

FDS9953A

Dual 30V P-Channel PowerTrench[®] MOSFET

General Description

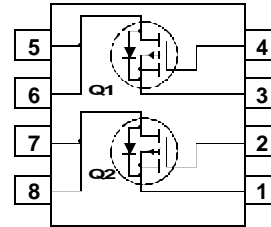
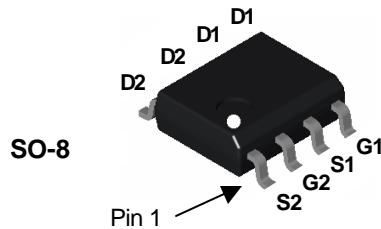
This PChannel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications requiring a wide range of gate drive voltage ratings (4.5V – 25V).

Applications

- Power management
- Load switch
- Battery protection

Features

- –2.9 A, –30 V $R_{DS(ON)} = 130\text{ m}\Omega$ @ $V_{GS} = -10\text{ V}$
 $R_{DS(ON)} = 200\text{ m}\Omega$ @ $V_{GS} = -4.5\text{ V}$
- Low gate charge (2.5nC typical)
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability



Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	–30	V
V_{GSS}	Gate-Source Voltage	± 25	V
I_D	Drain Current – Continuous (Note 1a)	± 2.9	A
	– Pulsed	± 10	
P_D	Power Dissipation for Dual Operation	2	W
	Power Dissipation for Single Operation (Note 1a)	1.6	
	(Note 1b)	1	
	(Note 1c)	0.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	–55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	40	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS9953A	FDS9953A	13"	12mm	2500 units

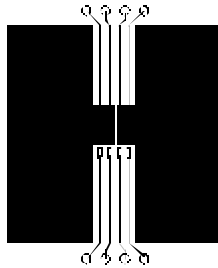
Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain–Source Breakdown Voltage	V _{GS} = 0 V, I _b = –250 μA	–30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _b = –250 μA, Referenced to 25°C		–23		mV/°C
I _{BSS}	Zero Gate Voltage Drain Current	V _{DS} = –24 V, V _{GS} = 0 V			–2	μA
I _{GSSF}	Gate–Body Leakage, Forward	V _{GS} = –25 V, V _{DS} = 0 V			–100	nA
I _{GSSR}	Gate–Body Leakage, Reverse	V _{GS} = 25 V, V _{DS} = 0 V			100	nA
On Characteristics (Note 2)						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _b = –250 μA	–1	–1.8	–3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I _b = –250 μA, Referenced to 25°C		4		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	V _{GS} = –10 V, I _b = –1 A V _{GS} = –10 V, I _b = –1 A, T _J =125°C V _{GS} = –4.5 V, I _b = –0.5 A V _{GS} = –4.5 V, I _b = –0.5 A, T _J =125°C		95 137 142 202	130 200 200 310	mΩ
I _{D(on)}	On–State Drain Current	V _{GS} = –10 V, V _{DS} = –5 V V _{GS} = –4.5 V, V _{DS} = –5 V	–5 –1.5			A
g _{FS}	Forward Transconductance	V _{DS} = –15 V, I _b = –1 A		4		S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = –15 V, V _{GS} = 0 V, f = 1.0 MHz		185		pF
C _{oss}	Output Capacitance			56		pF
C _{rss}	Reverse Transfer Capacitance			26		pF
Switching Characteristics (Note 2)						
t _{d(on)}	Turn–On Delay Time	V _{DD} = –15 V, I _b = –1 A, V _{GS} = –10 V, R _{GEN} = 6 Ω		4.5	9	ns
t _r	Turn–On Rise Time			13	23	ns
t _{d(off)}	Turn–Off Delay Time			11	20	ns
t _f	Turn–Off Fall Time			2	4	ns
Q _g	Total Gate Charge	V _{DS} = –5 V, I _b = –1 A, V _{GS} = –10 V		2.5	3.5	nC
Q _{gs}	Gate–Source Charge			0.8		nC
Q _{gd}	Gate–Drain Charge			0.9		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain–Source Diode Forward Current				–1.2	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = –1.3 A (Note 2)		–0.8	1.3	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _F = –1.25A, dI _F /dt = 100A/μs		17	100	nS

