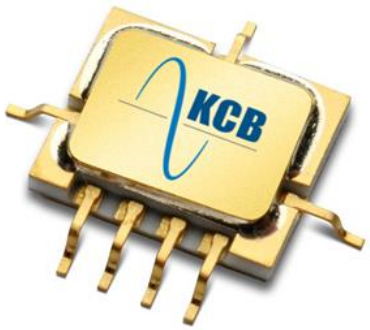
KS209

Switch, 10W
SPDT
0.02–3 GHz

KCB SOLUTIONS
THE HIGHEST STANDARD IN RF

DESCRIPTION

The is a 10W pHEMPT SPDT, low loss switch in a 7-lead 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.



FEATURES

- ✓ Broadband frequency range: 20 MHz to 2.5 GHz
- ✓ Low Insertion Loss: 0.4 dB typical @ 0.9 GHz.
- ✓ High Isolation: 26 dB typical @ 0.9 GHz.
- ✓ High input power compression: 0.1 dB @ > +40 dBm
- ✓ Low current consumption: <100 uA @ 3V
- ✓ High Reliability Class B and S Screening Available.
- ✓ See Page 7 for MR HI–REL Ordering Details.

APPLICATIONS

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

TABLE 1: ELECTRICAL CHARACTERISTICS [1,3]

(V_{CTL} = 0-3 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Z_0 = 50 Ω)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion Loss	IL	0.02 – 3GHz		0.40	0.75	dB
Isolation	ISO	0.02 – 1.0 GHz 1.0 – 2.0 GHz 2.0 – 3.0 GHz	28 22 17	36 26 22		dB dB dB
Return Loss[2]	RL	0.02 – 1.0 GHz 1.0 – 3.0 GHz	21 9	25 20		dB dB

1/ Performance is guaranteed only under the conditions listed in Table 1.

2/ Return loss state. Lower frequency return is dependent on value of the DC blocking capacitors

3/ See plots for more detail

TABLE 2: OPERATING CHARACTERISTICS

(V_{CTL} = 0-3 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Z_0 = 50 Ω)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Switching characteristics: Rise/fall On/off		10/90% or 90/10% RF 50% V_{CTL} to 90/10% RF		650 800		nS nS
0.1 dB Input Compression Point	IP0.1 dB	900 MHz		40.5		dBm
Thermal Resistance[1]		Positive Control		50.6		°C/W
Control Voltage High: Low (@ 20 uA max) High (@ 100 uA max) High (@ 200 uA max)	V_{CTL_L} V_{CTL_H} V_{CTL_H}		0		2.7 10	V V V

1/ Determined by analysis, not tested.

TABLE 3: ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	V_{CTL}	0	+10	V
RF Input power (V_{CTL} > 0.9GHz) 1/	P_{IN}		+41.5	dBm
Operating temperature	T_{OP}	-40	+80	˚C
Storage temperature	T_{STG}	-65	+150	˚C

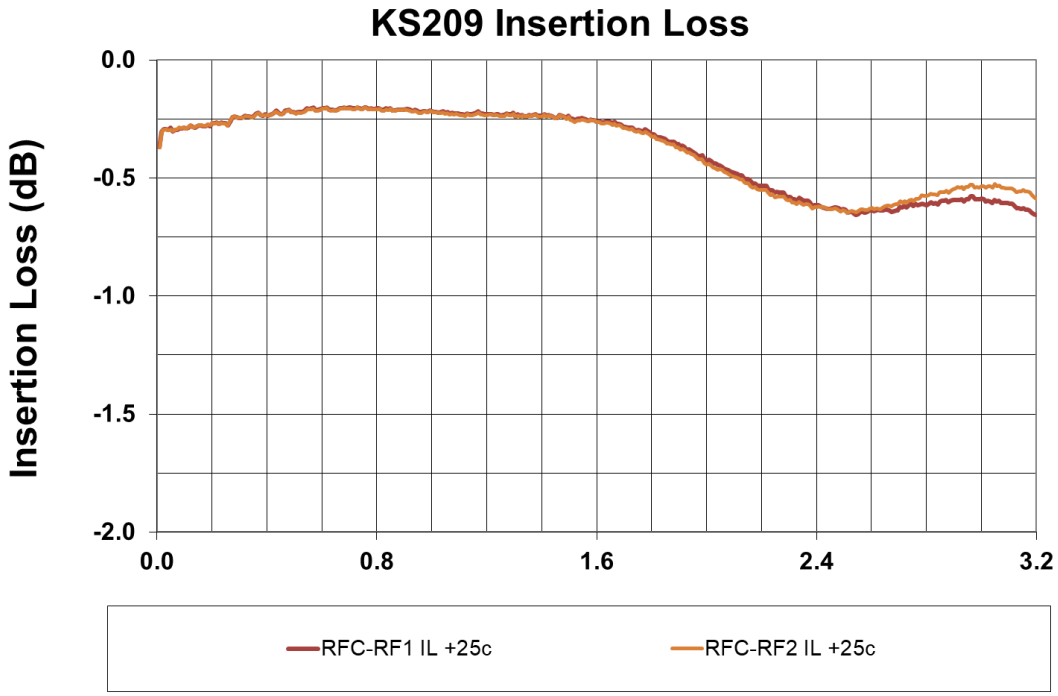
1/ Maximum power for junction temperature to remain below maximum in worst-case conditions.

