

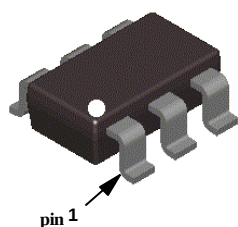
FDC6324L Integrated Load Switch

General Description

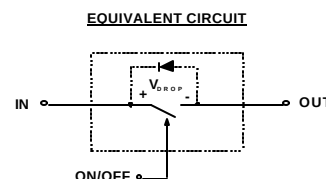
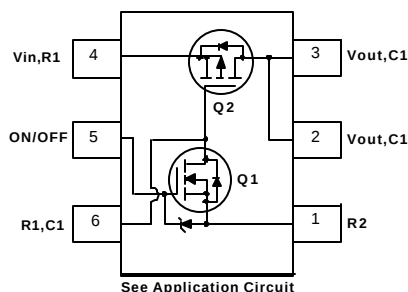
These Integrated Load Switches are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance and provide superior switching performance. These devices are particularly suited for low voltage high side load switch application where low conduction loss and ease of driving are needed.

Features

- $V_{DROP}=0.2V$ @ $V_{IN}=12V$, $I_L=1A$, $V_{ON/OFF}=1.5$ to $8V$
 $V_{DROP}=0.3V$ @ $V_{IN}=5V$, $I_L=1A$, $V_{ON/OFF}=1.5$ to $8V$.
- High density cell design for extremely low on-resistance.
- $V_{ON/OFF}$ Zener protection for ESD ruggedness. >6KV Human Body Model.
- SuperSOT™-6 package design using copper lead frame for superior thermal and electrical capabilities.



SuperSOT™-6



Absolute Operating Range $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	FDC6324L	Units
V_{IN}	Input Voltage Range	3 - 20	V
$V_{ON/OFF}$	ON/OFF Voltage Range	1.5 - 8	V
I_L	Load Current @ $V_{DROP}=0.5V$ - Continuous (Note 1)	1.5	A
	- Pulsed (Note 1 & 3)	2.5	
P_D	Maximum Power Dissipation (Note 2a)	0.7	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 150	$^\circ C$
ESD	Electrostatic Discharge Rating MIL-STD-883D Human Body Model (100pf/1500Ohm)	6	kV

THERMAL CHARACTERISTICS

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2a)	180	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 2)	60	$^\circ C/W$

Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
I _{FL}	Forward Leakage Current	V _{IN} = 20 V, V _{ON/OFF} = 0 V			1	μA
I _{RL}	Reverse Leakage Current	V _{IN} = -20 V, V _{ON/OFF} = 0 V			-1	μA
ON CHARACTERISTICS (Note 3)						
V _{IN}	Input Voltage		3		20	V
V _{ON/OFF}	On/Off Voltage		1.5		8	V
V _{DROP}	Conduction Voltage Drop @ 1A	V _{IN} = 10 V, V _{ON/OFF} = 3.3V		0.135	0.2	V
		V _{IN} = 5 V, V _{ON/OFF} = 3.3 V		0.215	0.3	
I _L	Load Current	V _{DROP} = 0.2 V, V _{IN} = 10 V, V _{ON/OFF} = 3.3 V	1			A
		V _{DROP} = 0.3 V, V _{IN} = 5 V, V _{ON/OFF} = 3.3 V	1			

Notes:

1. V_{IN}=20V, V_{ON/OFF}=8V, V_{DROP}=0.5V, T_A=25°C

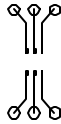
2. R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design.

$$P_D(t) = \frac{T_J - T_A}{R_{\theta J A}(t)} = \frac{T_J - T_A}{R_{\theta J} + R_{\theta CA}(t)} = I_D^2(t) \times R_{DS(ON)}@T_J$$

Typical R_{θJA} for single device operation using the board layouts shown below on FR-4 PCB in still air environment

a. 180°C/W when mounted on a 2oz minimum copper pad.

