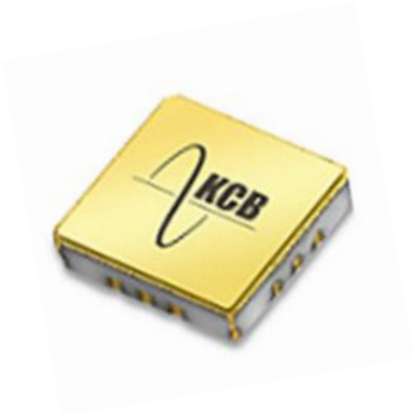
KS204

Switch, SPDT
0.02–8.0 GHz

KCB SOLUTIONS
THE HIGHEST STANDARD IN RF

DESCRIPTION

The is a GaAs pHEMT Non-Reflective high performance, low loss switch in a 3x3 mm leadless Hermetic Surface-Mount Technology (SMT) package for Harsh Environments including Defense and Satellite application. This device can be ordered with the 100% screening requirements of MIL-PRF-38535 Class B and S, in addition



FEATURES

- ✓ Low Insertion Loss: 0.8 dB @ 2 GHz.
- ✓ High Isolation: 55 dB @ 2 GHz.
- ✓ Non-Reflective Match in off state (S22).
- ✓ NASA EEE-INST-002 compliant.
- ✓ Successfully Tested to 1MRAD TID.
- ✓ High Reliability Class B and S Screening Available.
- ✓ See Page 5 for MR HI –REL Ordering Details.

APPLICATIONS

- ✓ Microwave Radios
- ✓ Military Radios
- ✓ VSAT
- ✓ Telecom Infrastructure
- ✓ Test Equipment

TABLE I: ELECTRICAL CHARACTERISTICS (+25˚C)[1]

Parameter	Symbol	Conditions	Min	Typical	Max	Units
Insertion Loss	IL	0.02 – 2.0 GHz		0.75	1.10	dB
		2.0 – 3.0 GHz		0.8	1.25	dB
		3.0 – 4.0 GHz		1.0	1.35	dB
		4.0 – 8.0 GHz		1.5	1.8	dB
Isolation	ISO	0.02 – 3.0 GHz	50	55		dB
		3.0 – 4.0 GHz	45	50		dB
		4.0 – 6.0 GHz	40	45		dB
		6.0 – 8.0 GHz	35	40		dB
Return Loss Input (All States) Output (ON State)	|S11|/ |S22|	0.02 – 2.0 GHz	19	22		dB
		2.0 – 3.0 GHz	15	22		dB
		3.0 – 4.0 GHz	12	18		dB
		4.0 – 8.0 GHz	9	12		dB
Return Loss Output (OFF State)	|S22|	0.02 – 0.3 GHz	0	4		dB
		0.3 – 0.5 GHz	5	8		dB
		0.5 – 2.0 GHz	9	11		dB
		2.0 – 4.0 GHz	12	15		dB
		4.0 – 8.0 GHz	9	13		dB

1. All electrical characteristics are measured at +25˚C at a minimum.

TABLE 2: OPERATING CHARACTERISTICS (-40 TO +85˚C, V_{CTL} = 0V/5V)[1]

Parameter	Symbol	Conditions	Min	Typical	Max	Units
Input Compression Point	IP1dB	0.02 – 0.5 GHz 0.5 – 8.0 GHz		+24 +30		dBm dBm
3rd order input inter-cept point (+8 dBm tones, 1 MHz spacing)	IIP3	0.02 – 0.5 GHz 0.5 – 8.0 GHz		+30 +46		dBm dBm
Rise/Fall Time	t_{RISE}/t_{FALL}	10%/90% RF rise/ 90%/10% RF fall time		5		nS
ON/OFF Time	t_{ON}/t_{OFF}	50% V_{CTL} to 90%/10% RF		15		nS
Control Voltage High	V_{IH}	Positive Control	+2.7		+7.0	V
Control Voltage Low	V_{IL}	Positive Control	-0.25		0.25	V
Control Voltage High	V_{IH}	Negative Control	-7.0		-2.7	V
Control Voltage Low	V_{IL}	Positive Control	-0.25		0.25	V
Digital Input Leakage	I_{IN}	V_{CTL} = -7.0V	-200			µA

