



## GaAs MMIC 3 WATT T/R SWITCH DC - 3 GHz

### Typical Applications

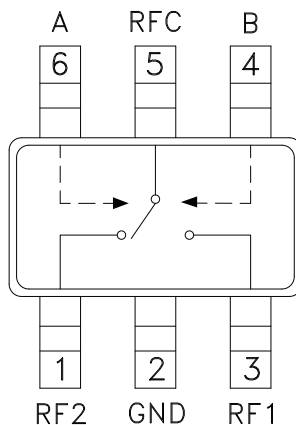
The HMC595A / 595AE is ideal for:

- Cellular/3G Infrastructure
- Private Mobile Radio Handsets
- WLAN, WiMAX & WiBro
- Automotive Telematics
- Test Equipment

### Features

- Low Insertion Loss: 0.3 dB
- High Input IP3: +63 dBm
- Isolation: 30 dB
- Positive Control: 0/+3V to 0/+10V
- Ultra Small Package: SOT26

### Functional Diagram



### General Description

The HMC595A & HMC595AE are low-cost SPDT switches in 6-lead SOT26 packages for use in transmit/receive applications which require very low distortion at high incident power levels. The device can control signals from DC to 3 GHz and is especially suited for Cellular/3G infrastructure, WiMAX and WiBro applications with only 0.3 dB typical insertion loss. The design provides a 3 watt power handling and +63 dBm third order intercept at +8 Volt bias. RF1 and RF2 are reflective shorts when "Off". Control inputs A & B are compatible with CMOS and some TTL logic families. These products are form, fit and function replacements for HMC595 & HMC595E while offering superior electrical performance.

### Electrical Specifications,

$T_A = +25^\circ\text{C}$ ,  $V_{ctl} = 0/+5\text{Vdc}$  (Unless Otherwise Stated), 50 Ohm System

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 1.0 GHz		0.25	0.5	dB
	DC - 2.0 GHz		0.3	0.6	dB
	DC - 2.5 GHz		0.4	0.7	dB
	DC - 3.0 GHz		0.5	0.8	dB
Isolation	DC - 1.0 GHz	26	30		dB
	DC - 2.0 GHz	22	26		dB
	DC - 2.5 GHz	18	24		dB
	DC - 3.0 GHz	14	18		dB
Return Loss	DC - 1.0 GHz		30		dB
	DC - 2.0 GHz		25		dB
	DC - 2.5 GHz		22		dB
	DC - 3.0 GHz		20		dB
Input Power for 1dB Compression	0.5 - 3.0 GHz	$V_{ctl} = 0/+3V$	29	31	dBm
		$V_{ctl} = 0/+5V$	35	37	dBm
		$V_{ctl} = 0/+8V$	37	39	dBm
Input Third Order Intercept (Two-tone Input Power = +23 dBm Each Tone)	0.5 - 3.0 GHz	$V_{ctl} = 0/+3V$		50	dBm
		$V_{ctl} = 0/+5V$		64	dBm
		$V_{ctl} = 0/+8V$		63	dBm
Switching Characteristics	DC - 3.0 GHz	tRISE, tFALL (10/90% RF)		50	ns
		tON, tOFF (50% CTL to 10/90% RF)		100	ns

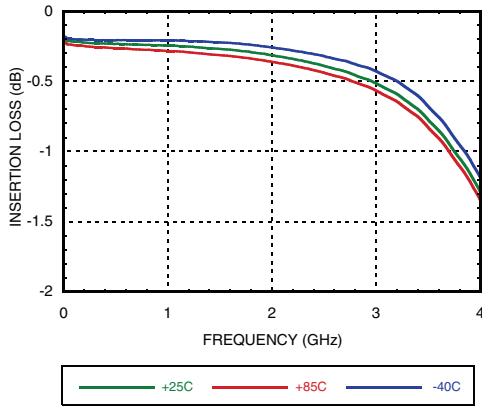
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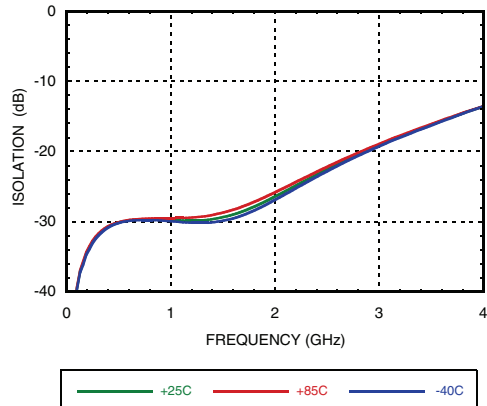


