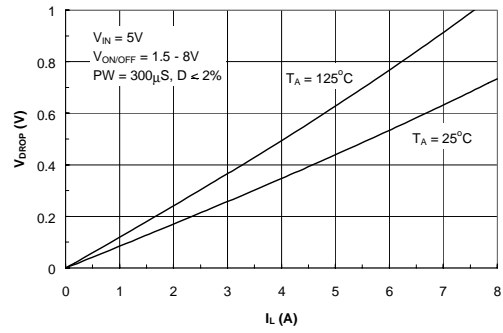Variation with Load Current.**

**Figure 2. Conduction Voltage Drop
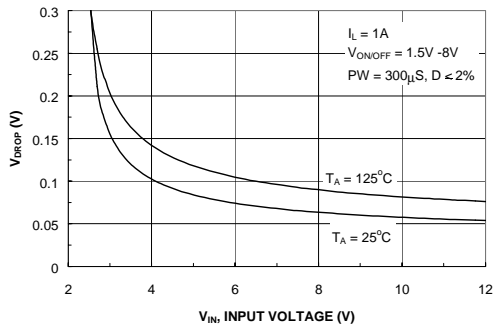Variation with Load Current.**

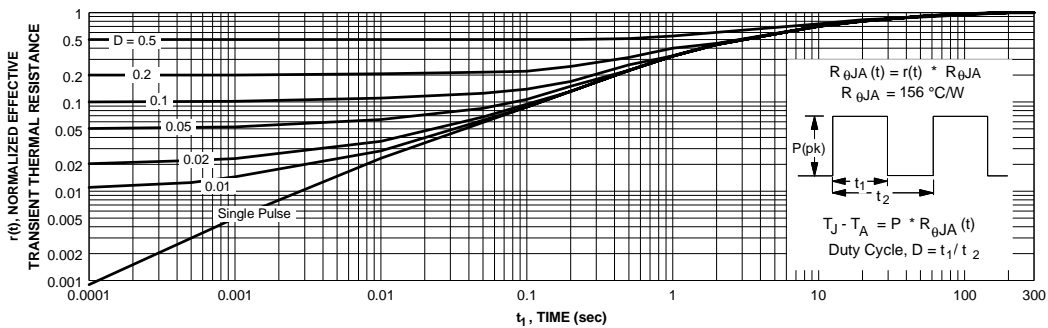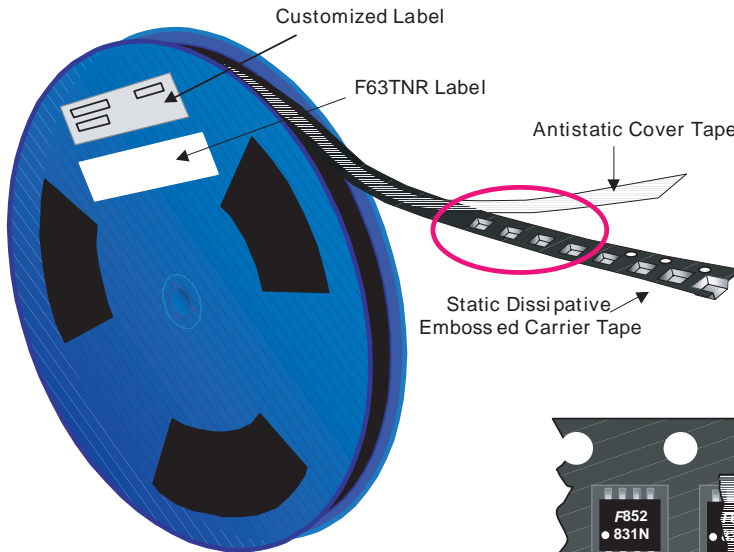**Figure 3. On-Resistance Variation
with Input Voltage.**

Figure 4.Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 2.
Transient thermal response will change depending on the circuit board design.

# SuperSOT™-8 Tape and Reel Data and Package Dimensions

FAIRCHILD
SEMICONDUCTOR ™

SSOT-8 Packaging
Configuration: Figure 1.0

Customized Label

F63TNR Label

Antistatic Cover Tape

Static Dissipative
Embossed Carrier Tape
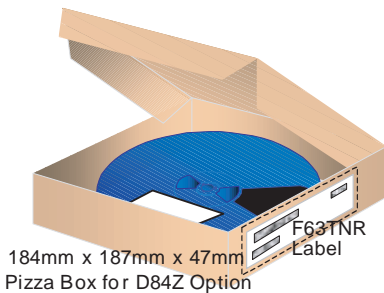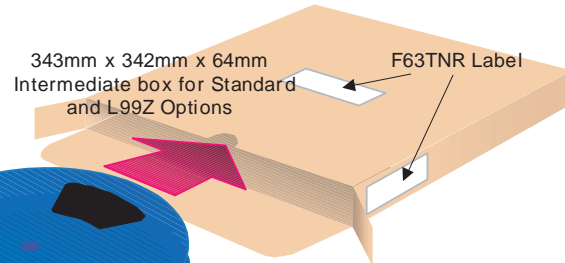
Packaging Description:

SSOT-8 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 13" or 330cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 500 units per 7" or 177cm diameter reel. This and some other options are further described in the Packaging Information table.

