

## Features

- 802.11b/g and Bluetooth Applications
- Low Insertion Loss:  
0.65 dB 2.4 GHz to 2.5 GHz band
- High R<sub>x</sub> Isolation: 23 dB typical
- High R<sub>x</sub> Gain: 12 dB
- Flip-chip configuration
- RoHS\* Compliant

## Description

M/A-COM's MAMF-009448-000DIE is a bumped single band GaAs PHEMT MMIC SP3T switch with an integrated LNA with bypass mode in the RX path. Typical applications are for single band 2.4 GHz WLAN (802.11 b/g) and Bluetooth applications.

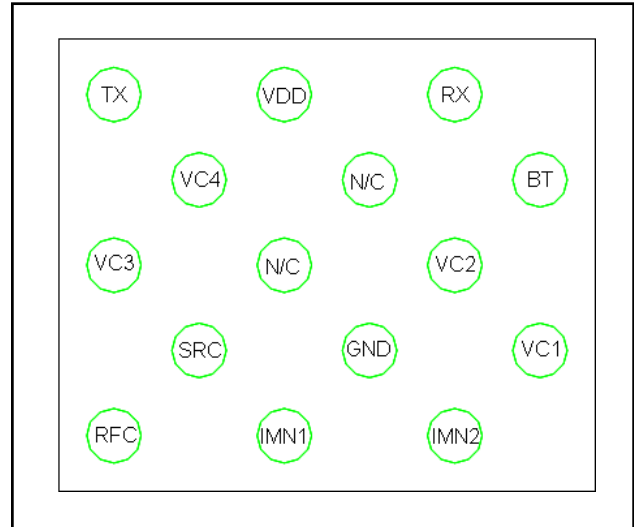
The MAMF-009448-000DIE delivers high isolation, low insertion loss, low noise and high linearity at 2.4 - 2.5 GHz. The MAMF-009448-000DIE is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability. This die features 2.5 % SnAg solder bump for flip-chip on lead frame package or WLCSP.

## Ordering Information <sup>1</sup>

Part Number	Package
MAMF-009448-000DIE	Separated Die on Grip Ring

1. Die quantity varies.

## Die Bumping Pad Layout (bump side up)



## Die Bumping Pad Configuration

Pad	Name	Description
1	BT	Blue Tooth T <sub>x</sub> /R <sub>x</sub> Port
2	T <sub>x</sub>	2.5 GHz T <sub>x</sub> Port
3	RFC	Antenna Port
4	R <sub>x</sub>	2.5 GHz R <sub>x</sub> Port
5	V <sub>DD</sub>	Drain Voltage Supply
6	IMN1	LNA Input Match Port 1
7	IMN2	LNA Input Match Port 2
8	SRC	Source Bypass Capacitor
9	V <sub>c</sub> 1	Voltage Control 1
10	V <sub>c</sub> 2	Voltage Control 2
11	V <sub>c</sub> 3	Voltage Control 3
12	V <sub>c</sub> 4	Voltage Control 4
13	GND	Ground

\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

## Electrical Specifications<sup>2</sup>: Freq. = 2.4 - 2.5 GHz, $V_{CC} = 3.3V$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	RFC to $T_X$ , RFC to BT	dB	—	0.65	—
Bypass Mode Insertion Loss	RFC to $R_X$	dB	—	5.0	—
Input/Output Return Loss	RFC to $T_X$ , RFC to BT	dB	—	20	—
Isolation	RFC to $T_X$ , RFC to BT RFC to $R_X$	dB dB	— —	25 23	— —
LNA On Gain	RFC to $R_X$	dB	—	12	—
LNA On Input/Output Return Loss	RFC to $R_X$	dB	—	10	—
Noise Figure	—	dB	—	1.9	—
IIP3	—	dBm	—	7	—
IP1dB	RFC to $T_X$ , RFC to BT LNA on Bypass path	dBm	—	32 -3.5 23.5	—
Quiescent Current	No RF, LNA On, $V_{CC} = 3.3 V$	mA	—	8	—
Leakage Current	All States except High Gain	$\mu A$	—	10	—