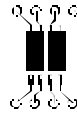
Typical Characteristics

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) 78°C/W when mounted on a 0.5in² pad of 2 oz copper



- b) 125°C/W when mounted on a 0.02 in² pad of 2 oz copper



- c) 135°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

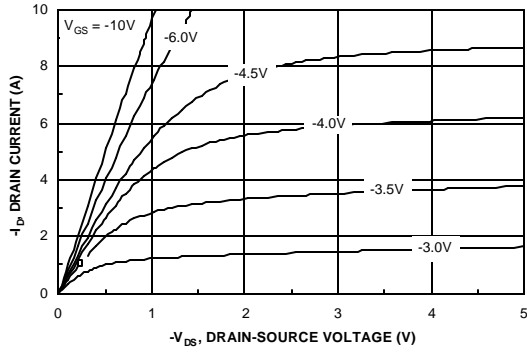


Figure 1. On-Region Characteristics.

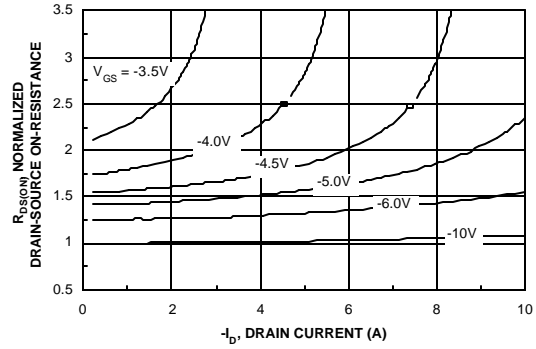


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

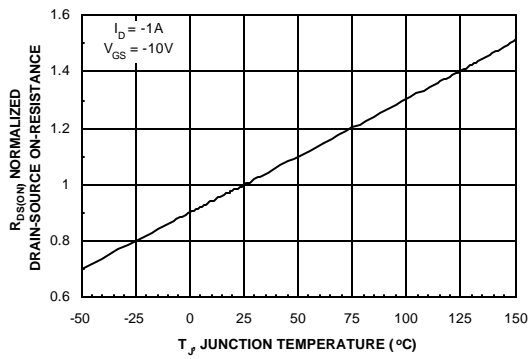


Figure 3. On-Resistance Variation with Temperature.

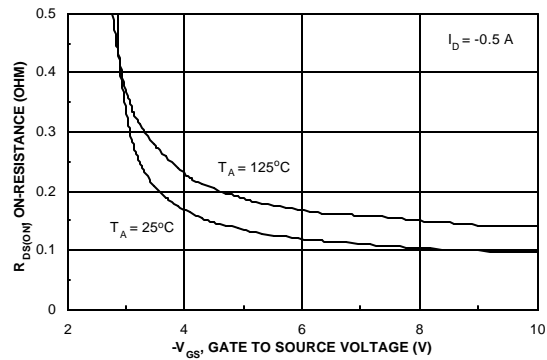


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

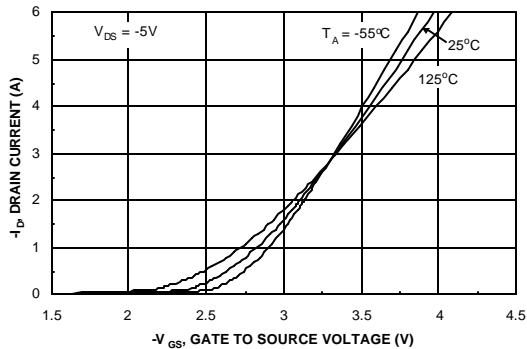


Figure 5. Transfer Characteristics.