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DC - 3 GHz**

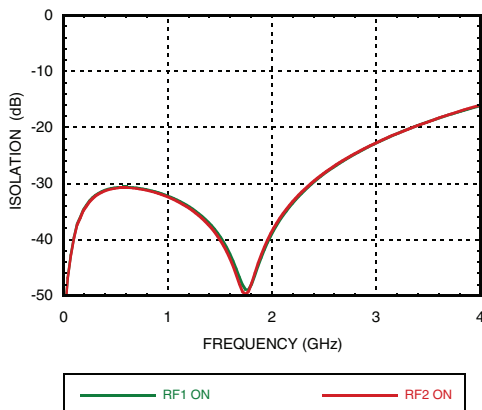
**Insertion Loss**



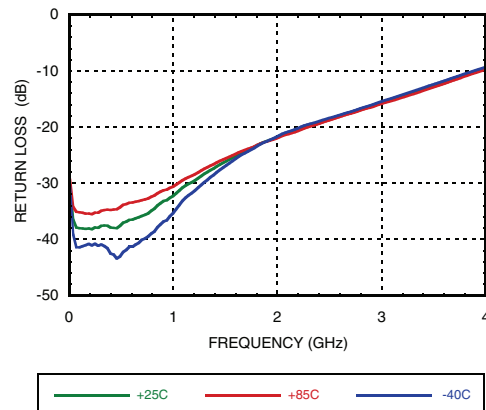
**Isolation Between RFC and RF1/RF2**



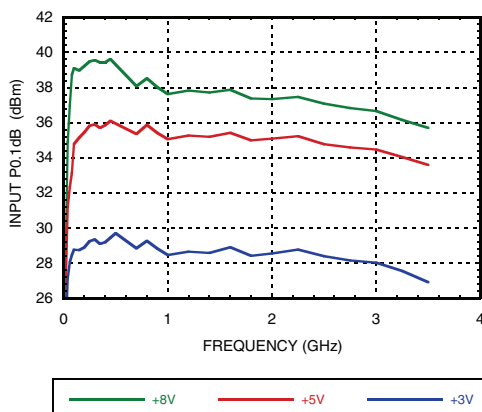
**RF1 to RF2 Isolations**



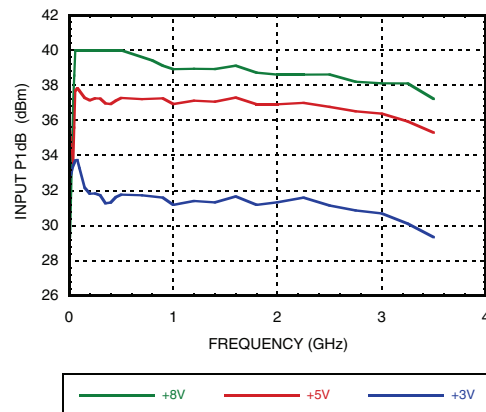
**Return Loss**



**Input P0.1dB vs. Vctl**



**Input P1dB vs. Vctl**

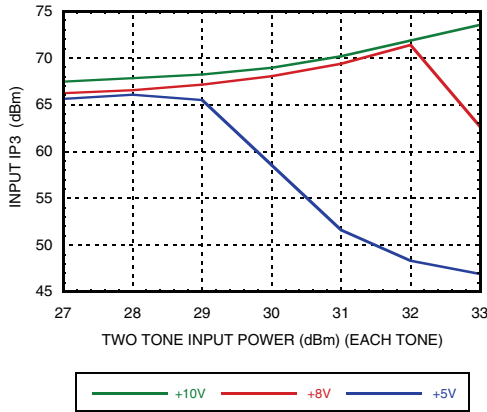




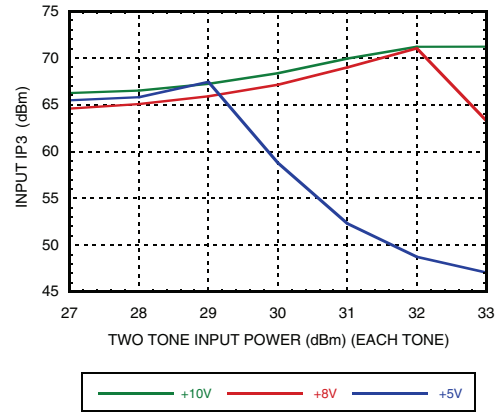
**GaAs MMIC 3 WATT T/R SWITCH  
DC - 3 GHz**

