



NC7SZ11 TinyLogic® UHS Three-Input AND Gate

Features

- Ultra-High Speed: t_{PD} 2.7 ns (Typical) into 50 pF at 5V V_{CC}
- High Output Drive: ± 24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Power Down High Impedance Inputs/Outputs
- Over-Voltage Tolerance inputs facilitate 5 V to 3 V Translation
- Proprietary Noise/EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC70 Package

Description

The NC7SZ11 is a single three-input AND Gate from Fairchild's Ultra-High Speed Series of TinyLogic®. The device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive while maintaining low static power dissipation over a broad V_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V V_{CC} operating range. The inputs and output are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 7 V, independent of V_{CC} operating voltage.

Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|--|---------------------------|
| NC7SZ11P6X | Z11 | 6-Lead SC70, EIAJ SC-88a, 1.25 mm Wide | 3000 Units on Tape & Reel |
| NC7SZ11L6X | E7 | 6-Lead MicroPak™, 1.00 mm Wide | 5000 Units on Tape & Reel |

Connection Diagrams

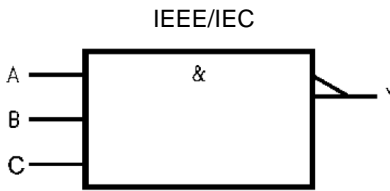
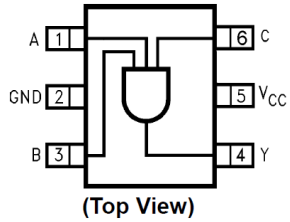
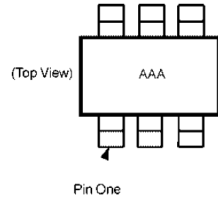


Figure 1. Logic Symbol

Pin Configurations



Pin One Orientation Diagram



AAA represents Product Code Top Mark - see ordering code.

Note: Orientation of Top Mark determines Pin One location. Read the Top Product Code Mark left to right, Pin One is the lower left pin (see diagram)

Figure 2. SC70 (Top View)

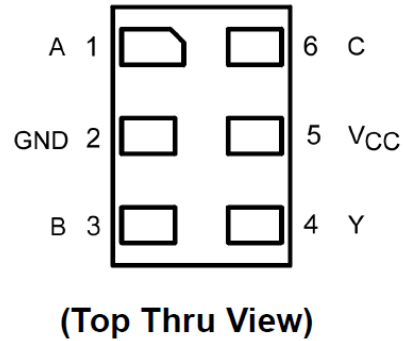


Figure 3. MicroPak (Top Through View)

Pin Definitions

| Pin # SC70 | Pin # MicroPak | Name | Description |
|------------|----------------|-----------------|----------------|
| 1 | 1 | A | Input |
| 2 | 2 | GND | Ground |
| 3 | 3 | B | Input |
| 4 | 4 | Y | Output |
| 5 | 5 | V _{CC} | Supply Voltage |
| 6 | 6 | C | Input |

Function Table

Y=ABC

| Inputs | | | Output |
|--------|---|---|--------|
| A | B | C | Y |
| X | X | L | L |
| X | L | X | L |
| L | X | X | L |
| H | H | H | H |

