

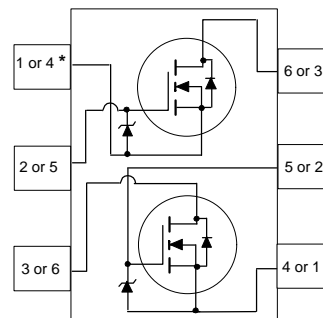
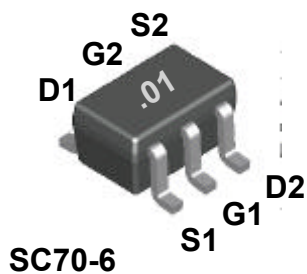
FDG6301N Dual N-Channel, Digital FET

General Description

These dual N-Channel logic level enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for bipolar digital transistors and small signal MOSFETs.

Features

- 25 V, 0.22 A continuous, 0.65 A peak.
 $R_{DS(ON)} = 4 \Omega @ V_{GS} = 4.5 V$,
 $R_{DS(ON)} = 5 \Omega @ V_{GS} = 2.7 V$.
- Very low level gate drive requirements allowing direct operation in 3 V circuits ($V_{GS(th)} < 1.5 V$).
- Gate-Source Zener for ESD ruggedness (>6kV Human Body Model).
- Compact industry standard SC70-6 surface mount package.



*The pinouts are symmetrical; pin 1 and 4 are interchangeable.
Units inside the carrier can be of either orientation and will not affect the functionality of the device.

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

| Symbol | Parameter | FDG6301N | Units |
|----------------|---|--------------|------------------|
| V_{DSS} | Drain-Source Voltage | 25 | V |
| V_{GSS} | Gate-Source Voltage | 8 | V |
| I_D | Drain/Output Current | - Continuous | 0.22 |
| | | - Pulsed | 0.65 |
| P_D | Maximum Power Dissipation (Note 1) | 0.3 | W |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| ESD | Electrostatic Discharge Rating MIL-STD-883D Human Body Model(100 pF / 1500 Ω) | 6.0 | kV |

THERMAL CHARACTERISTICS

| | | | |
|-----------------|---|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 415 | $^\circ\text{C/W}$ |
|-----------------|---|-----|--------------------|

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|--|--|--|------|------|---------|
| OFF CHARACTERISTICS | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} = 0 V, I _D = 250 μA | 25 | | | V |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | I _D = 250 μA, Referenced to 25 °C | | 25 | | mV / °C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 20 V, V _{GS} = 0 V | | | 1 | μA |
| | | T _J = 55°C | | | 10 | μA |
| I _{GSS} | Gate - Body Leakage Current | V _{GS} = 8 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 | 0.65 | 0.85 | 1.5 | V |
| ΔV _{GS(th)} /ΔT _J | Gate Threshold Voltage Temp. Coefficient | I _D = 250 μA, Referenced to 25 °C | | -2.1 | | mV / °C |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 4.5 V, I _D = 0.22 A | | 2.6 | 4 | Ω |
| | | T _J = 125°C | | 5.3 | 7 | |
| | | V _{GS} = 2.7 V, I _D = 0.19 A | | 3.7 | 5 | |
| I _{D(on)} | On-State Drain Current | V _{GS} = 4.5 V, V _{DS} = 5 V | 0.22 | | | A |
| g _{FS} | Forward Transconductance | V _{DS} = 5 V, I _D = 0.22 A | | 0.2 | | S |
| DYNAMIC CHARACTERISTICS | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} = 10 V, V _{GS} = 0 V, f = 1.0 MHz | | 9.5 | | pF |
| C _{oss} | Output Capacitance | | | 6 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 1.3 | | pF |
| SWITCHING CHARACTERISTICS (Note 2) | | | | | | |
| t _{D(on)} | Turn - On Delay Time | V _{DD} = 5 V, I _D = 0.5 A, V _{GS} = 4.5 V, R _{GEN} = 50 Ω | | 5 | 10 | ns |
| t _r | Turn - On Rise Time | | | 4.5 | 10 | ns |
| t _{D(off)} | Turn - Off Delay Time | | | 4 | 8 | ns |
| t _f | Turn - Off Fall Time | | | 3.2 | 7 | ns |
| Q _g | Total Gate Charge | | V _{DS} = 5 V, I _D = 0.22 A, V _{GS} = 4.5 V | | 0.29 | 0.4 |
| Q _{gs} | Gate-Source Charge | | | 0.12 | | nC |
| Q _{gd} | Gate-Drain Charge | | | 0.03 | | nC |
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS | | | | | | |
| I _S | Maximum Continuous Source Current | | | | 0.25 | A |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 0.25 A (Note 2) | | 0.8 | 1.2 | V |