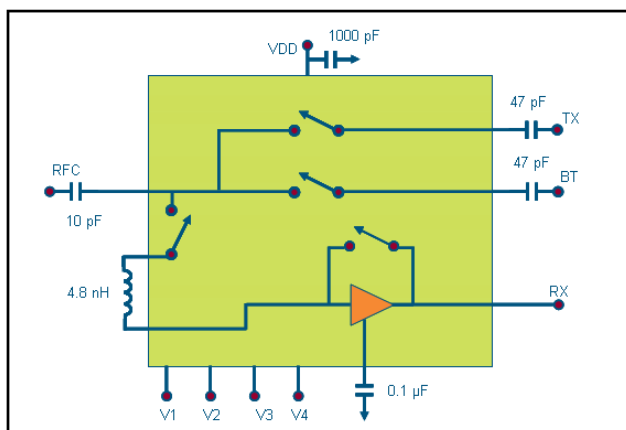
2. External blocking capacitors on RFC,  $T_X$  and BT ports.

## Truth Table<sup>3,4,5</sup>

Control V1	Control V2	Control V3	Control V4	$V_{DD}$	LNA On	RFC- $R_X$	RFC-BT	RFC- $T_X$
Hi	Low	Low	Low	Hi	No	Off	On	Off
Low	Hi	Low	Hi	Hi	Yes	High-Gain	Off	Off
Low	Hi	Low	Low	Hi	No	Low-Gain	Off	Off
Low	Low	Hi	Low	Hi	No	Off	Off	On

3. For positive voltage control, external DC blocking capacitors are required on RFC,  $T_X$  and BT ports.  
4. Differential voltage,  $V(\text{state Low}) - V(\text{state Hi})$ , must be +2.7 V minimum and must not exceed 4 V.  
5. Low =  $0 \pm 0.1 V$ , Hi =  $V_{DD} \pm 0.4 V$ .

## Functional Schematic



## Handling Procedures

Please observe the following precautions to avoid damage:

## Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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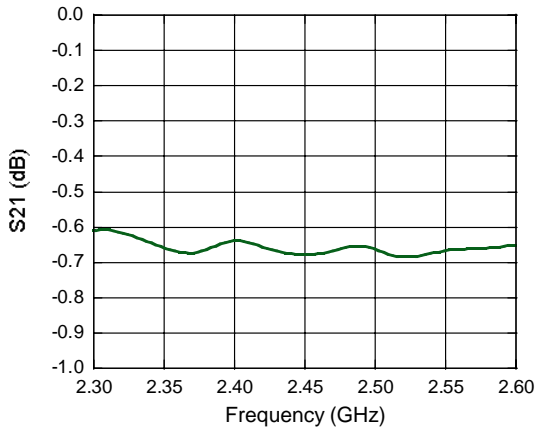
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## Typical Performance Curves

