FAIRCHILD SEMICONDUCTOR TM

January 2000
PRELIMINARY

FDS3680

100V N-Channel PowerTrench® MOSFET

General Description

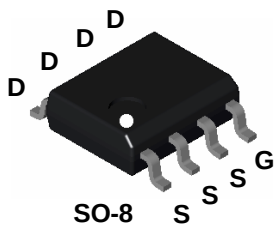
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

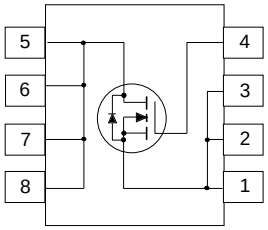
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

Features

- 5.2 A, 100 V. $R_{DS(ON)}$ = 0.043 Ω @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 0.048 Ω @ V_{GS} = 6 V.
- Low gate charge.
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$.
- High power and current handling capability.





Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		100	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current – Continuous	(Note 1a)	5.2	A
	– Pulsed		50	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.2	
		(Note 1c)	1.0	
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
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	25	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS3680	FDS3680	13''	12mm	2500 units

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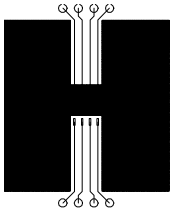
Electrical Characteristics

T_A = 25°C unless otherwise noted

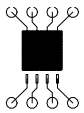
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA,Referenced to 25°C		101		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V			25	µA
I_{GSSF}	Gate–Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage Current, 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	2	2.4	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA,Referenced to 25°C		–6.5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 5.2 A V_{GS} = 10 V, I_D = 5.2 A T_J=125°C V_{GS} = 6 V, I_D = 4.5 A		0.032 0.061 0.034	0.043 0.086 0.048	Ω
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	25			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 5.2 A		25		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz		1735		pF
C_{oss}	Output Capacitance			176		pF
C_{rss}	Reverse Transfer Capacitance			53		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 50 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 10 Ω		14	25	ns
t_r	Turn–On Rise Time			8.5	17	ns
$t_{d(off)}$	Turn–Off Delay Time			63	94	ns
t_f	Turn–Off Fall Time			21	34	ns
Q_g	Total Gate Charge	V_{DS} = 50 V, I_D = 6 A, V_{GS} = 10 V		38	53	nC
Q_{gs}	Gate–Source Charge			8.1		nC
Q_{gd}	Gate–Drain Charge			9.2		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)		0.73	1.2	V

Notes:

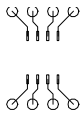
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 50°C/W when mounted on a 1in^2 pad of 2 oz copper



b) 105°C/W when mounted on a 0.04 in^2 pad of 2 oz copper



c) 125°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

Typical Characteristics

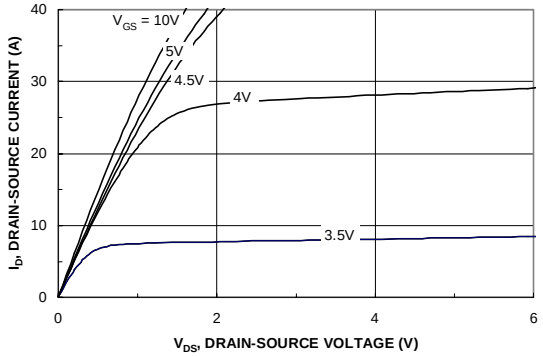


Figure 1. On-Region Characteristics.

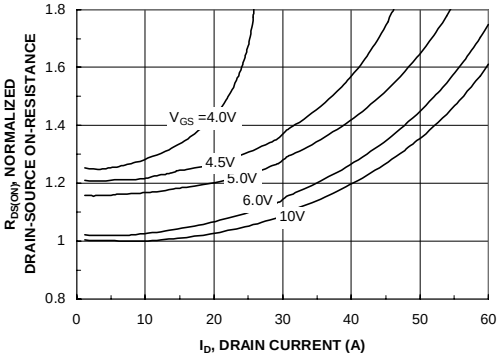


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

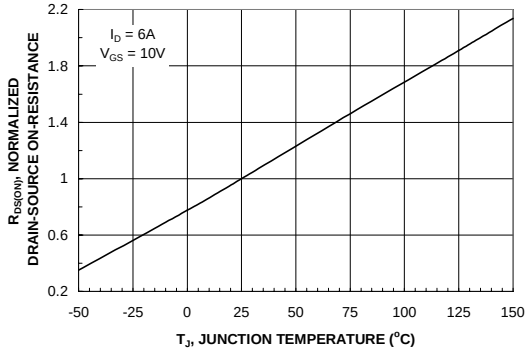


Figure 3. On-Resistance Variation withTemperature.