Notes:

- 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. R_{θJA} = 415°C/W on minimum pad mounting on FR-4 board in still air.
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

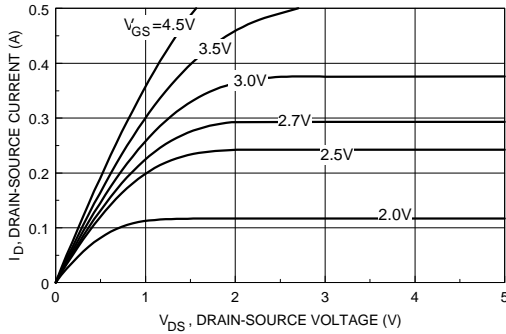


Figure 1. On-Region Characteristics.

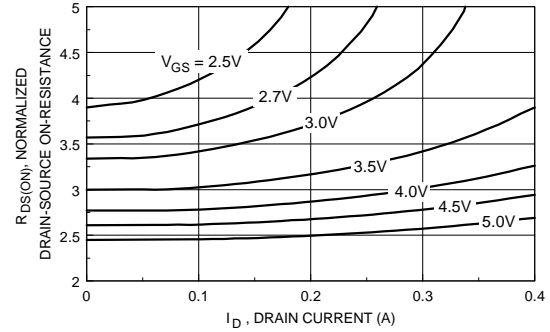


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

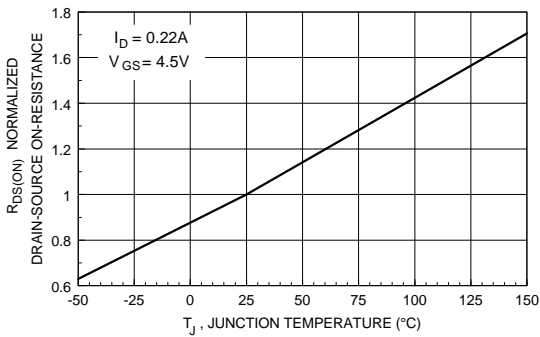


Figure 3. On-Resistance Variation with Temperature.

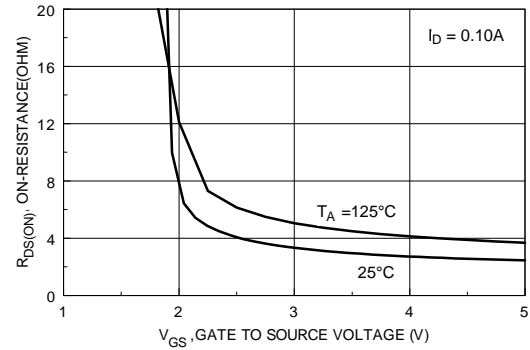


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

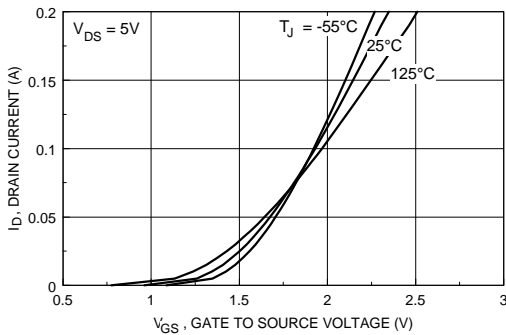


Figure 5. Transfer Characteristics.

