



# THE DATASHEET OF FDR858P



## FDR858P

### Single P-Channel, Logic Level, PowerTrench™ MOSFET

#### General Description

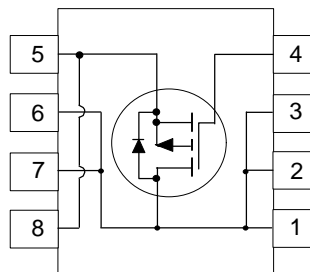
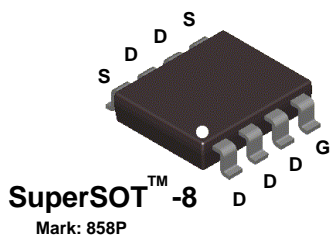
The SuperSOT-8 family of P-Channel Logic Level MOSFETs have been designed to provide a low profile, small footprint alternative to industry standard SO-8 little foot type product.

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

These devices are well suited for notebook computer applications: load switching and power management, battery charging circuits, and DC/DC conversion.

#### Features

- -8 A, -30 V.  $R_{DS(ON)} = 0.019 \Omega @ V_{GS} = -10 \text{ V}$ ,  
 $R_{DS(ON)} = 0.028 \Omega @ V_{GS} = -4.5 \text{ V}$ .
- Low gate charge (21nC typical).
- High performance trench technology for extremely low  $R_{DS(ON)}$ .
- SuperSOT™-8 package: small footprint (40%) less than SO-8); low profile (1mm thick); maximum power comparable to SO-8.



#### 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	$\pm 20$	V
$I_D$	Drain Current - Continuous (Note 1)	-8	A
	- Pulsed	-50	
$P_D$	Maximum Power Dissipation (Note 1a) (Note 1b) (Note 1c)	1.8	W
		1	
		0.9	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

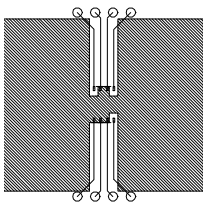
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	70	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	20	$^\circ\text{C/W}$

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

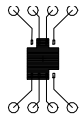
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-30			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	$I_D = -50\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-22		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -24\text{ V}, V_{GS} = 0\text{ V}$ $T_J = 55^\circ\text{C}$			-1	$\mu\text{A}$
					-10	$\mu\text{A}$
$I_{GSS}$	Gate - Body Leakage Current	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$I_{GSS}$	Gate - Body Leakage, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
<b>ON CHARACTERISTICS</b> (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-1	-1.7	-3	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	$I_D = -50\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		4		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -8\text{ A}$ $T_J = 125^\circ\text{C}$		0.0155	0.019	$\Omega$
				0.021	0.03	
			$V_{GS} = -4.5\text{ V}, I_D = -6.3\text{ A}$	0.022	0.028	
$I_{D(on)}$	On-State Drain Current	$V_{GS} = -10\text{ V}, V_{DS} = -5\text{ V}$	-50			A
$g_{FS}$	Forward Transconductance	$V_{DS} = -10\text{ V}, I_D = -3.2\text{ A}$		25		S
<b>DYNAMIC CHARACTERISTICS</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		2010		pF
$C_{oss}$	Output Capacitance			590		pF
$C_{rss}$	Reverse Transfer Capacitance			260		pF
<b>SWITCHING CHARACTERISTICS</b> (Note 2)						
$t_{D(on)}$	Turn - On Delay Time	$V_{DD} = -15\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -10\text{ V}, R_{GEN} = 6\ \Omega$		12	22	ns
$t_r$	Turn - On Rise Time			15	27	ns
$t_{D(off)}$	Turn - Off Delay Time			100	140	ns
$t_f$	Turn - Off Fall Time			55	80	ns
$Q_g$	Total Gate Charge		$V_{DS} = -15\text{ V}, I_D = -8\text{ A},$ $V_{GS} = 5\text{ V}$		21	30
$Q_{gs}$	Gate-Source Charge			6		nC
$Q_{gd}$	Gate-Drain Charge			8		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current				-0.67	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -0.67\text{ A}$ (Note 2)		-0.7	-1.2	V

Notes:

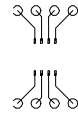
- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a.  $70^\circ\text{C/W}$  on a  $1\text{ in}^2$  pad of 2oz copper.



b.  $125^\circ\text{C/W}$  on a  $0.026\text{ in}^2$  of pad of 2oz copper.



c.  $135^\circ\text{C/W}$  on a  $0.005\text{ in}^2$  of pad of 2oz copper.

Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## Typical Electrical Characteristics

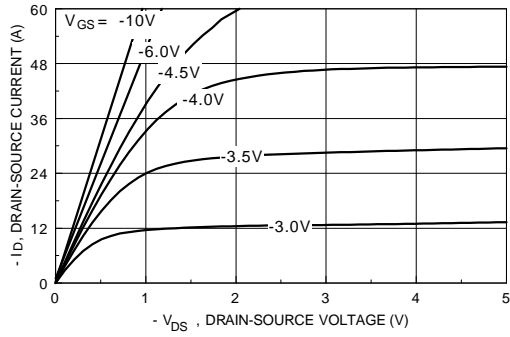


Figure 1. On-Region Characteristics.

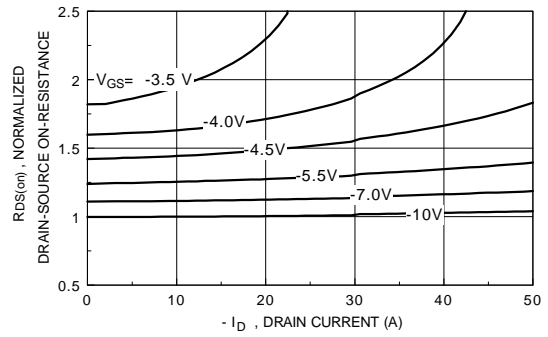


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

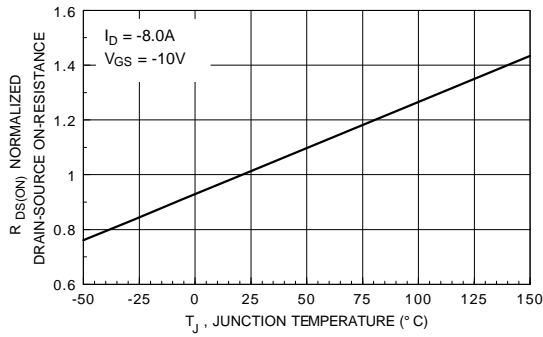


Figure 3. On-Resistance Variation with Temperature.

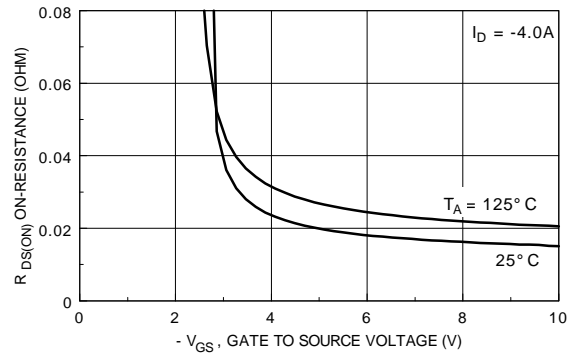


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

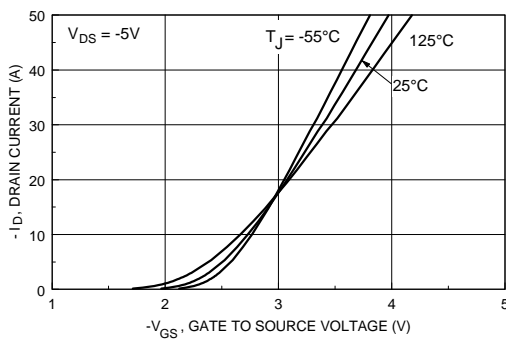


Figure 5. Transfer Characteristics.

