

FDG328P

P-Channel 2.5V Specified PowerTrench® MOSFET

General Description

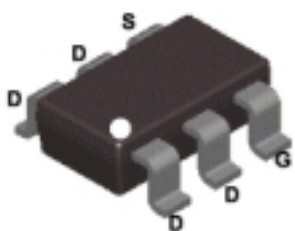
This P-Channel 2.5V specified MOSFET is produced in a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications for a wide range of gate drive voltages (2.5V – 12V).

Applications

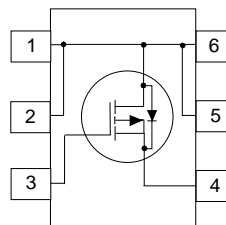
- Load switch
- Power management
- DC/DC converter

Features

- -1.5 A, -20 V. $R_{DS(ON)} = 0.145 \Omega @ V_{GS} = -4.5 V$
 $R_{DS(ON)} = 0.210 \Omega @ V_{GS} = -2.5 V$
- Low gate charge
- High performance trench technology for extremely low $R_{DS(ON)}$
- Compact industry standard SC70-6 surface mount package



SC70-6



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

Symbol	Parameter	Rated	Units
V_{DSS}	Drain-Source Voltage	-20	V
V_{GSS}	Gate-Source Voltage	± 12	V
I_D	Drain Current – Continuous (Note 1a)	-1.5	A
	– Pulsed	-6	
P_D	Power Dissipation for Single Operation (Note 1a)	0.75	W
	(Note 1b)	0.48	
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 1b)	260	$^\circ\text{C/W}$
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Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.28	FDG328P	7"	8mm	3000 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	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, Referenced to 25°C		-9		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
I_{GSSF}	Gate–Body Leakage, Forward	$V_{GS} = 12\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = -12\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-0.6		-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, Referenced to 25°C		3		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = -4.5\text{ V}, I_D = -1.5\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -1.2\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -1.5\text{ A}, T_J = 125^\circ\text{C}$		120 169 156	145 210 203	m Ω
$I_{D(on)}$	On–State Drain Current	$V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	-3			A
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{ V}, I_D = -1.5\text{ A}$		5		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$		337		pF
C_{oss}	Output Capacitance	$f = 1.0\text{ MHz}$		88		pF
C_{riss}	Reverse Transfer Capacitance			51		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = -10\text{ V}, I_D = 1\text{ A},$		9	18	ns
t_r	Turn–On Rise Time	$V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$		12	22	ns
$t_{d(off)}$	Turn–Off Delay Time			10	20	ns
t_f	Turn–Off Fall Time			5	10	ns
Q_g	Total Gate Charge	$V_{DS} = -10\text{ V}, I_D = -1.5\text{ A},$		3.7	6	nC
Q_{gs}	Gate–Source Charge	$V_{GS} = -4.5\text{ V}$		0.7		nC
Q_{gd}	Gate–Drain Charge			1.3		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				-0.62	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -0.62\text{ A}$ (Note 2)		-0.7	-1.2	V

Notes:

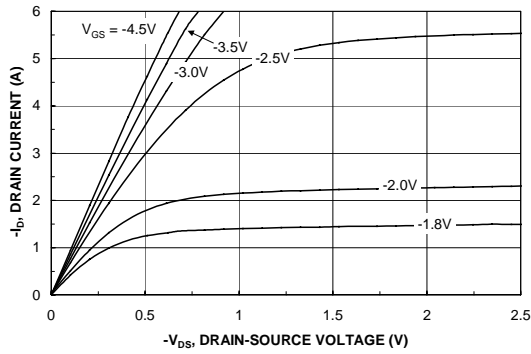
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

a.) 170°W when mounted on a 1 in^2 pad of 2 oz. copper.

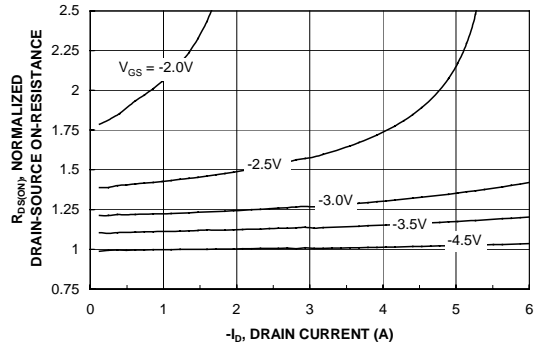
b.) 260°W when mounted on a minimum pad.

