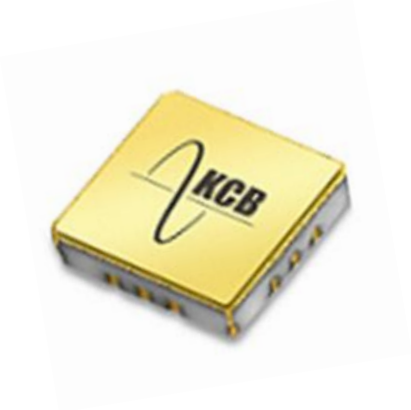
KS207

Switch, SPDT DC–20.0 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 to the required QCI.



FEATURES

- ✓ Low Insertion Loss: 1.6 dB @ 15.0 GHz.
- ✓ High Isolation: 40.0 dB @ 15.0 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 6 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	DC - 1.0 GHz		0.7	1.0	dB
		1.0 - 10.0 GHz		0.9	1.6	dB
		10.0 - 15.0 GHz		1.1	2.0	dB
		15.0 - 20.0 GHz		2.0	2.5	dB
Isolation	ISO	DC - 1.0 GHz	50	55		dB
		1.0 - 10.0 GHz	42	43		dB
		10.0 - 15.0 GHz	40	42		dB
		15.0 - 20.0 GHz	25	30		dB
Return Loss RFC/RF1 or RFC/RF2 (ON State)	|S11|/ |S22|	DC - 18.0 GHz	14	19		dB
		18.0 – 20.0 GHz	12	17		dB

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

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

Parameter	Symbol	Conditions	Min	Typical	Max	Units
Input P1dB	IP1dB	0.5 - 20.0 GHz		+26		dBm
Input IP3 (10 MHz spacing)	IIP3	0.5 - 20.0 GHz		+44		dBm
Rise/Fall Time	t_{RISE}/t_{FALL}	10%/90% RF rise/ 90%/10% RF fall time			20	nS
ON/OFF Time	t_{ON}/t_{OFF}	50% V_{CTL} to 90%/10% RF			40	nS
Control Logic (Complementary Logic)	I_{IN}				5	µA

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

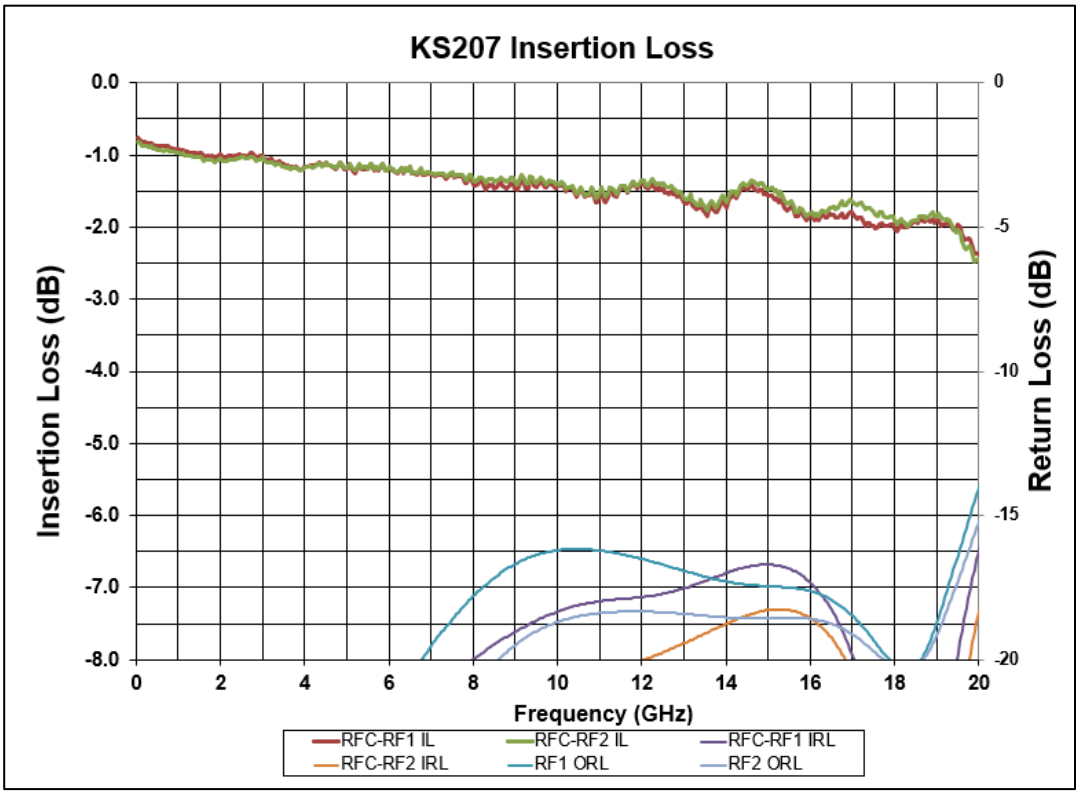
TABLE 3: ABSOLUTE MAXIMUM RATINGS[1,2]