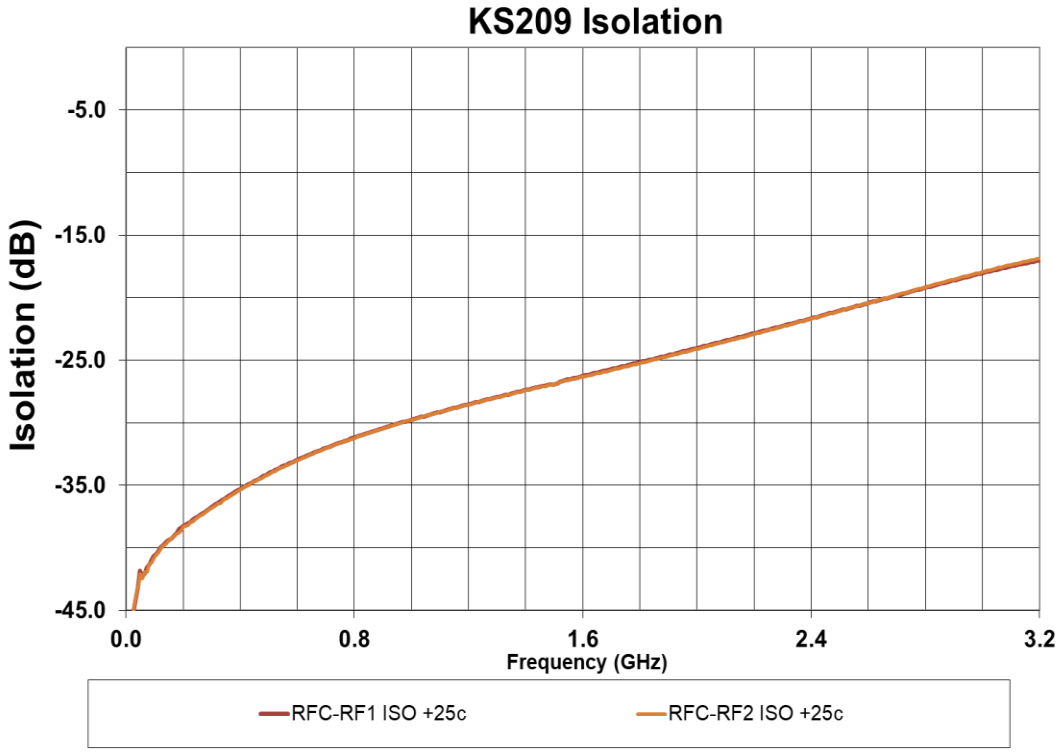
Note: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value.