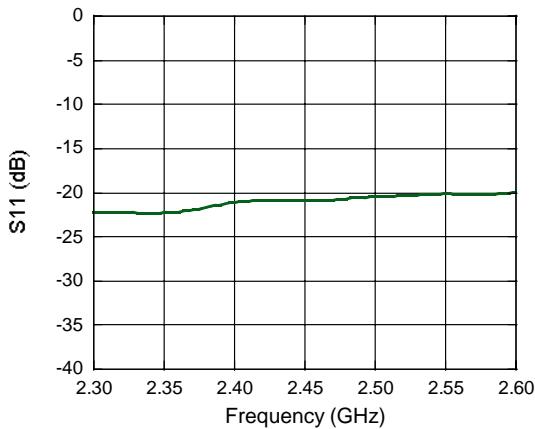
**RFC to BT Insertion Loss**



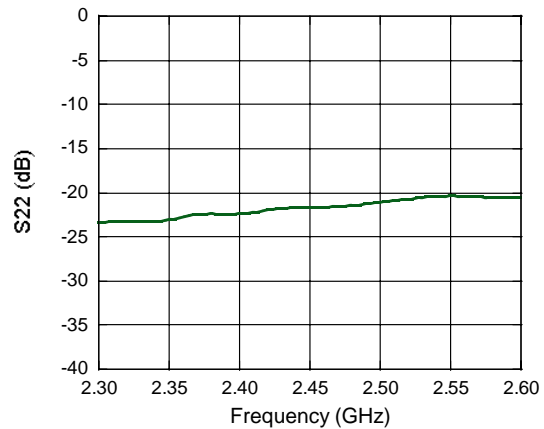
**Truth Table**

V1	V2	V3	V4	State
1	0	0	0	RFC to BT ON

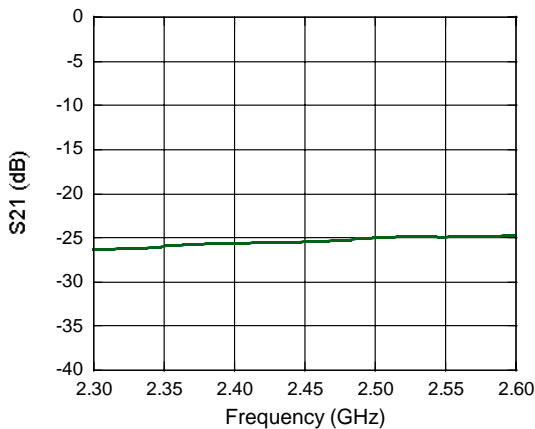
**RFC to BT Return Loss**



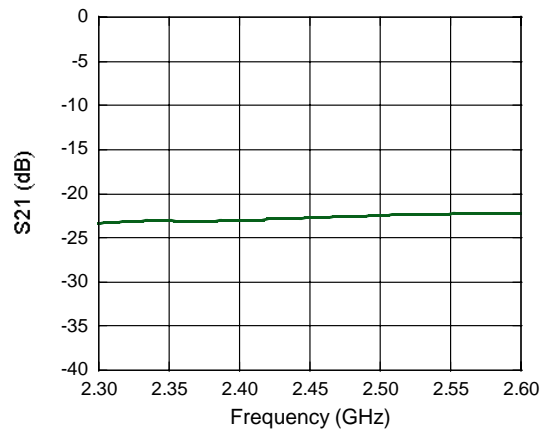
**RFC to BT Return Loss**



**RFC to Tx Isolation**



**RFC to Rx Isolation**



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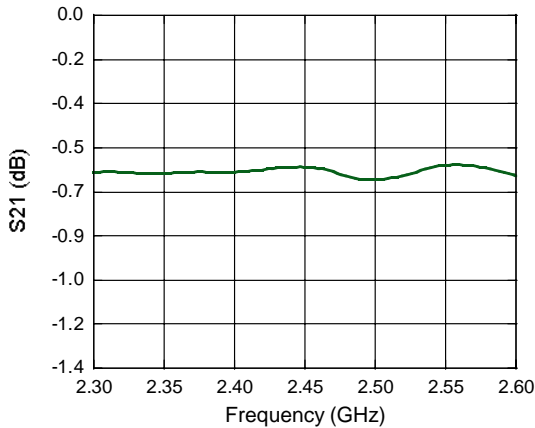
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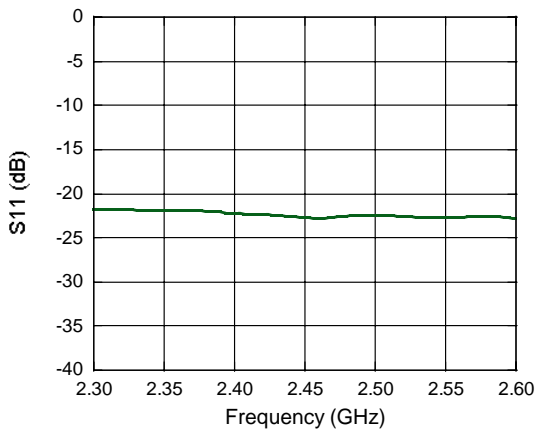
**RFC to  $T_x$  Insertion Loss**