H = HIGH Logic Level

L = LOW Logic Level

X = Either LOW or HIGH Logic Level

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | | Min. | Max. | Unit |
|-----------------------|---|---|------|----------|--------------------|
| V_{CC} | Supply Voltage | | -0.5 | 7.0 | V |
| V_{IN} | DC Input Voltage | | -0.5 | 7.0 | V |
| V_{OUT} | DC Output Voltage | | -0.5 | 7.0 | V |
| I_{IK} | DC Input Diode Current | $V_{IN} < -0.5\text{ V}$ | | -50 | mA |
| I_{OK} | DC Output Diode Current | $V_{OUT} < -0.5\text{ V}$ | | -50 | mA |
| | | $V_{OUT} > 6\text{ V}, V_{CC}=\text{GND}$ | | +20 | |
| I_{OUT} | DC Output Current | | | ± 50 | mA |
| I_{CC} OR I_{GND} | DC V_{CC} or Ground Current | | | ± 50 | mA |
| T_{STG} | Storage Temperature Range | | -65 | +150 | $^{\circ}\text{C}$ |
| T_J | Junction Temperature Under Bias | | | +150 | $^{\circ}\text{C}$ |
| T_L | Junction Lead Temperature (Soldering, 10 Seconds) | | | +260 | $^{\circ}\text{C}$ |
| P_D | Power Dissipation at +85 $^{\circ}\text{C}$ | SC70-6 | | 150 | mW |
| | | MicroPak-6 | | 130 | |
| ESD | Human Body Model, JESD22-A114 | | | 4000 | V |
| | Charged Device Model, JESD22-C101 | | | 2000 | |

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol | Parameter | Conditions | Min. | Max. | Unit |
|---------------|-------------------------------|--------------------------------------|------|----------|-----------------------------|
| V_{CC} | Supply Voltage Operating | | 1.65 | 5.50 | V |
| | Supply Voltage Data Retention | | 1.50 | 5.50 | |
| V_{IN} | Input Voltage | | 0 | 5.5 | V |
| V_{OUT} | Output Voltage | | 0 | V_{CC} | V |
| T_A | Operating Temperature | | -40 | +85 | $^{\circ}\text{C}$ |
| t_r, t_f | Input Rise and Fall Times | V_{CC} at 1.8 V, 2.5 V \pm 0.2 V | 0 | 20 | ns/V |
| | | V_{CC} at 3.3 V \pm 0.3 V | 0 | 10 | |
| | | V_{CC} at 5.0 V \pm 0.5 V | 0 | 5 | |
| θ_{JA} | Thermal Resistance | SC70-6 | | 425 | $^{\circ}\text{C}/\text{W}$ |
| | | MicroPak-6 | | 500 | |

Note:

1. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

| Symbol | Parameter | V _{CC} | Conditions | T _A =25°C | | | T _A =-40 to +85°C | | Unit |
|------------------|---------------------------|-----------------|---|----------------------|-----------------------------|----------------------|------------------------------|----------------------|------|
| | | | | Min. | Typ. | Max. | Min. | Max. | |
| V _{IH} | HIGH Level Input Voltage | 1.8 ± 0.15 | | 0.75 V _{CC} | | | 0.75 V _{CC} | | V |
| | | 2.30 to 5.50 | | 0.70 V _{CC} | | | 0.70 V _{CC} | | |
| V _{IL} | LOW Level Input Voltage | 1.8 ± 0.15 | | | | 0.25 V _{CC} | | 0.25 V _{CC} | V |
| | | 2.30 to 5.50 | | | | 0.30 V _{CC} | | 0.30 V _{CC} | |
| V _{OH} | HIGH Level Output Voltage | 1.65 | V _{IN} =V _{IH} , I _{OH} =-100 μA | 1.55 | 1.65 | | 1.55 | | V |
| | | 2.30 | | 2.20 | 2.30 | | 2.20 | | |
| | | 3.00 | | 2.90 | 3.00 | | 2.90 | | |
| | | 4.50 | | 4.40 | 4.50 | | 4.40 | | |
| | | 1.65 | I _{OH} =-4 mA | 1.29 | 1.52 | | 1.29 | | |
| | | 2.30 | I _{OH} =-8 mA | 1.90 | 2.15 | | 1.90 | | |
| | | 3.00 | I _{OH} =-16 mA | 2.50 | 2.80 | | 2.40 | | |
| | | 3.00 | I _{OH} =-24 mA | 2.40 | 2.68 | | 2.30 | | |
| | | 4.50 | I _{OH} =-32 mA | 3.90 | 4.20 | | 3.80 | | |
| V _{OL} | LOW Level Output Voltage | 1.65 | V _{IN} =V _{IL} , I _{OL} =100 μA | | 0.00 | 0.10 | | 0.10 | V |
| | | 2.30 | | | 0.00 | 0.10 | | 0.10 | |
| | | 3.00 | | | 0.00 | 0.10 | | 0.10 | |
| | | 4.50 | | | 0.00 | 0.10 | | 0.10 | |
| | | 1.65 | I _{OL} =4 mA | | 0.80 | 0.24 | | 0.24 | |
| | | 2.30 | I _{OL} =8 mA | | 0.10 | 0.30 | | 0.30 | |
| | | 3.00 | I _{OL} =16 mA | | 0.15 | 0.40 | | 0.40 | |
| | | 3.00 | I _{OL} =24 mA | | 0.22 | 0.55 | | 0.55 | |
| | | 4.50 | I _{OL} =32 mA | | 0.22 | 0.55 | | 0.55 | |
| | | I _{IN} | Input Leakage Current | 0 to 5.5 | V _{IN} =5.5 V, GND | | | ±1 | |
| I _{OFF} | Power Off Leakage Current | 0 | V _{IN} or V _{OUT} =5.5 V | | | 1 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.50 | V _{IN} =5.5 V, GND | | | 2 | | 20 | μA |

