

KT105

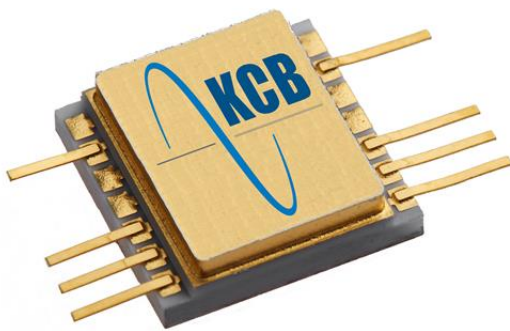
Digital
Attenuator
0.02–3.2 GHz

DESCRIPTION

The KT105 is a GaAs pHEMT broadband seven bit digital attenuator with serial control in a hermetic Surface-Mount Technology (SMT) package for high reliability applications. This attenuator offers low insertion loss and excellent attenuation accuracy. It can be supplied and tested to the screening requirements of MIL-PRF-38534 Class H and K in addition to the required QCI.

FEATURES

- ✓ 7 Bit Fixed attenuator, LSB .25dB, MSB 16dB.
- ✓ NASA EEE-INST-002 compliant.
- ✓ High Reliability Class H and K Screening Available.
- ✓ Class K device: 300K RAD Tolerance
- ✓ See Page 5 for MR HI –REL Ordering Details.



APPLICATIONS

- ✓ Space Transponders
- ✓ Military Radios
- ✓ Telecom Infrastructure
- ✓ Test Equipment

ELECTRICAL CHARACTERISTICS (-40 to +85 °C)¹

Parameter	Symbol	Conditions	Min	Typical	Max	Units
Insertion Loss	IL	0.02 – 1.0 GHz		1.5	2.0	dB
		1.0 – 2.0 GHz		2.0	2.5	dB
		2.0 – 3.2 GHz		3.0	4.0	dB
Attenuation Range	Attn	0.02 – 3.2 GHz	0	0.25	31.75	dB
Return Loss (I/O)	IRL/ORL	0.02 – 1.0 GHz	15	20		dB
		1.0 – 2.0 GHz	14	18		dB
		2.0 – 3.2 GHz	8	14		dB
Attenuation Accuracy		0.02 – 2.0 GHz				
		0 dB–7.75 dB			±(0.2+1.5%)	dB
		8 dB–31.75 dB			±(0.15+5%)	dB
		2.0–3.2 GHz				
		0dB–31.75 dB			±(0.25+4.5%)	dB

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

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OPERATING CHARACTERISTICS (+25 °C)¹

Parameter	Symbol	Conditions	Min	Typical	Max	Units
Input Compression Point	IP1dB	0.02 – 0.1 GHz: IL state		+27		dBm
		Attn states		+16		dBm
		0.1 – 0.5 GHz: IL state		+35		dBm
		Attn states		+27		dBm
		0.5 – 2.0 GHz: IL state		+35		dBm
		Attn states		+27		dBm
		2.0 – 3.2 GHz: IL state		+35		dBm
		Attn states		+27		dBm
		2.0 – 3.2 GHz: IL state		+35		dBm
3rd order input inter- cept point (+18 dBm tones, +/- 1% spacing, any state)	IIP3	0.02 – 0.1 GHz	+29	+35		dBm
		0.1 – 0.5 GHz	+45	+50		dBm
		0.5 – 2.0 GHz	+50	+55		dBm
		2.0 – 3.2 GHz	+50	+55		dBm
2nd order input inter- cept point (+18 dBm tones, +/- 1% spacing, any state)	IIP2	0.02 – 0.1 GHz	+45	+65		dBm
		0.1 – 3.2 GHz	+60	+70		dBm
Relative Phase Error		0.02 – 3.2 GHz			±0.44	Deg/ (dB-GHz)
Settling time	t _{SETTLE}	50% V _{CTL} to RF settled to within 0.1 dB		0.2	1	µS
Control Voltage High	V _{IH}	V _{DD} = 4.5 – 5.5 V	0.5xV _{DD}		V _{DD}	V
Control Voltage Low	V _{IL}	V _{DD} = 4.5 – 5.5 V	0		0.8	V
Digital Input Leakage	I _{IN}	V _{DD} = 4.5 – 5.5 V	-1		1	µA