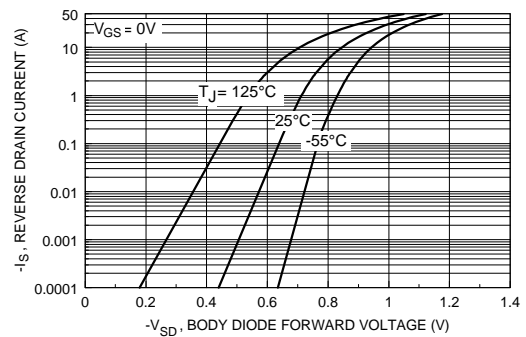


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (continued)

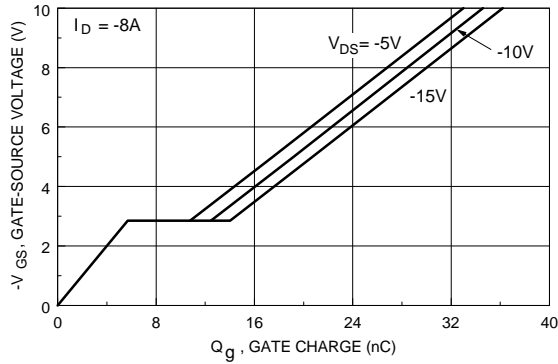


Figure 7. Gate Charge Characteristics.

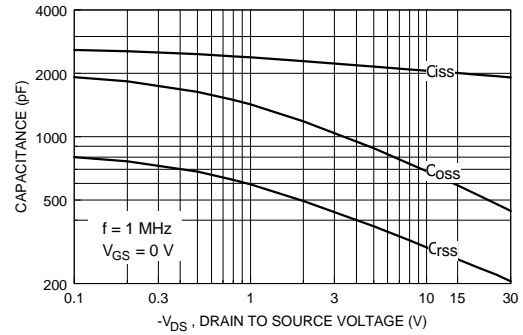


Figure 8. Capacitance Characteristics.

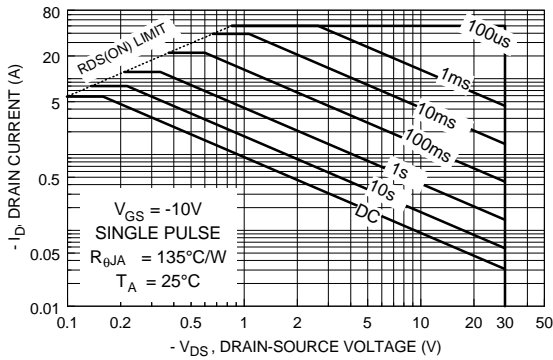


Figure 9. Maximum Safe Operating Area.

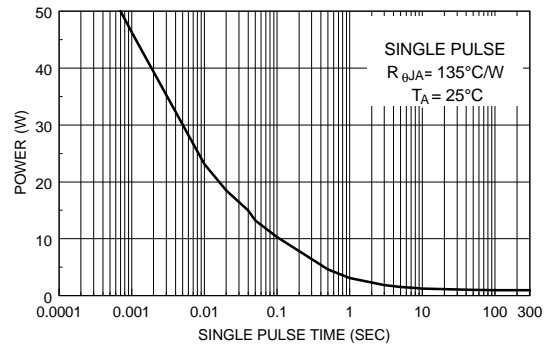


Figure 10. Single Pulse Maximum Power Dissipation.

