MMIC DIE

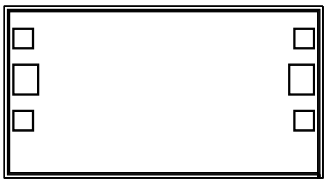
Gain Equalizer

EQY-18-24-D+

50Ω 6 to 18 GHz

THE BIG DEAL

- 18 dB Slope
- Insertion Loss, 20.4 dB Typ. at 6 GHz
- Insertion Loss, 2.2 dB Typ. at 18 GHz
- Return Loss, 20 dB Typ.



+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

SEE ORDERING INFORMATION ON THE LAST PAGE

APPLICATIONS

- Test and Measurement Equipment
- EW, Radar, and ECM Defense Systems
- Back Haul Radio

PRODUCT OVERVIEW

Mini-Circuits' EQY-18-24-D+ is a MMIC Gain Equalizer fabricated using highly repeatable GaAs MMIC process incorporating resistors, capacitors, and inductors to accomplish a negative insertion loss slope. EQY-18-24-D+ has a nominal attenuation slope of 18 dB across the wide bandwidth of 6 to 18 GHz.

KEY FEATURES

Features	Advantages
Negative Insertion Loss Slope vs. Frequency	Useful for compensating negative gain slope of amplifiers, filter effects in receivers, and transmitters to achieve flat gain versus frequency.
Wideband Operation, 6 to 18 GHz	Supports a wide array of applications including Test & Measurement Equipment, EW, Radar, and ECM Defense Systems, and Back Haul radio.
Excellent Power Handling Capability	Enables its use at the output of a variety of amplifiers.
Unpackaged Die	Enable user to integrate it directly into hybrids.

REV. A
ECO-026456
EQY-18-24-D+
MCL NY
250805

Gain Equalizer

EQY-18-24-D+

50Ω 6 to 18 GHz

ELECTRICAL SPECIFICATIONS[1] AT +25°C, 50Ω, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		6		18	GHz
Insertion Loss	6		20.4		dB
	10		13.5		
	14		6.6		
	16		3.9		
	18		2.1		
VSWR	6-10		1.11		:1
	10-14		1.13		
	14-16		1.17		
	16-18		1.35		

1. Die is soldered in a 3x3 mm 16-lead QFN-style package and measured on Mini-Circuits Characterization Test Board TB-EQY-18-24C+. See Characterization & Application Circuit (Fig.1).

ABSOLUTE MAXIMUM RATINGS[2]

Parameter	Ratings
Operating Case Temperature	-55°C to +105°C
Storage Temperature	-65°C to +150°C
RF Input Power[3]	+33 dBm (5 minute max) +30 dBm (continuous)

2. Permanent damage may occur if any of these limits are exceeded.
3. Derates linearly to +29 dBm at +105°C.

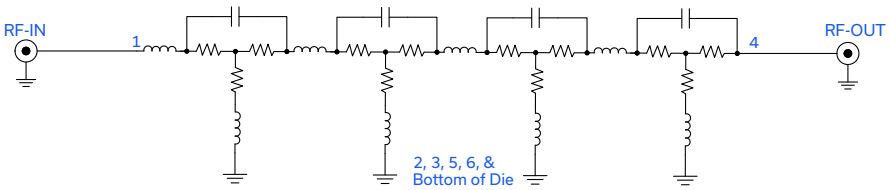
MMIC DIE

Gain Equalizer

EQY-18-24-D+

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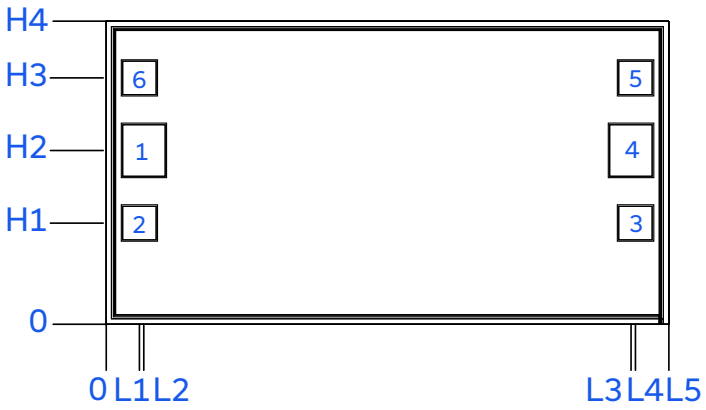
SIMPLIFIED SCHEMATIC



PAD DESCRIPTION

Function	Pad Number	Description
RF-IN	1	RF-Input Pad
RF-OUT	4	RF-Output Pad
GND	2, 3, 5, 6, & Bottom of the Die	The bond pads are connected to back-side through vias and do not require wire-bond connections to ground.

