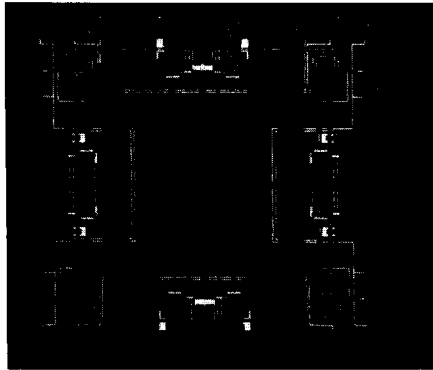


GaAs MMIC HIGH ISOLATION TRANSFER SWITCH DC - 10 GHz

FEBRUARY 1998

Features

- BAND WIDTH: DC - 10GHz
- INSERTION LOSS: 2.0 dB
- ISOLATION: > 50 dB



General Description

The HMC150 is a transfer switch which provides high isolation over a DC to 10GHz frequency range. The device can be used to switch additional gain (or attenuation) in series with the signal path. Alternatively, the device can be used to reverse the signal path through any two port device. Switch control is via complementary logic paths A and B located in several locations along the periphery of the MMIC.

7
Switches

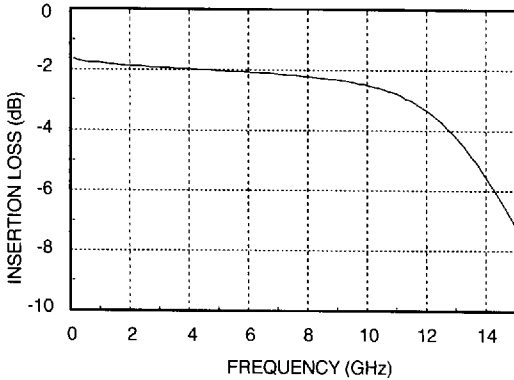
Electrical Performance With 0/-5V Control, 50 Ohm System, -55 to +85 deg C

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 5GHz		2.0	2.5	dB
	DC - 10 GHz		2.6	3.1	dB
Isolation	DC - 10 GHz	45	50		dB
Return Loss	DC - 5 GHz	14	18		dB
	DC - 10 GHz	10	14		dB
Phase Balance	DC - 10GHz		1		Deg
Input Power for 1dB Compression (0/-5V Ctl)	0.5 - 10 GHz	+22	+27		dBm
Input Third Order Intercept	0.5 - 10 GHz	+38	+42		dBm
Switching Characteristics	DC - 10 GHz	tRISE, tFALL (10/90% RF)	3		ns
		tON, tOFF (50% CTL to 10/90% RF)	6		ns

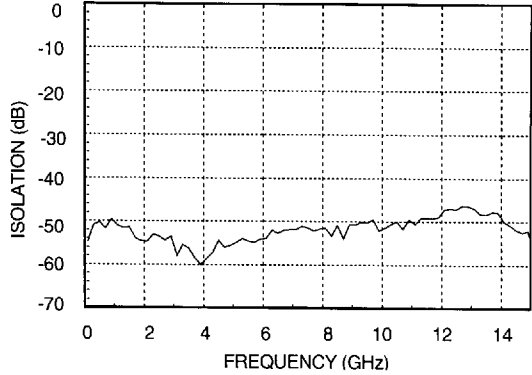
HMC150 HIGH ISOLATION TRANSFER SWITCH DC - 10 GHz