These full reels are individually barcode labeled and placed inside a standard intermediate box (illustrated in figure 1.0) made of recyclable corrugated brown paper. One box contains two reels maximum. And these boxes are placed inside a barcode labeled shipping box which comes in different sizes depending on the number of parts shipped.

F852
831N

Pin 1
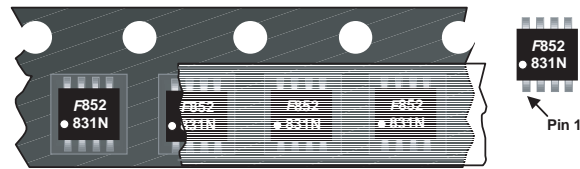
SSOT-8 Unit Orientation

SSOT-8 Packaging Information		
Packaging Option	Standard (no flow code)	D84Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	500
Reel Size	13" Dia	7" Dia
Box Dimension (mm)	343x64x343	184x187x47
Max qty per Box	6,000	1,000
Weight per unit (gm)	0.0416	0.0416
Weight per Reel (kg)	0.5615	0.0980
Note/Comments		

343mm x 342mm x 64mm
Intermediate box for Standard
and L99Z Options

F63TNR Label

F63TNR
Label

184mm x 187mm x 47mm
Pizza Box for D84Z Option

F63TNR
Label

F63TNR Label sample

LOT: CBVK741B019		QTY: 3000
FSID: FDR835N		SPEC:
D/C1: D9842	QTY1:	SPEC REV:
D/C2:	QTY2:	CPN:
		N/F: F (F63TNR)3

SSOT-8 Tape Leader and Trailer
Configuration: Figure 2.0

Carrier Tape

Cover Tape

Trailer Tape
300mm minimum or
38 empty pockets

Components

Leader Tape
500mm minimum or
62 empty pockets
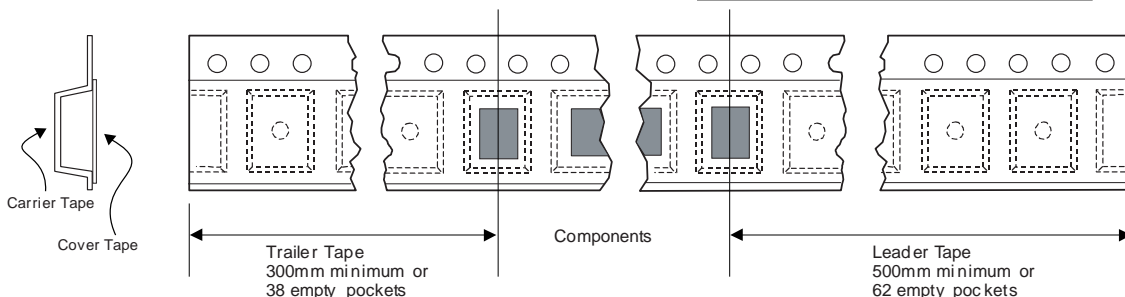
SuperSOT™-8 Tape and Reel Data and Package Dimensions, continued