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

PLOTS

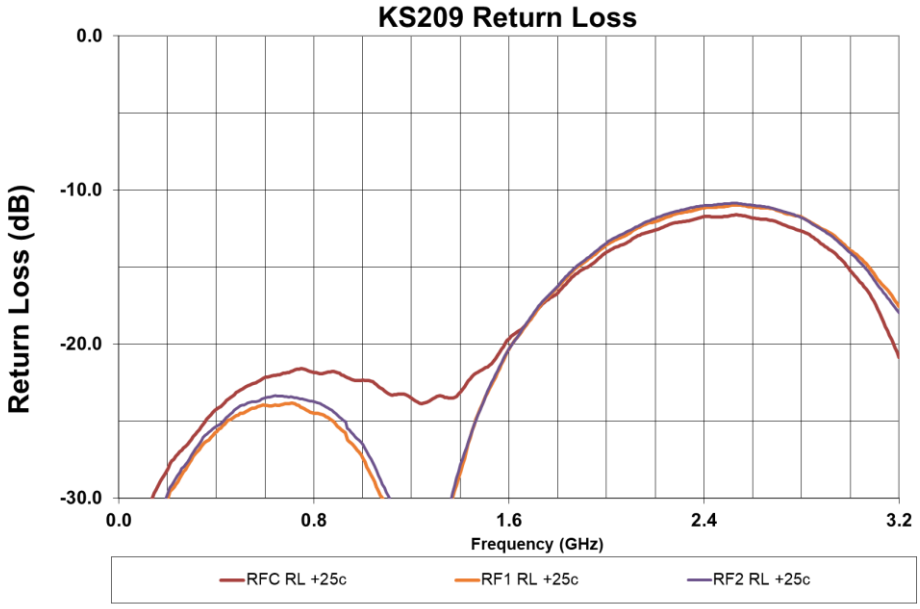
(V_{CTL} = 5V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Z_0 = 50 Ω)

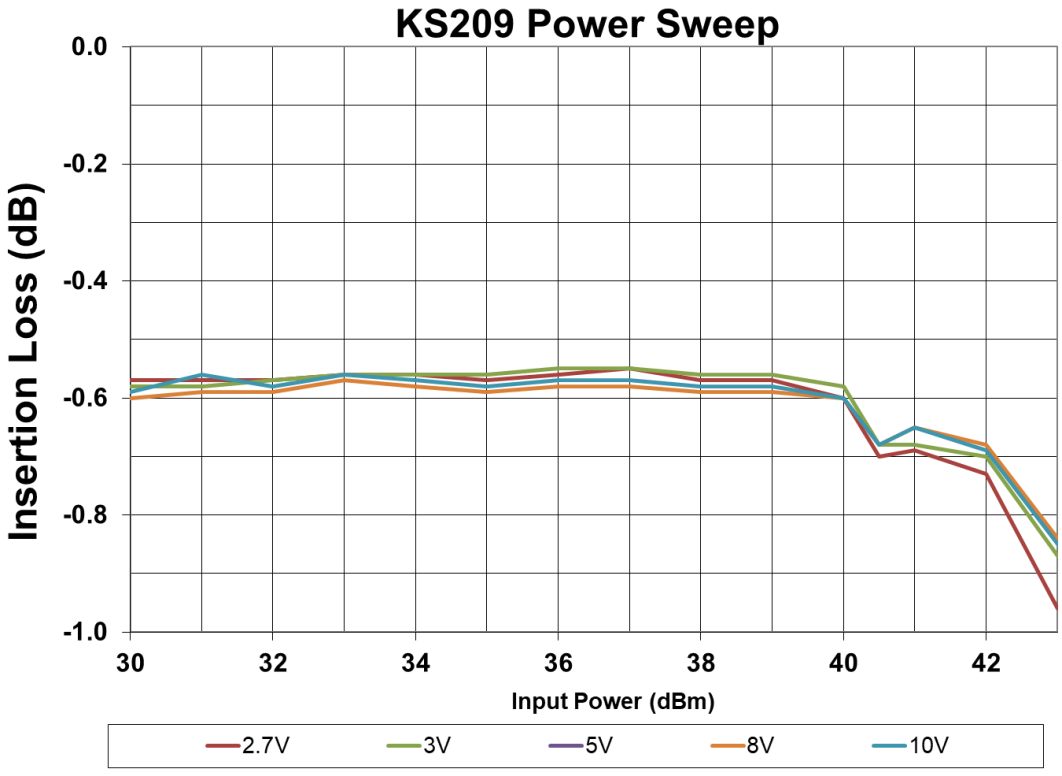




PLOTS

(V_{CTL} = 5V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Z_0 = 50 Ω)





1/ 900MHz tone used for power sweep. Power sweep recorded at various V_{HIGH} values.