FEBRUARY 1998

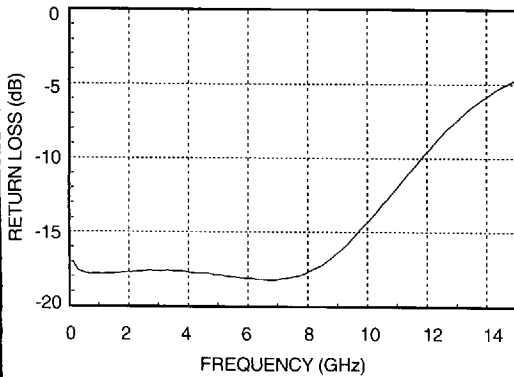
Insertion Loss



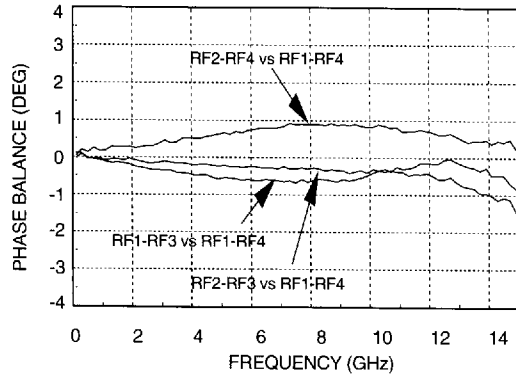
Isolation



Return Loss



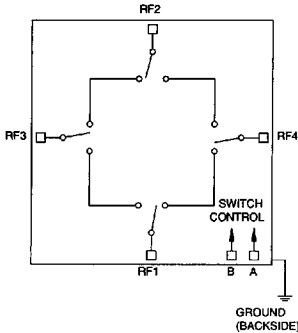
Phase Balance



HMC150 HIGH ISOLATION TRANSFER SWITCH DC - 10 GHz

FEBRUARY 1998

Schematic



Truth Table

Control Input		Signal Path State	
A	B	RF to RF1	RF to RF2
High	Low	ON	OFF
Low	High	OFF	ON

Absolute Maximum Ratings

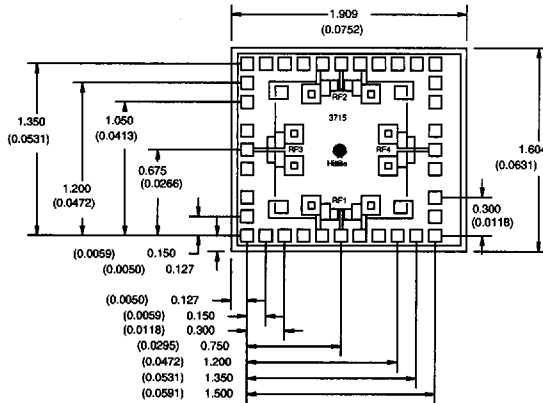
Control Voltage Range	+0.5 to -7.5 Vdc
Storage Temperature	-65 to +150 deg C
Operating Temperature	-55 to +125 deg C

Control Voltages

State	Bias Condition
Low	0 to -0.2V @ 20uA Max.
High	-5V @ 200uA Typ to -7V @ 600uA Max

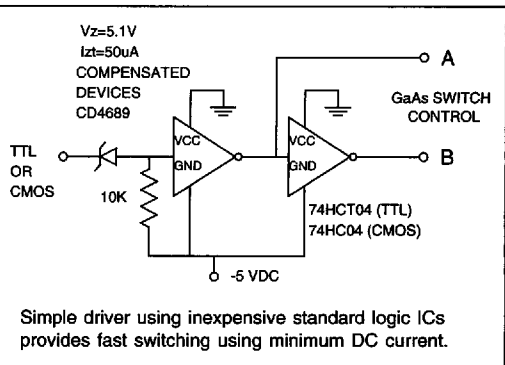
7
Switches

Outline



ALL DIMENSION IN MILLIMETERS (INCHES)
ALL TOLERANCES ARE ±0.025 (0.001)
DIE THICKNESS IS 100(0.004), BACKSIDE IS GROUND
BOND PADS ARE 100(0.004), SQUARE
BOND PAD METALLIZATION: GOLD
BACKSIDE METALLIZATION: GOLD

Suggested Driver Circuit



Simple driver using inexpensive standard logic ICs provides fast switching using minimum DC current.

HMC150 HIGH ISOLATION TRANSFER SWITCH DC - 10 GHz

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Handling Precautions

Follow these precautions to avoid permanent damage:

Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.

Static Sensitivity: Follow ESD precautions to protect against $\geq \pm 250V$ ESD strikes (*see page 8 - 2*).

Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.

