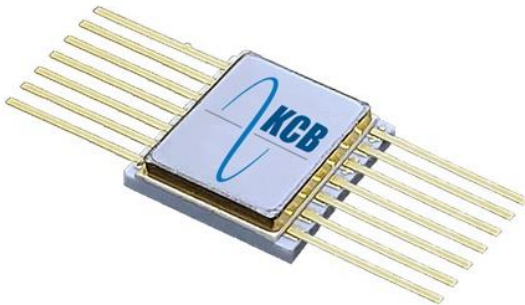


KT109

Digital
Attenuator
0.02–3.2 GHz

DESCRIPTION

The KT109 is a GaAs pHEMT broadband seven bit digital attenuator with parallel 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.

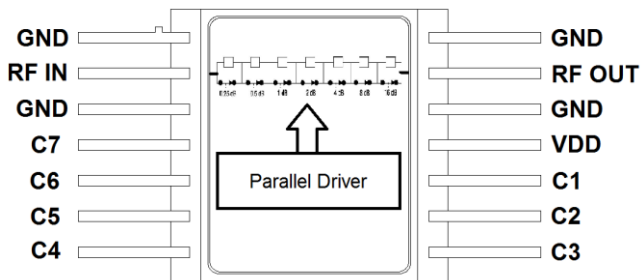


FEATURES

- ✓ 7 Bit Fixed attenuator, LSB .25dB, MSB 16dB.
- ✓ NASA EEE-INST-002 compliant.
- ✓ High Reliability Class H and K Screening Available.
- ✓ Class K: 300K Rad tolerance (KT109K/H only)
- ✓ 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 – 3.2 GHz	12	18		dB
Attenuation Accuracy		0.02 – 2.0 GHz				
		0 dB–15.75 dB			±(0.20+1.5%)	dB
		16 dB–31.75 dB			±(0.20+4.5%)	dB
		2.0–3.2 GHz				
0 dB–15.75 dB				±(0.25+4.5%)	dB	
16 dB–31.75 dB					±(0.25+6.0%)	dB

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

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OPERATING CHARACTERISTICS (-40 to +85 °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		
3rd order input intercept 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 intercept 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% VCTL 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.