SSOT-8 Embossed Carrier Tape
Configuration: Figure 3.0

User Direction of Feed
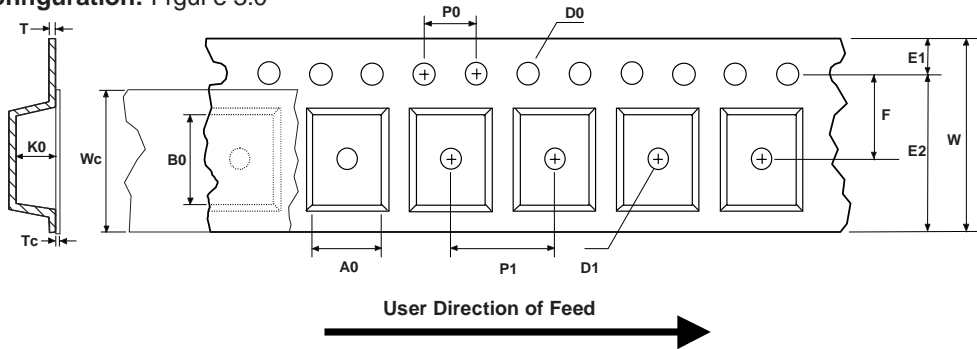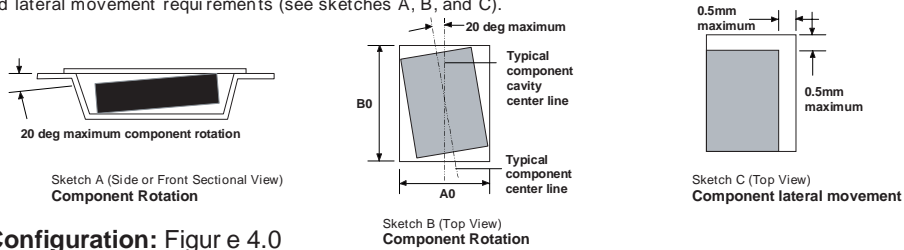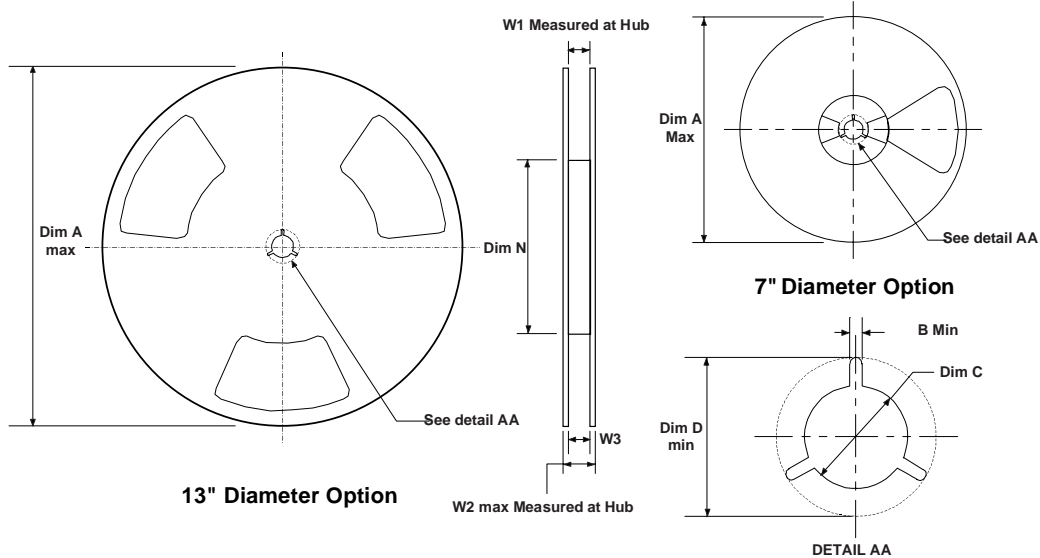
Dimensions are in millimeter													
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
SSOT-8 (12mm)	4.47 +/-0.10	5.00 +/-0.10	12.0 +/-0.3	1.55 +/-0.05	1.50 +/-0.10	1.75 +/-0.10	10.25 min	5.50 +/-0.05	8.0 +/-0.1	4.0 +/-0.1	1.37 +/-0.10	0.280 +/-0.150	9.5 +/-0.025	0.06 +/-0.02

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).