BONDING PAD POSITION



DIE DIMENSIONS IN µm, TYP.

L1	L2	L3	L4	L5
92	104	1446	1459	1550

H1	H2	H3	H4
279	479	679	835

Thickness	Die size	Pad Size 1 & 4	Pad Size 2,3,5 & 6
100	1550 x 835	117 x 142	92 x 92

CHARACTERIZATION & APPLICATION CIRCUIT

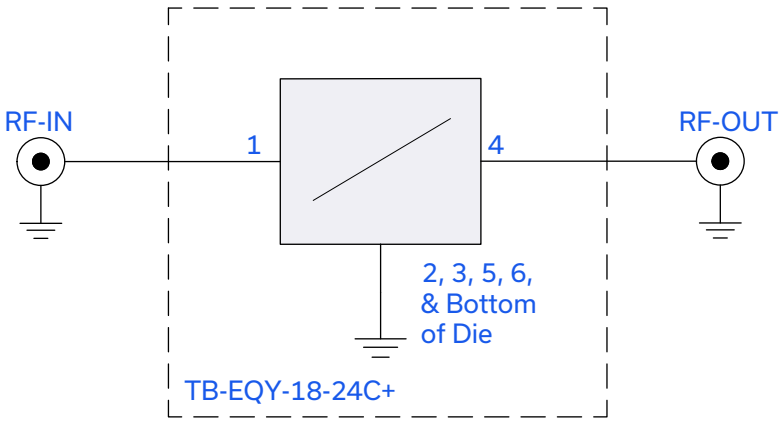
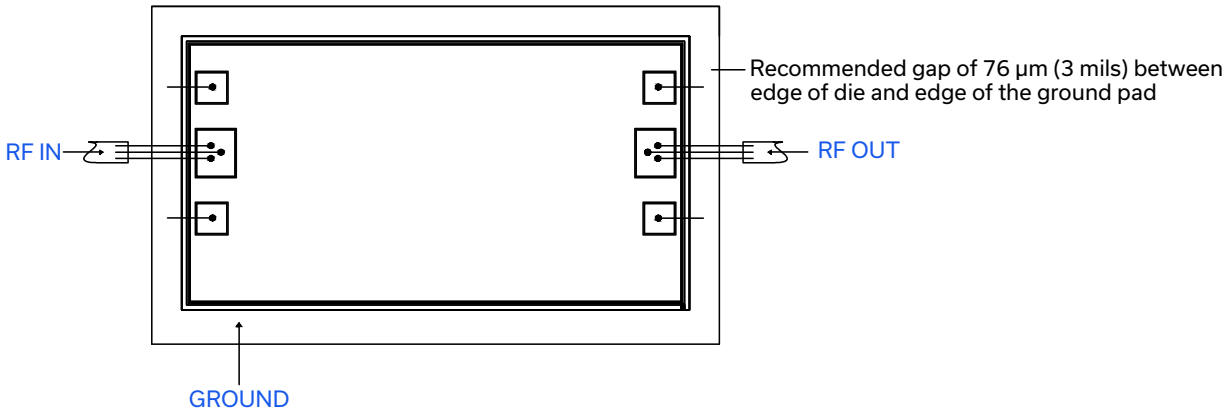


Fig 1. Characterization & Application Circuit
Note: This block diagram is used for characterization. (DUT is soldered into a 3x3 mm 16-lead QFN-style package and measured on Mini-Circuits characterization test board TB-EQY-18-24C+.) Insertion Loss and Return Loss are measured using Keysight N5245A PNA-X Microwave Network Analyzer.

Condition:
Insertion Loss & Return Loss: P_{IN}= 0 dBm

ASSEMBLY DIAGRAM



ASSEMBLY PROCEDURE

1. Storage
   Die should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD
   MMIC Equalizer die are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be open in clean room conditions at an appropriately grounded anti-static workstation.
3. Die Handling and Attachment
   Devices need careful handling using correctly designed collets, it is recommended to handle the chip along the edges with a custom design collet. The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are Ablestik 84-1 LMISR4 or equivalents. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. The surface of the chip has exposed air bridges and should not be touched with vacuum collet, tweezers or fingers.
4. Wire Bonding
   Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the die gold bond pads. Thermo-sonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1mil diameter. Bonds must be made from the bond pads on the die to the packaged or substrate. All bond wire length and bond wire height should be kept as short as possible unless specified by the Assembly Drawing to minimize performance degradation due to undesirable series inductance.