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} | Conditions | T _A =25°C | | | T _A =-40 to +85°C | | Unit | Figure |
|-------------------------------------|--|-----------------|---|----------------------|------|------|------------------------------|------|------|----------------------|
| | | | | Min. | Typ. | Max. | Min. | Max. | | |
| t _{PLH} , t _{PHL} | Propagation Delay | 1.80 ± 0.15 | C _L =15 pF, R _L =1M Ω | 2.0 | 9.0 | 18.5 | 2.0 | 19.0 | ns | Figure 4 Figure 5 |
| | | 2.50 ± 0.20 | | 0.8 | 4.9 | 10.5 | 0.8 | 11.0 | | |
| | | 3.30 ± 0.30 | | 0.5 | 3.5 | 8.5 | 0.5 | 9.0 | | |
| | | 5.00 ± 0.50 | | 0.5 | 2.5 | 6.5 | 0.5 | 7.0 | | |
| | | 3.30 ± 0.30 | C _L =50 pF, R _L =500 Ω | 1.5 | 4.1 | 8.5 | 1.5 | 9.0 | | |
| | | 5.00 ± 0.50 | | 0.8 | 2.9 | 7.5 | 0.8 | 8.0 | | |
| C _{IN} | Input Capacitance | 0.00 | | | 4 | | | | pF | |
| C _{PD} | Power Dissipation Capacitance ⁽²⁾ | 3.30 | | | 20 | | | | pF | Figure 6 |
| | | 5.00 | | | 25 | | | | | |

Note:

- C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output lading and operating at 50% duty cycle. C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CCStatic}).

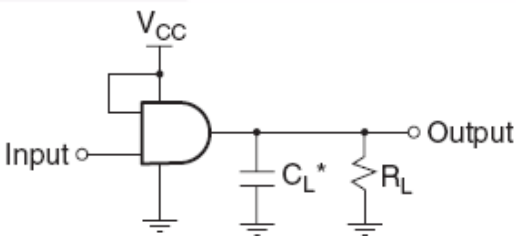


Figure 4. AC Test Circuit

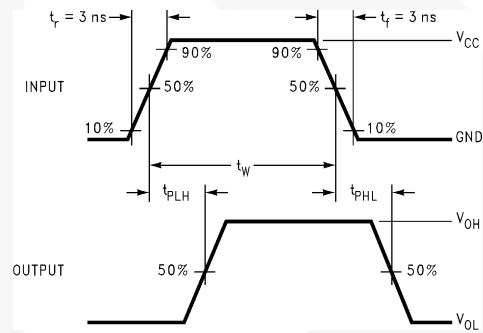


Figure 5. AC Waveforms

Notes:

- C_L includes load and stray capacitance.
- Input PRR=1.0 MHz; t_w500 ns.