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

ABSOLUTE MAXIMUM RATINGS

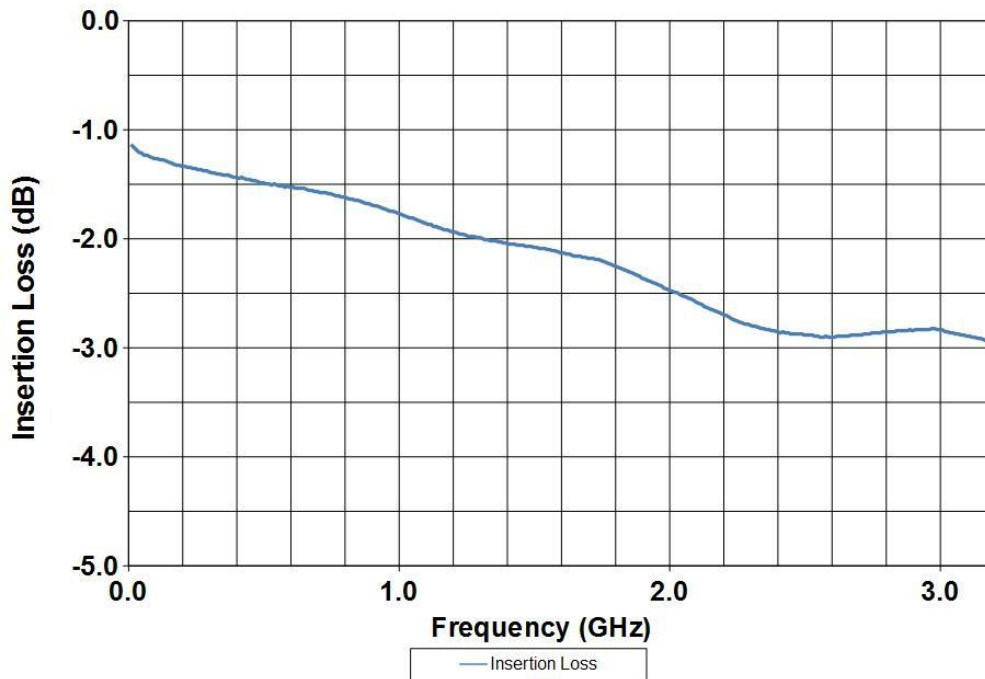
Characteristic	Min.	Max.	Units
Supply voltage	-0.3	7.0	V
Control voltage	-0.3	V _{DD} + 0.3	V
RF Input power ¹		+24	dBm
Operating temperature	-40	+85	°C
Storage temperature	-65	150	°C
Thermal resistance		400	°C/W
ESD sensitivity (HBM)		500 (Class 1B)	V