EVALUATION BOARD (KS209-EB)

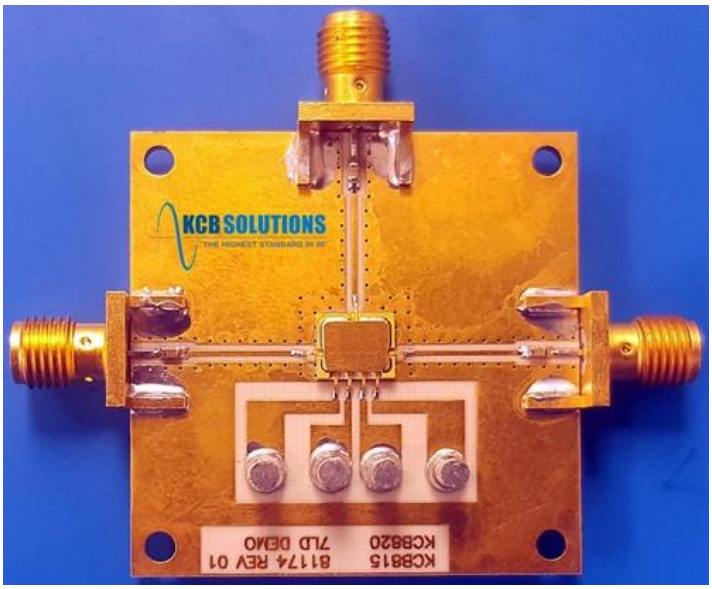


Figure 5

RECOMMENDED SOLDER LAYOUT

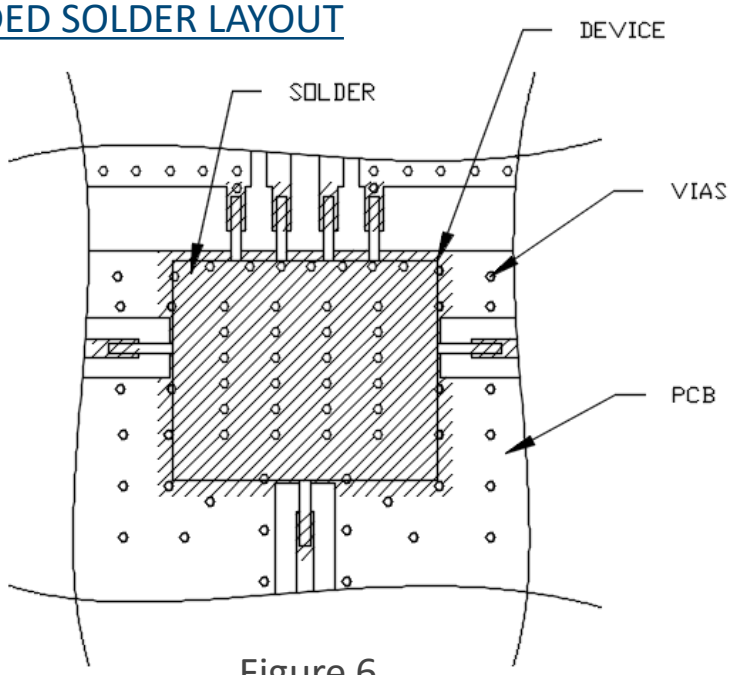


Figure 6

NOTES:

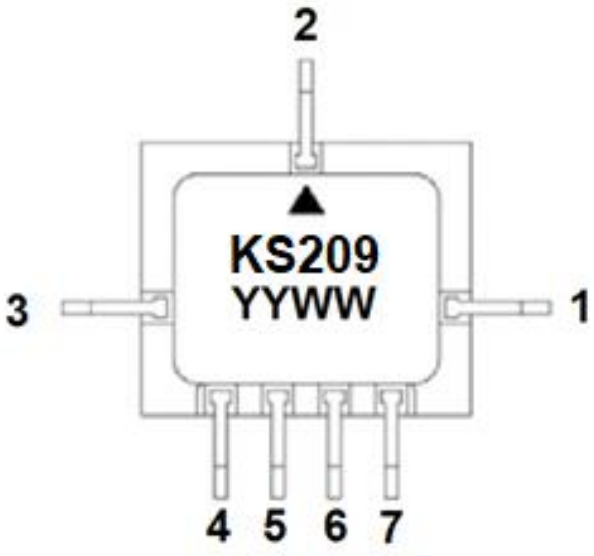
1. TRANSMISSION LINES SCALED FOR ROGERS RO4003, 0.008 INCHES THICK
2. GROUND ALL UNUSED PORTS
3. MAXIMUM REFLOW TEMPERATURE: 265C.
4. DXF FILE AVAILABLE UPON REQUEST.
5. CONTACT KCB SOLUTIONS FOR FURTHER GUIDANCE ON DEVICE PLACEMENT AND ATTACHMENT

TABLE 4. TRUTH TABLE (V_{HIGH} = 2 – 5 V)

V1	V2	J1-J2	J1-J3
V_{LOW}	V_{HIGH}	Isolation	Insertion Loss
V_{HIGH}	V_{LOW}	Insertion Loss	Isolation

Note: V_{LOW} = 0 to 0.2 V, V_{HIGH} = 2.7 to 10 V. Any state other than descried in this Table places the device in an undefined state. An undefined state does not damage the device.