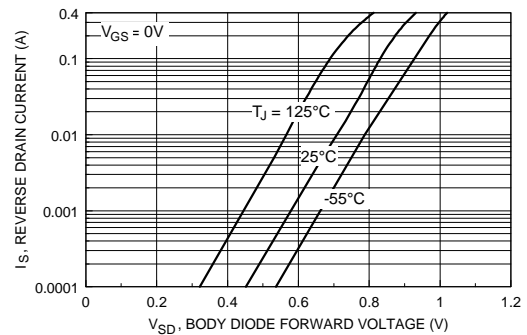


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

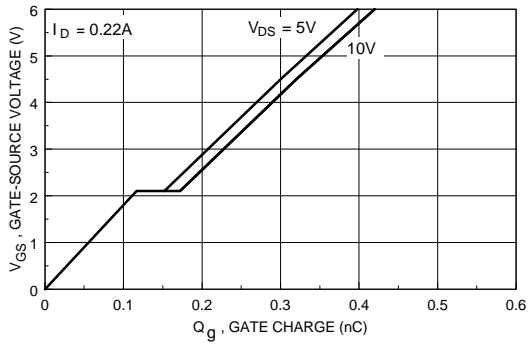


Figure 7. Gate Charge Characteristics.

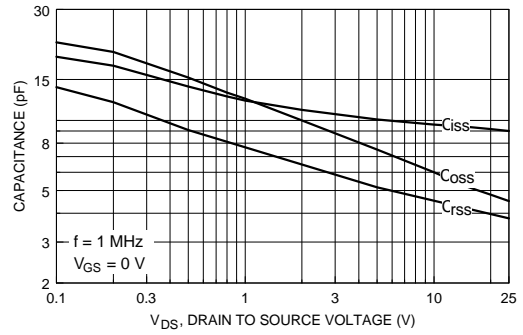


Figure 8. Capacitance Characteristics.

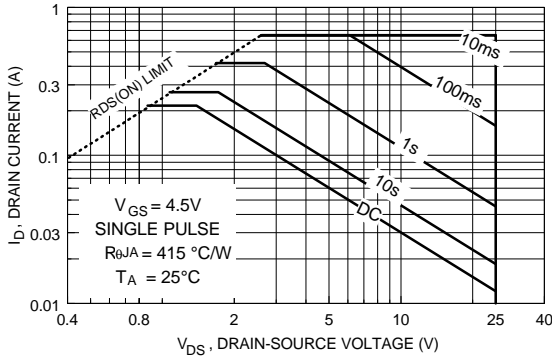


Figure 9. Maximum Safe Operating Area.

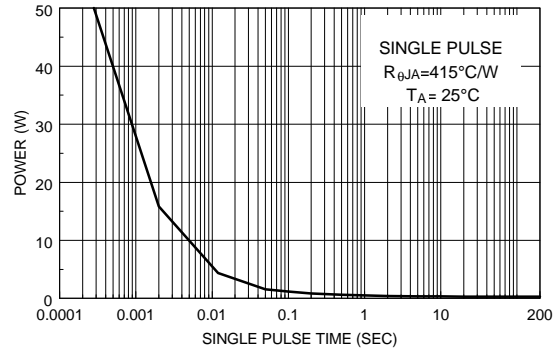


Figure 10. Single Pulse Maximum Power Dissipation.