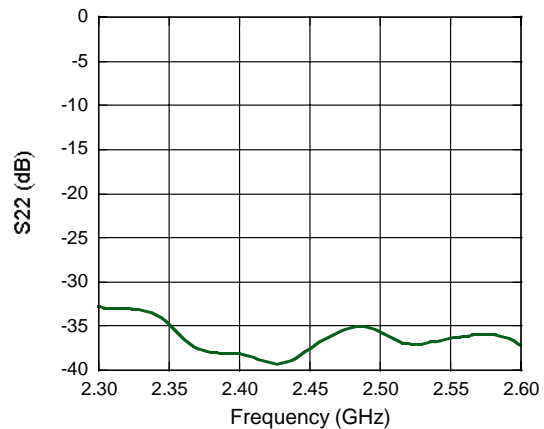
**Truth Table**

V1	V2	V3	V4	State
0	0	1	0	RFC to $T_x$ ON

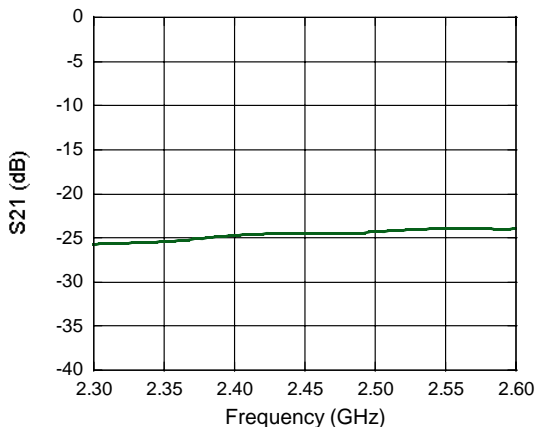
**RFC to  $T_x$  Return Loss**



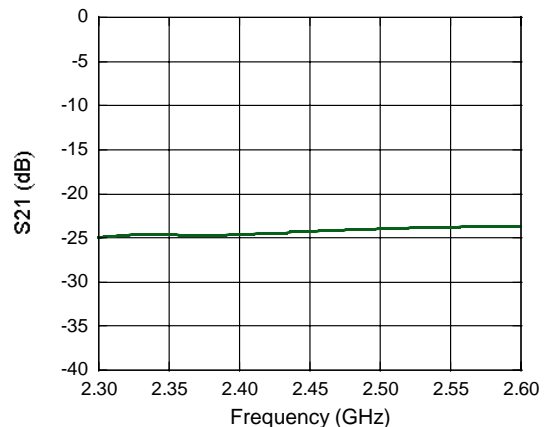
**RFC to  $T_x$  Return Loss**



**RFC to  $T_x$  Isolation to BT**

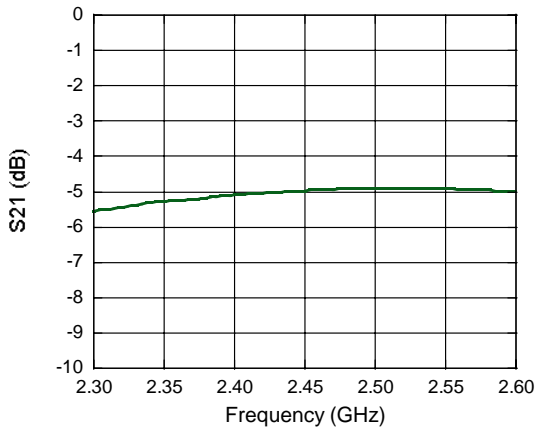


**RFC to  $T_x$  Isolation to  $R_x$**



## Typical Performance Curves

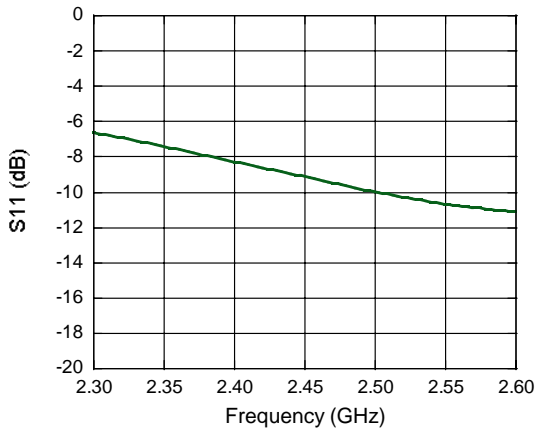
**RFC to  $R_x$  LO Insertion Loss**



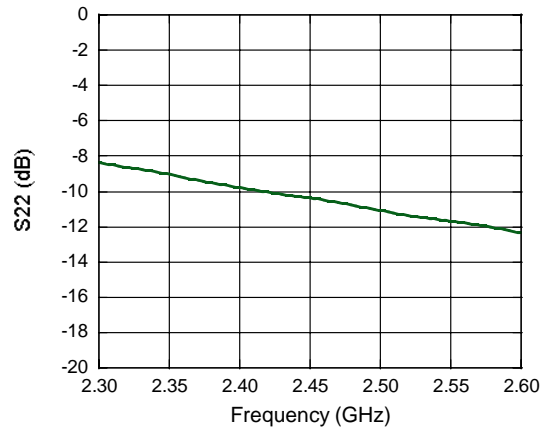