General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

Mounting

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat.

Eutectic Die Attach:

A 80/20 gold tin preform is recommended with a work surface temperature of 255 deg. C and a tool temperature of 265 deg. C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 deg. C.

DO NOT expose the chip to a temperature greater than 320 deg. C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

Epoxy Die Attach:

Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position.

Cure epoxy per the manufacturer's schedule.

Wire Bonding

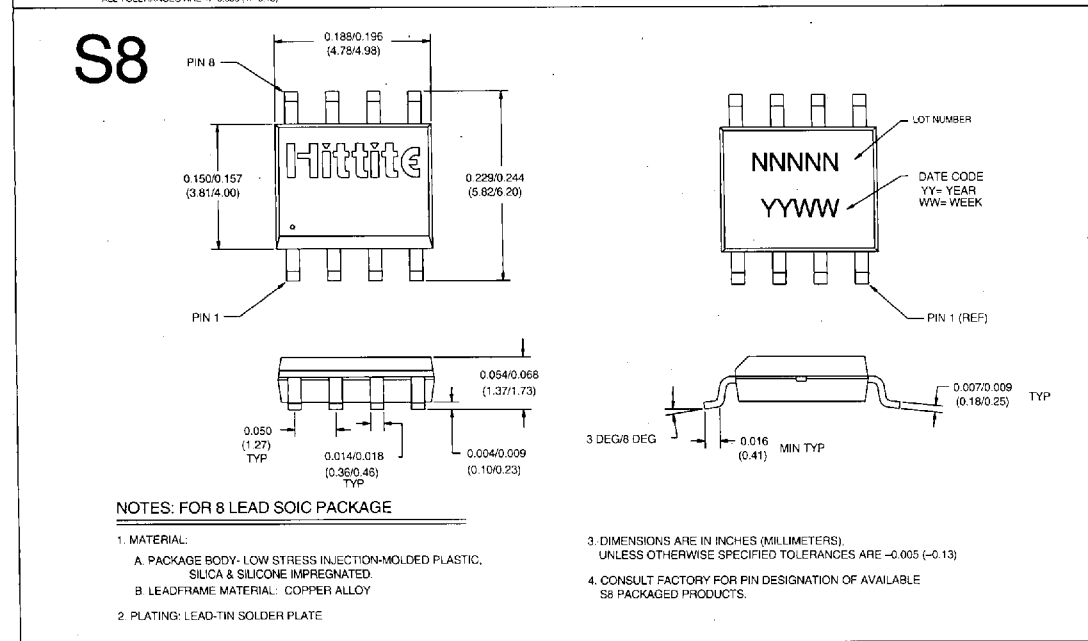
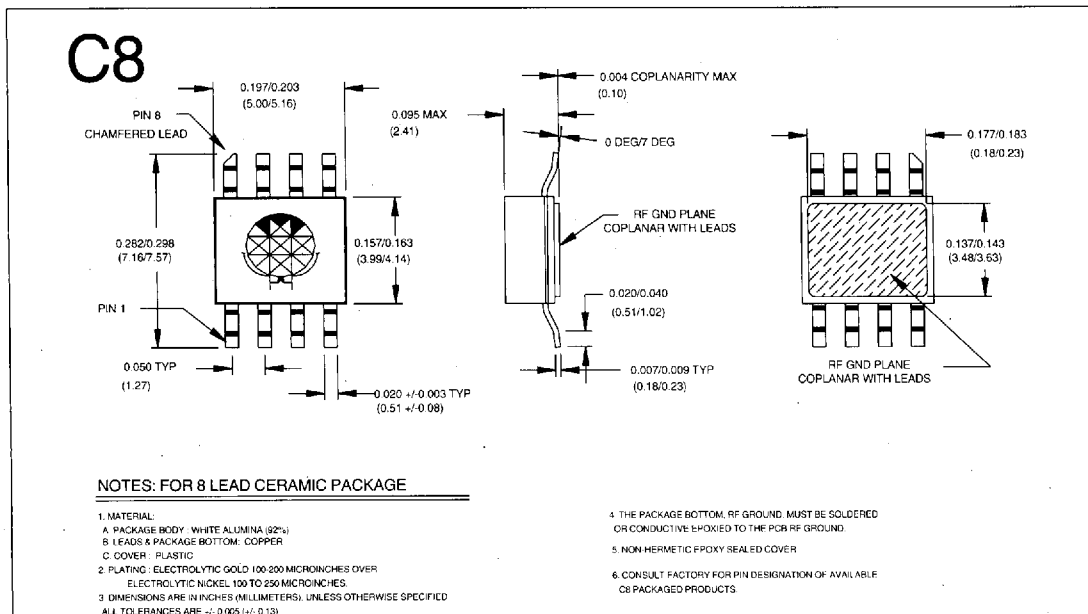
Ball or wedge bond with 1.0 diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 deg. C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds.