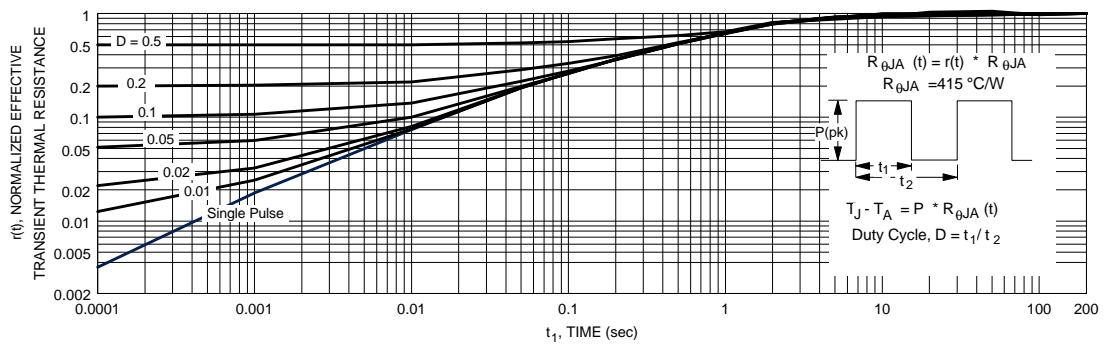


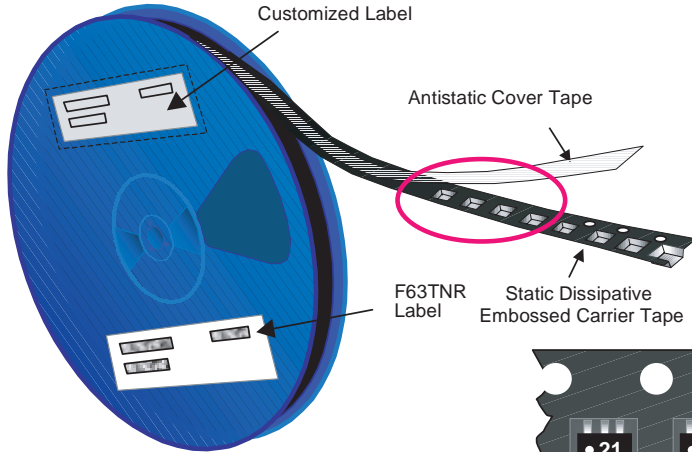
Figure 11. Transient Thermal Response Curve.

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

SC70-6 Tape and Reel Data and Package Dimensions



SC70-6 Packaging Configuration: Figure 1.0

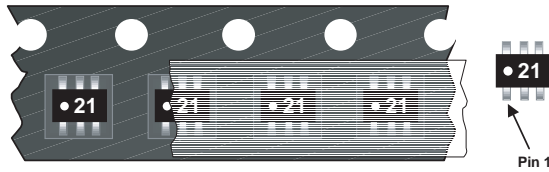


Packaging Description:

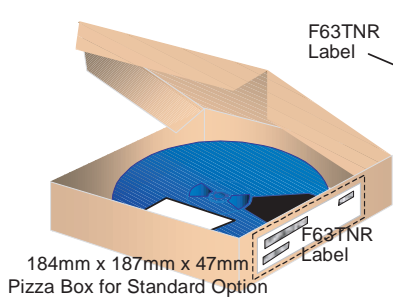
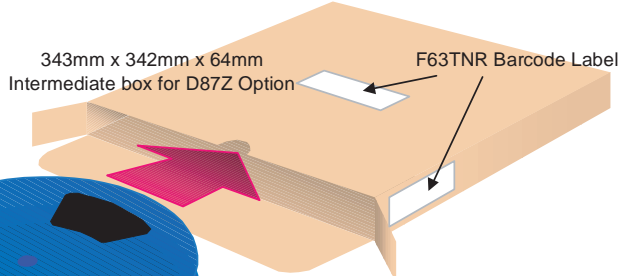
SC70-6 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in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