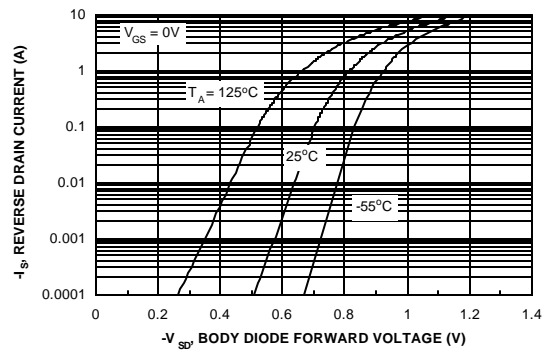


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

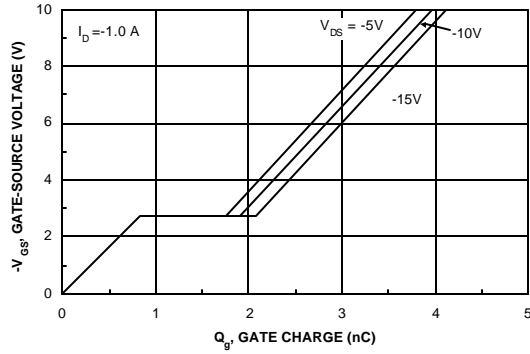


Figure 7. Gate Charge Characteristics.

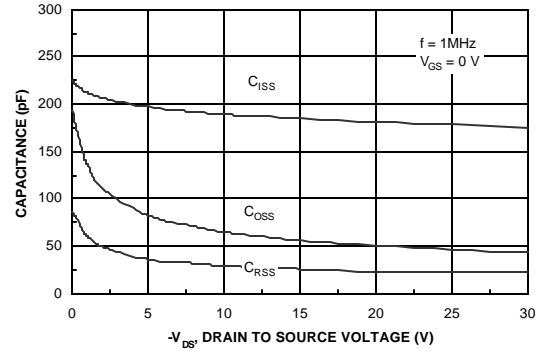


Figure 8. Capacitance Characteristics.

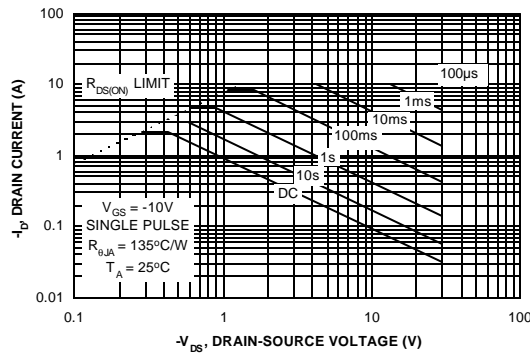


Figure 9. Maximum Safe Operating Area.

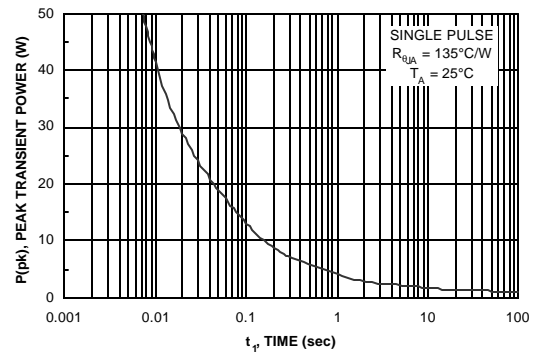


Figure 10. Single Pulse Maximum Power Dissipation.