2a



Scale 1 : 1 on letter size paper

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

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

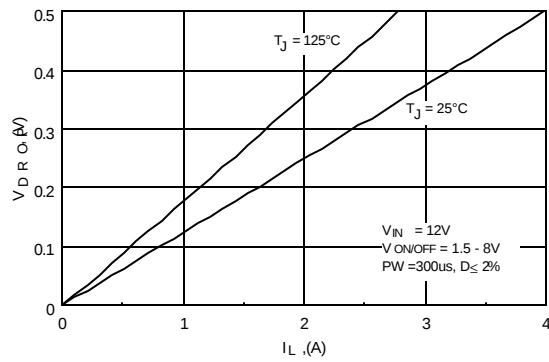


Figure 1. V_{DROP} Versus I_L at $V_{\text{IN}}=12\text{V}$.

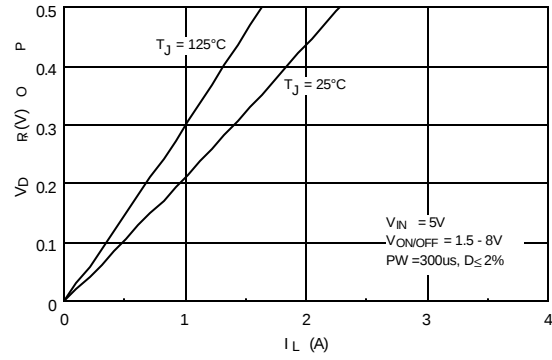


Figure 2. V_{DROP} Versus I_L at $V_{\text{IN}}=5.0\text{V}$.

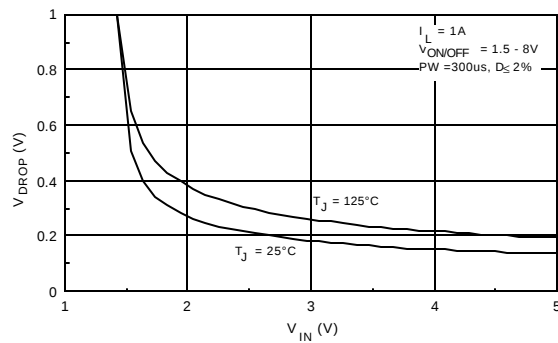


Figure 3. V_{DROP} Versus V_{IN} at $I_L=1\text{A}$.

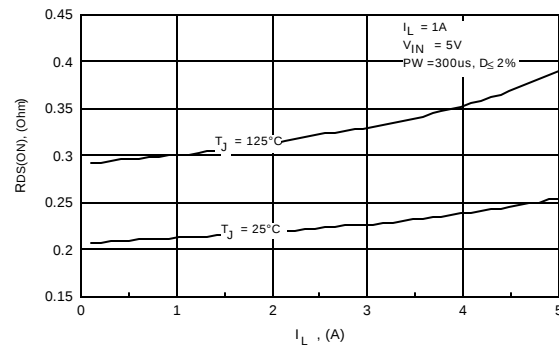


Figure 4. $R_{\text{DS(ON)}}$ Versus I_L at $V_{\text{IN}}=5.0\text{V}$.

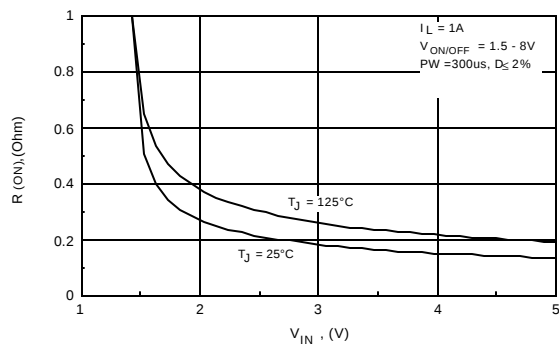


Figure 5. On Resistance Variation with Input Voltage.

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

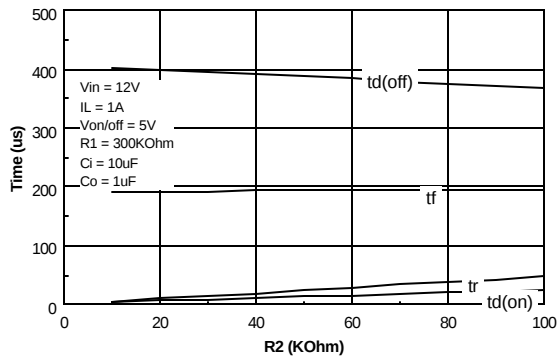


Figure 6. Switching Variation with R_2 at $V_{in} = 12\text{V}$ and $R_1 = 300\text{K}\Omega$.