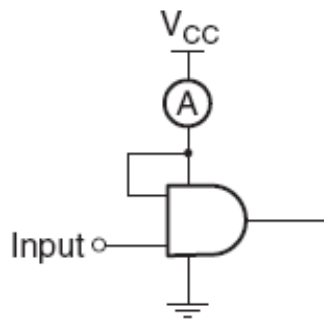


Figure 6. I_{CCD} Test Circuit

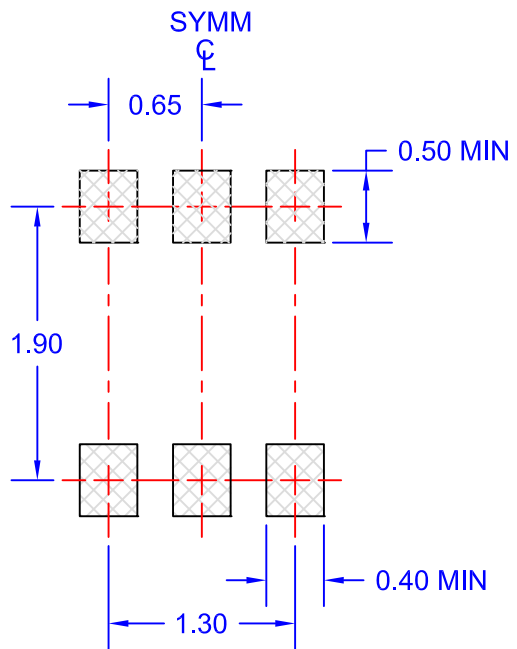
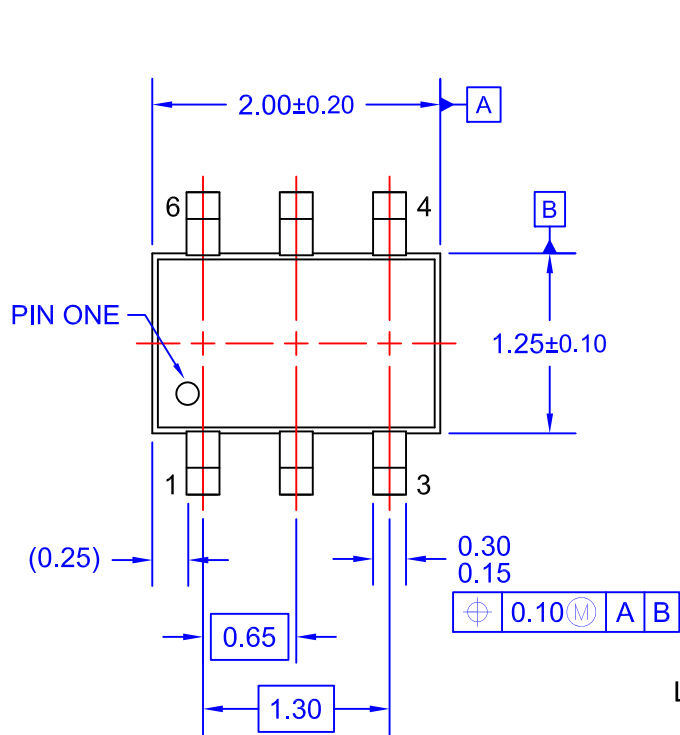
Note:

- Input=AC Waveform; t_r=t_f=1.8 ns; PRR=10 MHz; Duty Cycle=50%.

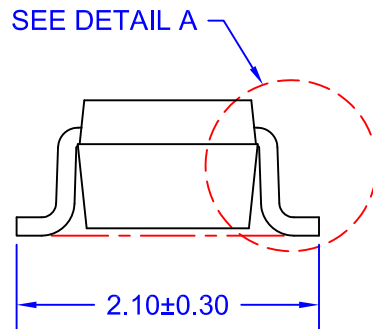
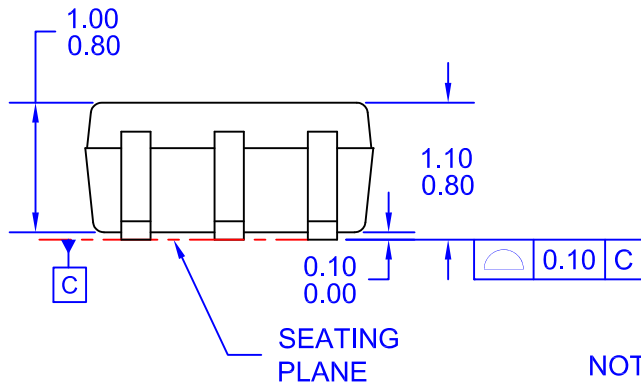
Tape and Reel Specifications