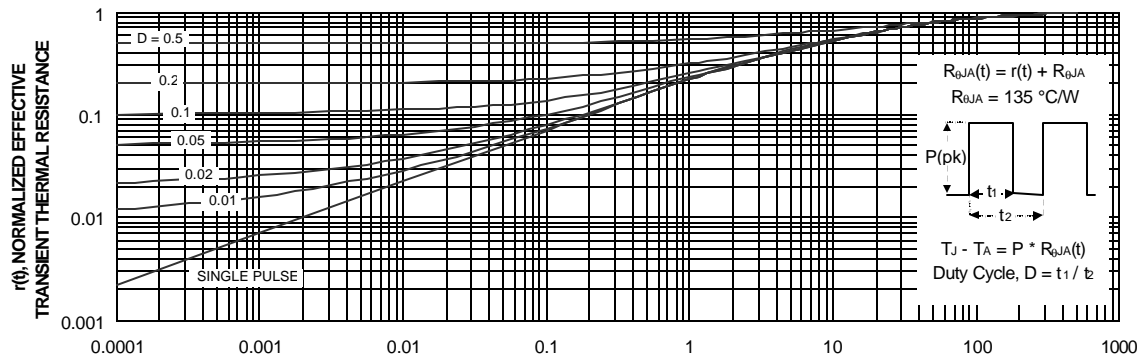


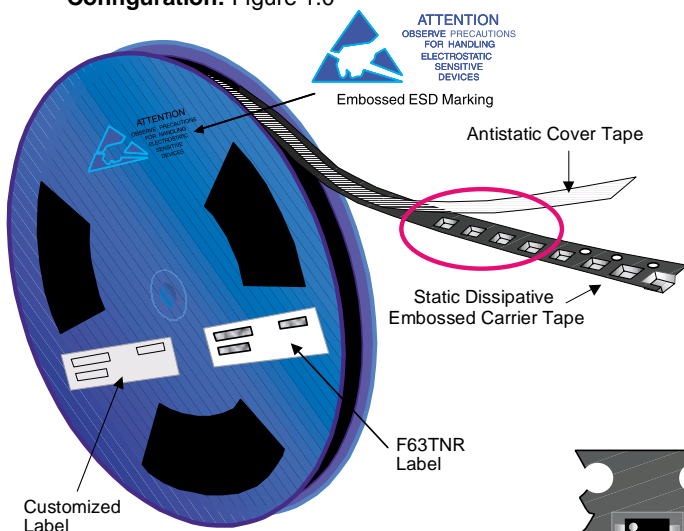
Figure 11. Transient Thermal Response Curve.

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



SOIC(8lds) Packaging Configuration: Figure 1.0

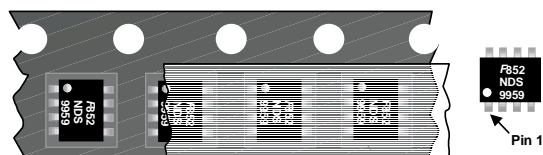


Packaging Description:

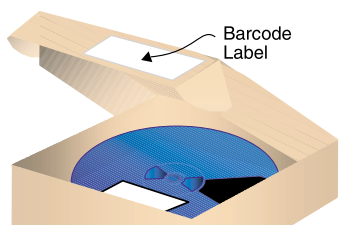
SOIC-8 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in 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 (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)	355x333x40	530x130x83	355x333x40	193x183x80
Max qty per Box	5,000	30,000	8,000	2,000
Weight per unit (gm)	0.0774	0.0774	0.0774	0.0774
Weight per Reel (kg)	0.6060	-	0.9696	0.1182
Note/Comments				