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

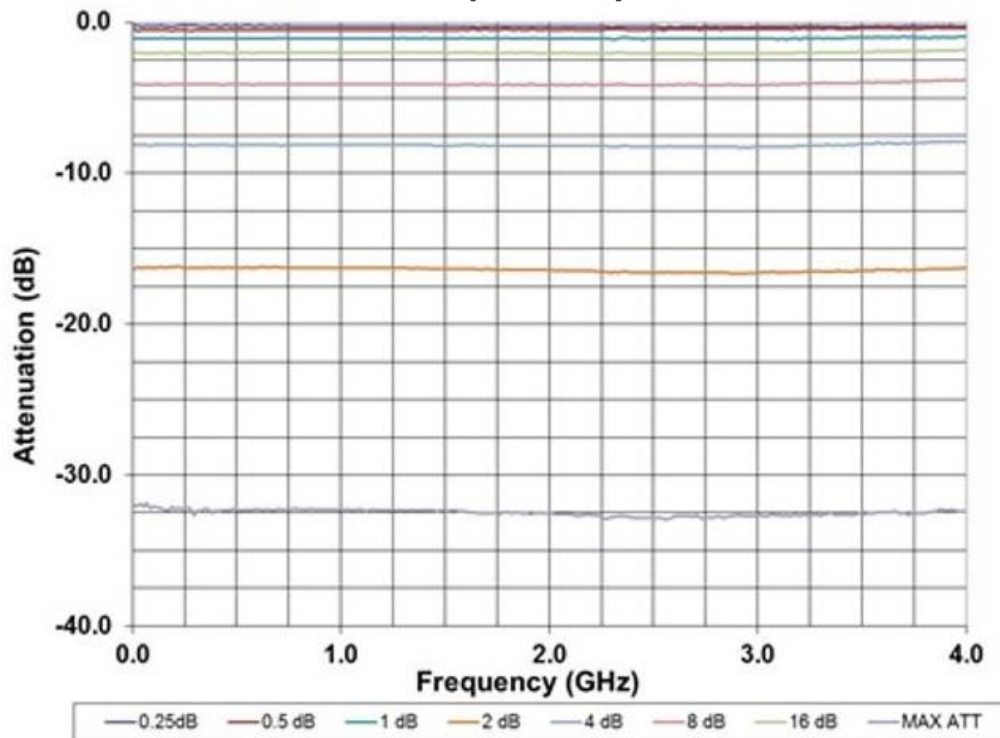


TYPICAL PERFORMANCE (+25 °C)

Insertion Loss vs Frequency:

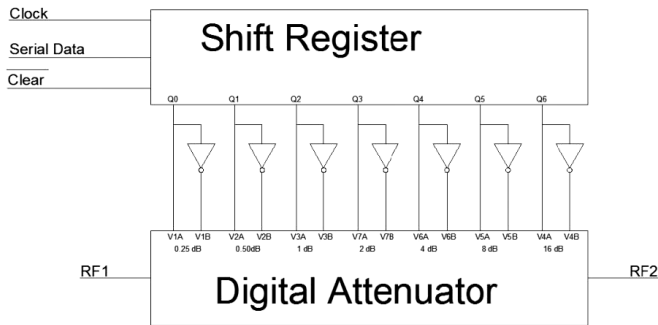


Attenuation vs Frequency:

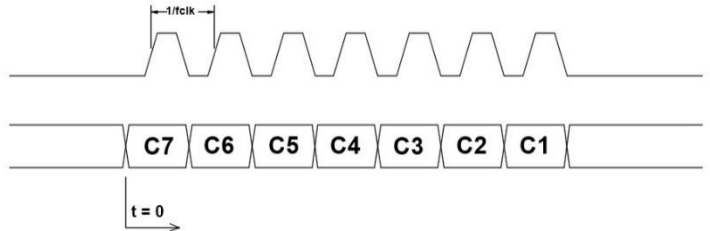


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FUNCTIONAL BLOCK DIAGRAM



TIMING DIAGRAM



Note: CLR_N sets device into IL state regardless of C1 through C7 status

SERIAL INTERFACE CHARACTERISTICS

($V_{DD} = 5.0V$, $-34^{\circ}C < T_{OP} < +100^{\circ}C$)

Parameter	Symbol	Min.	Max.	Units
Clock frequency	f_{CLK}		10	MHz
Initial input setup time	T_s	4	-	nS
Hold time, input to shift clock	T_h	2	-	nS
Setup time, CLR_N to shift clock	T_{Isup}	40	-	nS
Pulse width (CLK)		100	-	nS
Pulse Width (CLR_N)	$T_{w(L)}$	6	-	nS