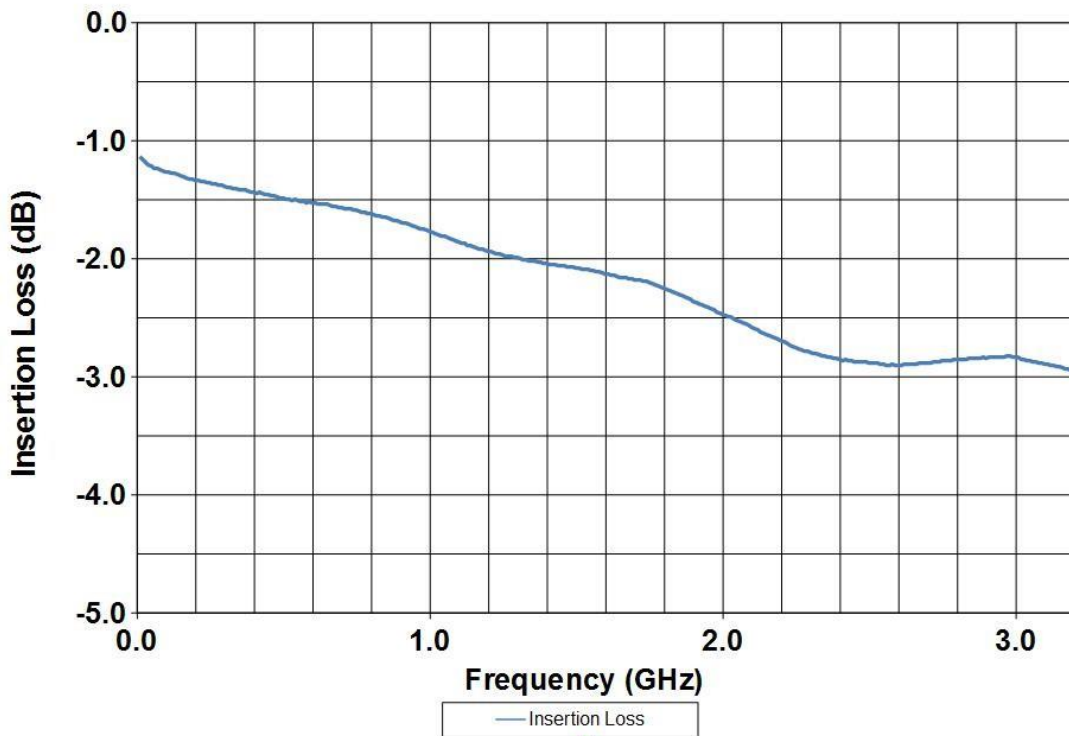
ABSOLUTE MAXIMUM RATINGS

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

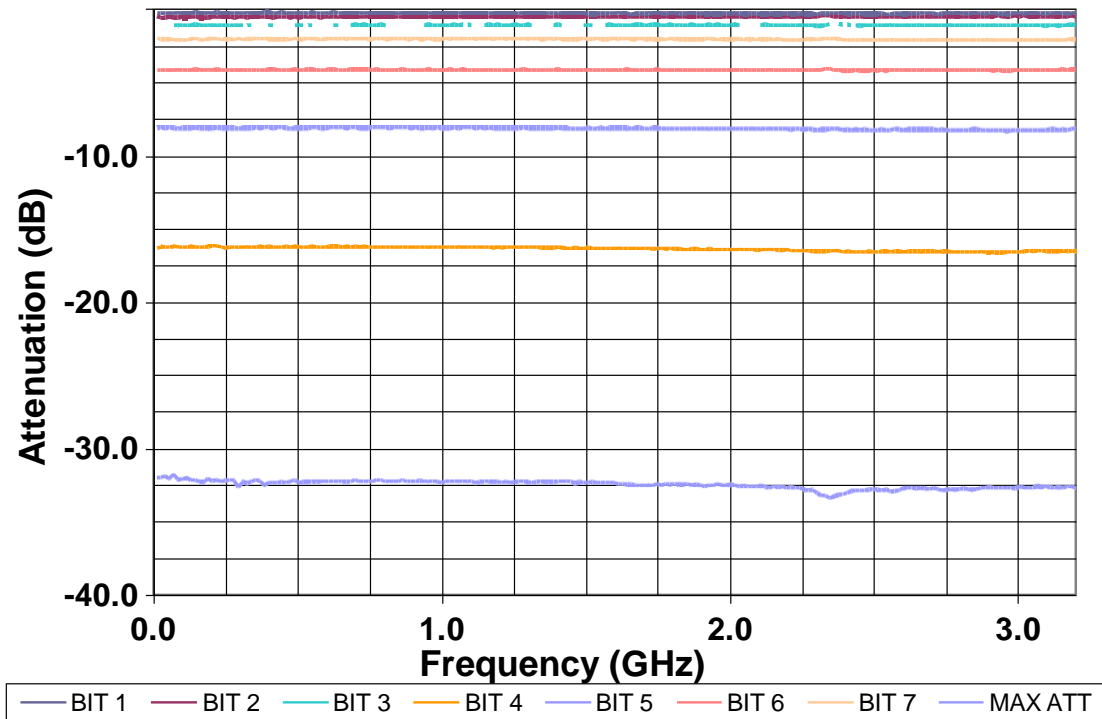
1. Unit shall survive operation without damage over the temperature range but not tested.

TYPICAL PERFORMANCE (+25 °C)

Insertion Loss vs Frequency:



Attenuation vs Frequency:

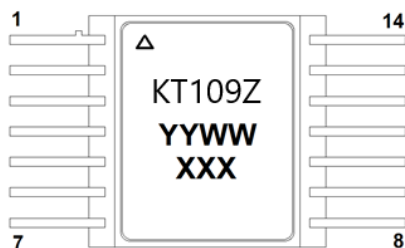


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TRUTH TABLE/CONTROL CONDITIONS

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

DEVICE MARKING/PIN OUT:



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

PIN	Designation	PIN	Designation
1	GND	8	C3
2	RF IN	9	C2
3	GND	10	C1
4	C7	11	V _{DD}
5	C6	12	GND
6	C5	13	RF OUT
7	C4	14	GND

PACKAGE NOTES

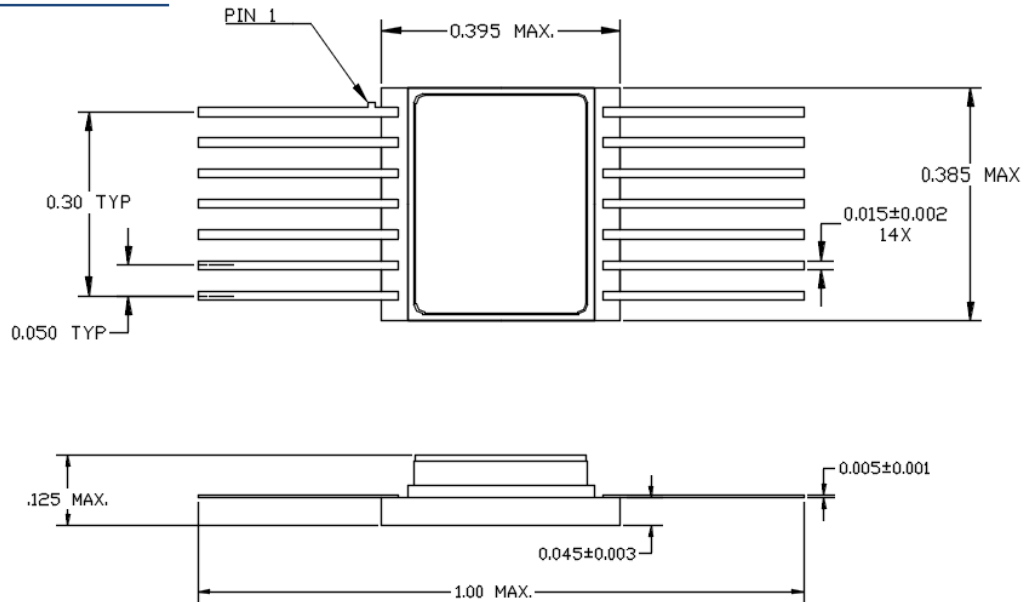
- Lid/Leads: ASTM F-15 Alloy
- Base/Walls: Alumina
- Finish:
 - Lid: Nickel
 - Leads/Seal Ring/Bottom: Gold over Nickel

ADDITIONAL NOTES:

- Maximum reflow temperature: 265°C for 90 seconds maximum
- Package base is RF ground
- External blocking capacitors required on all RF ports
- CARE SHOULD BE TAKEN WHEN SELECTING PCB MATERIAL AND ASSEMBLY METHODS TO MINIMIZE CTE MISMATCH WITH PACKAGE.

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OUTLINE DRAWING:



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= ClassK	100%	100%
Temperature Cycle	1010	C, 10Cycles	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		N/A	100%
Electrical Test	Per Product Specification	+25°C	100%	100%
Burn In	1015	A	100%/160 Hrs/125°C	100%/320 Hrs/125°C
Final Electrical	Per Product Specification	+25°C	100%	100%
Group A Electrical	Per Product Specification	-40°C/+ 85°C	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	KT109C	KT109H	KT109K