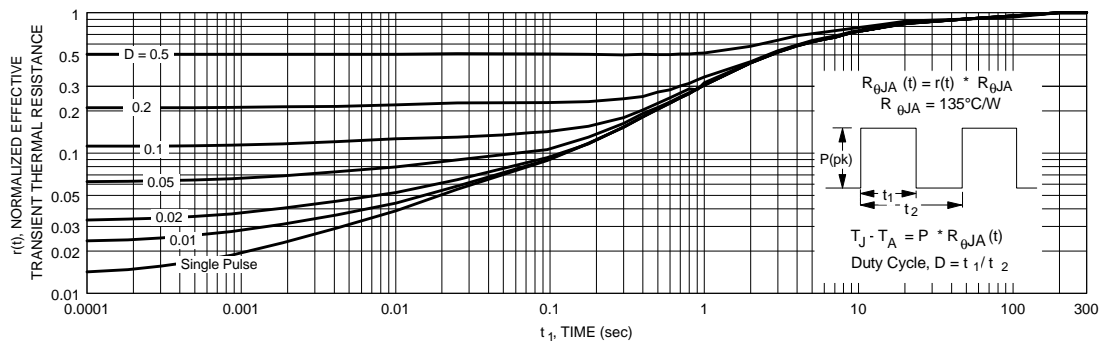


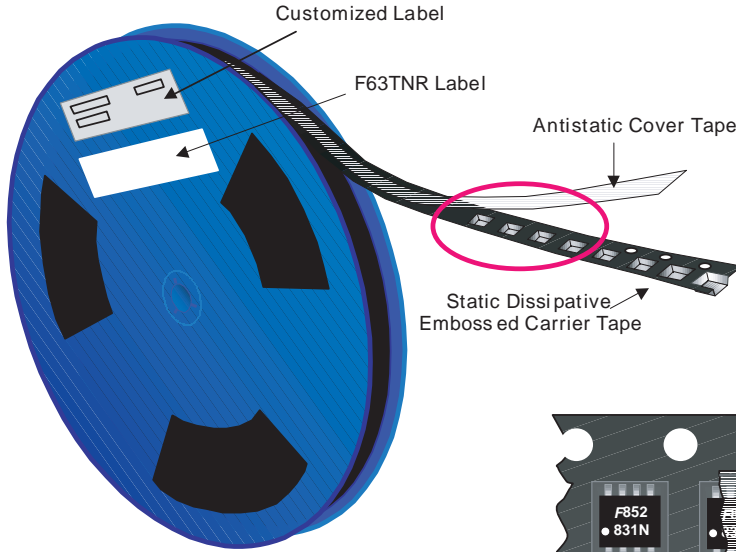
Figure 11. Transient Thermal Response Curve.

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

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



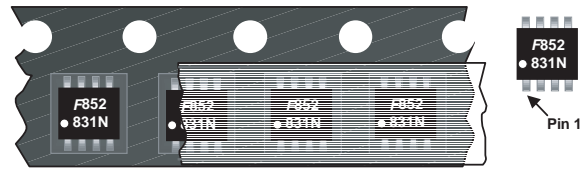
## SSOT-8 Packaging Configuration: Figure 1.0



### Packaging Description:

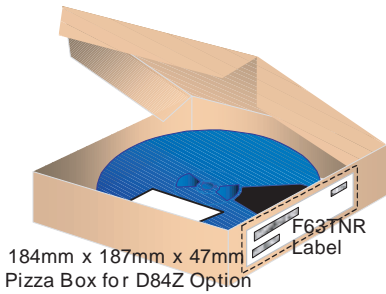
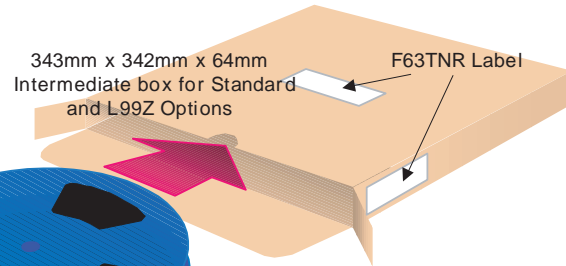
SSOT-8 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in 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.



### SSOT-8 Unit Orientation

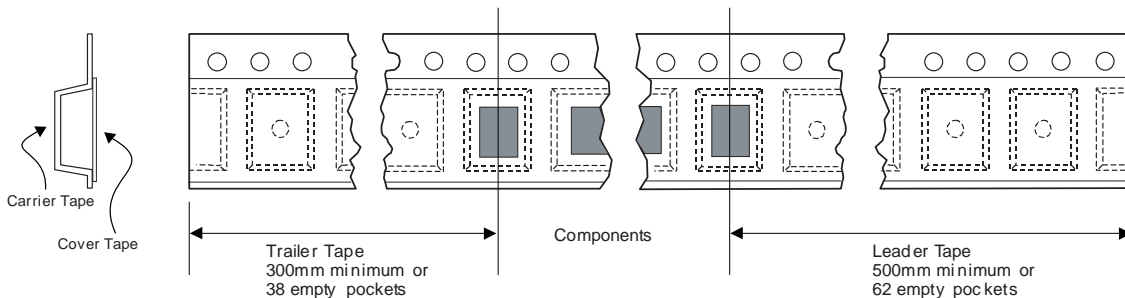
SSOT-8 Packaging Information		
Packaging Option	Standard (no flow code)	D84Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	500
Reel Size	13" Dia	7" Dia
Box Dimension (mm)	343x64x343	184x187x47
Max qty per Box	6,000	1,000
Weight per unit (gm)	0.0416	0.0416
Weight per Reel (kg)	0.5615	0.0980
Note/Comments		