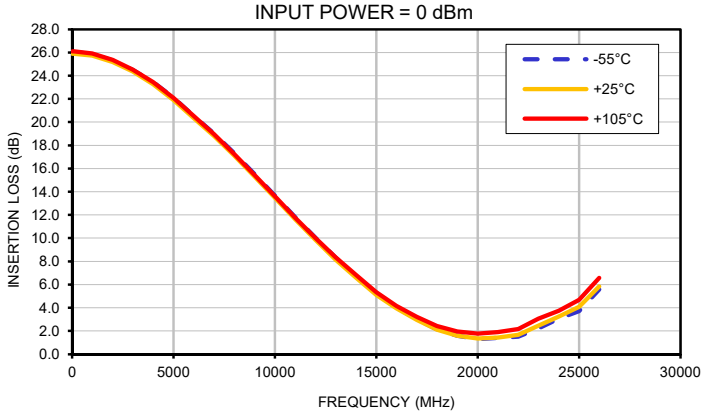
Gain Equalizer

EQY-18-24-D+

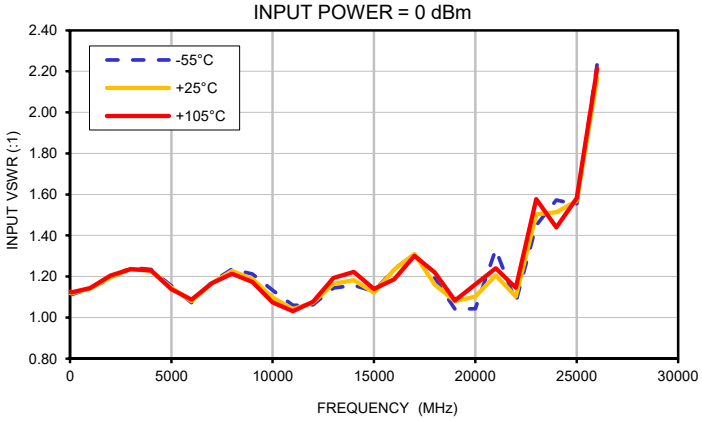
50Ω 6 to 18 GHz

TYPICAL PERFORMANCE CURVES

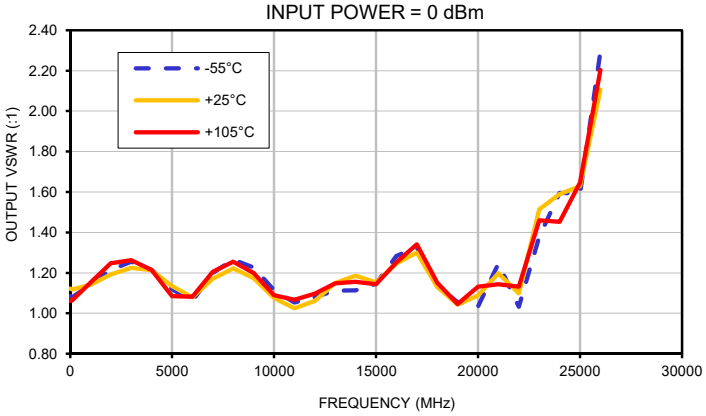
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



INPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm



MMIC DIE

Gain Equalizer

EQY-18-24-D+

50Ω 6 to 18 GHz

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

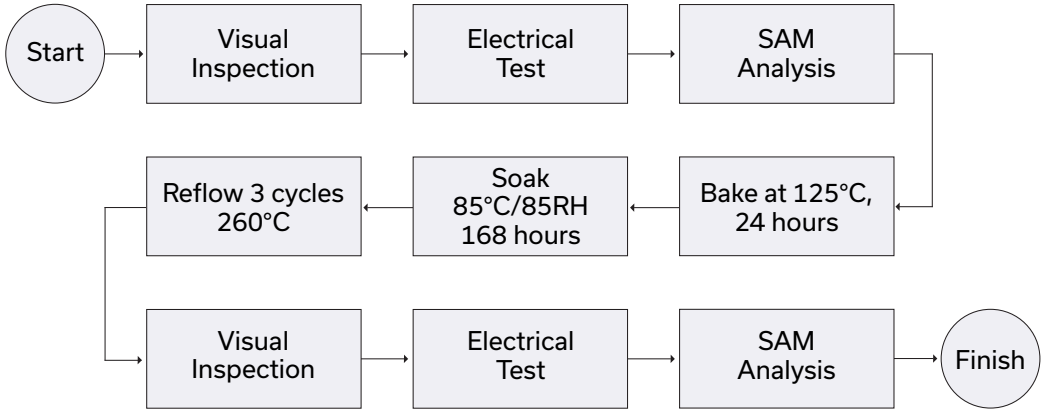
Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set with and without port extension(.zip file)
Case Style	Die
Die Ordering and Packaging Information	Quantity, Package — Model No. Small, Gel - Pak: 5,10,50,100 KGD* — EQY-18-24-DG+ Medium†, Partial wafer: KGD*<1247 — EQY-18-24-DP+ Full wafer — EQY-18-24-DF+ †Available upon request contact sales representative Refer to AN-60-067
Die Marking	JU18E
Environmental Ratings	ENV80