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

Typical Characteristics



Characteristics



Current

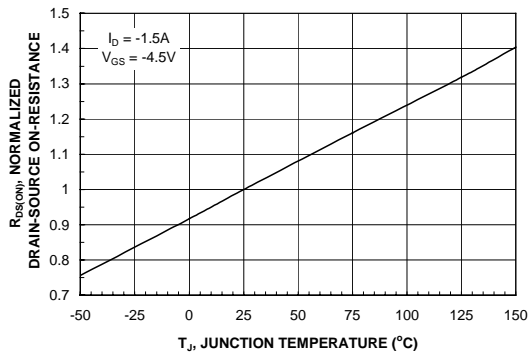


Figure 3. On-Resistance Variation with Temperature.

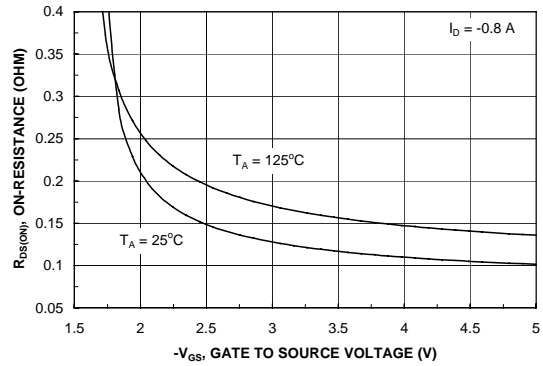


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

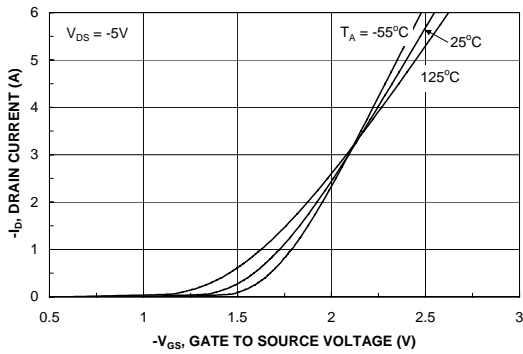


Figure 5. Transfer Characteristics.

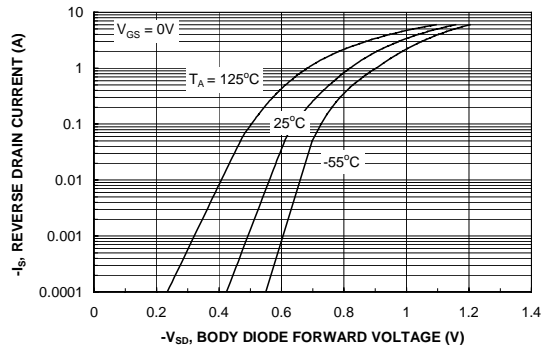


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

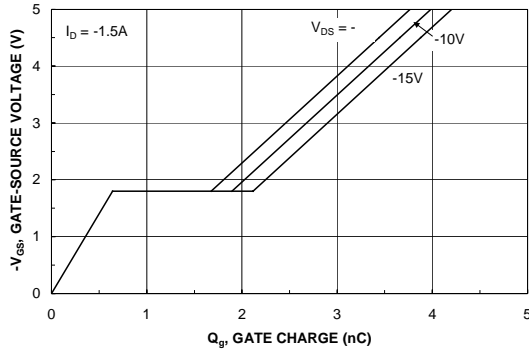


Figure 7. Gate Charge Characteristics.

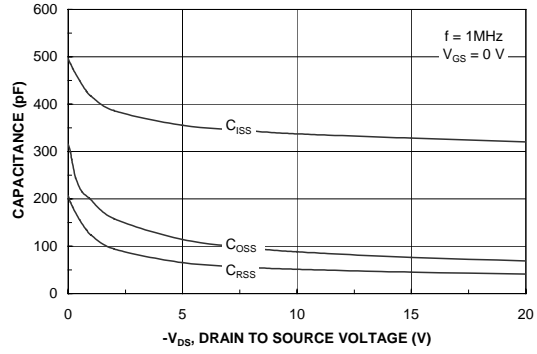


Figure 8. Capacitance Characteristics.

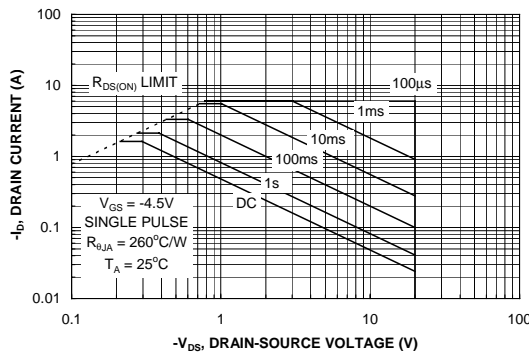


Figure 9. Maximum Safe Operating Area.

