FAIRCHILD

SEMICONDUCTOR ™

December 2000
PRELIMINARY

FDS7760A

N-Channel Logic Level PowerTrench® MOSFET

General Description

This N-Channel Logic Level MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Applications

- DC/DC converter
- Load switch
- Motor drives

Features

- 15 A, 30 V. $R_{DS(ON)}$ = 5.5 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 8 mΩ @ V_{GS} = 4.5 V.

- Low gate charge (37nC typical)

- Fast switching speed.

- High performance trench technology for extremely low $R_{DS(ON)}$.

- High power and current handling capability.

SO-8
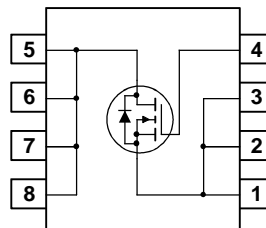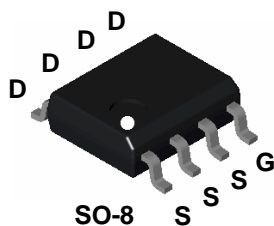
Absolute Maximum Ratings $T_A=25^oC$ unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current – Continuous	(Note 1a)	15	A
	– Pulsed		60	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.2	
		(Note 1c)	1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1c)	50 (10 sec)	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	30	°C/W

Package Outlines and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDS7760A	FDS7760A	13''	12mm	2500 units

DMOS Electrical Characteristics

$T_A = 25°C$ unless otherwise noted

| Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 2)						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 15$ V, $I_D = 15$ A			360	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				15	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ µA	30			V
$\dfrac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C		24		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24$ V, $V_{GS} = 0$ V			1	µA
I_{GSSF}	Gate–Body Leakage, Forward	$V_{GS} = 20$ V, $V_{DS} = 0$ V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = –20$ V $V_{DS} = 0$ V			–100	nA
On Characteristics **(Note 2)**						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250$ µA	1	1.6	3	V
$\dfrac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C		-5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10$ V, $I_D = 15$ A $V_{GS} = 10$ V, $I_D = 15$ A, $T_J = 125°C$ $V_{GS} = 4.5$ V, $I_D = 13$ A		4.5 7 6	5.5 10 8	mΩ
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10$ V, $V_{DS} = 5$ V	50			A
g_{FS}	Forward Transconductance	$V_{DS} = 10$ V, $I_D = 15$ A		65		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 15$ V, $V_{GS} = 0$ V, f = 1.0 MHz		3514		pF
C_{oss}	Output Capacitance			1123		pF
C_{rss}	Reverse Transfer Capacitance			307		pF
Switching Characteristics **(Note 2)**						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 15$ V, $I_D = 1$ A, $V_{GS} = 10$ V, $R_{GEN} = 6$ Ω		13	20	ns
t_r	Turn–On Rise Time			12	19	ns
$t_{d(off)}$	Turn–Off Delay Time			78	125	ns
t_f	Turn–Off Fall Time			32	51	ns
Q_g	Total Gate Charge	$V_{DS} = 15$ V, $I_D = 15$ A, $V_{GS} = 5$ V		37	55	nC
Q_{gs}	Gate–Source Charge			10		nC
Q_{gd}	Gate–Drain Charge			12		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.1	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0$ V, $I_S = 2.1$ A (Note 2)		0.7	1.2	V

Notes:

1. $R_{\theta JA}$ 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 $R_{\theta CA}$ is determined by the user's board design.
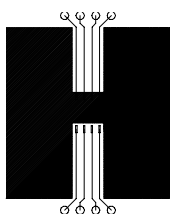
a) 50°/W when mounted on a 1in^2 pad of 2 oz copper
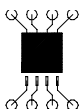
b) 105°/W when mounted on a .04 in^2 pad of 2 oz copper
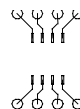
c) 125°/W when mounted on a minimum pad.

