WIDEBAND, MICROWAVE, SHUTDOWN

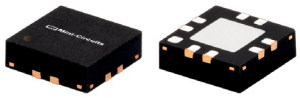
Monolithic Amplifier

TSS-183A+

50Ω 5 to 18 GHz

THE BIG DEAL

- Fast Shutdown, 29 nS
- Gain, 13.6 dB Typ. at 12 GHz & Flatness, ±0.9 dB
- Output Power, Up to +17.9 dBm Typ. at 10 GHz
- Excellent Isolation, 36 dB Typ.
- Positive Supply Voltage, +5.0 V
- Integrated DC Blocks, Bias-Tee & Microwave Bypass Capacitor
- Unconditionally Stable



Generic photo used for illustration purposes only

CASE STYLE: DQ849

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

APPLICATIONS

- Military EW and Radar
- DBS
- Wideband Isolation Amplifier
- Microwave Point-to-Point Radios
- Satellite Systems

PRODUCT OVERVIEW

The TSS-183A+ is a surface mount, MMIC amplifier with shutdown feature fabricated using InGaAs pHEMT technology and is a fully integrated gain block up to 18 GHz. It is packaged in Mini-Circuits industry standard 3x3 mm MCLP package, which provides excellent RF and thermal performance. The TSS-183A+ integrates the entire matching network with the majority of the bias circuit inside the package, reducing the need for complicated external circuits. This approach makes the TSS-183A+ extremely flexible and enables simple, straightforward use.

KEY FEATURES

Feature	Advantages
Wideband, 5 to 18 GHz	Broad frequency range supports a wide array of applications from microwave radio and radar, to military communications and countermeasures.
Excellent Gain Flatness	Typical ±0.9 dB gain flatness across the entire frequency range minimizes the need for external equalizer networks making it a great fit for instrumentation and EW applications.
High Isolation	With reverse isolation of 36 dB, the TSS-183A+ is an excellent choice for buffering broadband circuits. It is an ideal LO driver amplifier and provides designers system flexibility and margin when integrating cascaded RF components.
Shutdown Feature	Allows users to turn on and off the amplifier with pulsed signals while keeping the power supply at constant voltage.
Small Size	3x3 mm, 8-lead MCLP package
Integrated DC Blocks & Bias-Tee	Saves motherboard space and minimizes overall cost. Very user friendly.

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TSS-183A+
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ELECTRICAL SPECIFICATIONS[1] AT +25°C, Zo = 50Ω, AND V_{DD} = +5 V UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Amplifier-ON			Amplifier-OFF	Units
		Min.	Typ.	Max.	Typ.	
Frequency Range		5		18	5-18	GHz
Noise Figure	5		7.4			dB
	8		4.1			
	10		4.4			
	12		4.6			
	14		5.0			
	18		6.0			
Gain	5		13.5		-27	dB
	8	12	14.9		-19	
	10	12	14.2		-18	
	12		13.6		-17	
	14		13.4		-17	
	18	10.4	13.1		-18	
Gain Flatness	5-18		±0.9			dB
Reversed Isolation	5-18		36		22	dB
Input Return Loss	5		12		6	dB
	8		36		3	
	10		16		3	
	12		13		4	
	14		16		5	
	18		8		5	
Output Return Loss	5		9		6	dB
	8		14		4	
	10		18		4	
	12		14		2	
	14		13		2	
	18		9		1	
Output Power @ 1 dB Compression AMP-ON	5		+17.2			dBm
	8		+18.5			
	10	+16.0	+17.9			
	12		+17.8			
	14		+18.7			
	18		+17.9			
Output IP3 (P_{OUT} = +9 dBm/tone)	5		+33.7			dBm
	8		+30.0			
	10		+28.9			
	12		+27.8			
	14		+26.6			
	18		+27.4			
Device Operating Voltage (V_{DD})		+4.8	+5.0	+5.2	+5.0	V
Device Operating Current (I_D)			145	166	0.3	mA
Control Voltage (V_G)			0		-5	V
DC Current (I_D) Variation vs. Temperature[2]			29.4			µA/°C
DC Current (I_D) Variation vs. Voltage			0.0021			mA/mV
Thermal Resistance			61			°C/W