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| P6X | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status |
|--------------------|--------------------|---------------|---------------|-------------------|
| L6X | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 5000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |



LAND PATTERN RECOMMENDATION

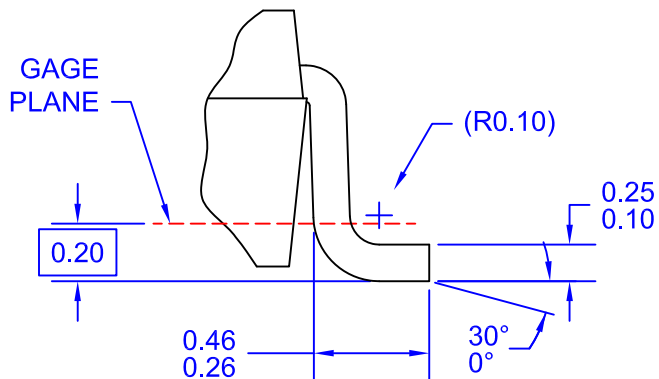


NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE CONFORMS TO EIAJ SC-88, 1996.

B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.

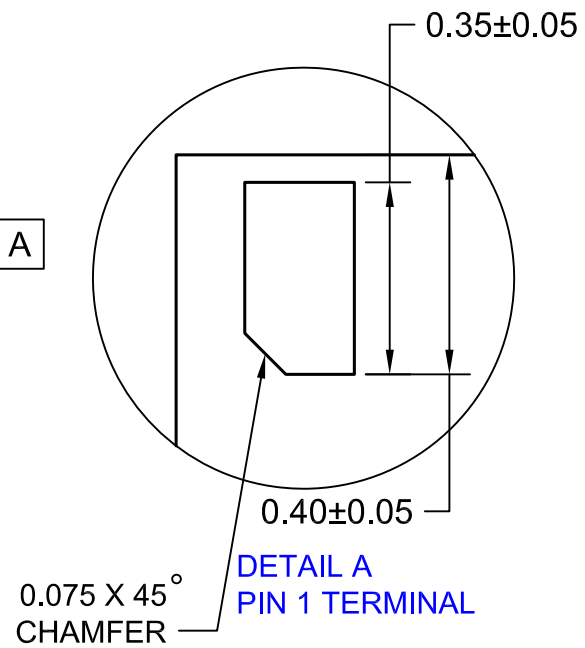
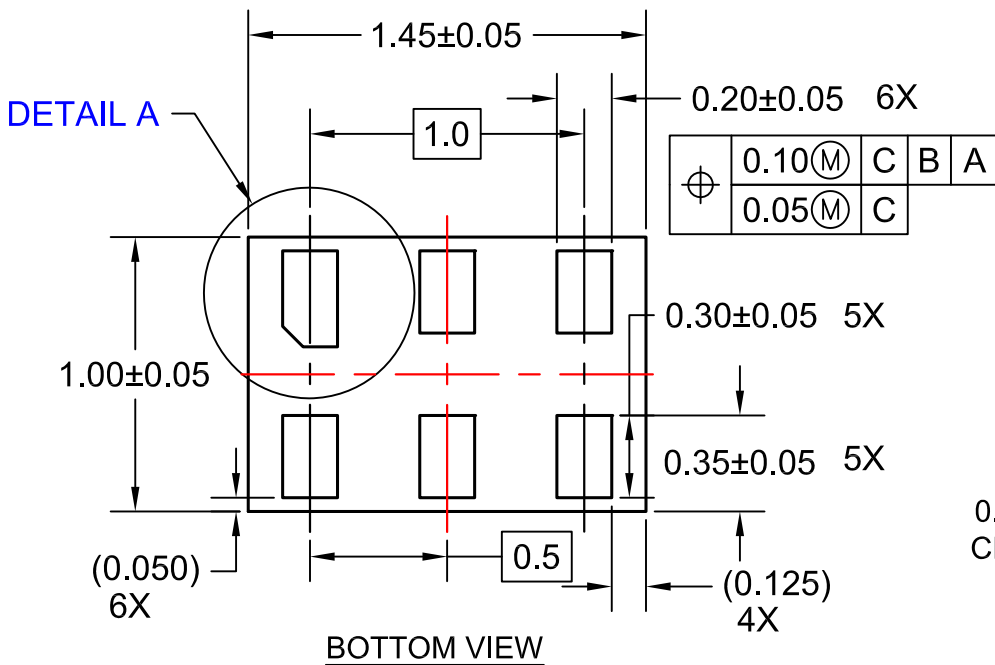
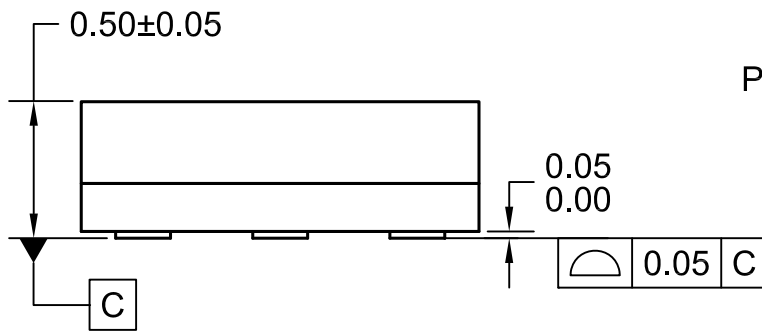
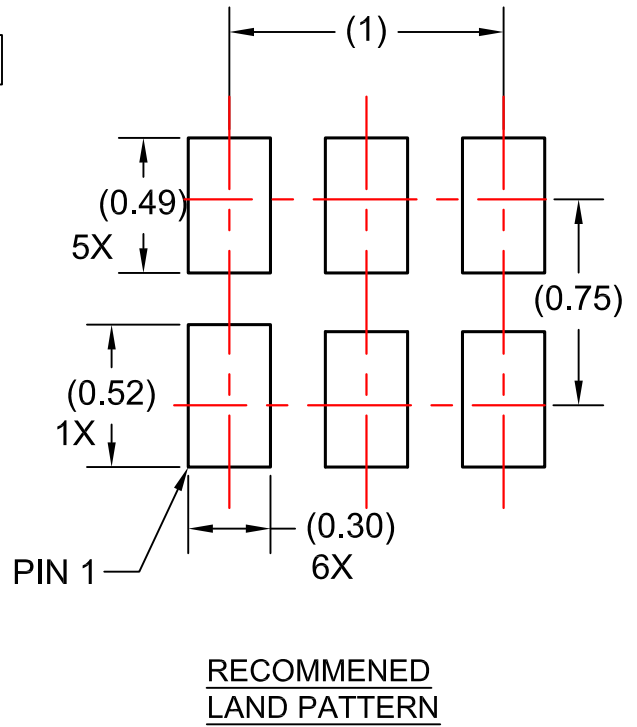
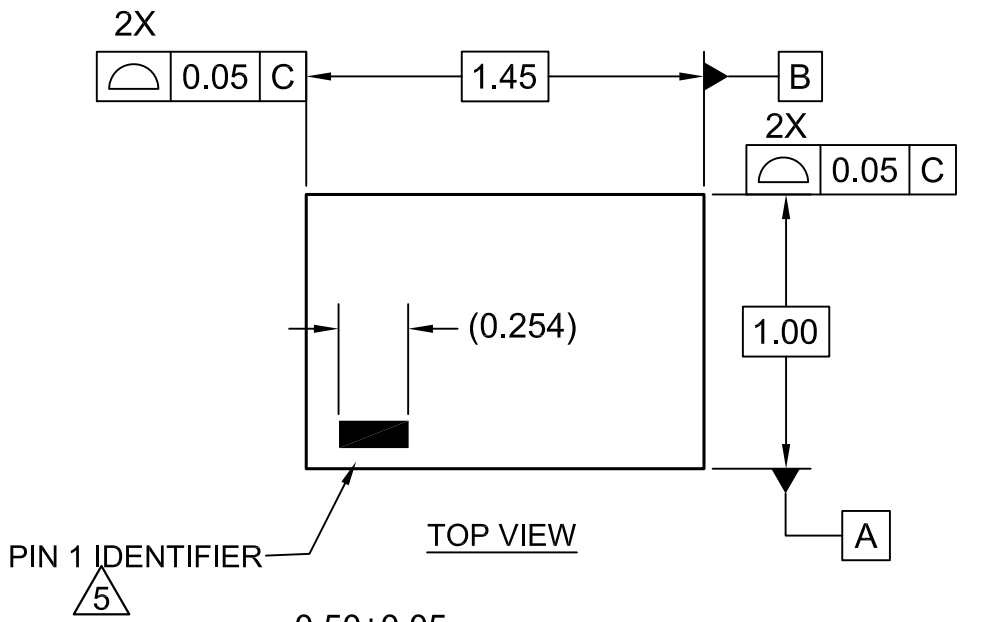
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009