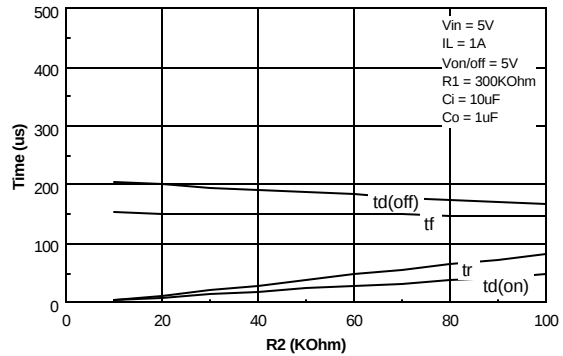


Figure 7. Switching Variation with R_2 at $V_{in} = 5\text{V}$ and $R_1 = 300\text{K}\Omega$.

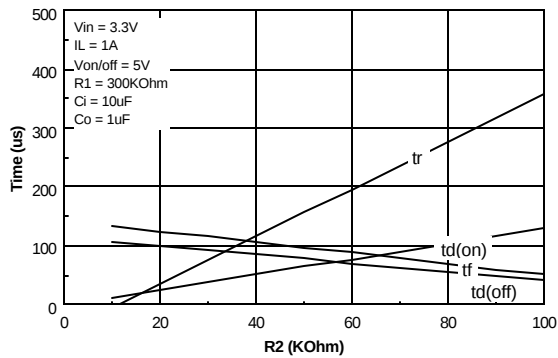


Figure 8. Switching Variation with R_2 at $V_{in} = 3.3\text{V}$ and $R_1 = 300\text{K}\Omega$.

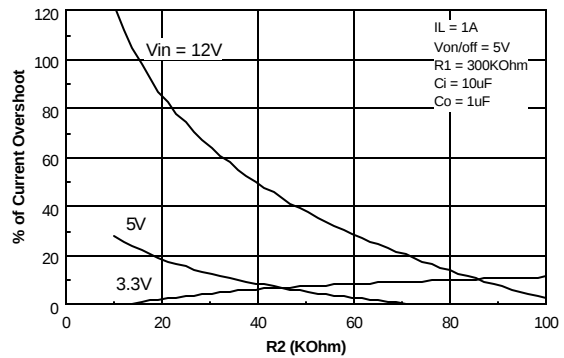


Figure 9. % of Current Overshoot Variation with V_{in} and R_2 .

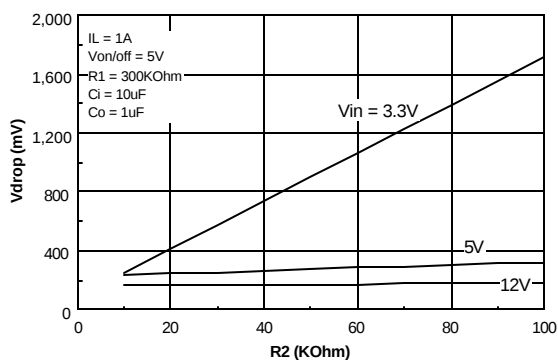


Figure 10. V_{drop} Variation with V_{in} and R_2 .

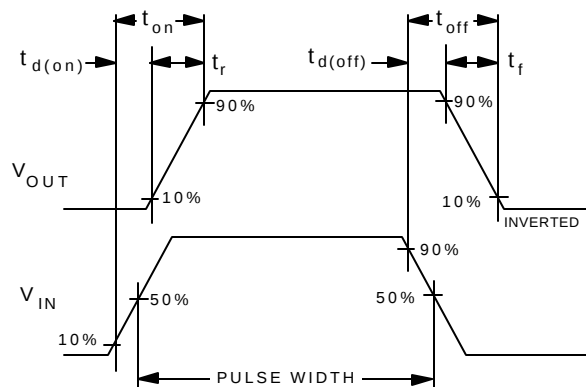


Figure 11. Switching Waveforms.