DEVICE MARKING/PIN OUT



PIN	Designation
1	RF2
2	RFC
3	RF1
4	GND
5	A
6	B
7	GND

PACKAGE NOTES:

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

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

ADDITIONAL NOTES:

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

TAPE & REEL: TBD

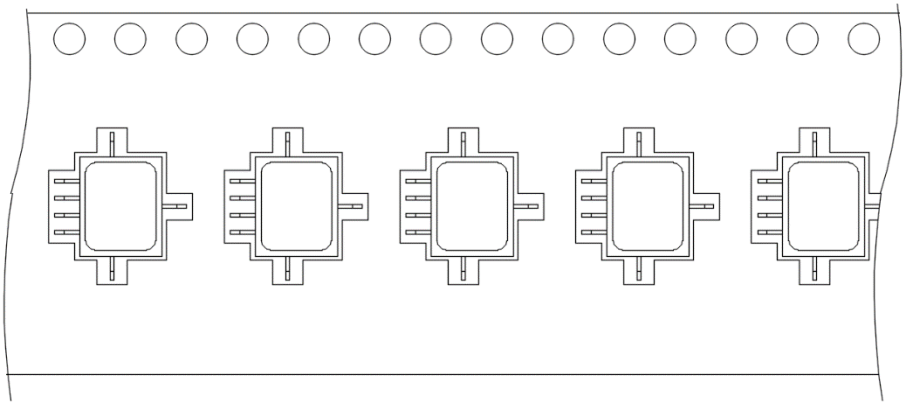


Figure 8

OUTLINE:

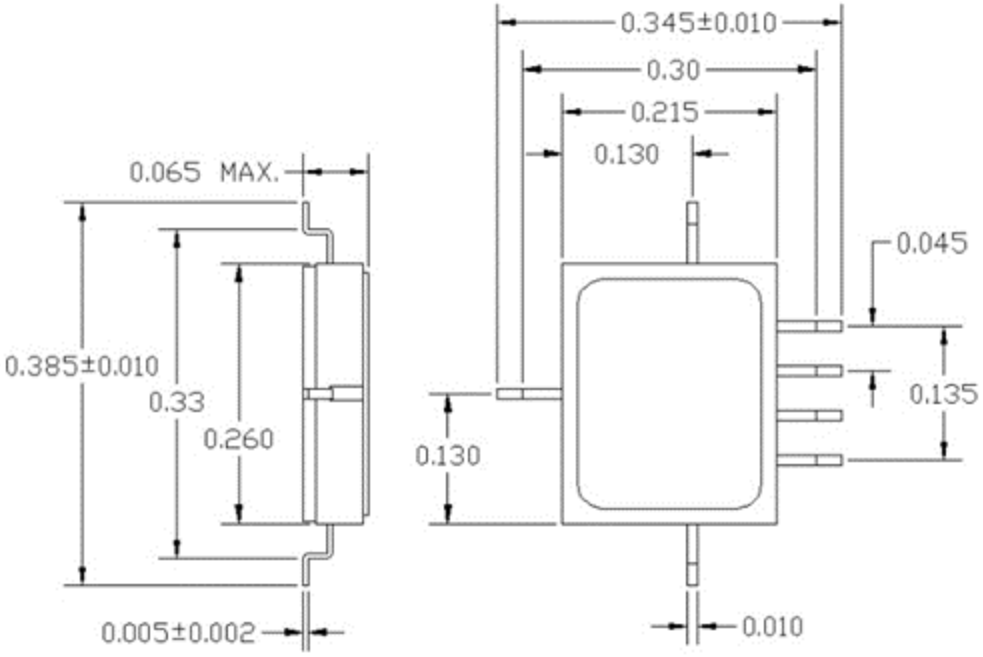


Figure 9

TABLE 5: 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	KS209C	KS209B	KS209S