1. All operating characteristics are guaranteed over full performance temperature range but not tested.

TABLE 3: ABSOLUTE MAXIMUM RATINGS

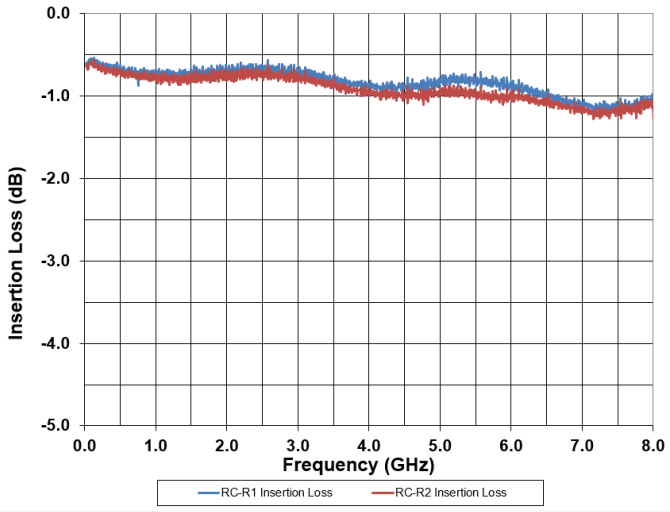
Characteristic	Min.	Max.	Units
Control voltage (A+B)	-0.5	+9.0	V
RF Input power		+30	dBm
Operating temperature	-55	+125	˚C
Storage temperature	-65	+150	˚C
Thermal resistance		53.5	˚C/W
ESD sensitivity (HBM)		250 (Class 1A)	V

Caution: Class 1A (HBM 250V) Electrostatic Sensitive Device. Proper ESD precaution should be used when handling device.

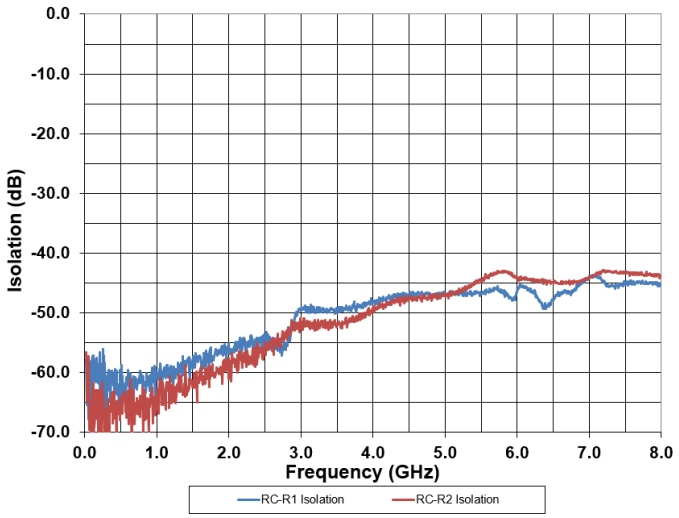
1. Unit shall survive operation without damage over the temperature range but not tested.

TYPICAL PERFORMANCE (+25 °C)