Wirebonds should be started on the chip and terminated on the package. RF bonds should be as short as possible.

7
Switches

PACKAGE OUTLINE DRAWINGS

FEBRUARY 1998

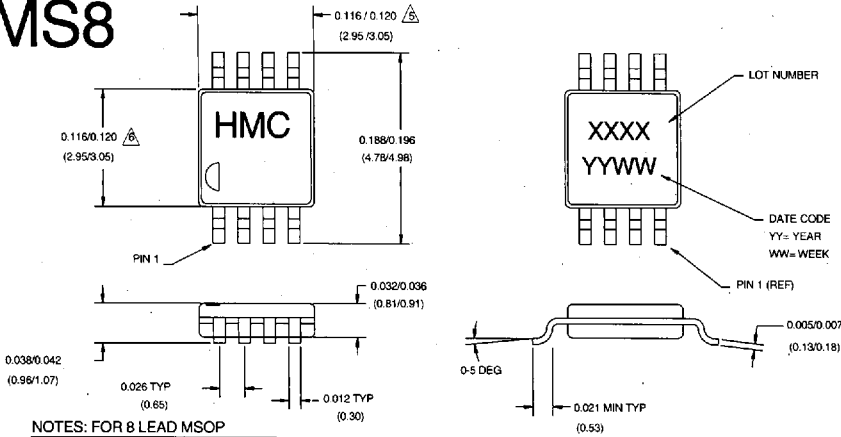


9
 Package Outline Drawings

PACKAGE OUTLINE DRAWINGS

FEBRUARY 1998

MS8

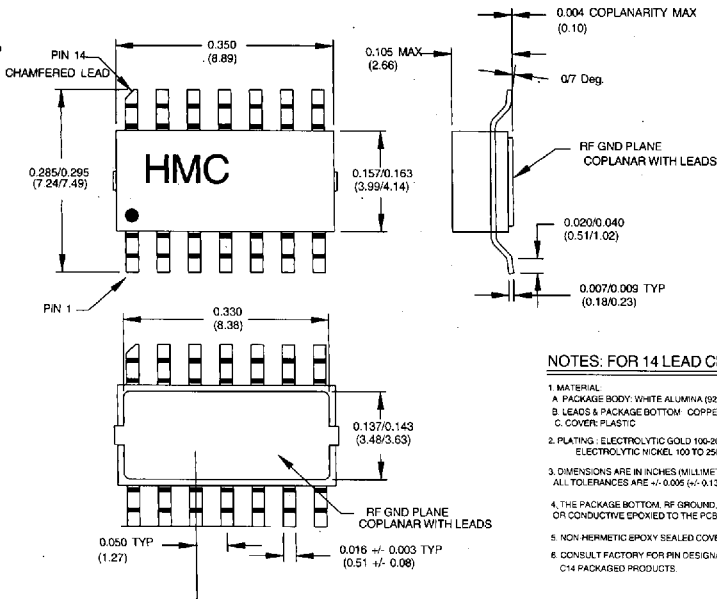


NOTES: FOR 8 LEAD MSOP

- MATERIAL:
 - PACKAGE BODY- LOW STRESS INJECTION-MOLDED PLASTIC, SILICA & SILICONE IMPREGNATED.
 - LEADFRAME MATERIAL: COPPER ALLOY
- PLATING: LEAD-TIN SOLDER PLATE
- DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE +/- 0.005 (+/- 0.13)