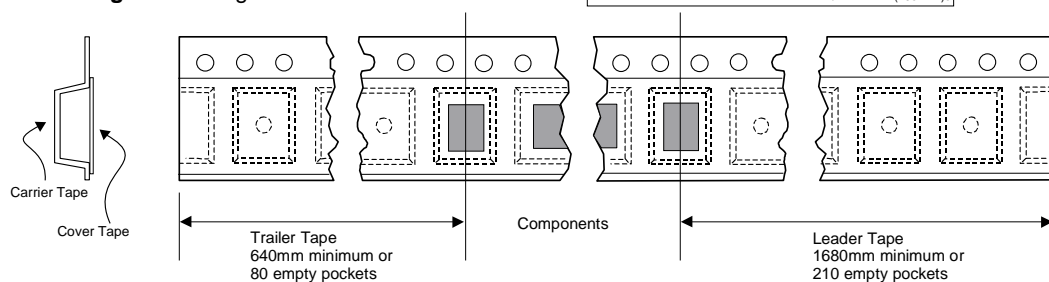


SOIC-8 Unit Orientation

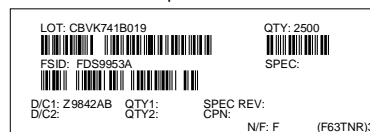


193mm x 183mm x 80mm
Pizza Box for Standard Option

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

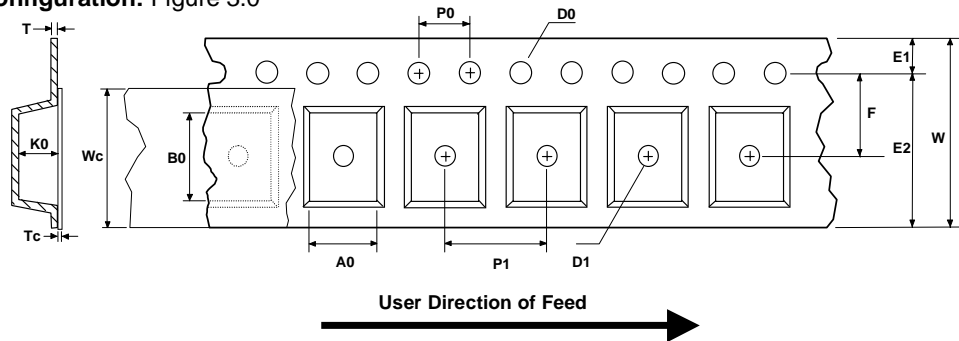


F63TNR Label sample



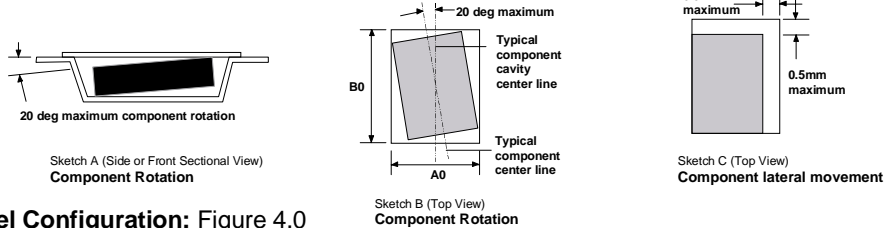
SOIC-8 Tape and Reel Data, continued

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

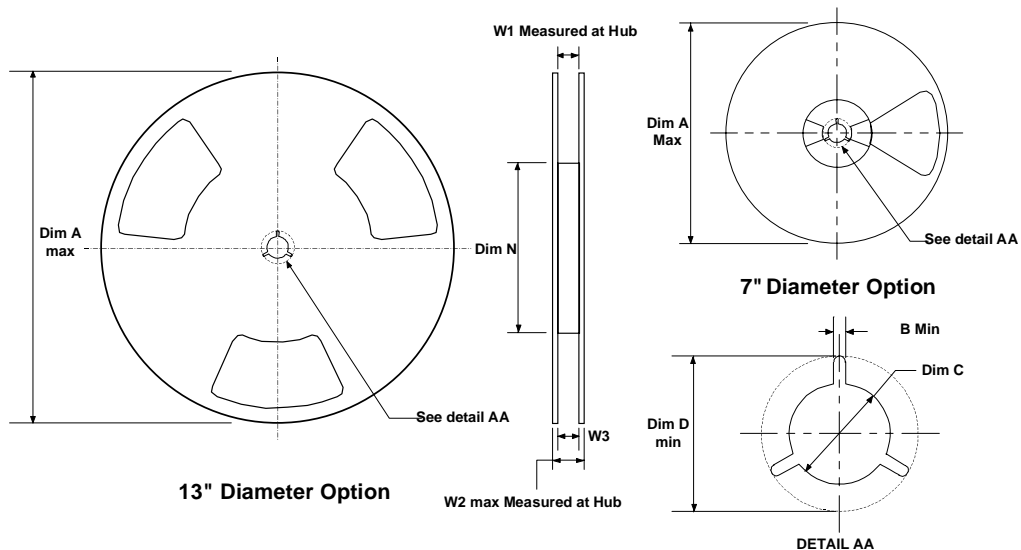


Dimensions are in millimeter														
Pkg type	A0	B0	W	D0	D1	E1	E2	F	P1	P0	K0	T	Wc	Tc
SOIC(8lds) (12mm)	5.30 +/-0.10	6.50 +/-0.10	12.0 +/-0.3	1.55 +/-0.05	1.60 +/-0.10	1.75 +/-0.10	10.25 min	5.50 +/-0.05	8.0 +/-0.1	4.0 +/-0.1	2.1 +/-0.10	0.450 +/-0.150	9.2 +/-0.3	0.06 +/-0.02

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).