2. Test: Pulse Width < 300µs, Duty Cycle < 2.0%
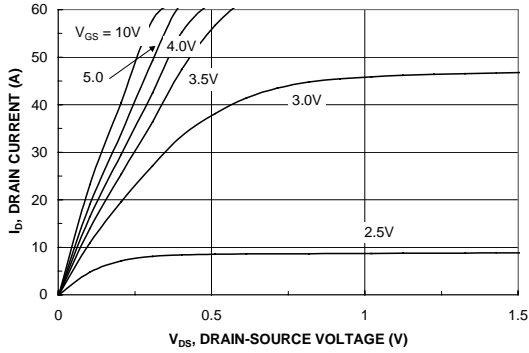
Typical Characteristics
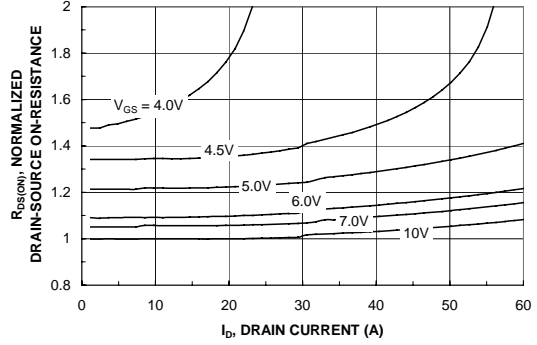
Figure 1. On-Region Characteristics.

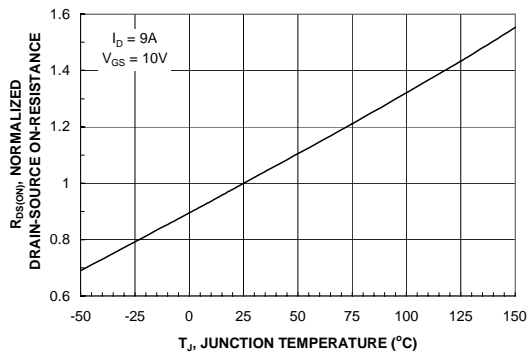Figure 2. On-Resistance Variation with
Drain Current and Gate Voltage.

Figure 3. On-Resistance Variation with
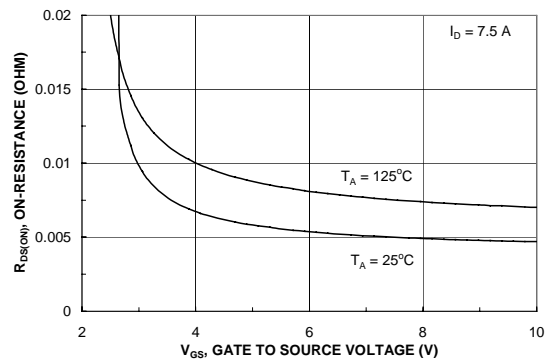Temperature.

Figure 4. On-Resistance Variation with
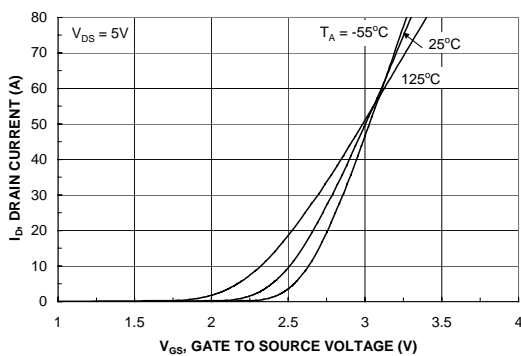Gate-to-Source Voltage.
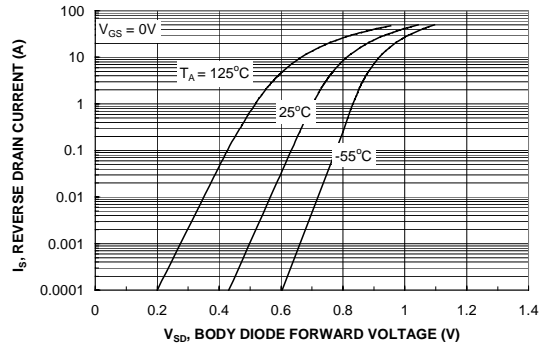
Figure 5. Transfer Characteristics.

Figure 6. Body Diode Forward Voltage Variation
with Source Current and Temperature.