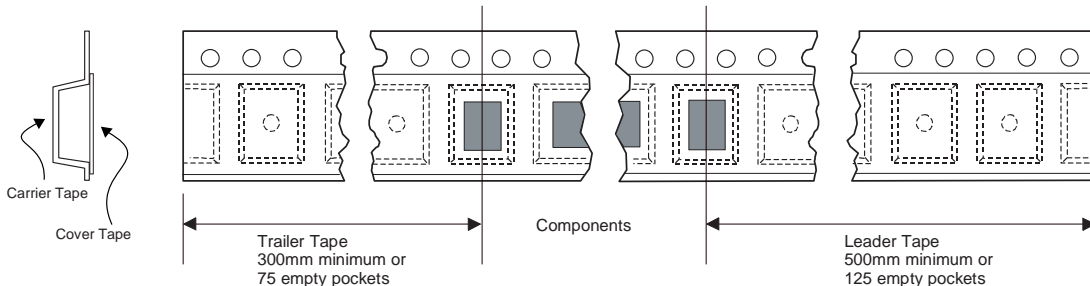
SC70-6 Unit Orientation



F63TNR Label sample

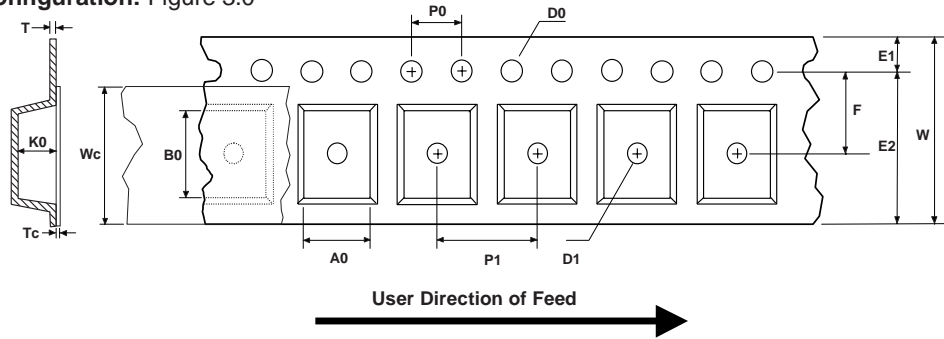


SC70-6 Tape Leader and Trailer Configuration: Figure 2.0



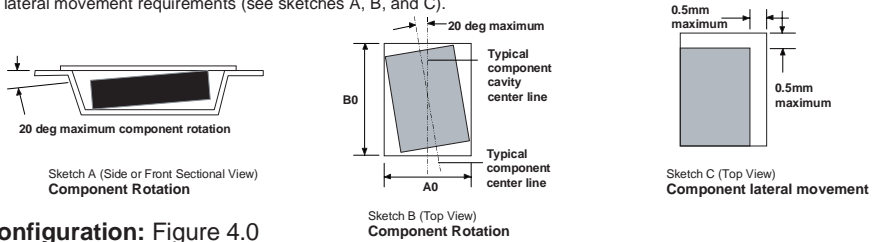
SC70-6 Tape and Reel Data and Package Dimensions, continued