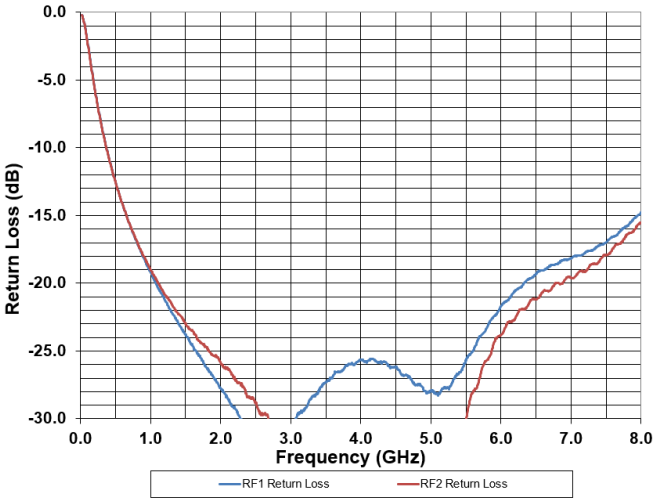
Insertion Loss vs Frequency



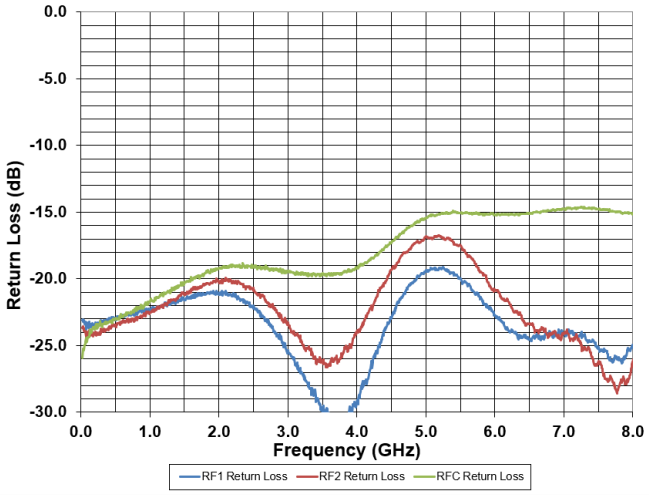
Isolation vs Frequency



Return Loss vs Frequency (OFF State)

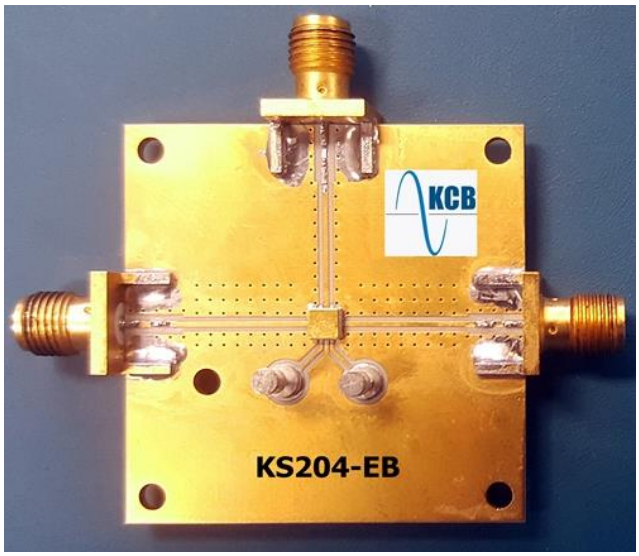


Return Loss vs Frequency (ON State)

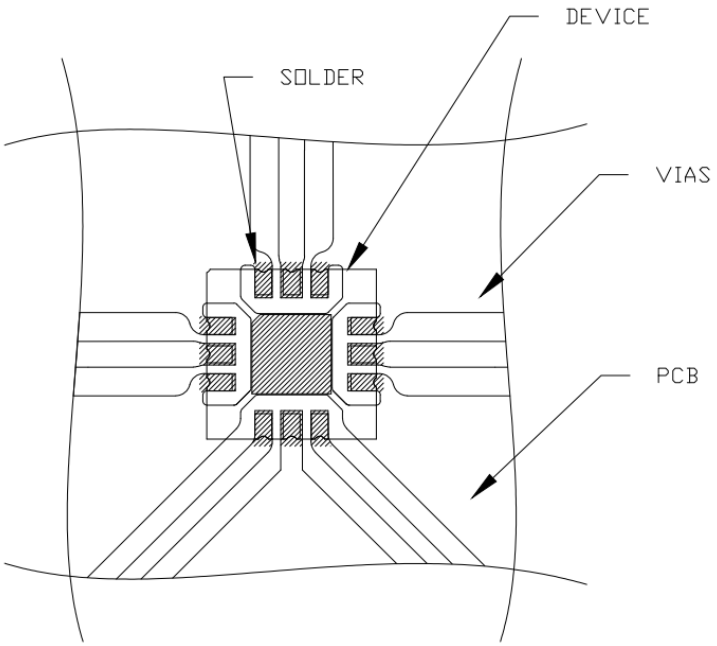


Note: Scatter plot data was gathered using modified evaluation board with 2.4 mm Southwest connectors.