Typical Characteristics
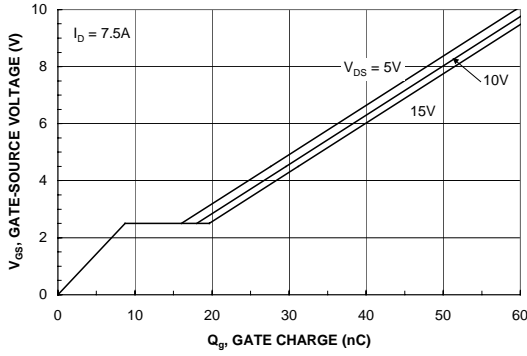
Figure 7. Gate Charge Characteristics.
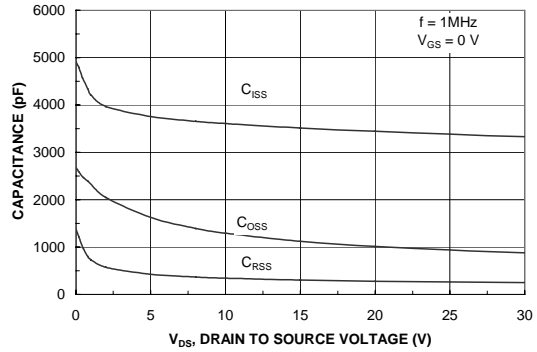
Figure 8. Capacitance Characteristics.
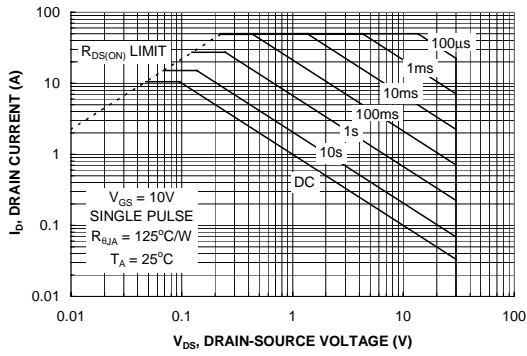
Figure 9. Maximum Safe Operating Area.
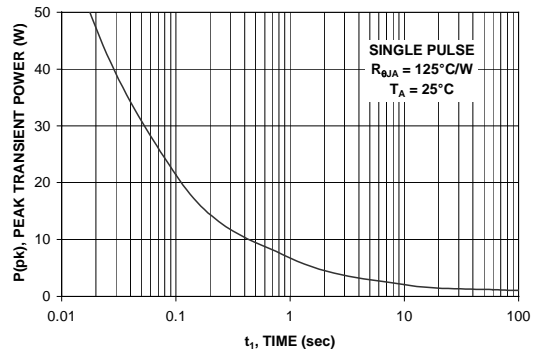
Figure 10. Single Pulse Maximum Power Dissipation.

$$R_{\theta JA}(t) = r(t) + R_{\theta JA}$$
$$R_{\theta JA} = 125 \text{ °C/W}$$

$$T_J - T_A = P * R_{\theta JA}(t)$$
Duty Cycle, $D = t_1 / t_2$

Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1c.
Transient thermal response will change depending on the circuit board design.

SOIC-8 Tape and Reel Data

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SOIC(8lds) Packaging
Configuration: Figure 1.0

FAIRCHILD
SEMICONDUCTOR.

ELECTROSTATIC
SENSITIVE DEVICES

ESD Label

Antistatic Cover Tape

Static Dissipative
Embossed Carrier Tape

F63TNR
Label

Customized
Label

Packaging Description:

SOIC-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, seala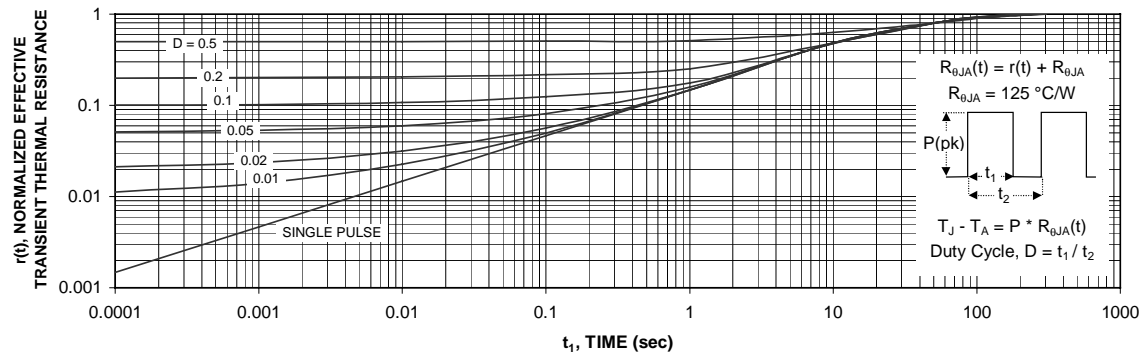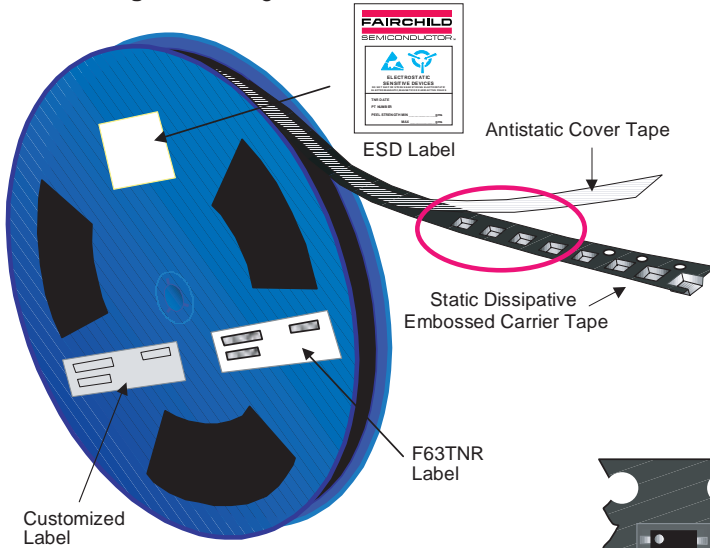nt, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 330cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 500 units per 7" or 177cm diameter reel. This and some 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
NDS
9959

Pin 1
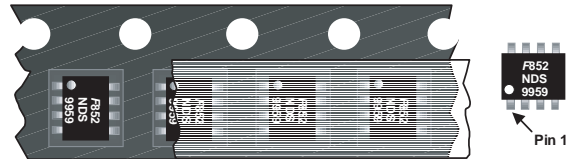
SOIC-8 Unit Orientation

SOIC (8lds) Packaging Information				
Packaging Option	Standard (no flow code)	L86Z	F011	D84Z
Packaging type	TNR	Rail/Tube	TNR	TNR
Qty per Reel/Tube/Bag	2,500	95	4,000	500
Reel Size	13" Dia	-	13" Dia	7" Dia
Box Dimension (mm)	343x64x343	530x130x83	343x64x343	184x187x47
Max qty per Box	5,000	30,000	8,000	1,000
Weight per unit (gm)	0.0774	0.0774	0.0774	0.0774
Weight per Reel (kg)	0.6060	-	0.9696	0.1182
Note/Comments				

343mm x 342mm x 64mm
Standard Intermediate box

ESD Label

F63TNl label

F63TN Label

ESD Label

F63TNR Label sample

LOT: CBVK741B019   QTY: 2500

FSID: FDS9953A   SPEC:

D/C1: D9842   QTY1:   SPEC REV:
D/C2:   QTY2:   CPN:
                         N/F: F   (F63TNR)3
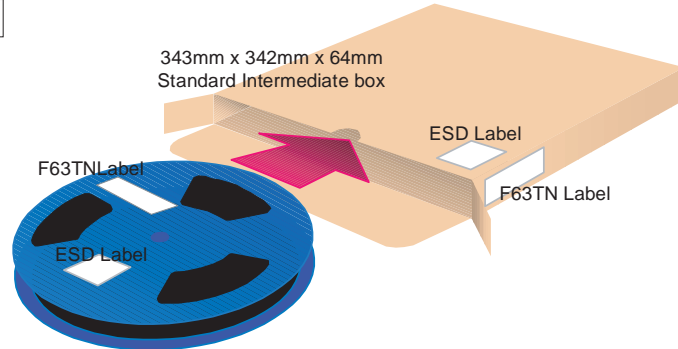
SOIC(8lds) Tape Leader and Trailer
Configuration: Figure 2.0