- 4 CHARACTERS TO BE HELVETICA MEDIUM .030 HIGH WHITE INK LOCATED APPROXIMATELY AS SHOWN
- Δ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.006 (0.15mm) PER SIDE
- Δ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.010 (0.25mm) PER SIDE

C14



NOTES: FOR 14 LEAD CERAMIC PACKAGE

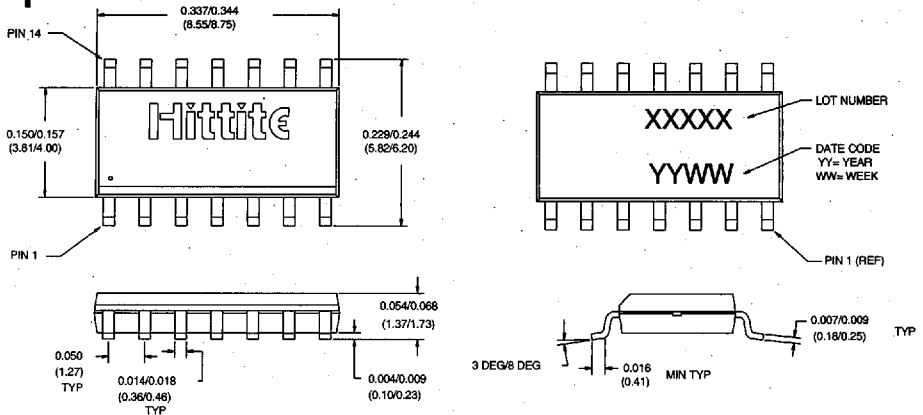
- MATERIAL:
 - PACKAGE BODY: WHITE ALUMINA (92%)
 - LEADS & PACKAGE BOTTOM: COPPER
 - COVER: PLASTIC
- PLATING: ELECTROLYTIC GOLD 100-200 MICRONS OVER ELECTROLYTIC NICKEL 100 TO 250 MICRONS
- DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED ALL TOLERANCES ARE +/- 0.005 (+/- 0.13)
- THE PACKAGE BOTTOM: RF GROUND: MUST BE SOLDERED OR CONDUCTIVE EPOXYED TO THE PCB RF GROUND.
- NON-HERMETIC EPOXY SEALED COVER
- CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE C14 PACKAGED PRODUCTS.

9
Package Outline Drawings

PACKAGE OUTLINE DRAWINGS

FEBRUARY 1998

S14



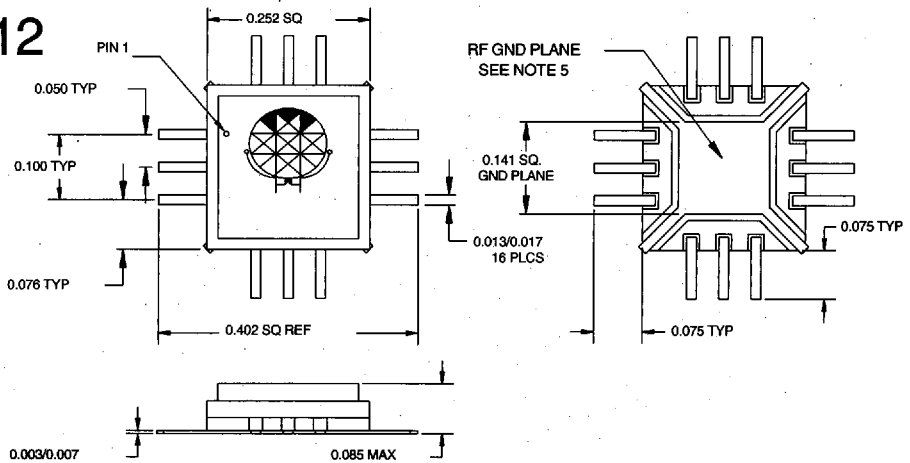
NOTES: FOR 14 LEAD SOIC PACKAGE

1. MATERIAL:
 - A. PACKAGE BODY: LOW STRESS INJECTION-MOLDED PLASTIC, SILICA & SILICONE IMPREGNATED
 - B. LEADFRAME MATERIAL: COPPER ALLOY
2. PLATING: LEAD-TIN SOLDER PLATE

3. DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE +/-0.005 (+/-0.13)

4. CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE S14 PACKAGED PRODUCTS.

C12



NOTES: FOR 12 LEAD CERAMIC PACKAGE

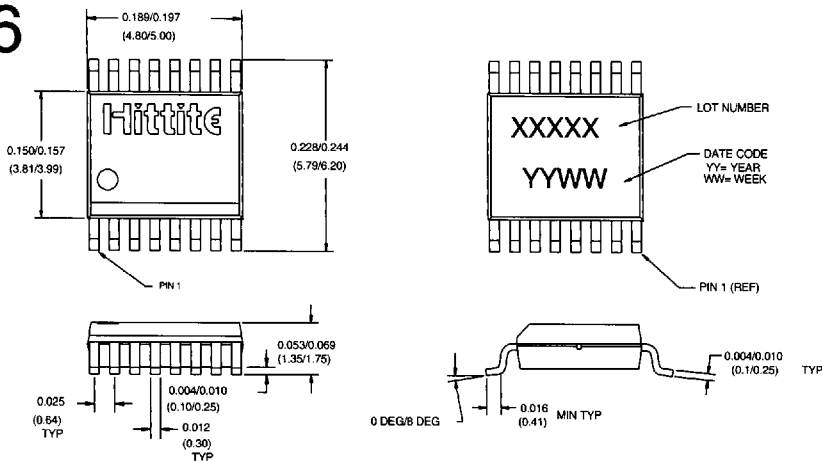
1. MATERIAL:
 - A. PACKAGE BODY & COVER: WHITE ALUMINA (92%)
 - B. LEADS: KOVAR(80) OR ASTM F15 (ALLOY 42) EQUIVALENT
2. PLATING (LEADS): ELECTROLYTIC GOLD 25 MICRONS MINIMUM OVER ELECTROLYTIC NICKEL 100 TO 250 MICRONS THICK
3. DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE SPECIFIED ALL TOLERANCES ARE +/-0.005

4. NON-HERMETIC EPOXY SEALED COVER.
5. THE PACKAGE BOTTOM, RF GROUND, MUST BE SOLDERED OR CONDUCTIVE EPOXYED TO THE RF PCB GROUND
6. CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE C12 PACKAGED PRODUCTS.

PACKAGE OUTLINE DRAWINGS

FEBRUARY 1998

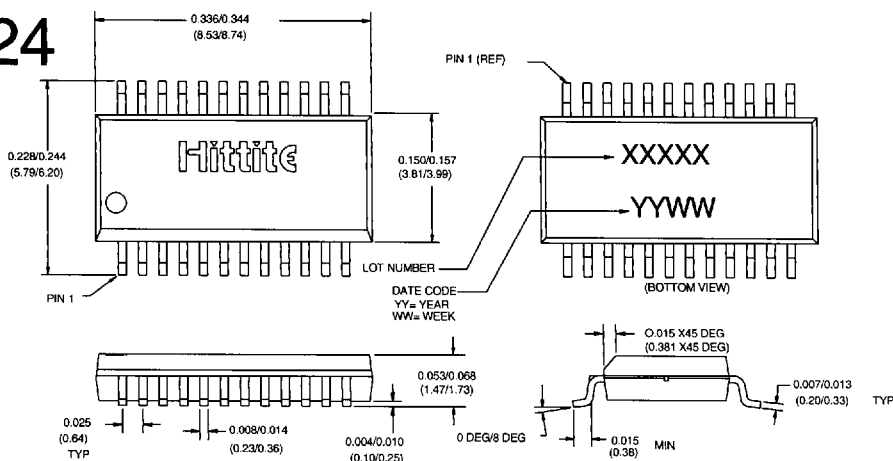
QS16



NOTES: FOR 16 LEAD QSOP PACKAGE

- MATERIAL:
 - PACKAGE BODY: LOW STRESS INJECTION-MOLDED PLASTIC, SILICA & SILICONE IMPREGNATED.
 - LEADFRAME MATERIAL: COPPER ALLOY
 - PLATING: LEAD-TIN SOLDER PLATE
3. DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE ± 0.005 (± 0.13)
4. CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE QS16 PACKAGED PRODUCTS.