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

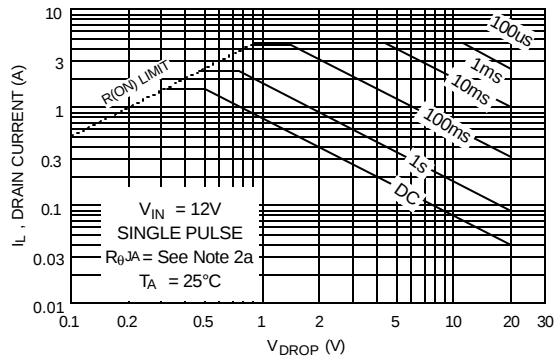


Figure 12. Safe Operating Area.

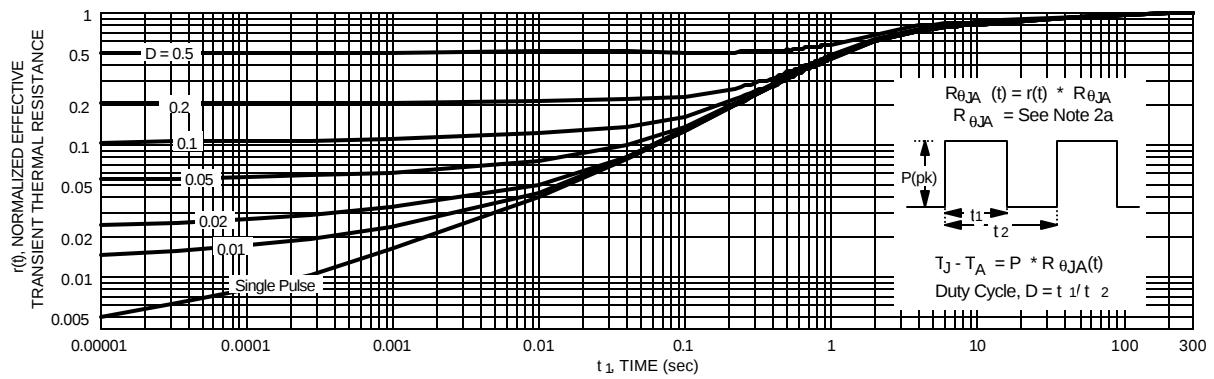
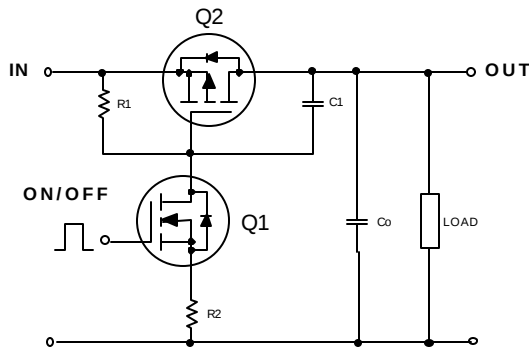


Figure 13. Transient Thermal Response Curve.

Note: Thermal characterization performed on the conditions described in Note 2a. Transient thermal response will change depends on the circuit board

FDC6324L Load Switch Application

APPLICATION CIRCUIT



General Description

This device is particularly suited for computer peripheral switching applications where 20V input and 1A output current capability are needed. This load switch integrates a small N-Channel Power MOSFET (Q1) which drives a large P-Channel Power MOSFET (Q2) in one tiny SuperSOT™-6 package.

A load switch is usually configured for high side switching so that the load can be isolated from the active power source. A P-Channel Power MOSFET, because it does not require its drive voltage above the input voltage, is usually more cost effective than using an N-Channel device in this particular application. A large P-Channel Power MOSFET minimizes voltage drop. By using a small N-Channel device the driving stage is simplified.