Carrier Tape

Cover Tape

Trailer Tape
640mm minimum or
80 empty pockets

Components

Leader Tape
1680mm minimum or
210 empty pockets
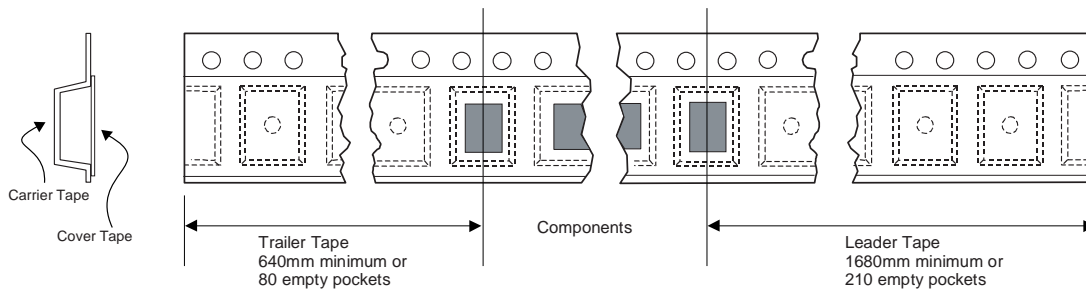
SOIC-8 Tape and Reel Data, continued

SOIC(8lds) Embossed Carrier Tape
Configuration: Figure 3.0

User Direction of Feed

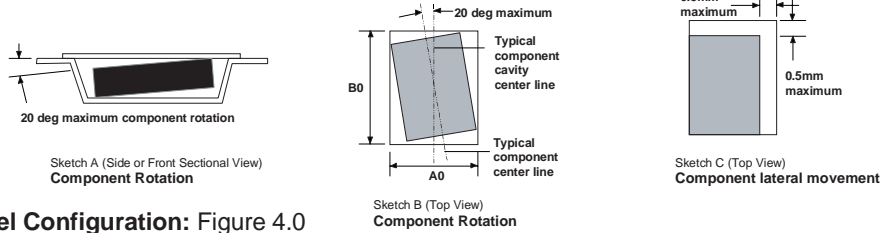|							**Dimensions are in millimeter**							
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
SOIC(8lds) (12mm)	6.50 +/-0.10	5.30 +/-0.10	12.0 +/-0.3	1.55 +/-0.05	1.60 +/-0.10	1.75 +/-0.10	10.25 min	5.50 +/-0.05	8.0 +/-0.1	4.0 +/-0.1	2.1 +/-0.10	0.450 +/- 0.150	9.2 +/-0.3	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).

Sketch A (Side or Front Sectional View)
Component Rotation

Sketch B (Top View)
Component Rotation

Sketch C (Top View)
Component lateral movement

SOIC(8lds) Reel Configuration: Figure 4.0

13" Diameter Option

7" Diameter Option

DETAIL AA
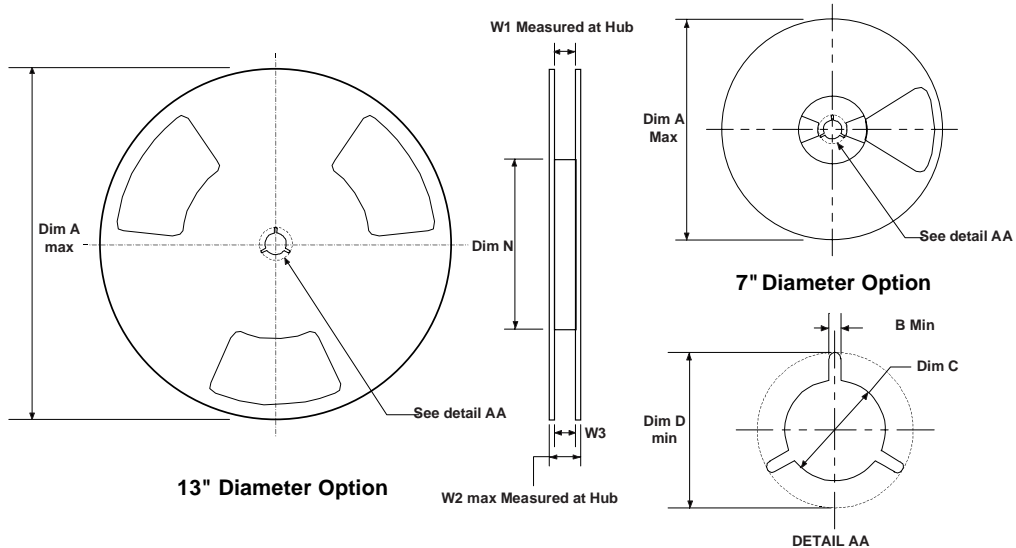
				Dimensions are in inches and millimeters				
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
12mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 – 0.606 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