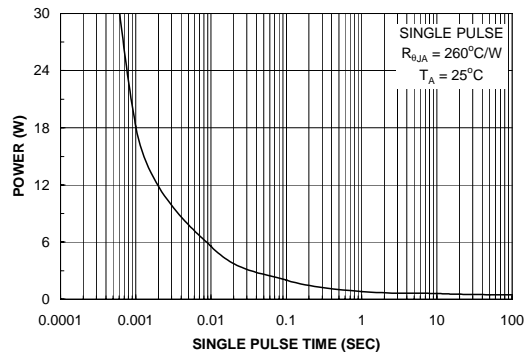


Figure 10. Single Pulse Maximum Power Dissipation.

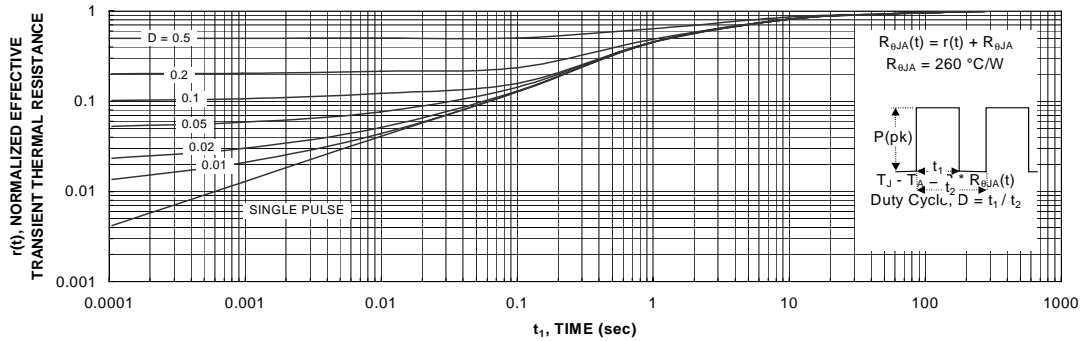


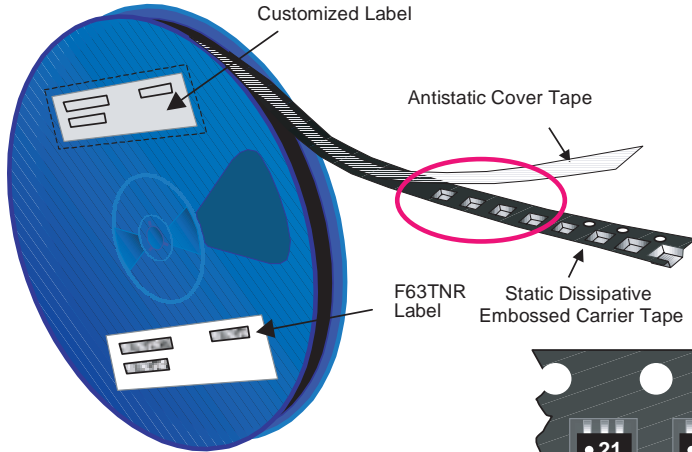
Figure 11. Transient Thermal Response Curve.

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

SC70-6 Tape and Reel Data

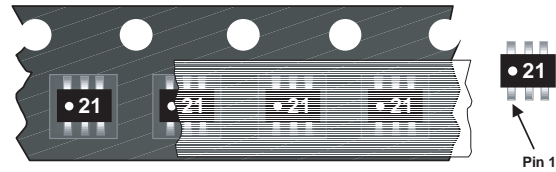


SC70-6 Packaging Configuration: Figure 1.0

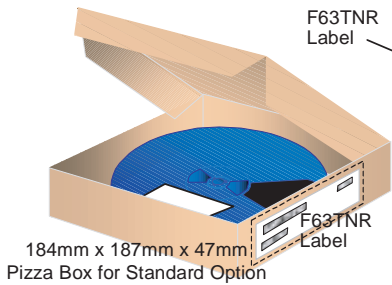
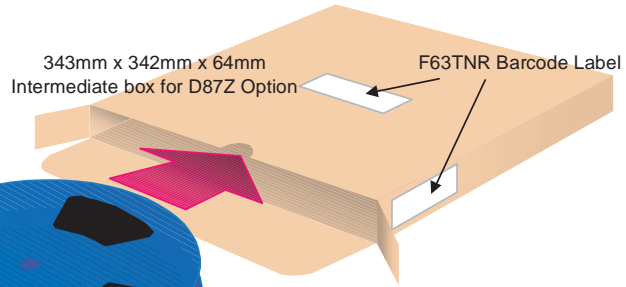


Packaging Description:
 SC70-6 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. 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.