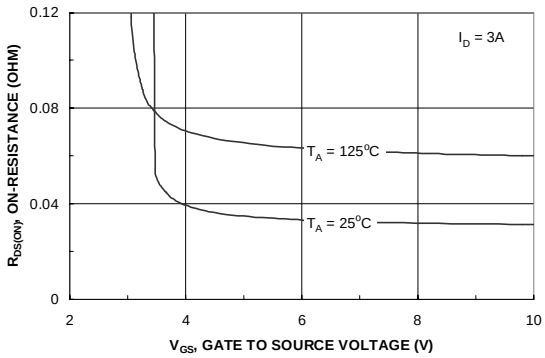


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

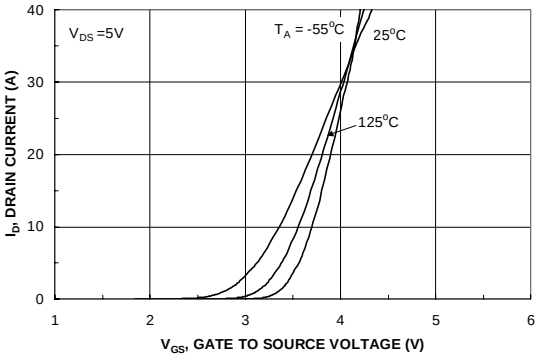


Figure 5. Transfer Characteristics.

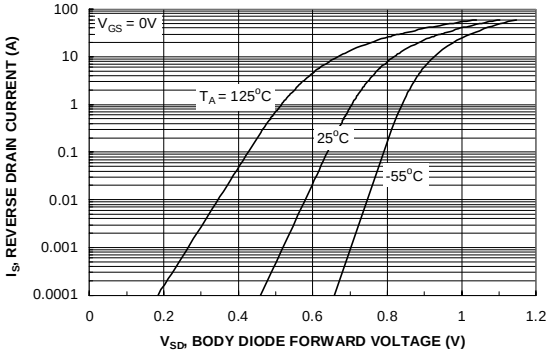


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

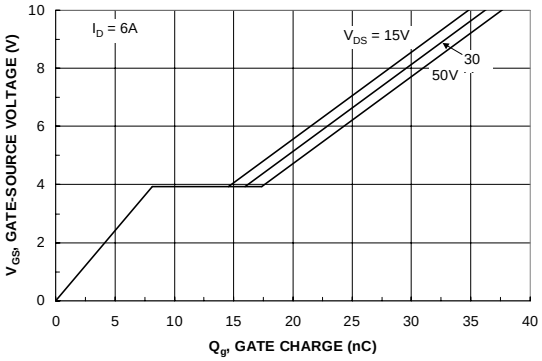


Figure 7. Gate Charge Characteristics.

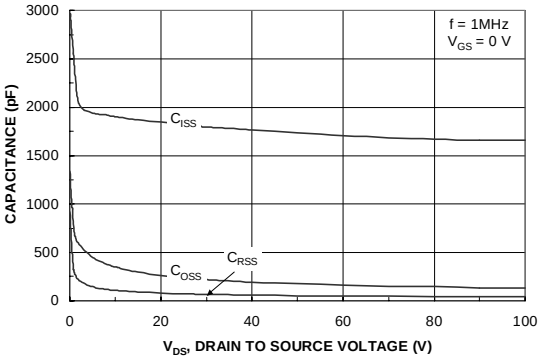


Figure 8. Capacitance Characteristics.

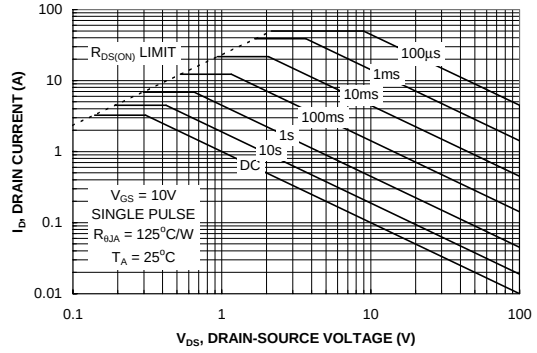


Figure 9. Maximum Safe Operating Area.