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SEMICONDUCTOR TM

SOIC-8 (FS PKG Code S1)

1 : 1
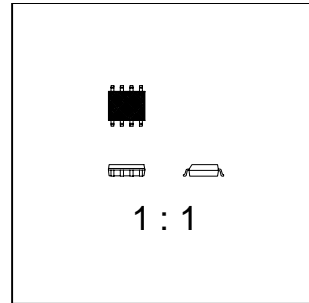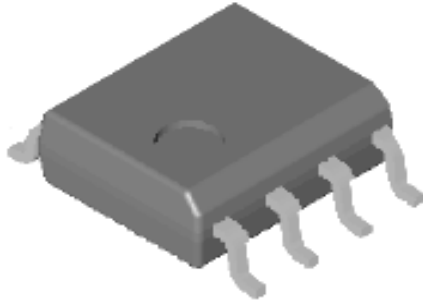
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0774

–B– ⟨2⟩

LEAD NO. 1
IDENTIFICATION

0.1968 [5.00]
0.1890 [4.80]

0.1574 [4.00]
0.1497 [3.80]

8 7 6 5

–C– ⟨2⟩

0.2440 [6.20]
0.2284 [5.80]

1 2 3 4
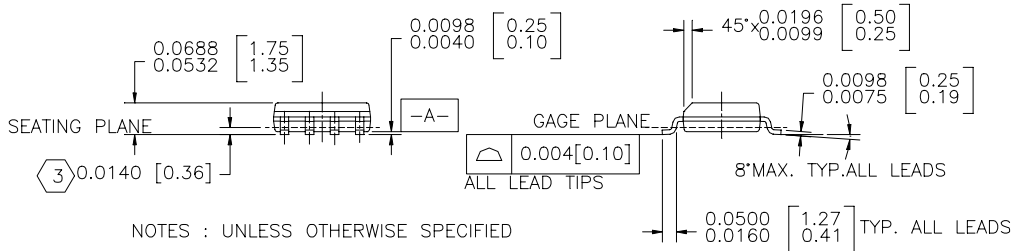
0.0500 [1.27]

0.0200 [0.51]
0.0138 [0.35] TYP.

⟨3⟩ ⌖ 0.010[0.25]Ⓜ [0.25] A CⓈ B

0.0200 [0.51]

0.2260 [5.74]

0.0390 [0.99]

0.0500 [1.27]

LAND PATTERN RECOMMENDATION

0.0688 [1.75]
0.0532 [1.35]

0.0098 [0.25]
0.0040 [0.10]

SEATING PLANE

–A–

⟨3⟩ 0.0140 [0.36]

45° X 0.0196 [0.50]
0.0099 [0.25]

0.0098 [0.25]
0.0075 [0.19]

GAGE PLANE

⌒ 0.004[0.10]
ALL LEAD TIPS

8°MAX. TYP.ALL LEADS

0.0500 [1.27]
0.0160 [0.41] TYP. ALL LEADS

NOTES : UNLESS OTHERWISE SPECIFIED

1. STANDARD LEAD FINISH:
   200 MICROINCHES / 5.08 MICRONS MINIMUM
   LEAD / TIN (SOLDER) ON COPPER.

⟨2.⟩ THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH

⟨3.⟩ MAXIMUM LEAD 0.024 [0.609]

SO 0.150 WIDE 8 LEADS

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CoolFET™	GTO™	QS™	UHC™
CROSSVOLT™	HiSeC™	QT Optoelectronics™	VCX™
DOME™	ISOPLANAR™	Quiet Series™	
E²CMOS™	MICROWIRE™	SILENT SWITCHER ®	
EnSigna™	OPTOLOGIC™	SMART START™	
FACT™	OPTOPLANAR™	SuperSOT™-3	
FACT Quiet Series™	PACMAN™	SuperSOT™-6	
FAST ®	POP™	SuperSOT™-8	

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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.
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Rev. G