## Truth Table

V1	V2	V3	V4	LO State
0	1	0	0	RFC to $R_x$ ON

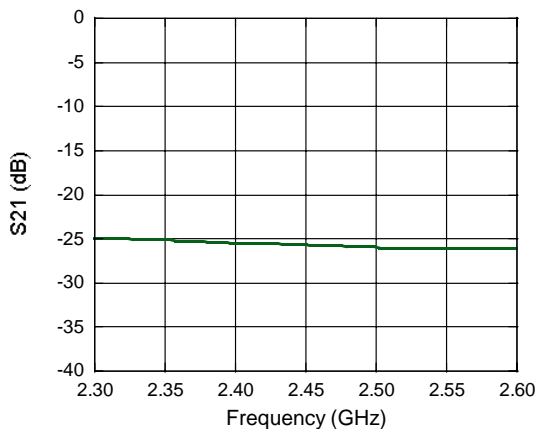
**RFC to  $R_x$  LO Return Loss**



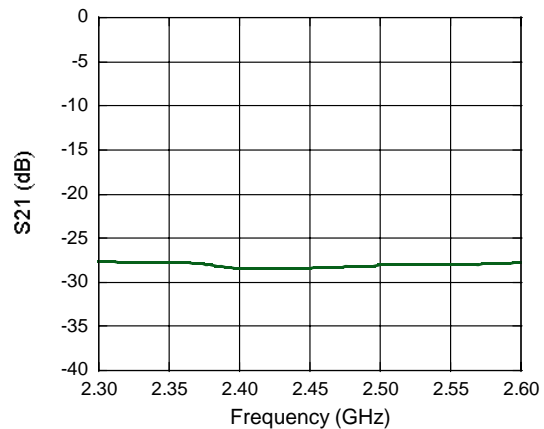
**RFC to  $R_x$  LO Return Loss**



**RFC to  $R_x$  LO Isolation to BT**



**RFC to  $R_x$  LO Isolation to  $T_x$**



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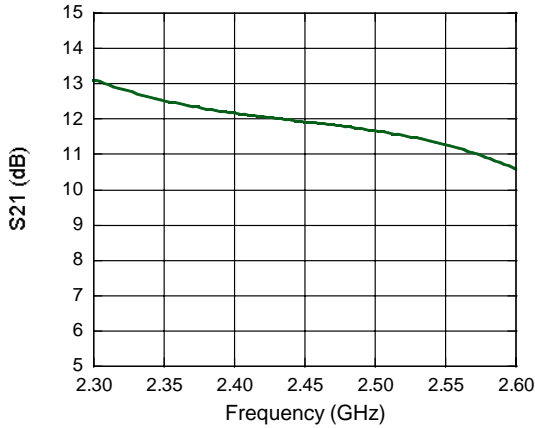
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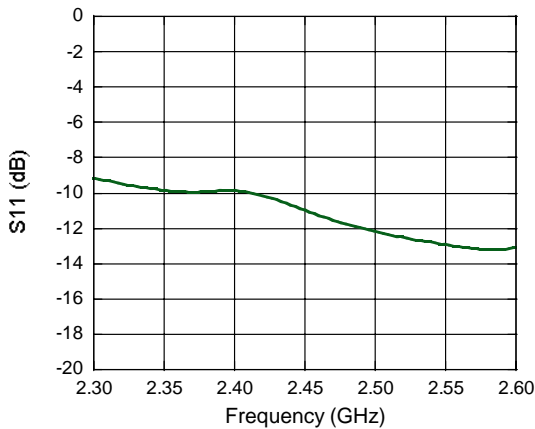
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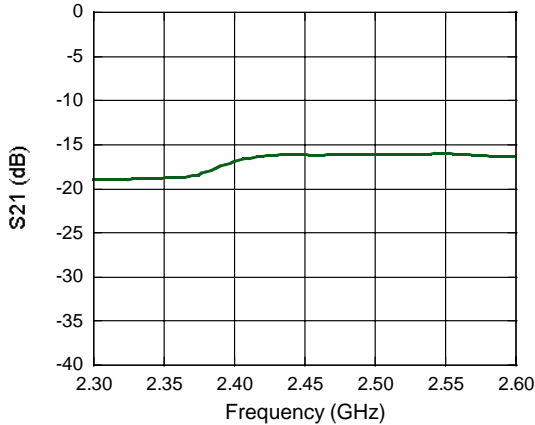