SC70-6 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)	0.0055	0.0055
Weight per Reel (kg)	0.1140	0.3960
Note/Comments		



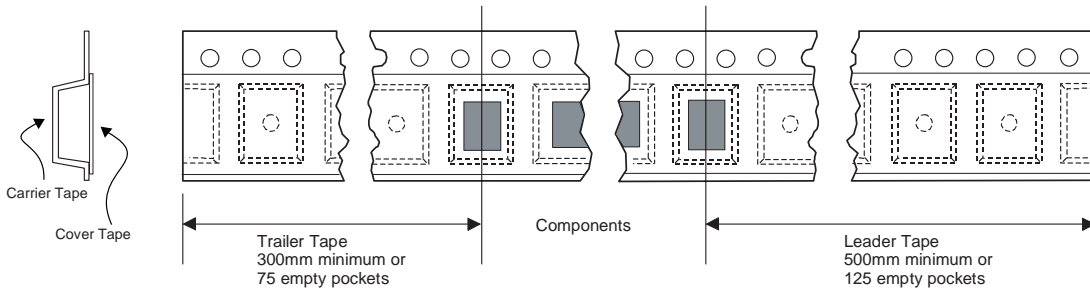
SC70-6 Unit Orientation



F63TNR Label sample

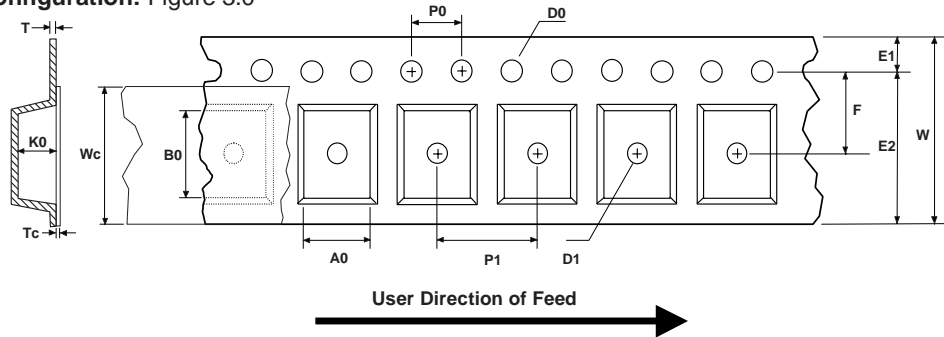


SC70-6 Tape Leader and Trailer Configuration: Figure 2.0



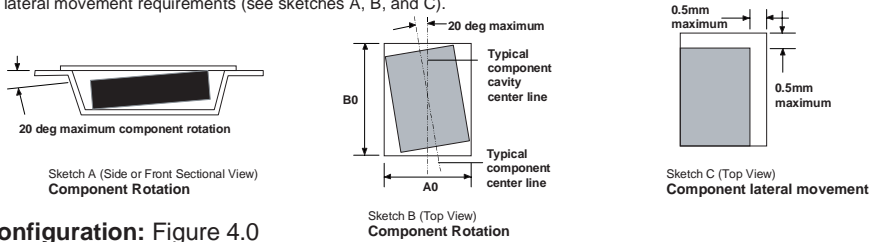
SC70-6 Tape and Reel Data, continued

SC70-6 Embossed Carrier Tape Configuration: Figure 3.0

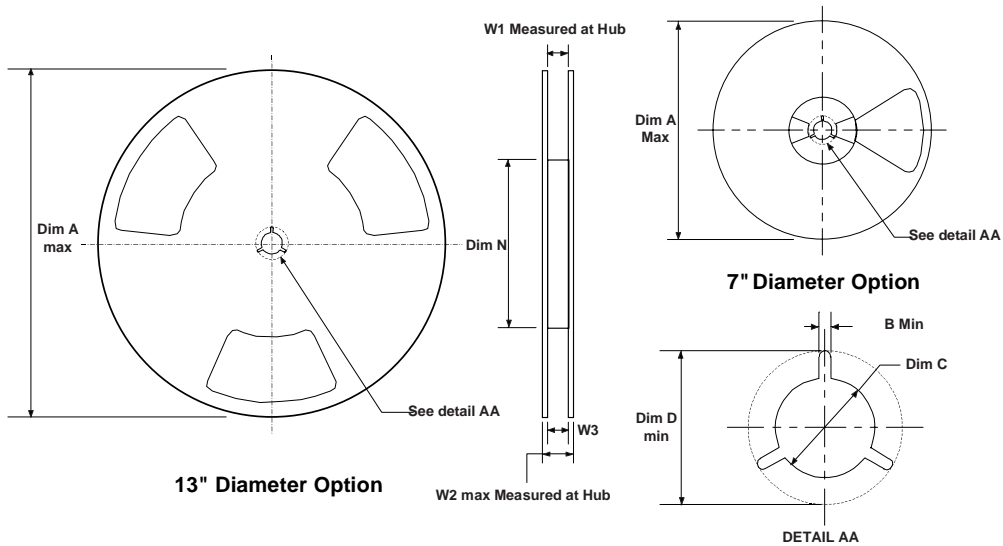


Dimensions are in millimeter														
Pkg type	A0	B0	W	D0	D1	E1	E2	F	P1	P0	K0	T	Wc	Tc
SC70-6 (8mm)	2.24 +/-0.10	2.34 +/-0.10	8.0 +/-0.3	1.55 +/-0.05	1.125 +/-0.125	1.75 +/-0.10	6.25 min	3.50 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	1.20 +/-0.10	0.255 +/-0.150	5.2 +/-0.3	0.06 +/-0.02

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).



SC70-6 Reel Configuration: Figure 4.0

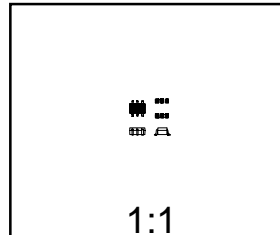
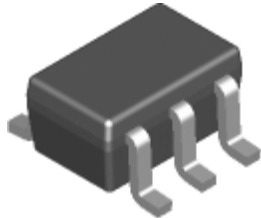