TRUTH TABLE/CONTROL CONDITIONS

CLR_N	C7	C6	C5	C4	C3	C2	C1	RF1—RF2
1	0	0	0	0	0	0	0	IL
1	0	0	0	0	0	0	1	0.25 dB
1	0	0	0	0	0	1	0	0.5 dB
1	0	0	0	0	1	0	0	1.0 dB
1	0	0	0	1	0	0	0	2.0 dB
1	0	0	1	0	0	0	0	4.0 dB
1	0	1	0	0	0	0	0	8.0 dB
1	1	0	0	0	0	0	0	16.0 dB
1	1	1	1	1	1	1	1	31.75 dB
0	X	X	X	X	X	X	X	IL



- XXX = Serial # will be added for Class H and K Part #
- Z = Screening designation (C/H/K)

PIN	Designation	PIN	Designation
1	RF IN	5	CLR_N
2	GND	6	VDD
3	Data In	7	GND
4	CLK	8	RF OUT

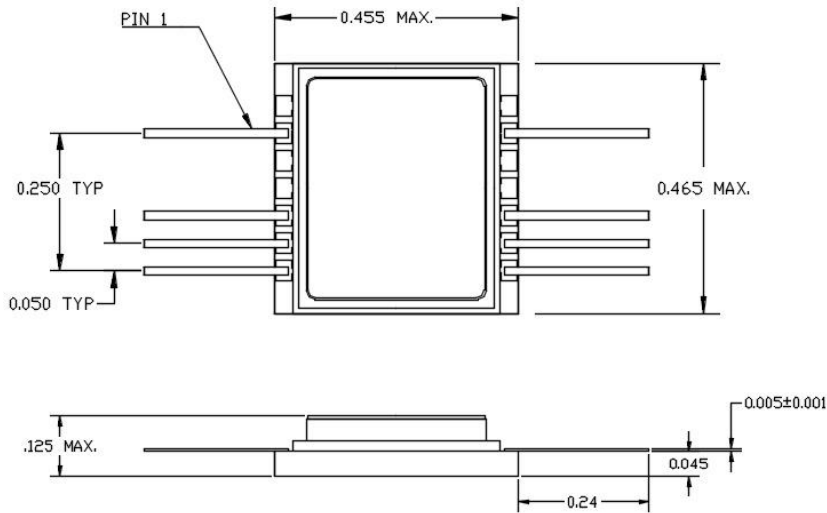
PACKAGE NOTES:

- Lid/Leads: ASTM F-15 Alloy
- Base/Walls: Alumina
- Lid Finish: Nichel plate
- Leads/Seal Ring/Bottom: Gold over Nickel



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OUTLINE DRAWING:



Package Notes:

- Lid/Leads: ASTM F-15 Alloy
- Base/Walls: Alumina
- Lid Finish: Gold over Nickel
- Leads/Seal Ring/Bottom: Gold over Nickel
- Lead configuration can be customized to specific end use if required.

Additional Notes:

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

SCREENING FLOW:

Test Inspection	MIL – STD -883		Requirement	
	Method	Condition	Class H	Class K
Element Evaluation	MIL-PRF-38534	Table C-1	Per Table	Per Table
Non-Destructive Bond Pull	2023		Process under SPC	100%
Internal Visual	2010	B = Class H, A = Class K	100%	100%
Temperature Cycle	1010	C, 10 Cycles	100%	100%
Acceleration	2001	B (Y1 only)	100%	100%
PIND	2020	A (5 Cycles)	N/A	100%
Serialization	Per Product Specification		100%	100%
Radiographic	2012	2 Views	N/A	100%
Electrical Test	Per Product Specification	+25OC	100%	100%
Burn In	1015	A	100%/160 Hrs/125OC	100%/240 Hrs/125OC
Final Electrical	Per Product Specification	+25OC	100%	100%
Group A Electrical	Per Product Specification	-40OC and + 85OC	45/0	45/0
Seal: Fine Leak		A		
Gross Leak	1014	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 H and K part numbers.
4. Electrical Test Data will be recorded for each serial number and included in Final Test Report for all Class K 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 H	Class K
KCB Solutions Part Number	KT105C	KT105H	KT105K