### F63TNR Label sample

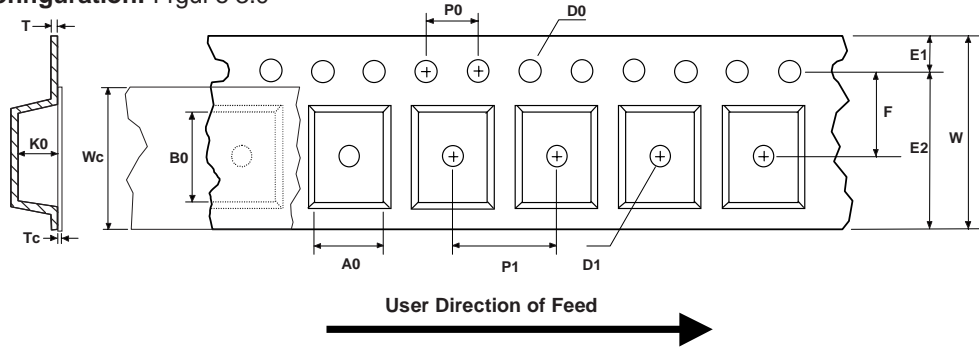


## SSOT-8 Tape Leader and Trailer Configuration: Figure 2.0



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

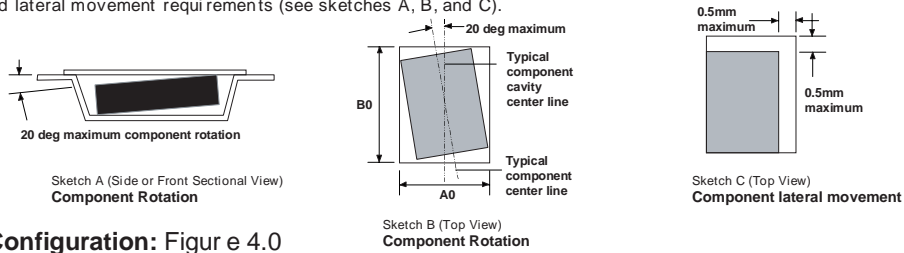
## SSOT-8 Embossed Carrier Tape Configuration: Figure 3.0



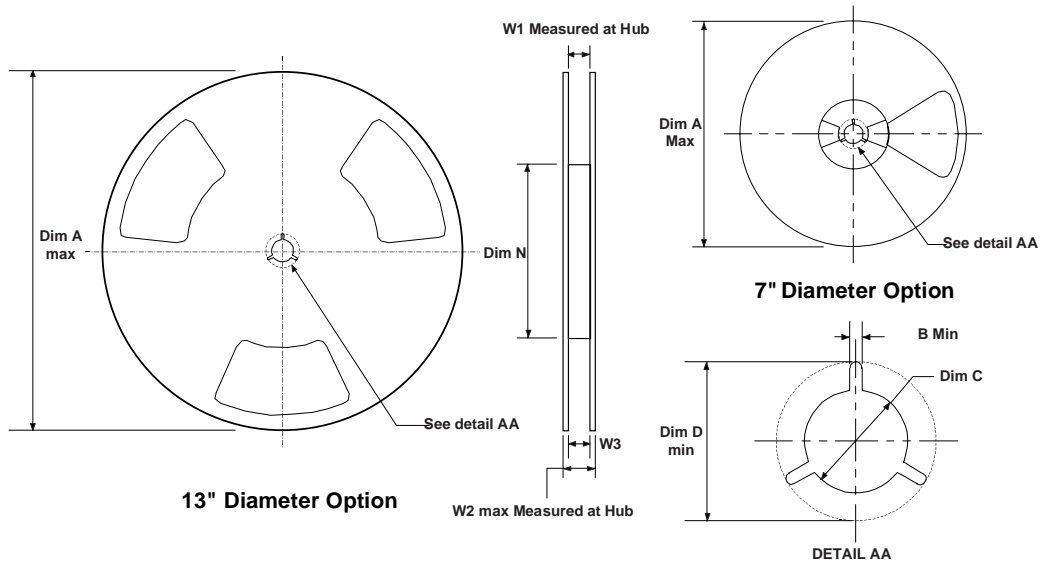
Dimensions are in millimeter

Pkg type	A0	B0	W	D0	D1	E1	E2	F	P1	P0	K0	T	Wc	Tc
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).