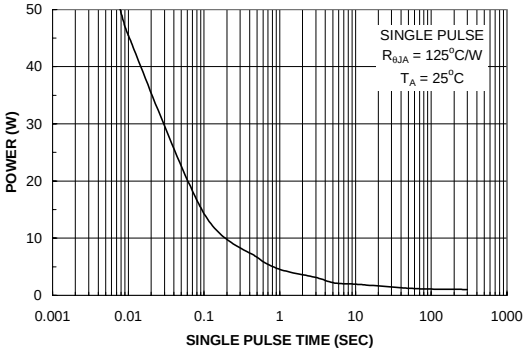


Figure 10. Single Pulse Maximum Power Dissipation.

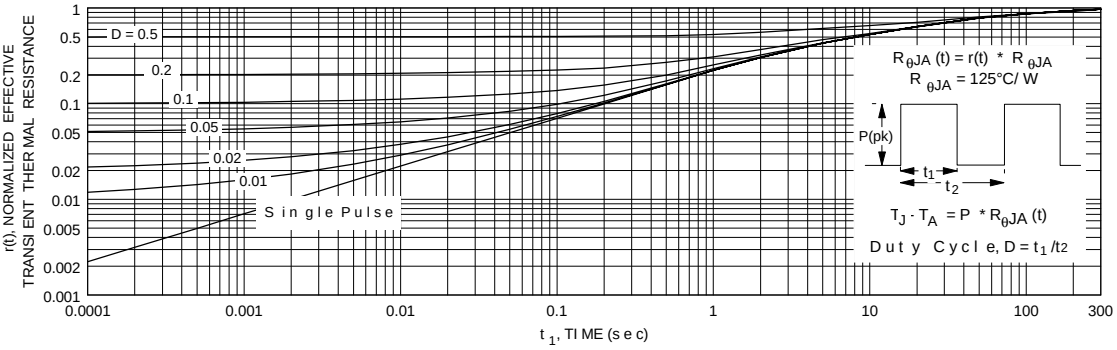


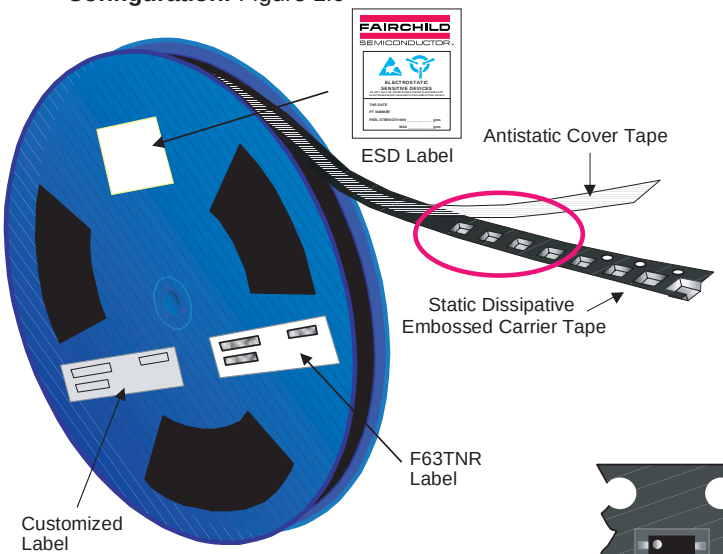
Figure 11. Transient Thermal Response Curve.

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

SO-8 Tape and Reel Data and Package Dimensions

FAIRCHILD SEMICONDUCTOR™

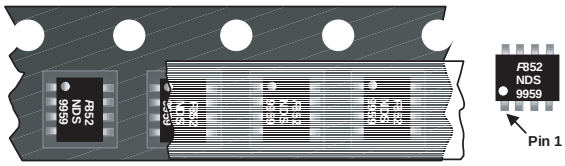
SOIC(8lds) Packaging Configuration: Figure 1.0



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, sealant, 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.