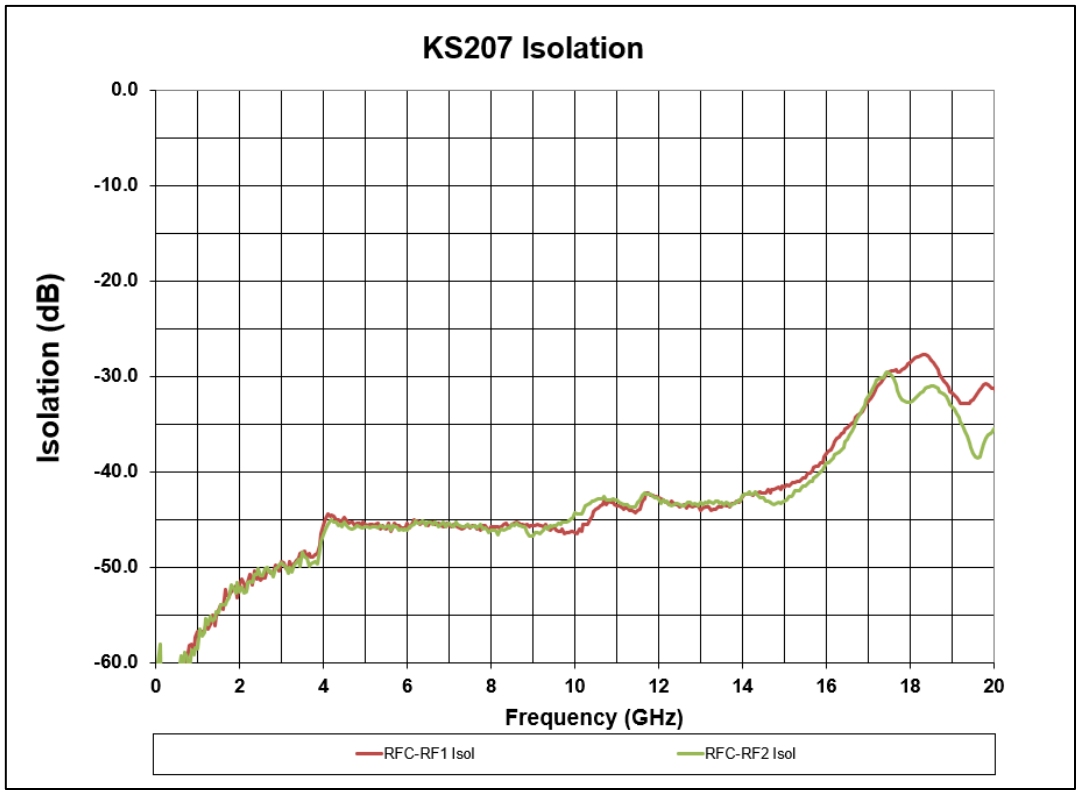
Characteristic	Min.	Max.	Units
Control Voltage	-8.5	+0.1	V
RF Input power		+27	dBm
Channel temperature		+150	°C
Storage temperature	-65	+150	°C
Case temperature (Top)	-55	+125	°C
ESD Classification		≤ 500	V
Thermal resistance, junction-to-case (θ_{JC})		140	C/W

Caution: Class 1A (HBM ≤500V) 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.
2. Exceeding maximum limits may cause damage.