Component Values

R1	Typical	10k - 1MΩ	
R2	Typical	0 - 10kΩ	(optional)
C1	Typical	1000pF	(optional)

Design Notes

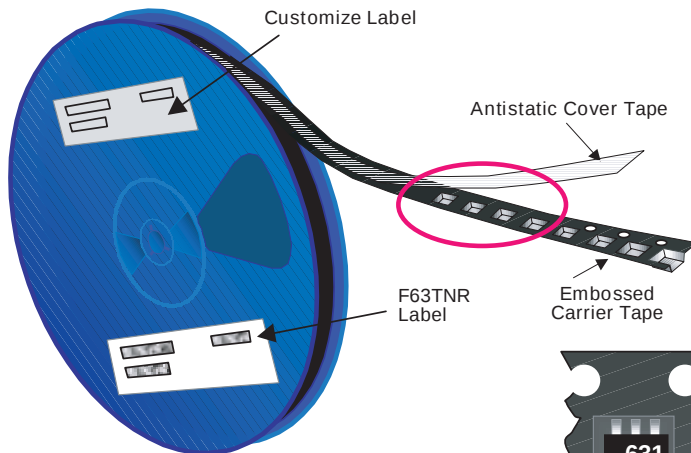
- R1 is needed to turn off Q2.
- R2 can be used to soft start the switch in the case the output capacitance Co is small.
- $R2 \leq$ should be at least 10 times smaller than R1 to guarantee Q1 turns on.
- By using R1 and R2 a certain amount of current is lost from the input. This bias current loss is given by the equation

$$I_{BIAS_LOSS} = \frac{V_{in}}{R1 + R2}$$
 when the switch is ON. I_{BIAS_LOSS} can be minimized by large R1.
- R2 and C_{RSS} of Q2 make ramp for slow turn on. If excessive overshoot current occurs due to fast turn on, additional capacitance C1 can be added externally to slow down the turn on.

SuperSOT™-6 Tape and Reel Data and Package Dimensions



SSOT-6 Packaging Configuration: Figure 1.0

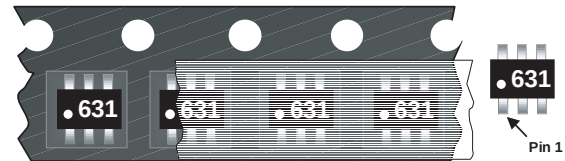


Packaging Description:

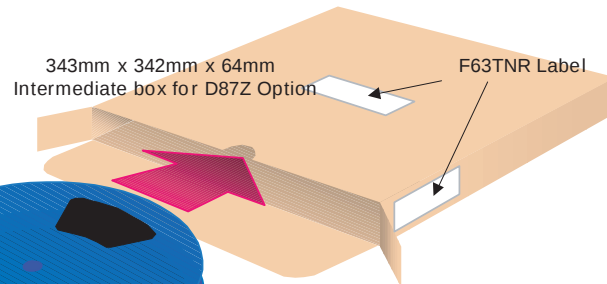
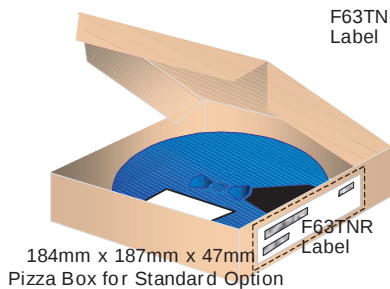
SSOT-6 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 10,000 units per 13" or 330cm diameter reel. This and some other options are described in the Packaging Information table.

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

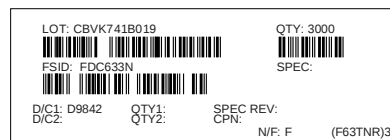
SSOT-6 Packaging Information		
Packaging Option	Standard (no flow code)	D87Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	10,000
Reel Size	7" Dia	13"
Box Dimension (mm)	184x187x47	343x343x64
Max qty per Box	9,000	30,000
Weight per unit (gm)	0.0158	0.0158
Weight per Reel (kg)	0.1440	0.4700
Note/Comments		