SWITCHES - SPDT T/R - SMT

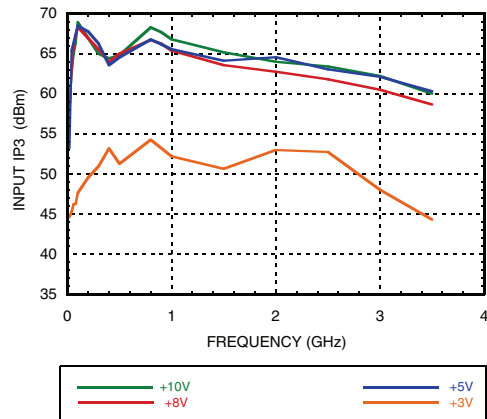
**Input IP3 vs. Input Power @ 900 MHz**



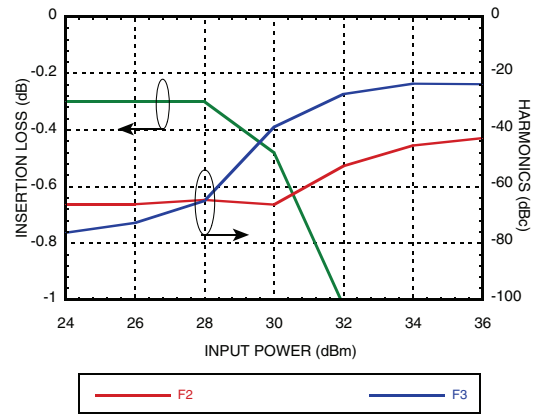
**Input IP3 vs. Input Power @ 1900 MHz**



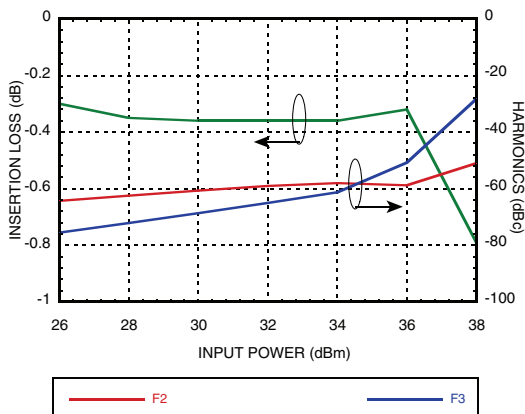
**Input Third Order Intercept Point**



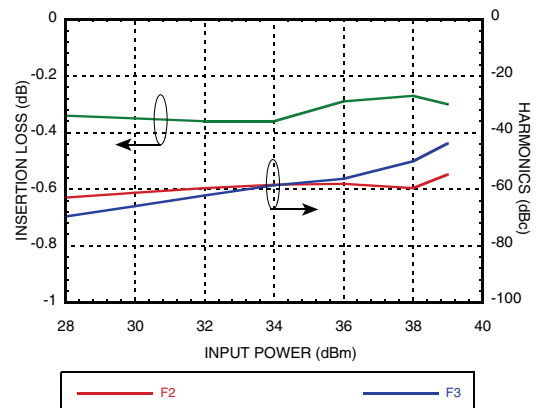
**2nd & 3rd Harmonics @ 900 MHz  
Vctl = +3 Volts**



**2nd & 3rd Harmonics @ 900 MHz  
Vctl = +5 Volts**

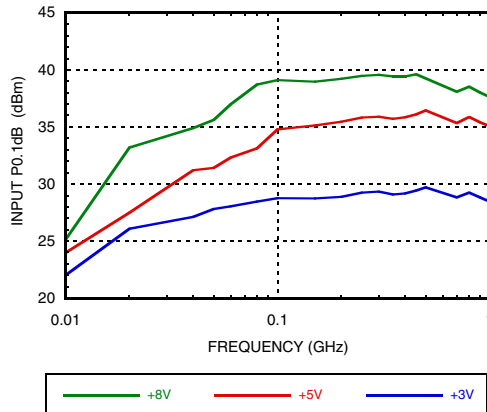
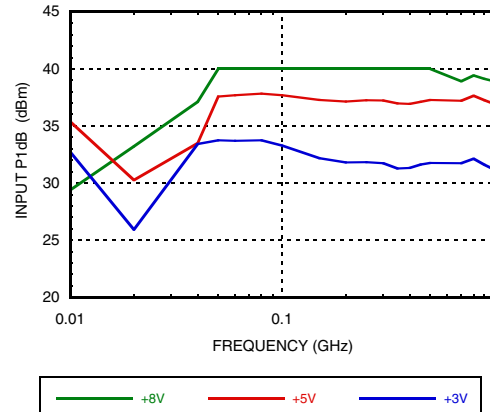