* Known Good Die ('KGD') means that the die in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such die fall within a predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die are capable of meeting typical RF electrical performance specified by Mini-Circuits.

ESD RATING

Human Body Model (HBM): Class 1C (1000 V to < 2000 V) in accordance with ANSI/ESD STM 5.1 - 2001 Machine
Charged Device Model (CDM): Class 1B (500 V to < 1000 V) in accordance with ANSI/ESD 5.2-2001

MSL TEST FLOW CHART



NOTES

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained there in. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

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MMIC Gain Equalizer

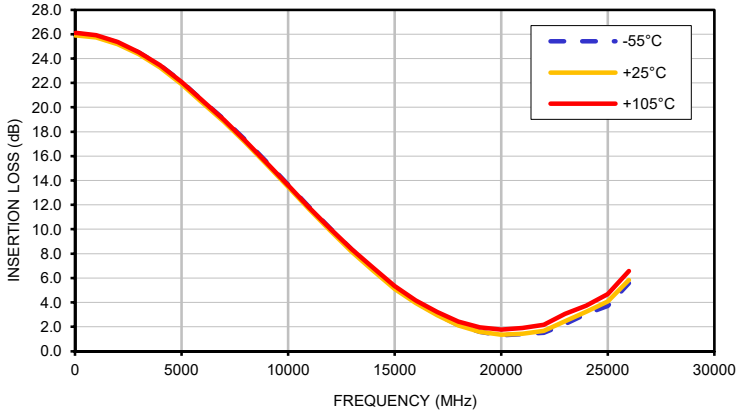
EQY-18-24-D+

Typical Performance Data

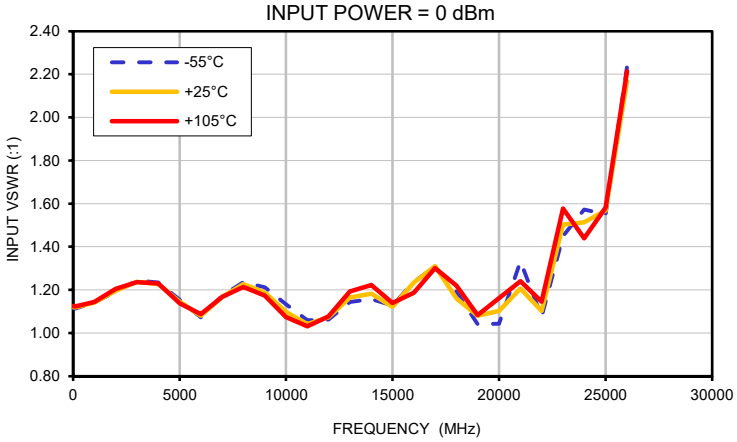
FREQ.	INSERTION LOSS			INPUT VSWR			OUTPUT VSWR		
(MHz)	(dB)			(:1)			(:1)		
	@-55°C	@25°C	@+105°C	@-55°C	@25°C	@+105°C	@-55°C	@25°C	@+105°C
10	26.04	25.89	26.08	1.12	1.12	1.13	1.08	1.12	1.06
20	26.03	25.89	26.11	1.12	1.12	1.13	1.08	1.12	1.06
30	26.03	25.89	26.10	1.12	1.12	1.12	1.08	1.12	1.06
40	26.04	25.90	26.10	1.12	1.12	1.12	1.08	1.12	1.06
50	26.04	25.89	26.10	1.12	1.12	1.12	1.08	1.12	1.06
60	26.03	25.90	26.10	1.11	1.12	1.12	1.08	1.12	1.06
70	26.04	25.89	26.10	1.11	1.12	1.12	1.08	1.12	1.06
80	26.04	25.89	26.11	1.11	1.12	1.12	1.08	1.12	1.06
90	26.04	25.90	26.11	1.11	1.12	1.12	1.08	1.12	1.06
100	26.04	25.89	26.10	1.11	1.12	1.12	1.08	1.12	1.06
1000	25.86	25.72	25.92	1.14	1.14	1.14	1.14	1.14	1.15
2000	25.31	25.18	25.36	1.19	1.20	1.21	1.21	1.19	1.25
3000	24.51	24.36	24.52	1.24	1.24	1.24	1.25	1.23	1.26
4000	23.44	23.27	23.45	1.23	1.23	1.23	1.21	1.21	1.21
5000	22.10	21.90	22.08	1.15	1.15	1.14	1.12	1.13	1.08