Dimensions are in inches and millimeters									
Tape Size	Reel Option	Dim A	Dim B	Dim C	Dim D	Dim N	Dim W1	Dim W2	Dim W3 (LSL-USL)
8mm	7" Dia	7.00 177.8	0.059 1.5	0.512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9
8mm	13" Dia	13.00 330	0.059 1.5	0.512 +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

SC70-6 Package Dimensions



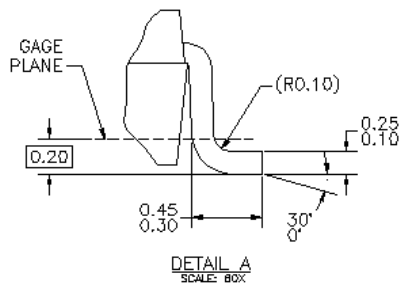
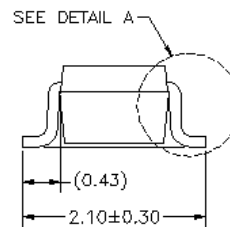
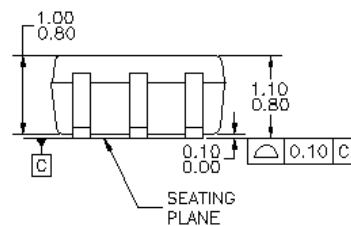
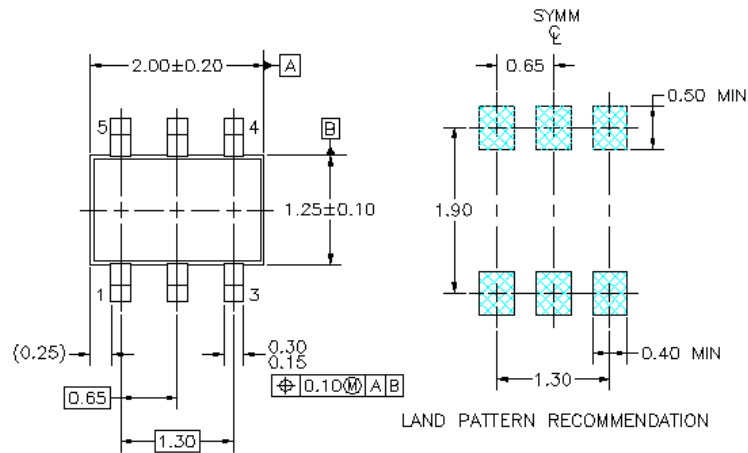
SC70-6 (FS PKG Code 76)



Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0055



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-88, 1996.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.

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DOME™	ISOPANAR™	SuperSOT™-3	
E ² CMOS™	MICROWIRE™	SuperSOT™-6	
EnSigna™	OPTOLOGIC™	SuperSOT™-8	
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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.