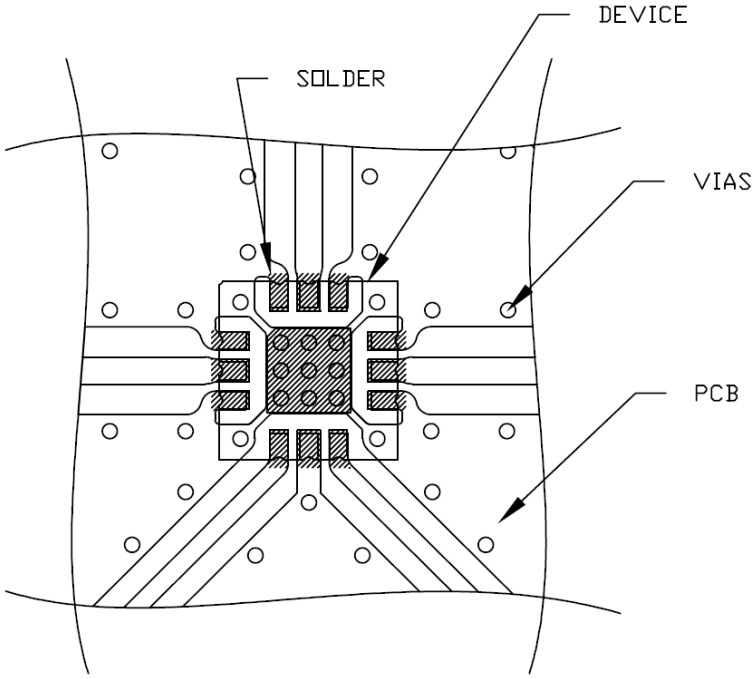
TYPICAL PERFORMANCE (+25 °C)





EVALUATION BOARD (KS207-EB)

RECOMMENDED SOLDER LAYOUT



NOTES:

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

KCB Solutions, LLC
900 Mount Laurel, Shirley, MA 01464
Office: (978) 425-0400

info@kcbsolutions.com
www.kcbsolutions.com

TRUTH TABLE

Control Input		Condition of Switch	
V1	V2	RF1	RF2
Low	High	On	Off
High	Low	Off	On

Note: Vlow = -5 V, Vhigh = 0V

SCHEMATIC

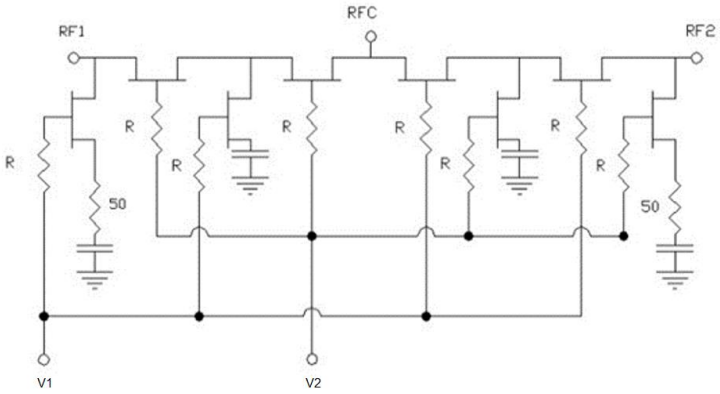
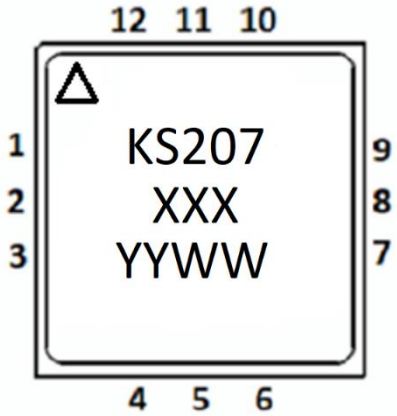


FIGURE 1: DEVICE MARKING/PIN OUT



Pin	Designation	Pin	Designation
1	GND	7	GND
2	RF1	8	RF2
3	GND	9	GND
4	V1	10	GND
5	GND	11	RFC
6	V2	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 paddle is RF ground
- External blocking capacitors required on all RF ports