SC70-6 Embossed Carrier Tape Configuration: Figure 3.0

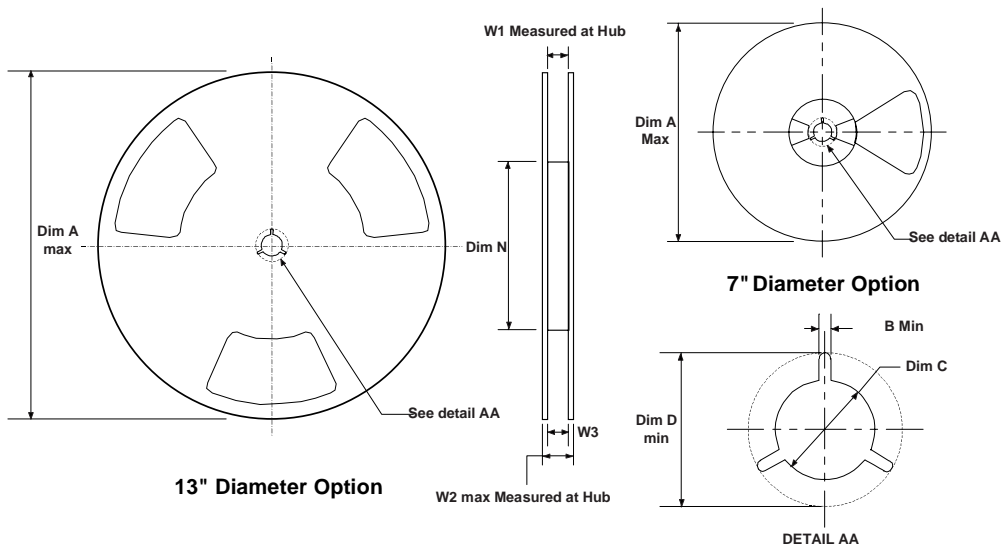


| Dimensions are in millimeter | | | | | | | | | | | | | | |
|------------------------------|-----------------|-----------------|---------------|-----------------|-------------------|-----------------|-------------|-----------------|---------------|---------------|-----------------|-------------------|---------------|-----------------|
| 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).



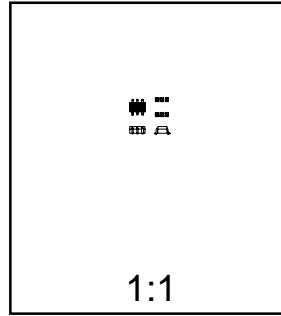
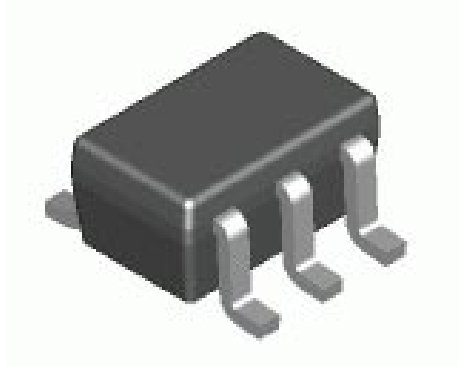
SC70-6 Reel Configuration: Figure 4.0



| 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 Tape and Reel Data and Package Dimensions, continued

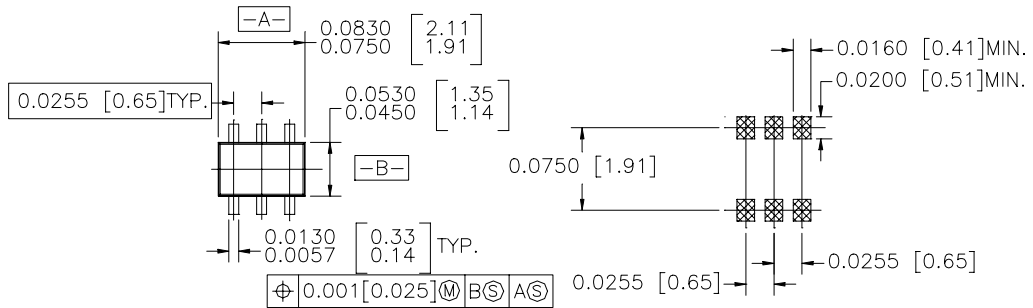
SC70-6 (FS PKG Code 76)



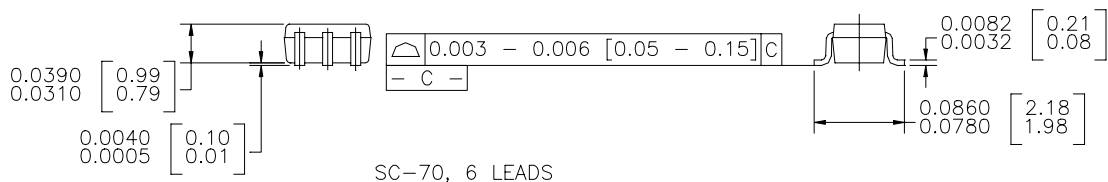
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0055



LAND PATTERN RECOMMENDATION



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