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FMS2028

SP6T GaAs MULTI-BAND GSM ANTENNA SWITCH

Package Style: Bare Die

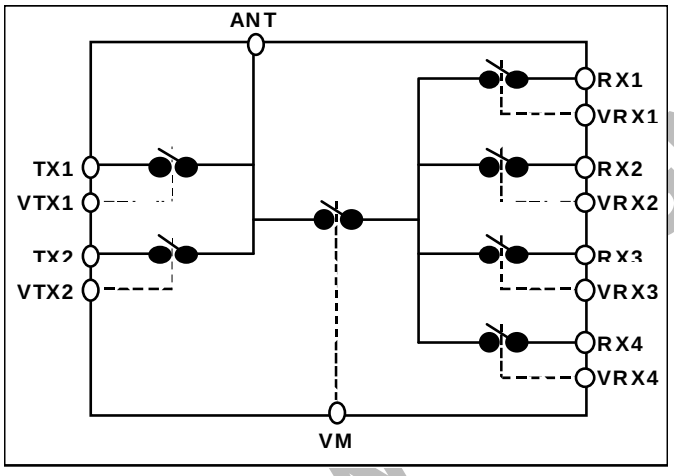
Product Description

The FMS2028 is a low loss, high isolation, broadband single-pole six-throw Gallium Arsenide antenna switch. The die is fabricated using the FL05 0.5µm switch process from RFMD that offers leading edge performance optimized for switch applications.

The FMS2028 is designed for use in dual-, tri-, and quad-band GSM handset antenna switch and RF front end modules.

Optimum Technology Matching® Applied

- ☐ GaAs HBT
- ☐ GaAs MESFET
- ☐ InGaP HBT
- ☐ SiGe BiCMOS
- ☐ Si BiCMOS
- ☐ SiGe HBT
- ☑ GaAs pHEMT
- ☐ Si CMOS
- ☐ Si BJT
- ☐ GaN HEMT
- ☐ InP HBT
- ☐ RF MEMS
- ☐ LDMOS



Features

- Very Low Tx Insertion Loss
- High Tx-Rx Isolation: >45dB typ. at 1.8GHz
- High Tx-Tx Isolation: >30dB typ. at 1.8GHz
- Excellent Low Control Voltage Performance
- Excellent Harmonic Performance

Applications

- Suitable for Multi-band GSM/DCS/PCS/EDGE Applications

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Electrical Specifications					$T_{AMBIENT}$=25 °C, V_{CTRL}=0V/-5V, Z_{IN}=Z_{OUT}=50Ω
Tx Insertion Loss	0	0.4	0.55	dB	0.9GHz
	0	0.41	0.6	dB	1.8GHz
Rx Insertion Loss	0	0.73	1	dB	0.9GHz
	0	1.0	1.2	dB	1.8GHz
Return Loss		23		dB	0.5GHz to 2.5GHz
Isolation (Tx-Tx)	26	28.5	55	dB	0.9GHz
	19.5	21	45	dB	1.8GHz
Isolation (Tx-Rx)	42	47	55	dB	0.9GHz
	37	42	55	dB	1.8GHz
Isolation (Rx-Rx)	26	28		dB	0.5GHz to 1.0GHz
	20	22		dB	1.0GHz to 2.0GHz
P0.1dB		37		dBm	0.9GHz, CW
2nd Harmonic Level	-100	-80	-70	dBc	0.9GHz, P_{IN}=+35dBm, CW[1]
	-100	-80	-70	dBc	1.8GHz, P_{IN}=+33dBm, CW[1]
3rd Harmonic Level	-100	-70	-65	dBc	0.9GHz, P_{IN}=+35dBm, CW[1]
	-100	-72	-65	dBc	1.8GHz, P_{IN}=+33dBm, CW[1]
Switching Speed			0.3	µs	10% to 90% RF and 90% to 10% RF, P_{IN}=0dBm
			1	µs	50% to 90% RF and 50% to 90% RF, P_{IN}=0dBm
Control Current	0.01	12	40	µA	0.9GHz, P_{IN}=+35dBm, V_{CTRL}=0V to 2.7V
	0.01	1.3	10	µA	1.8GHz, P_{IN}=0dBm, V_{CTRL}=0V to 2.7V

Note: [1]Measured harmonic values are dependant upon system termination impedances at the harmonic frequency.