FIGURE 2: OUTLINE

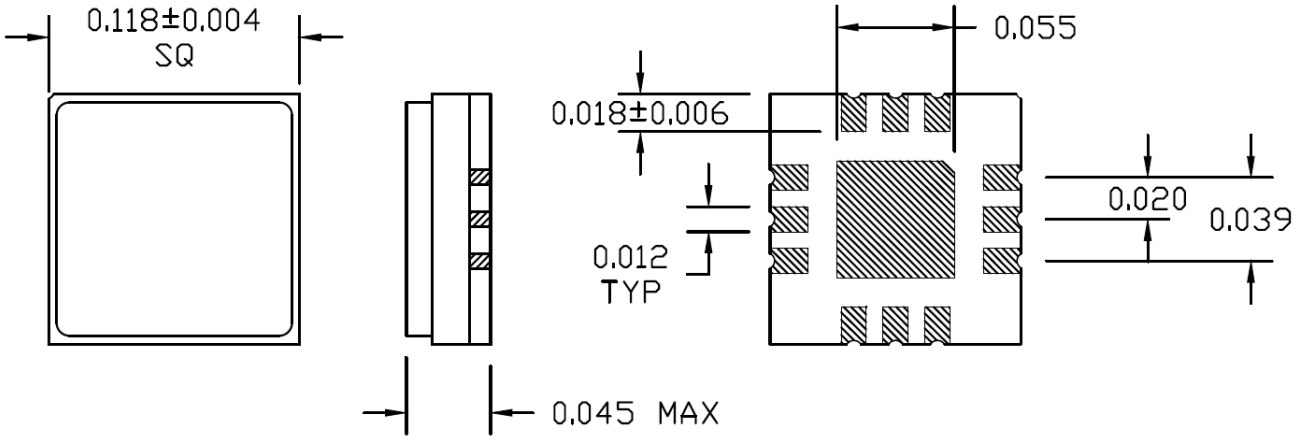
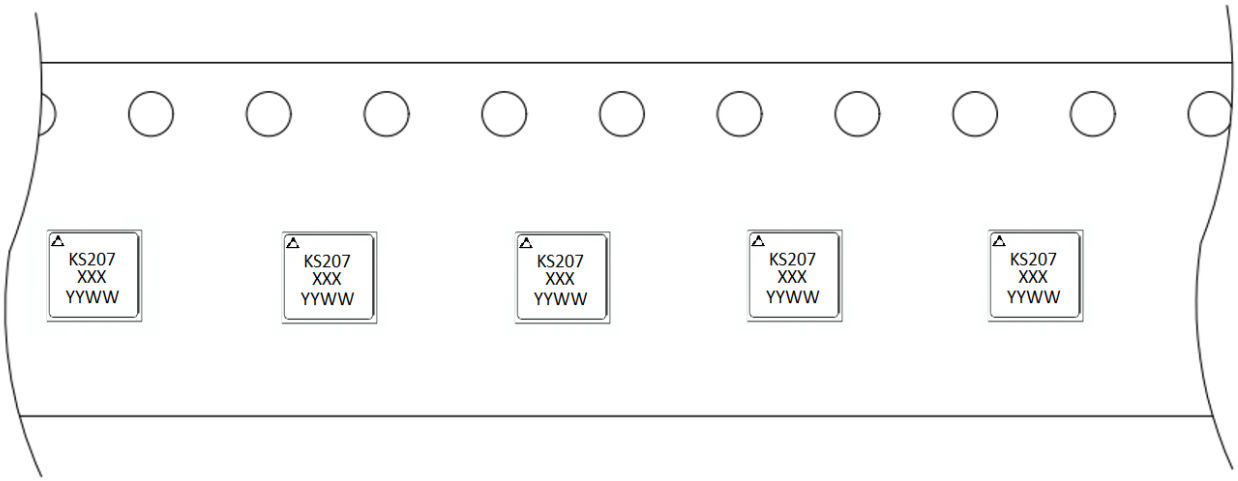


FIGURE 3: TAPE & REEL



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

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/125C	100%/240 Hrs/125C
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	KS207C	KS207B	KS207S