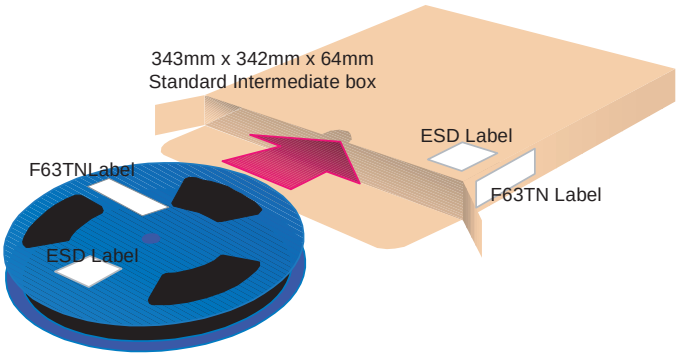


SOIC-8 Unit Orientation

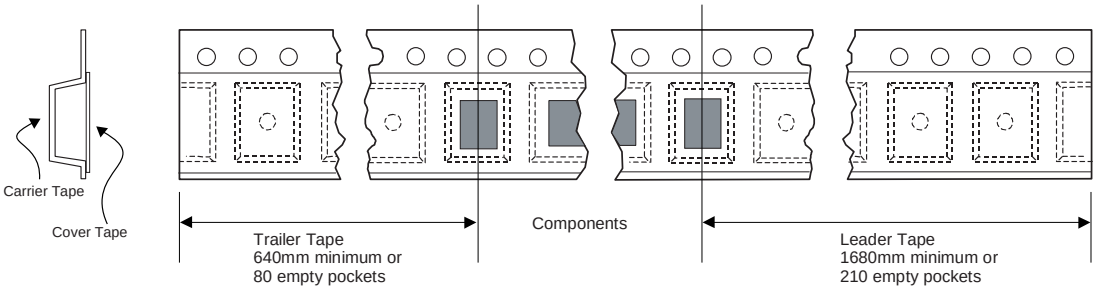
SOIC (8lds) Packaging Information				
Packaging Option	Standard (no flow code)	L86Z	F011	D84Z
Packaging type	TNR	Rail/Tube	TNR	TNR
Qty per Reel/Tube/Bag	2,500	95	4,000	500
Reel Size	13" Dia	-	13" Dia	7" Dia
Box Dimension (mm)	343x64x343	530x130x83	343x64x343	184x187x47
Max qty per Box	5,000	30,000	8,000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

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

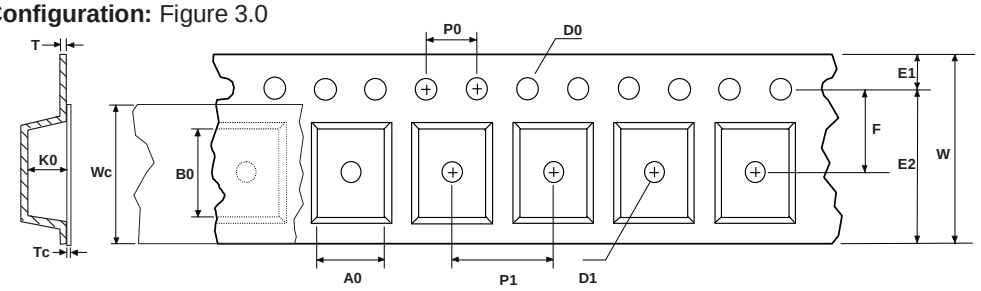


SOIC(8lds) Tape Leader and Trailer Configuration: Figure 2.0



SO-8 Tape and Reel Data and Package Dimensions, continued

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



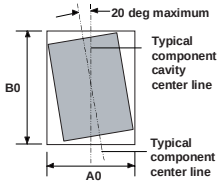
User Direction of Feed

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

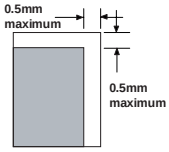
Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).