**RFC to  $R_x$  HI Insertion Loss**



**RFC to  $R_x$  HI Return Loss**



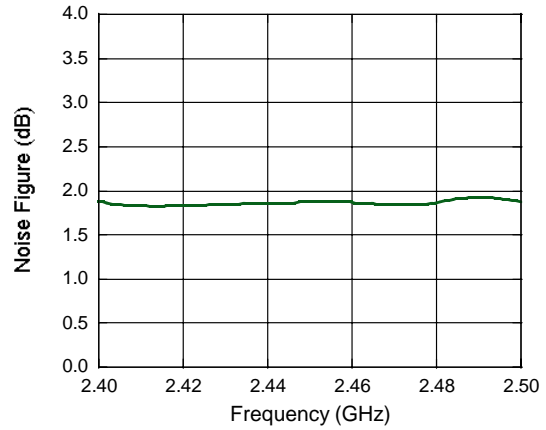
**RFC to  $R_x$  HI Isolation to BT**



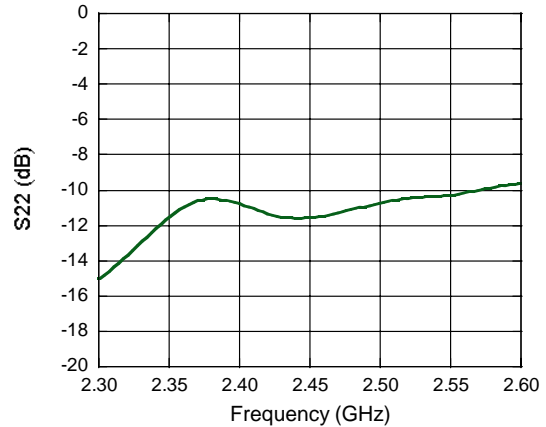
## Truth Table

V1	V2	V3	V4	HI State
0	1	0	1	RFC to $R_x$ ON

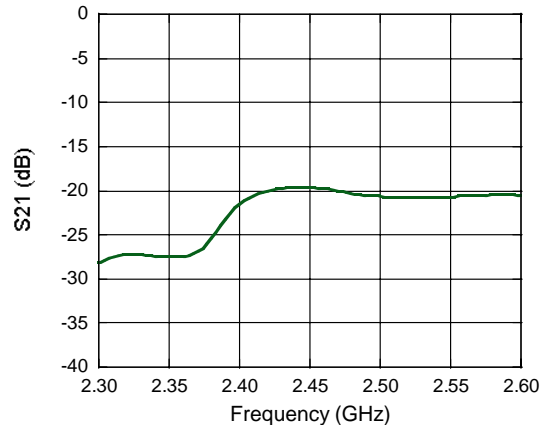
**Noise Figure**



**RFC to  $R_x$  HI Return Loss**



**RFC to  $R_x$  HI Isolation to  $T_x$**



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## Die Dimensions and Side View