SOIC(8lds) Reel Configuration: Figure 4.0

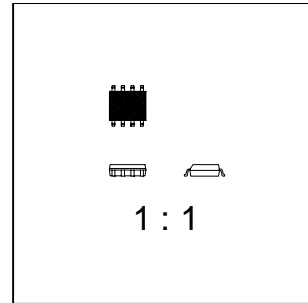
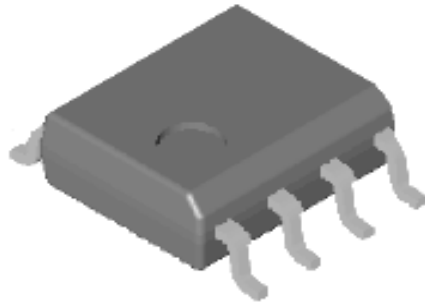


Dimensions are in inches and millimeters									
Tape Size	Reel Option	Dim A	Dim B	Dim C	Dim D	Dim N	Dim W1	Dim W2	Dim W3 (LSL-USL)
12mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 - 0.606 11.9 - 15.4
12mm	13" Dia	13.00 330	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

SOIC-8 Package Dimensions



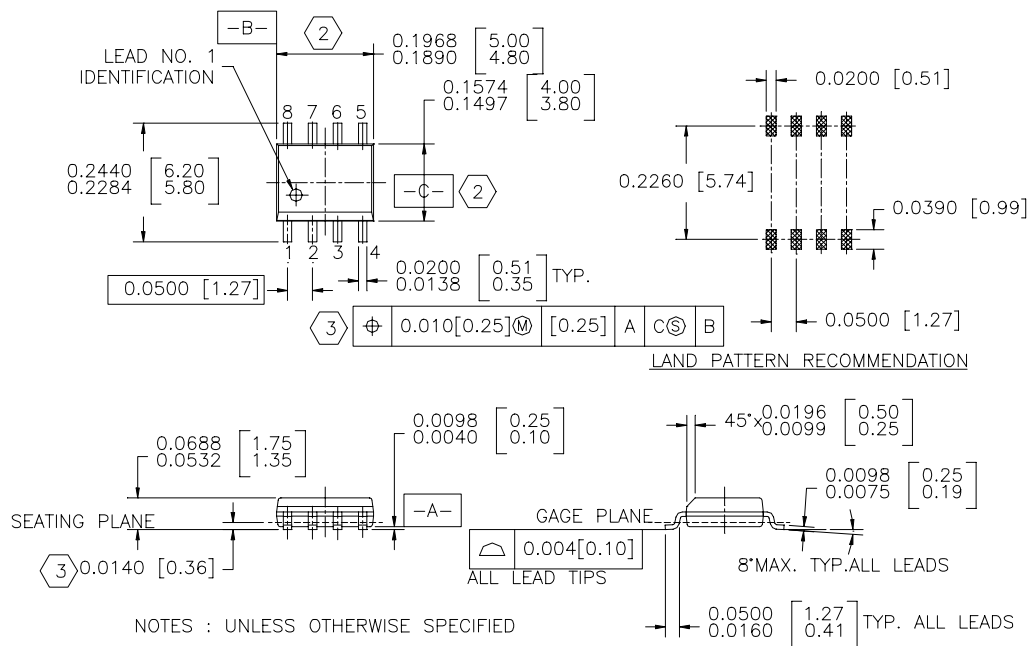
SOIC-8 (FS PKG Code S1)



Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0774



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CROSSVOLT TM	GlobalOptoisolator TM	PowerTrench [®]	SyncFET TM
DenseTrench TM	GTO TM	QFET TM	TinyLogic TM
DOME TM	HiSeC TM	QS TM	UHC TM
EcoSPARK TM	ISOPLANAR TM	QT Optoelectronics TM	UltraFET [®]
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