6000	20.54	20.35	20.53	1.07	1.08	1.09	1.06	1.08	1.08
7000	19.01	18.81	18.96	1.17	1.17	1.17	1.20	1.17	1.20
8000	17.33	17.13	17.26	1.24	1.23	1.21	1.27	1.22	1.25
9000	15.51	15.31	15.44	1.21	1.19	1.17	1.23	1.17	1.20
10000	13.67	13.47	13.61	1.13	1.10	1.07	1.12	1.08	1.09
11000	11.81	11.62	11.78	1.06	1.04	1.03	1.05	1.02	1.07
12000	10.02	9.85	10.01	1.06	1.07	1.08	1.08	1.06	1.10
13000	8.32	8.16	8.35	1.14	1.16	1.19	1.11	1.15	1.15
14000	6.73	6.59	6.83	1.16	1.18	1.22	1.11	1.19	1.16
15000	5.25	5.11	5.34	1.13	1.12	1.14	1.15	1.15	1.14
16000	4.03	3.94	4.15	1.24	1.24	1.19	1.28	1.25	1.25
17000	3.00	2.96	3.22	1.31	1.31	1.30	1.33	1.30	1.34
18000	2.13	2.10	2.43	1.19	1.16	1.22	1.14	1.13	1.15
19000	1.58	1.58	1.94	1.04	1.08	1.08	1.06	1.04	1.05
20000	1.30	1.36	1.77	1.04	1.10	1.16	1.03	1.09	1.13
21000	1.40	1.43	1.89	1.33	1.21	1.24	1.25	1.20	1.14
22000	1.51	1.66	2.17	1.08	1.10	1.15	1.03	1.10	1.13
23000	2.22	2.44	3.06	1.45	1.50	1.58	1.38	1.51	1.46
24000	3.05	3.24	3.74	1.57	1.51	1.44	1.60	1.59	1.45
25000	3.72	4.08	4.67	1.55	1.57	1.58	1.59	1.63	1.65
26000	5.58	5.83	6.57	2.24	2.17	2.21	2.30	2.11	2.20

Typical Performance Curves

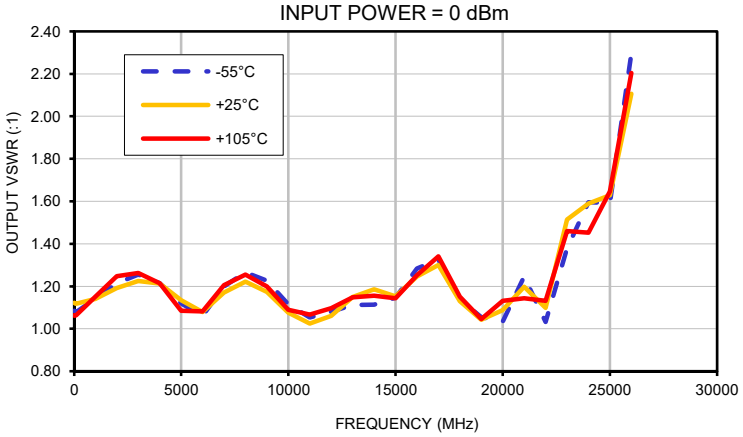
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



INPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT VSWR vs. TEMPERATURE
INPUT POWER = 0 dBm



Mini-Circuits

Environmental Specifications ENV80

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C or -40° to 105° C or -55° to 105° C or -45° to 105° C Ambient Environment	Refer to Individual Model Data Sheet
Storage Environment (Die)	-65° to 150°C	Individual Model Data Sheet
Storage Environment(Packaging)	-40° to 70°C and 40 to 60% humidity (In Factory Shipped Package)	

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