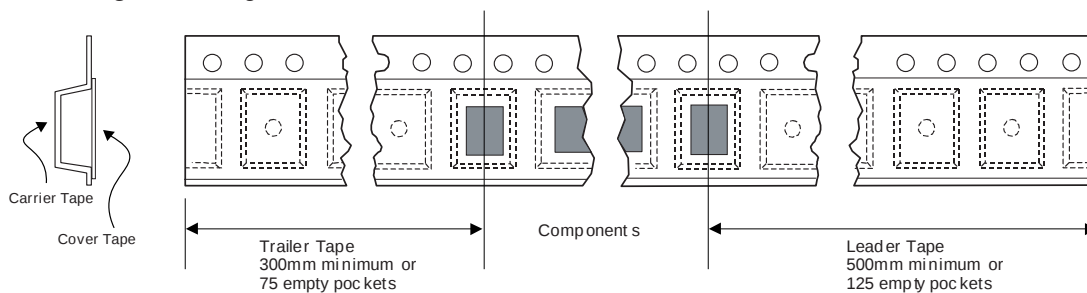
SSOT-6 Unit Orientation



F63TNR Label sample

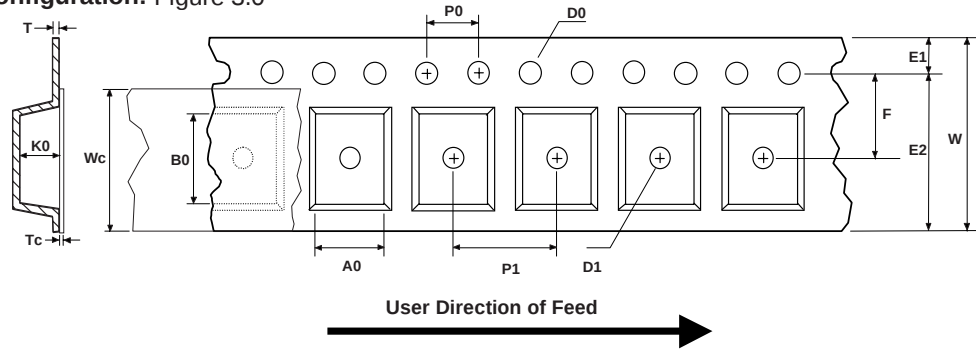


SSOT-6 Tape Leader and Trailer Configuration: Figure 2.0



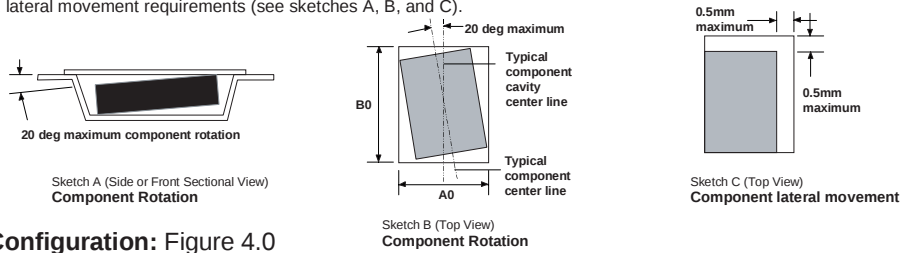
SuperSOT™-6 Tape and Reel Data and Package Dimensions, continued