**2nd & 3rd Harmonics @ 900 MHz  
Vctl = +8 Volts**



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**GaAs MMIC 3 WATT T/R SWITCH  
DC - 3 GHz**
**Input P0.1dB vs. Vctl**

**Input P1dB vs. Vctl**

**Absolute Maximum Ratings**

Max. Input Power $V_{ctl} = 0/+8V$	0.5 - 2.5 GHz	39 dBm
Control Voltage Range (A & B)	-0.2 to +12 Vdc	
Channel Temperature	150 °C	
Continuous Pdiss (T = +85 °C) (derate 9.2 mW/°C above 85 °C)	0.597W	
Thermal Resistance	109 °C/W	
Storage Temperature	-65 to +150 °C	
Operating Temperature	-40 to +85 °C	
ESD Sensitivity (HBM)	Class 1A	

DC Blocks are required at ports RFC, RF1 and RF2

**Control Voltages**

State	Bias Condition
Low	0 to +0.2 Vdc @ 10 $\mu$ A Typical
High	+3 Vdc @ 2 $\mu$ A Typical to +8 Vdc @ 100 $\mu$ A Typical ( $\pm$ 0.2 Vdc)

**Truth Table**

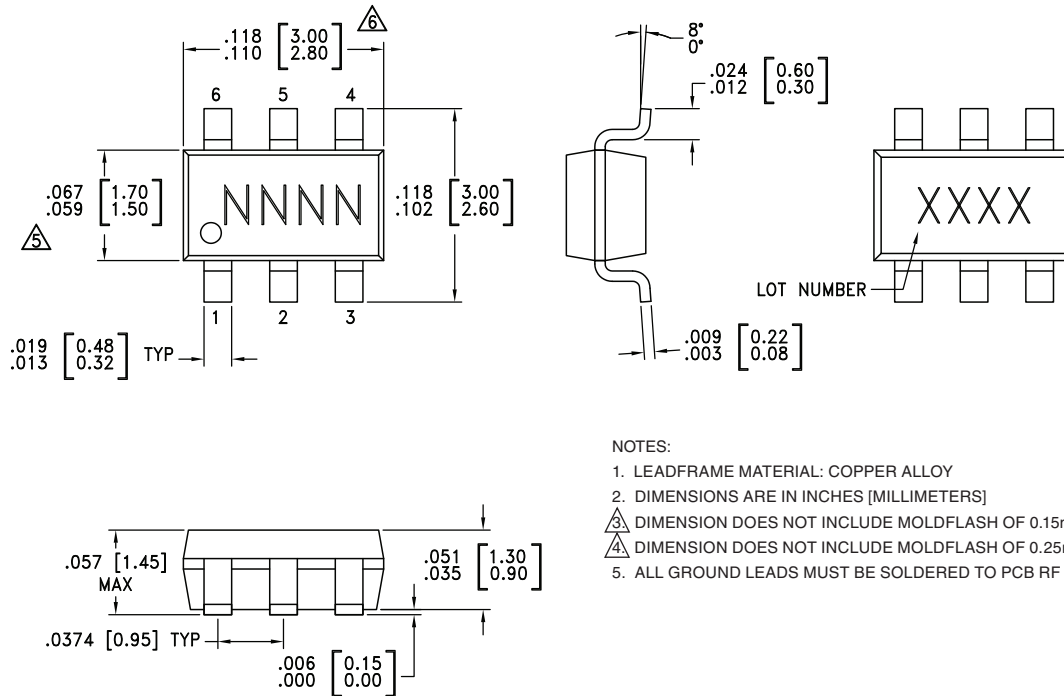
Control Input (Vctl)		Signal Path State	
A	B	RFC to RF1	RFC to RF2
High	Low	Off	On
Low	High	On	Off


**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**



**GaAs MMIC 3 WATT T/R SWITCH  
DC - 3 GHz**

**Outline Drawing**



**NOTES:**

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
4. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
5. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND

**Package Information**

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC595A	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	H595A XXXX
HMC595AE	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	595AE XXXX

[1] Max peak reflow temperature of 235 °C  
 [2] Max peak reflow temperature of 260 °C  
 [3] 4-Digit lot number XXXX

**Pin Descriptions**

Pin Number	Function	Description	Interface Schematic
1, 3, 5	RF2, RF1, RFC	This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required.	
2	GND	This pin must be connected to RF/DC ground.	
4	B	See truth table and control voltage table.	
6	A	See truth table and control voltage table.	

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