QS24



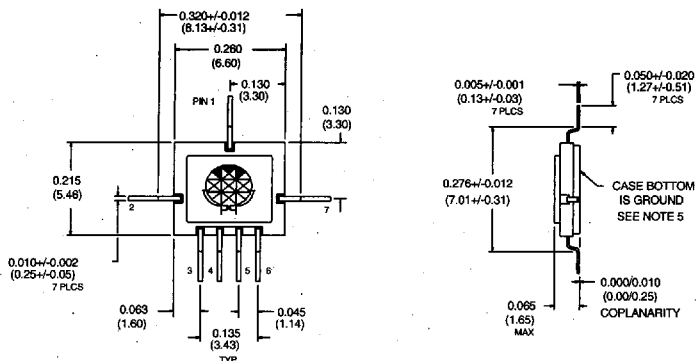
NOTES: FOR 24 LEAD QSOP PACKAGE

- MATERIAL:
 - PACKAGE BODY: LOW STRESS INJECTION-MOLDED PLASTIC, SILICA & SILICONE IMPREGNATED.
 - LEADFRAME MATERIAL: COPPER ALLOY
 - PLATING: LEAD-TIN SOLDER PLATE
3. DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE ± 0.005 (± 0.13)
4. CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE QS24 PACKAGED PRODUCTS.

PACKAGE OUTLINE DRAWINGS

FEBRUARY 1998

G7

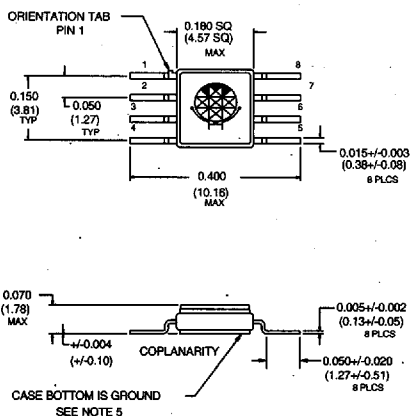


NOTES: FOR 7 LEAD CERAMIC PACKAGE

- MATERIAL:
 - G7 PACKAGE:
 - PACKAGE BODY- WHITE ALUMINA (92%)
 - LEADS, BASE, & COVER - ASTM F-15 ALLOY
 - CONDUCTOR TRACES- TUNGSTEN
- PLATING: ELECTROLYTIC GOLD 50 MICROINCHES MINIMUM, OVER ELECTROLYTIC NICKEL 50 MICROINCHES MINIMUM.
- DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE ± 0.005 (± 0.13)

- G8 PACKAGE IS AVAILABLE WITH STRAIGHT LEADS, SPECIFY "P7"...
- THE PACKAGE BOTTOM, RF GROUND, MUST BE SOLDERED OR CONDUCTIVE EPOXIED TO THE PCB RF GROUND.
- CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE G7 PACKAGED PRODUCTS.