SSOT-6 Embossed Carrier Tape Configuration: Figure 3.0

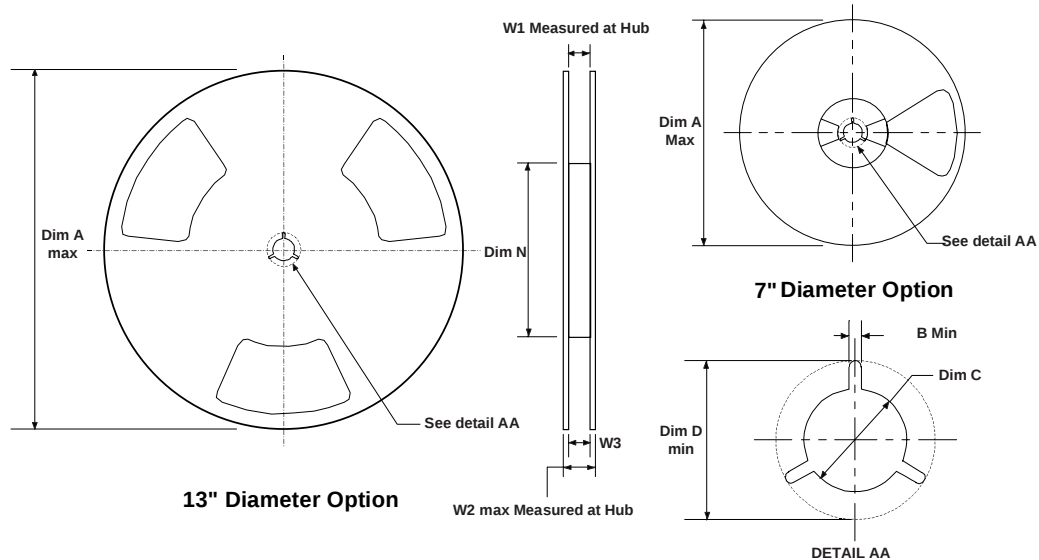


Dimensions are in millimeter														
Pkg type	A0	B0	W	D0	D1	E1	E2	F	P1	P0	K0	T	Wc	Tc
SSOT-6 (8mm)	3.23 +/-0.10	3.18 +/-0.10	8.0 +/-0.3	1.55 +/-0.05	1.125 +/-0.125	1.75 +/-0.10	6.25 min	3.50 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	1.37 +/-0.10	0.255 +/-0.150	5.2 +/-0.3	0.06 +/-0.02

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).



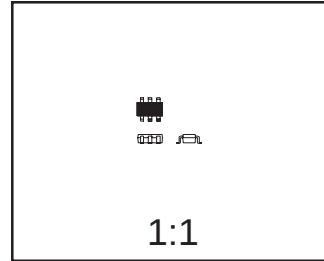
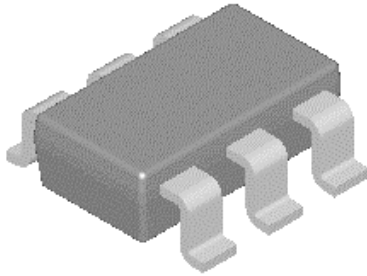
SSOT-6 Reel Configuration: Figure 4.0



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)
8mm	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	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9
8mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	4.00 100	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9

SuperSOT™-6 Tape and Reel Data and Package Dimensions, continued

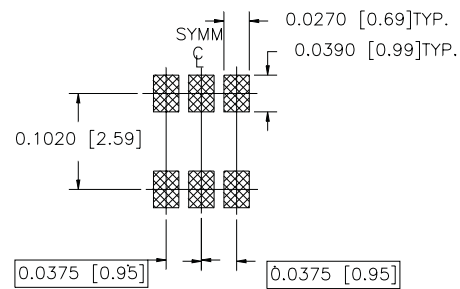
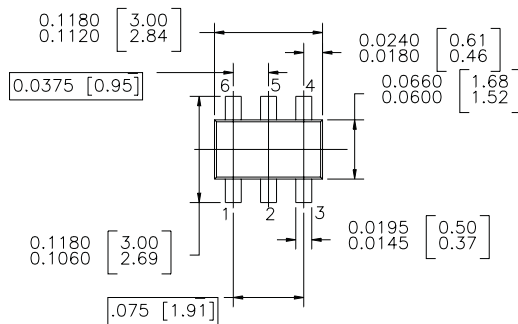
SuperSOT -6 (FS PKG Code 31, 33)



Scale 1:1 on letter size paper

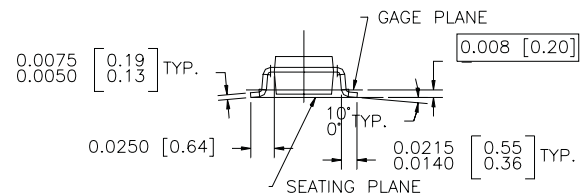
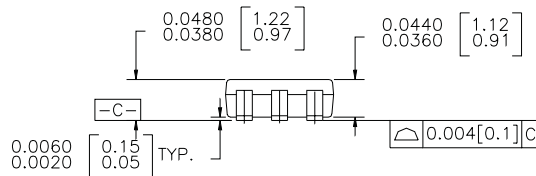
Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0158



LAND PATTERN RECOMMENDATION

CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS



NOTES : UNLESS OTHERWISE SPECIFIED

1.0 STANDARD LEAD FINISH : 150 MICROINCHES 93.81 MICROMETERS)
MINIMUM TIN / LEAD (SOLDER) ON COPPER.

2.0 NO JEDEC REGISTRATION AS OF JULY 1996

SUPER SOT 6 LEADS

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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.
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.