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Absolute Maximum Ratings

Parameter	Rating	Unit
Maximum Input Power (P_{IN})	+27	dBm
Control Voltage (V_{CTRL})		V
Operating Temperature (T_{OPER})	-40 to 85	°C
Storage Temperature (T_{STOR})	-55 to 150	°C

Caution! ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

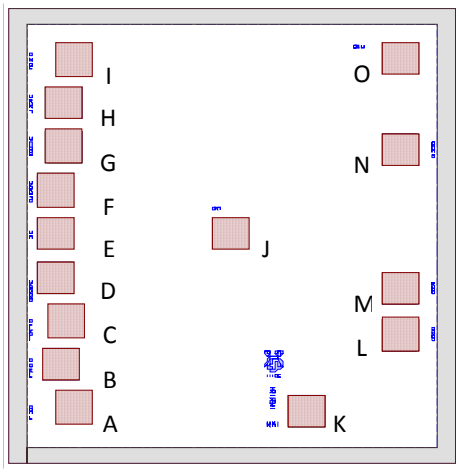
RoHS status based on EUDirective2002/95/EC (at time of this document revision).

Truth Table

VM	VRX4	VRX3	VRX2	VRX1	VTX2	VTX1	On Path
Low	Low	Low	Low	Low	Low	High	ANT-TX1
Low	Low	Low	Low	Low	High	Low	ANT-TX2
High	Low	Low	Low	High	Low	Low	ANT-RX1
High	Low	Low	High	Low	Low	Low	ANT-RX2
High	Low	High	Low	Low	Low	Low	ANT-RX3
High	High	Low	Low	Low	Low	Low	ANT-RX4

Notes: High 2.7V±0.2V; Low -0V±0.2V

Pad Layout



Pad	Name	Description	Pin Coordinates (μm)
A	Tx1	Tx1 RF Output	125.9, 121.4
B	VRx1	Rx1 Control Voltage	100.2, 215.9
C	VTx1	Tx1 Control Voltage	110.4, 310.5
D	VRx2	Rx2 Control Voltage	90.5, 405.1
E	VM	Common Receive Control Voltage	90.5, 499.7
F	VRx3	Rx3 Control Voltage	90.5, 594.3
G	VTx2	Tx2 Control Voltage	107, 688.9
H	VRx4	Rx4 Control Voltage	107, 783.5
I	Tx2	Tx2 RF Output	125.9, 878.1
J	ANT	Antenna	424.9, 499.7
K	Rx1	Rx1 RF Output	568.2, 114.8
L	GND	Ground	747.4, 282.7
M	Rx2	Rx2 RF Output	747.4, 380.3
N	Rx3	Rx3 RF Output	747.4, 681.2
O	Rx4	Rx4 RF Output	747.4, 882.1

Note: Coordinates are referenced from the bottom left hand corner of the die to the center of bond pad opening.

Die Size (μm)	Die Thickness (μm)	Min. Bond Pad Pitch (μm)	Min. Bond Pad Opening (μmxμm)
842x980	150	94.6	65x65

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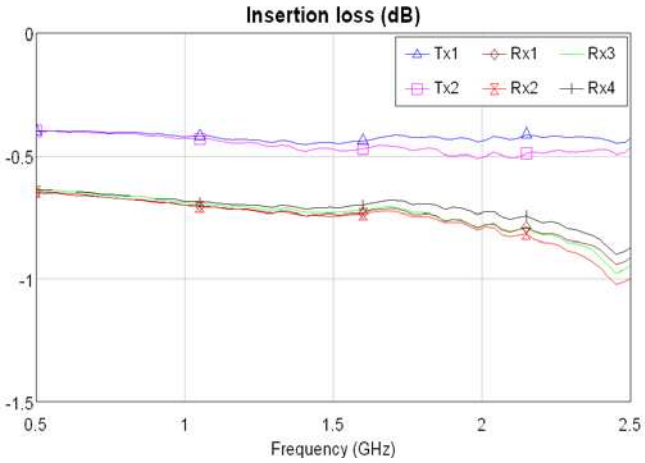
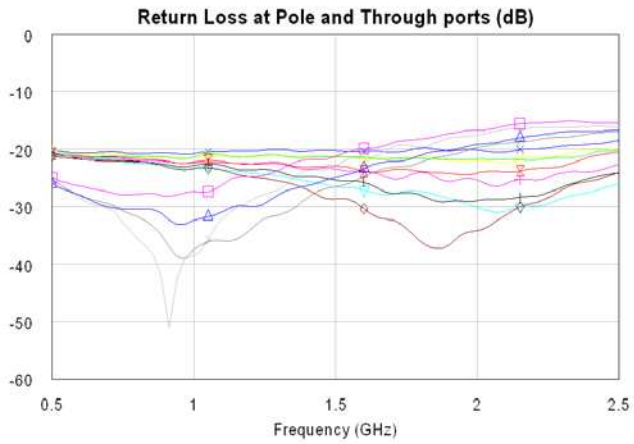
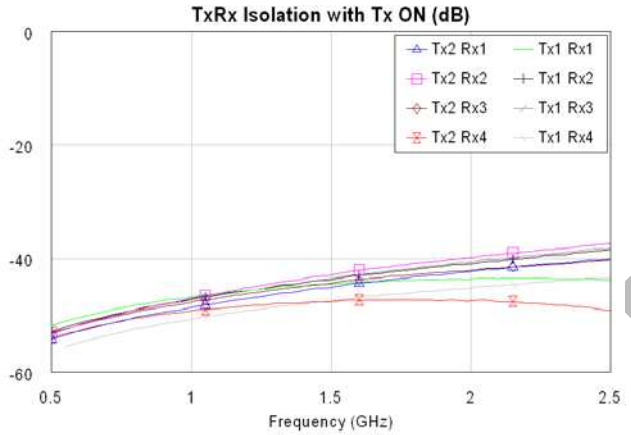
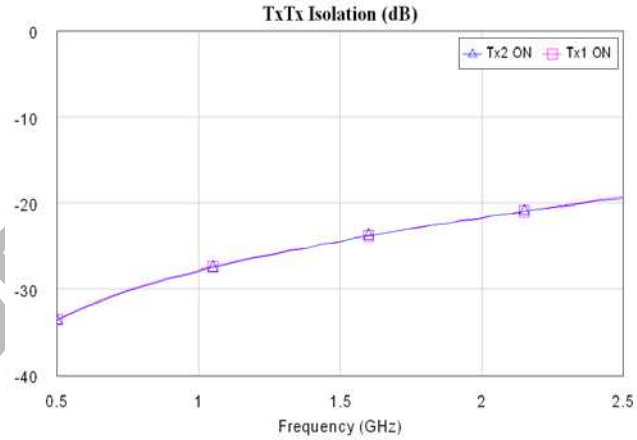
Typical Measured Performance On Evaluation Board