G8



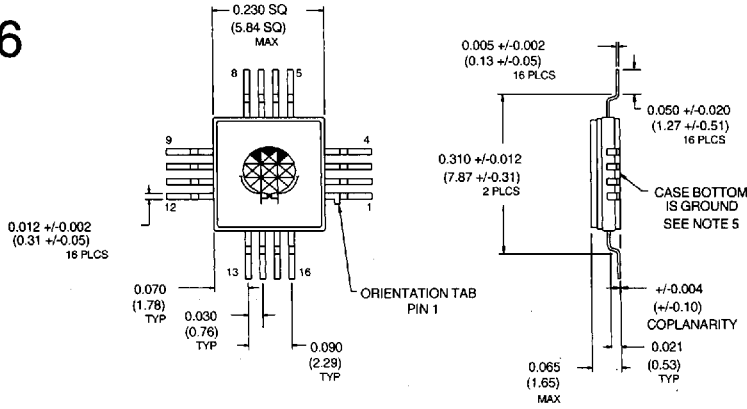
NOTES: FOR 8 LEAD GLASS/METAL PACKAGE

- MATERIAL:
 - G8 PACKAGE:
 - PACKAGE BODY- ALUMINA LOADED BOROSILICATE GLASS (#7052 CORNING)
 - LEADS, BASE, & COVER - ASTM F-15 ALLOY
- PLATING: ELECTROLYTIC GOLD 50 MICROINCHES MINIMUM, OVER ELECTROLYTIC NICKEL 50 MICROINCHES MINIMUM.
- DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE ± 0.005 (± 0.13)
- G8 PACKAGE IS AVAILABLE WITH STRAIGHT LEADS, SPECIFY "P8".
- THE PACKAGE BOTTOM, RF GROUND, MUST BE SOLDERED OR CONDUCTIVE EPOXIED TO THE PCB RF GROUND.

PACKAGE OUTLINE DRAWINGS

FEBRUARY 1998

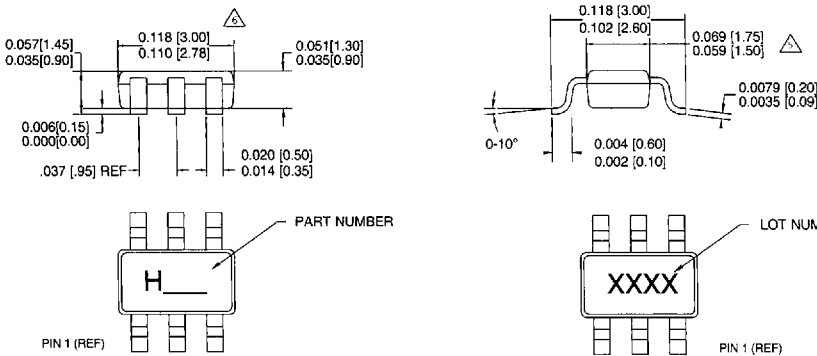
G16



NOTES: FOR 16 LEAD GLASS METAL PACKAGE

1. MATERIAL:
 - A. PACKAGE BODY: ALUMINA LOADED BOROSILICATE GLASS (#7052 CORNING)
 - B. LEADS, BASE & COVER: ASTM F-15 ALLOY
2. PLATING: ELECTROLYTIC GOLD 50 MICRONS MINIMUM OVER ELECTROLYTIC NICKEL 50 MICRONS MINIMUM
3. DIMENSIONS ARE IN INCHES (MILLIMETERS) UNLESS OTHERWISE SPECIFIED TOLERANCES ARE +/-0.005 (+/-0.13)
4. G16 PACKAGE IS AVAILABLE WITH STRAIGHT LEADS. SPECIFY 'P16'.
5. THE PACKAGE BOTTOM RF GROUND MUST BE SOLDERED OR CONDUCTIVE EPOXIED TO THE PCB RF GROUND.
6. CONSULT FACTORY FOR PIN DESIGNATION OF AVAILABLE G16 PACKAGED PRODUCTS.

SOT26



NOTES FOR 6 LEAD SOT PACKAGE:

1. MATERIAL:
 - A. PACKAGE BODY: LOW STRESS INJECTION-MOLDED PLASTIC.
 - B. LEADFRAME MATERIAL: COPPER ALLOY
 2. PLATING: LEAD-TIN SOLDER PLATE
 3. DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOLERANCES ARE 0.005 (0.13)
 4. CHARACTERS TO HELVETICA MEDIUM, .020 HIGH WHITE INK, LOCATED APPROXIMATELY AS SHOWN
- DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.006(0.15mm) PER SIDE.
 DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.010(0.25mm) PER SIDE.

Package Outline Drawings