## SSOT-8 Reel Configuration: Figure 4.0

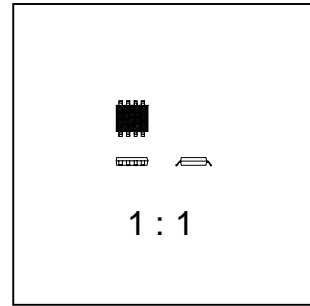
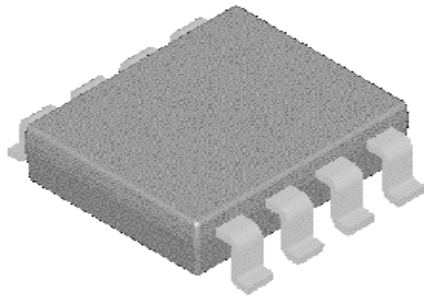


Dimensions are in inches and millimeters

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	5.906 150	0.488 +0.078/-0.000 12.4 +20	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 +20	0.724 18.4	0.469 - 0.606 11.9 - 15.4

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

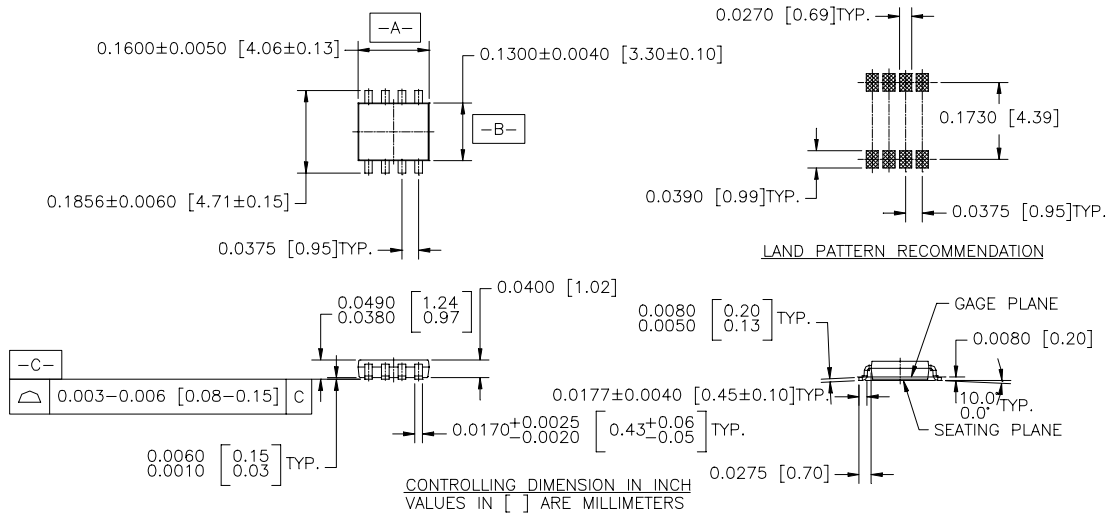
## SuperSOT™-8 (FS PKG Code 34, 35)



Scale 1:1 on letter size paper

Dimensions shown below are in:  
inches [millimeters]

Part Weight per unit (gram): 0.0416



NOTES : UNLESS OTHERWISE SPECIFIED

1. STANDARD LEAD FINISH TO BE 200 MICRONS / 5.08 MICROMETERS MINIMUM TIN/LEAD (SOLDER) ON COPPER.
2. NO JEDEC REGISTRATION AS JAN. 1996

SUPER SOT, 8 LEADS

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FACT™	QFET™	
FACT Quiet Series™	QS™	
FAST®	Quiet Series™	
FASTr™	SuperSOT™-3	
GTO™	SuperSOT™-6	
HiSeC™	SuperSOT™-8	

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## PRODUCT STATUS DEFINITIONS

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