E) DRAWING FILENAME: MKT-MAA06AREV7



DETAIL A
 SCALE: 60X





NOTES:

1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. LANDPATTERN RECOMMENDATION PER FSC
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.
6. FILENAME AND REVISION: MAC06AREV6





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- | | | | |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™ | F-PFS™ | OPTOPLANAR® | SYSTEM GENERAL® |
| AttitudeEngine™ | FRFET® | Power Supply WebDesigner™ | TinyBoost® |
| Awinda® | Global Power Resource™ | PowerTrench® | TinyBuck® |
| AX-CAP®* | GreenBridge™ | PowerXS™ | TinyCalc™ |
| BitSiC™ | Green FPS™ | Programmable Active Droop™ | TinyLogic® |
| Build it Now™ | Green FPS™ e-Series™ | QFET® | TINYOPTO™ |
| CorePLUS™ | Gmax™ | QS™ | TinyPower™ |
| CorePOWER™ | GTO™ | Quiet Series™ | TinyPWM™ |
| CROSSVOL™ | IntelliMAX™ | RapidConfigure™ | TinyWire™ |
| CTL™ | ISOPLANAR™ | Saving our world, 1mW/W/kW at a time™ | TranSiC™ |
| Current Transfer Logic™ | Making Small Speakers Sound Louder and Better™ | SignalWise™ | TriFault Detect™ |
| DEUXPEED® | MegaBuck™ | SmartMax™ | TRUECURRENT®* |
| Dual Cool™ | MICROCOUPLER™ | SMART START™ | μSerDes™ |
| EcoSPARK® | MicroFET™ | Solutions for Your Success™ | UHC® |
| EfficientMax™ | MicroPak™ | SPM® | Ultra FRFET™ |
| ESBC™ | MicroPak2™ | STEALTH™ | UniFET™ |
| F [®] | MillerDrive™ | SuperFET® | VCX™ |
| Fairchild® | MotionMax™ | SuperSOT™-3 | VisualMax™ |
| Fairchild Semiconductor® | MotionGrid® | SuperSOT™-6 | VoltagePlus™ |
| FACT Quiet Series™ | MTi® | SuperSOT™-8 | XST™ |
| FACT® | MTx® | SupreMOS® | Xsens™ |
| FastvCore™ | MVN® | SyncFET™ | 仙童® |
| FETBench™ | mWSaver® | Sync-Lock™ | |
| FPS™ | OptoHiT™ | | |
| | OPTOLOGIC® | | |

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

| Datasheet Identification | Product Status | Definition |
|--------------------------|-----------------------|---|
| Advance Information | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design. |
| Obsolete | Not In Production | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only. |

Rev. I77