1. Measured on Mini-Circuits Characterization test board TB-969+. See Characterization Test Circuit (Fig. 1).
2. (Current at +85°C - Current at -45°C)/130

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ABSOLUTE MAXIMUM RATINGS[3]

Parameter	Ratings
Operating Temperature (Ground Lead)	-45°C to +85°C
Storage Temperature	-55°C to +100°C
Total Power Dissipation	0.98 W
Input Power	+20 dBm
DC Voltage V_{DD}[4] (Pad 7, 8)	+5.5 V
DC Voltage V_G[5] (Pad 3, 4)	-15 V
DC Voltage RF-IN & RF-OUT (Pad 2 & 5)	+10 V

3. Permanent damage may occur if these limits are exceeded.
4. Measured by keeping V_G = 0 V. V_{DD1} & V_{DD2} pads are connected per Figure 1.
5. Measured by keeping V_{DD} = +5 V. V_{G1} & V_{G2} pads are connected per Figure 1.

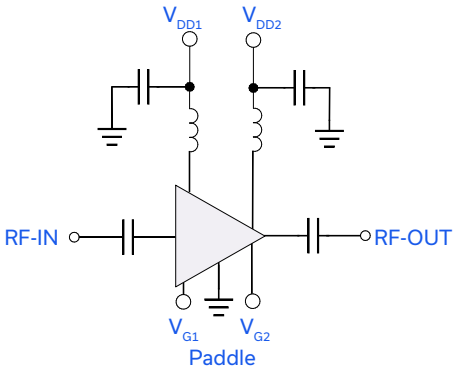
CONTROL VOLTAGE (V_G) FIG. 1

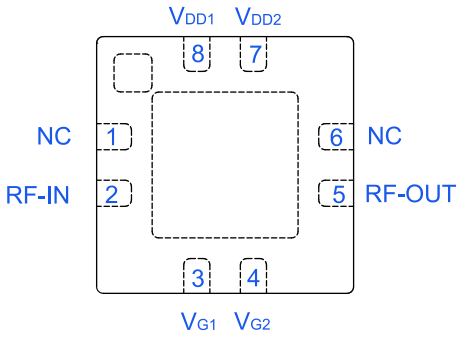
	Min.	Typ.	Max.	Units
Amplifier-ON	-0.2		0	V
Amplifier-OFF	-5		-4	V

SWITCHING SPECIFICATIONS (RISE/FALL TIME)

Parameter		Min.	Typ.	Max.	Units
Amplifier ON to Shutdown	OFF TIME (50% Control to 10% RF)		29		ns
	FALL TIME (90 to 10% RF)		14		
Amplifier Shutdown to ON	ON TIME (50% Control to 90% RF)		226		ns
	RISE TIME (10% to 90% RF)		163		
Control Voltage Leakage			12		mV

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION





Function	Pad Number	Description (See Application Circuit, Fig. 1)
RF-IN	2	RF input pad
RF-OUT	5	RF output pad
V_{DD1} & V_{DD2}	7,8	DC power supply (V_{DD}). Two pads are connected per Figure 1.
GND	Paddle	Connected to ground.
V_{G1} & V_{G2}	3,4	Control voltage for shutdown (V_G). Two pads are connected per Figure 1.
NC	1,6	No internal connection. Recommended usage per PCB layer PL-588