20 deg maximum component rotation

Sketch A (Side or Front Sectional View)
Component Rotation

20 deg maximum

Typical component cavity center line

Typical component center line

Sketch B (Top View)
Component Rotation

0.5mm maximum

0.5mm maximum

Sketch C (Top View)
Component lateral movement

SSOT-8 Reel Configuration: Figure 4.0

13" Diameter Option

W1 Measured at Hub

Dim A Max

See detail AA

7" Diameter Option

B Min

Dim C

Dim D min

DETAIL AA

Dim A max

Dim N

See detail AA

W2 max Measured at Hub

W3

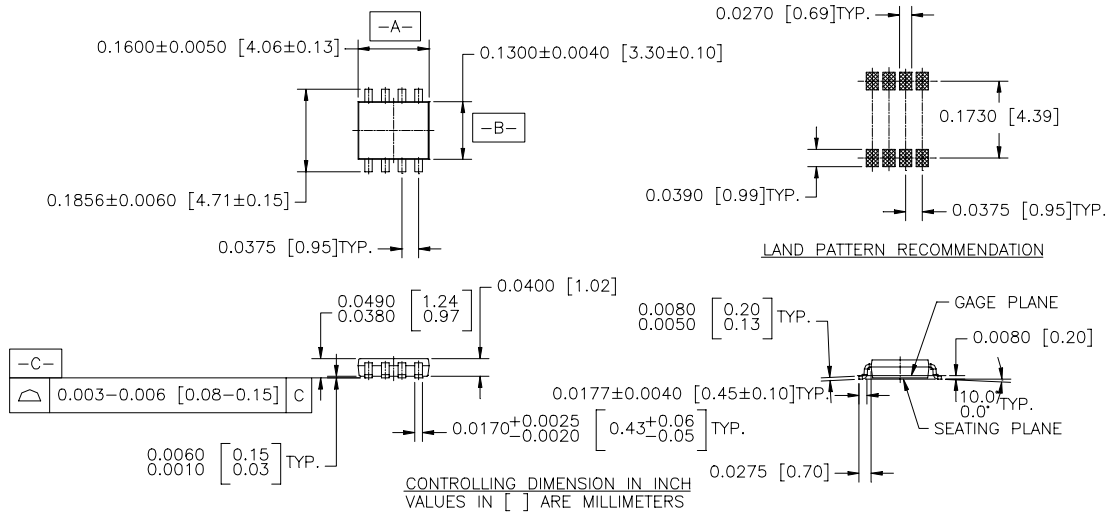| Dimensions are in inches and millimeters									
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
12mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	5.906 150	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 – 0.606 11.9 – 15.4
12mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	7.00 178	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 – 0.606 11.9 – 15.4

SuperSOT™-8 (FS PKG Code 34, 35)

1 : 1
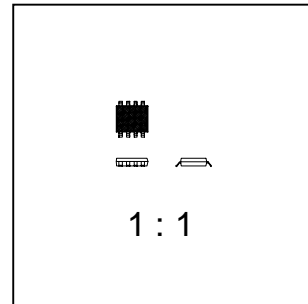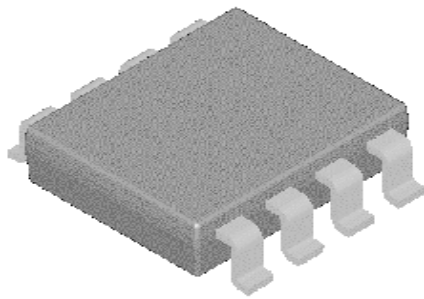
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0416

0.1600±0.0050 [4.06±0.13]

−A−

−B−

0.1300±0.0040 [3.30±0.10]

0.1856±0.0060 [4.71±0.15]

0.0375 [0.95]TYP.

0.0270 [0.69]TYP.

0.1730 [4.39]

0.0390 [0.99]TYP.

0.0375 [0.95]TYP.

LAND PATTERN RECOMMENDATION

0.0490 [1.24]
0.0380 [0.97]

0.0400 [1.02]

−C−

△ | 0.003−0.006 [0.08−0.15] | C

0.0170 +0.0025 −0.0020 [0.43 +0.06 −0.05] TYP.

0.0060 [0.15]
0.0010 [0.03] TYP.

0.0080 [0.20]
0.0050 [0.13] TYP.

0.0177±0.0040 [0.45±0.10]TYP.

GAGE PLANE

0.0080 [0.20]

10.0° TYP.
0.0°

SEATING PLANE

0.0275 [0.70]

CONTROLLING DIMENSION IN INCH
VALUES IN [ ] ARE MILLIMETERS

SUPER SOT, 8 LEADS

NOTES : UNLESS OTHERWISE SPECIFIED

1. STANDARD LEAD FINISH TI BE 200 MICROINCHES / 5.08 MICROMETERS
   MINIMUM TIN/LEAD (SOLDER) ON COPPER.

2. NO JEDEC REGISTRATION AS JAN. 1996

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FASTr™	QFET™	VCX™
Bottomless™	GlobalOptoisolator™	QS™	
CoolFET™	GTO™	QT Optoelectronics™	
CROSSVOLT™	HiSeC™	Quiet Series™	
DOME™	ISOPLANAR™	SuperSOT™-3	
E²CMOS™	MICROWIRE™	SuperSOT™-6	
EnSigna™	OPTOLOGIC™	SuperSOT™-8	
FACT™	OPTOPLANAR™	SyncFET™	
FACT Quiet Series™	POP™	TinyLogic™	
FAST®	PowerTrench®	UHC™	

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.

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, or (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 significant injury to the user.

2. A critical component is 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, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.