EVALUATION BOARD (KS204-EB)



RECOMMENDED SOLDER LAYOUT



NOTES:

1. TRANSMISSION LINES SCALED FOR ROGERS RO4003, 0.008 INCHES THICK
2. GROUND ALL UNUSED PORTS
3. MAXIMUM REFLOW TEMPERATURE: 265C.
4. DXF FILE AVAILABLE UPON REQUEST.
5. CONTACT KCB SOLUTIONS FOR FURTHER GUIDANCE ON DEVICE PLACEMENT AND ATTACHMENT

TRUTH TABLE (NEGATIVE CONTROL)

A	B	RF Path
0	-5	RFC—RF1
-5	0	RFC—RF2

TRUTH TABLE (POSITIVE CONTROL)

A	B	RF Path
+5	0	RFC—RF1
0	+5	RFC—RF2

Note: External blocking capacitors are required on all RF ports. Capacitor should be selected to allow for low frequency operation.

SCHEMATIC

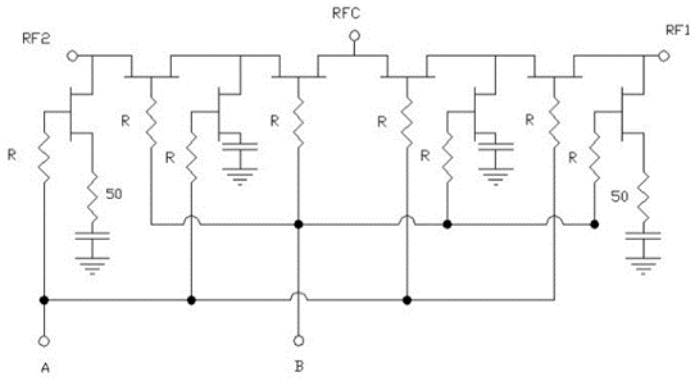
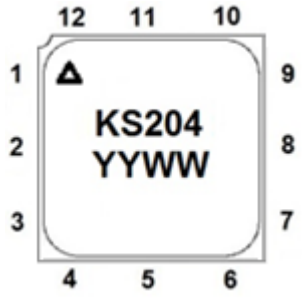


FIGURE 1: DEVICE MARKING/PIN OUT



XXX = Serial # will be added for Class B and S Part #

PIN	Designation	PIN	Designation
1	GND	7	GND
2	RF1	8	RF2
3	GND	9	GND
4	A	10	GND
5	GND	11	RFC
6	B	12	GND

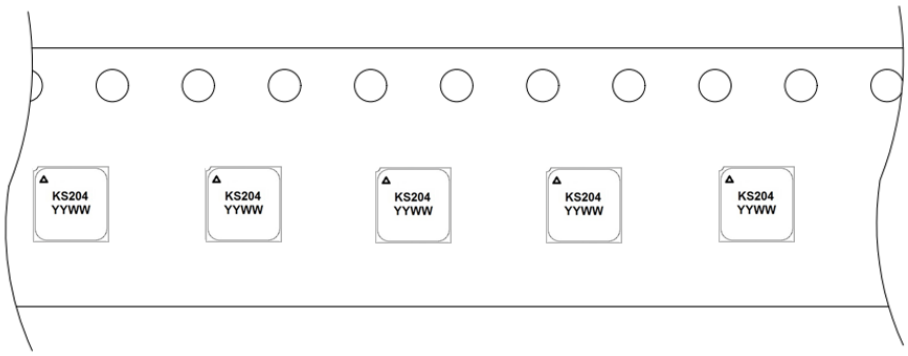
PACKAGE NOTES:

- Lid: ASTM F-15 Alloy
- Base/Walls: Alumina
- Lid/Bottom Finish: Gold over Nickel

ADDITIONAL NOTES:

- Maximum reflow temperature: 265°C for 90 seconds maximum
- Package base is RF ground
- External blocking capacitors required on all RF ports

FIGURE 2: TAPE & REEL:



- W = 12mm
- P0 = 4mm
- P1 = 8mm
- P2 = 2mm

FIGURE 3: OUTLINE

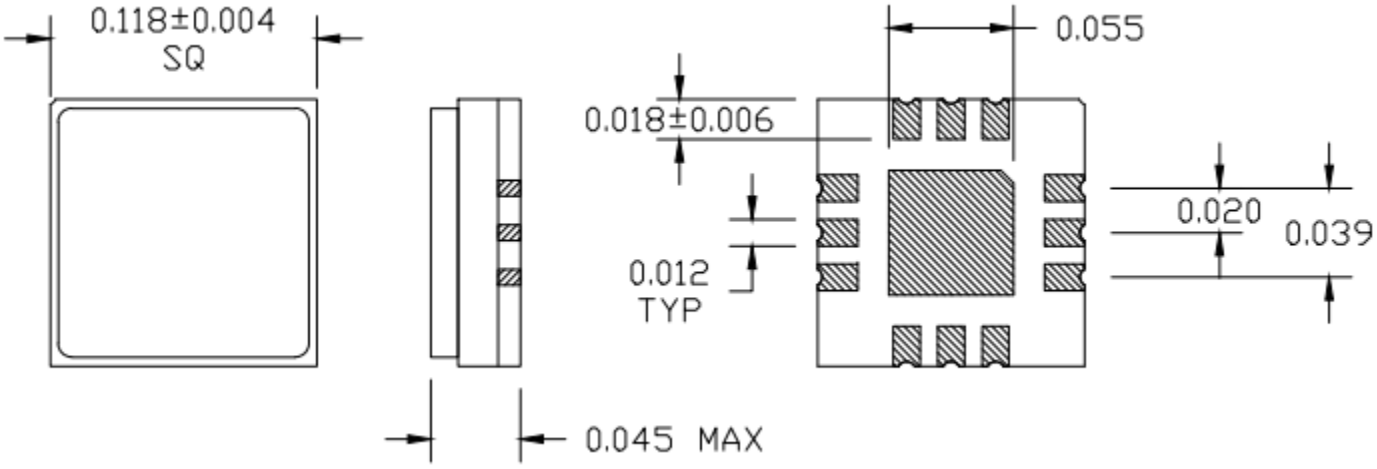


TABLE 4: SCREENING FLOW:

Test Inspection	MIL – STD -883		Requirement	
	Method	Condition	Class B	Class S
Wafer Lot Acceptance	5007		Per Table	Per Wafer Lot
Non-Destructive Bond Pull	2023		Process under SPC	Process under SPC
Internal Visual	2010	A = Class S, B = Class B	100%	100%
Temperature Cycle	1010	C, 10 Cycles	100%	100%
Acceleration	2001	E (Y1 only)	100%	100%
PIND	2020	A (5 Cycles)	N/A	100%
Serialization	IAW Figure 1		100%	100%
Radiographic	2012	2 Views	N/A	100%
Electrical Test	Table 1	+25˚C	100%	100%
Burn In	1015	A	100%/160 Hrs/125OC	100%/240 Hrs/125OC
Final Electrical	Table 1	+25˚C	100%	100%
PDA Calculation	5004	25% Δ IL / 100% Δ I_{CC}	5%	5%/3% Functional
Group A Electrical[5]	Table 1 Table 2	-55˚C and + 125˚C +25˚C only	45/0	45/0
Seal: Fine Leak Gross Leak	1014	A C	100%	100%
External Visual	2009		100%	100%

Notes:

1. Product under configuration control per KCB QAP 015.
2. Customer will be notified of all class 1 changes for Class B and S part numbers.
3. Wafer Lot Acceptance will include 100% die visual, SEM analysis and Lot Traceability.
4. Electrical Test Data will be recorded for each serial number and included in Final Test Report for all Class S part numbers.
5. Group A Electrical testing will include the Small Signal at the Min/Max operating condition. The Dynamic test (P1dB, IP3, SS) will be tested at +25c only.

ORDERING INFORMATION:

	Unscreened	Class B	Class S
KCB Solutions Part Number	KS204C	KS204B	KS204S