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CHARACTERIZATION TEST CIRCUIT / RECOMMENDED APPLICATION CIRCUIT

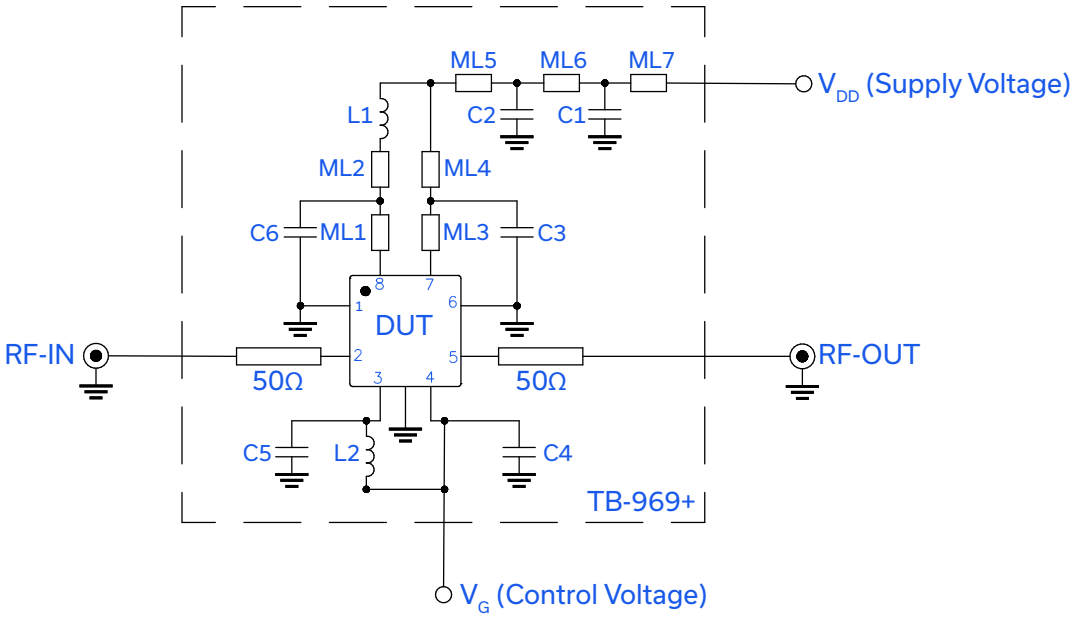


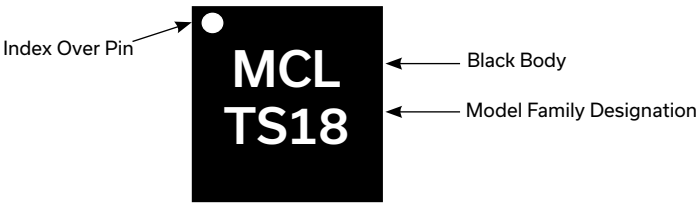
Fig 1. Block diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-969+) Gain, Return Loss, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return Loss: P_{IN} = -25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +9 dBm/tone at output.
3. Switching Time: P_{IN} = +7 dBm at 5.2 GHz. V_G = Pulse signal at 1 kHz, -5 V, with offset = -2.5 V, 50% duty cycle. V_{DD} = +5 V.

Component	P/N	Supplier	Value	Size
C1	GRM1555C1H5R6CA01D	Murata	5.6 pF	0402
C2	GRM1555C1H180JA01D	Murata	18 pF	0402
C3 – C5	GRM1555C1H102JA01D	Murata	0.001 uF	0402
C6	GRM155R71C104KA88D	Murata	0.1 uF	0402
L1 , L2	0805CS-030XJLC	Coilcraft	3.3 nH	0805

ML1 to ML7 are short mircrostrip lines. Refer to PL-588.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.

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

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DQ849 Plastic package, exposed paddle, Lead Finish: Matte-Tin
Tape & Reel **Standard Quantities Available on Reel**	F104 7" Reels with 20, 50, 100, 200, 500, 1000, or 2000 devices
Suggested Layout for PCB Design	PL-588
Evaluation Board	TB-969+
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): 1A (250 V to <500 V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

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 therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/terms/viewterm.html