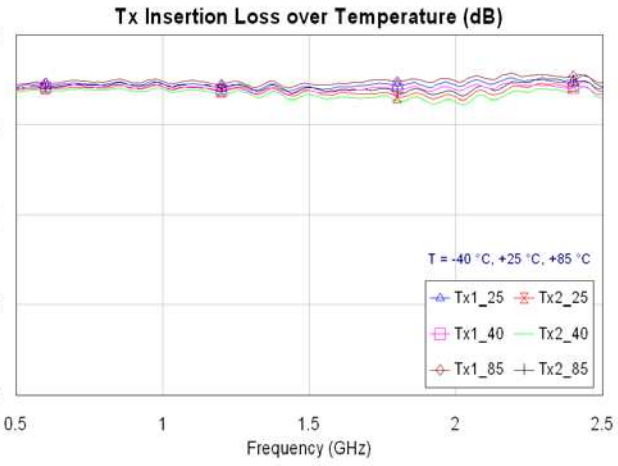
Measurement Conditions: V_{CTRL}=0V (low) and 2.7V (high), $T_{AMBIENT}$=25°C unless otherwise stated.

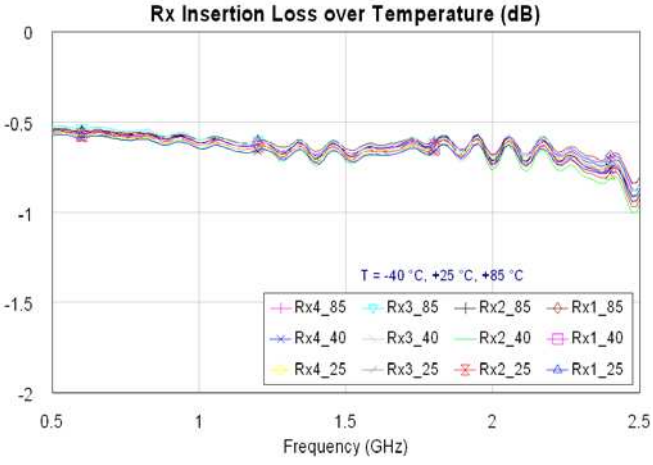




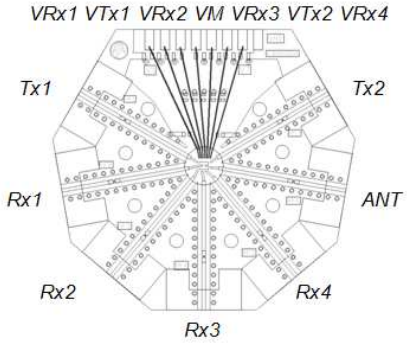




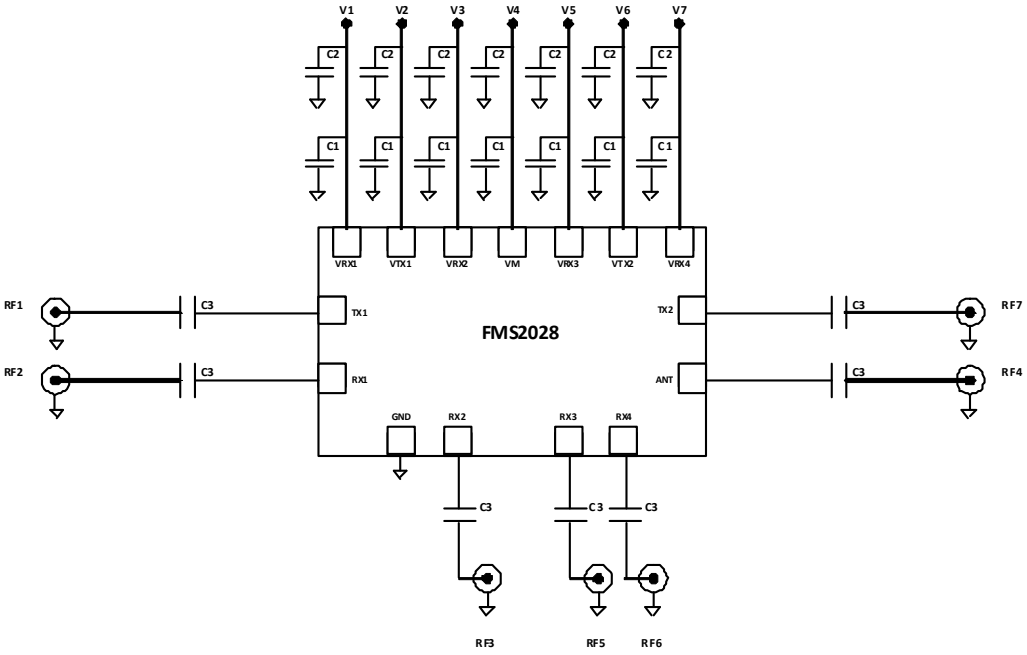




Evaluation Board Component Side Layout



Evaluation Board Layout



Bill of Materials

Label	Component
RFC	SMA RF connector
DCC	DC connector
C1	Capacitor, 47 pF, 0402
C2	Capacitor, 470 pF, 0603
C3	Capacitor, 100 pF, 0402
Board	Preferred evaluation board material is 0.25 mm thick ROGERS RT4350. All RF tracks should be 50Ω characteristic material.

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Preferred Assembly Instructions

GaAs devices are fragile and should be handled with great care. Specially designed collets should be used where possible.

The back of the die is metallized and the recommended mounting method is by the use of conductive epoxy. Epoxy should be applied to the attachment surface uniformly and sparingly to avoid encroachment of epoxy on to the top face of the die and ideally should not exceed half the chip height. For automated dispense Ablestick LMISR4 is recommended. For manual dispense Ablestick 84-1 LMI or 84-1 LMIT are recommended. These should be cured at a temperature of 150°C for 1 hour in an oven especially set aside for epoxy curing only. If possible, the curing oven should be flushed with dry nitrogen. The gold-tin (80% Au 20% Sn) eutectic die attach has a melting point of approximately 280°C but the absolute temperature being used depends on the leadframe material used and the particular application. The maximum time should be kept to a minimum.