Sketch A (Side or Front Sectional View)
Component Rotation

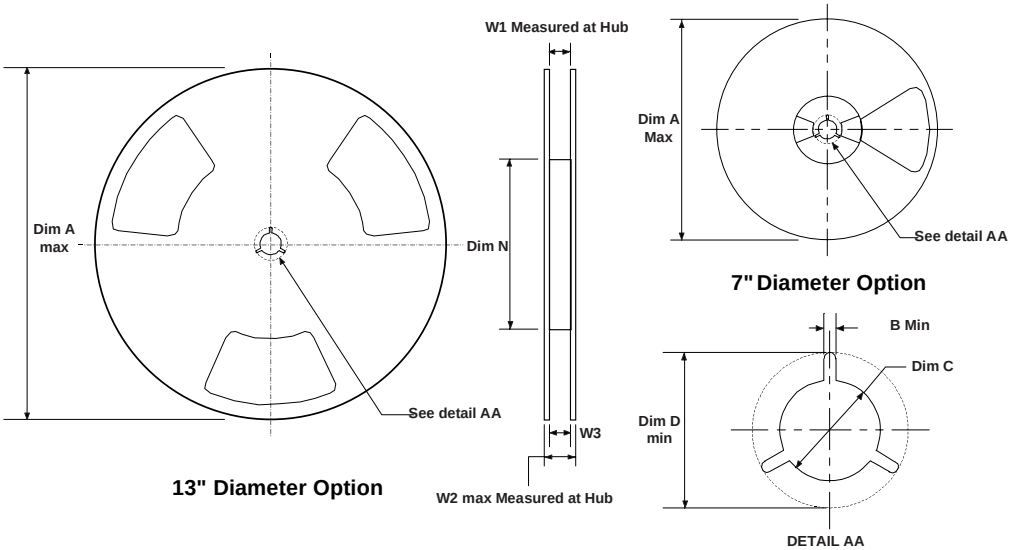


Sketch B (Top View)
Component Rotation



Sketch C (Top View)
Component lateral movement

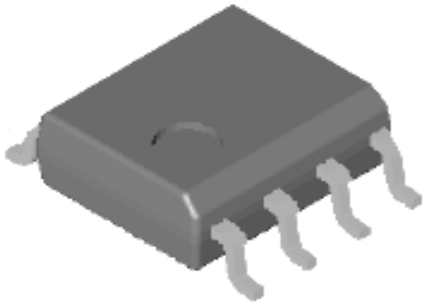
SOIC(8lds) Reel Configuration: Figure 4.0

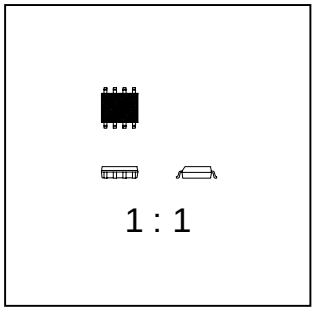


Dimensions are in inches and millimeters									
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
12mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 –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

SO-8 Tape and Reel Data and Package Dimensions, continued

SOIC-8 (FS PKG Code S1)

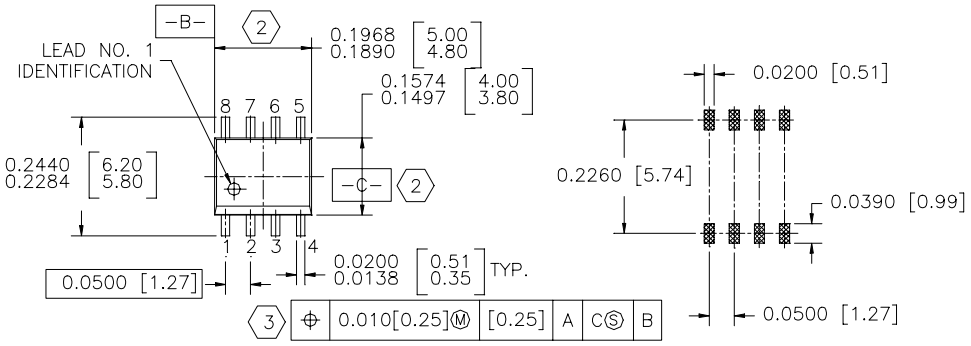


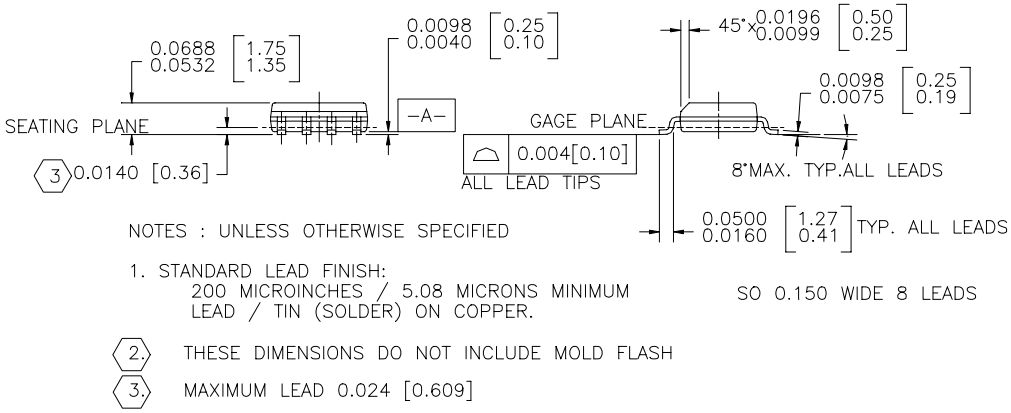


Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0774





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]

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SuperSOT™-6
SuperSOT™-8
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UHC™
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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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