This part has gold (Au) bond pads requiring the use of gold (99.99% pure) bondwire. It is recommended that 25.4mm diameter gold wire be used. Recommended lead bond technique is thermocompression wedge bonding with 0.001" (25µm) diameter wire. Bond force, time stage temperature, and ultrasonics are all critical parameters and the settings are dependant on the setup and application being used. Ultrasonic or thermosonic bonding is not recommended.

Bonds should be made from the die first and then to the mounting substrate or package. The physical length of the bondwires should be minimized especially when making RF or ground connections.

Handling Precautions

To avoid damage to the devices, care should be exercised during handling. Proper Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing.

ESD/MSL Rating

These devices should be treated as Class 1A (250V to 500V) as defined in JEDEC Standard No. 22-A114. Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

Application Notes and Design Data

Application Notes and design data including S-parameters and large-signal models are available on request from www.rfmd.com.

Reliability

An MTTF of in excess of 9 million hours at a channel temperature of 150°C is achieved for the process used to manufacture this device.

Disclaimers

This product is not designed for use in any space-based or life-sustaining/supporting equipment.

Ordering Information

Delivery Quantity	Ordering Code
Standard Order Quantity (waffle-pack)	FMS2028-000
Small Quantity (25)	FMS2028-000SQ
Small Quantity (3)	FMS2028-000S3