



**THE DATASHEET OF  
MWT-1789SB**



## Features:

- Designed for single voltage operations
- Ideal for 0.5 – 4.0 GHz High Linearity / High Dynamic Range Applications
- Excellent RF Performance:
  - 44 dBm IP3
  - 65 dBc ACPR
  - 28 dBm P1dB
  - 18 dB SSG @ 2000MHz
  - 1.3 dB NF @ 2000MHz
- MTTF>100 years @ channel temperature 150 °C
- Lead Free RoHS Compliant Surface-Mount SOT-89 Package



## Description:

Designed specifically for single voltage operations (i.e., no negative voltage is required), the MwT-1789SB is a high linearity GaAs MESFET device in low cost SOT89 package that is ideally suited for high linearity driver or high dynamic range LNA applications. The applications include 2G, 2.5G, and 3G wireless infrastructure standards, such as GSM, TDMA, cdma, Edge, cdma2000, WCDMA, TD-SCDMA, and UMTS base stations. This product is also ideal for high data rate wireless LAN infrastructure applications, such as high QAM rate 802.11 WiFi and 802.16 WiMax base stations and APs (Access Points). In addition, the product can be used for point-to-point microwave communications links. The third order intercept performance of the MwT-1789SB is excellent, typically 16 dB above the 1 dB power gain compression point. The NF is as low as 1.0 dB at 900 MHz. The chip is produced using MwT's proprietary high linearity device design and process with reliable metal system. All chips are passivated using MwT's patented "Diamond-Like Carbon" process for increased durability.

## Electrical Specifications<sup>(1)</sup>: @ V<sub>dd</sub>=6.5V, I<sub>ds</sub>~260mA, T<sub>a</sub>=25 °C

SYMBOL	PARAMETERS & CONDITIONS	FREQ	UNIT	TYP
SSG	Small Signal Gain	2GHz	dB	18
P1dB	Output Power @ 1 dB Compression	2GHz	dBm	28
PAE	Power Added Efficiency	2GHz	%	40
IP3	Third Order Intercept Point	2GHz	dBm	44
NF	Noise Figure (2)	2GHz	dB	1.3

(1) RF measurements are taken in a test fixture with tuners at input and output.

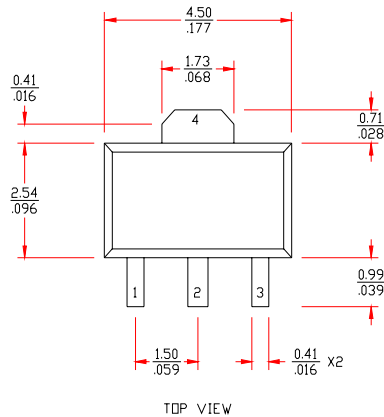
(2) V<sub>dd</sub>=4.5 V @ I<sub>ds</sub>~100mA.

**DC Specifications:** ( $T_a = 25^\circ\text{C}$ )

SYMBOL	PARAMETERS & CONDITIONS	UNITS	MIN	TYP	MAX
IDSS	Saturated Drain Current Vds=3.0 V Vgs=0.0 V	mA	440		680
IDS	Drain-to-Source Current Vdd=4.5V	mA	100		350
Gm	Transconductance Vds=2.0 V Vgs=0.0 V	mS		380	
Vgs	Gate-to-Source Voltage Vdd=6.5 V	V		-0.5	
Vp	Pinch-off Voltage Vds=3.0 V Ids=16.0 mA	V		-2.5	-5.0
BVGSO	Gate-to-Source Breakdown Voltage Igs= -2.4 mA	V	-6.0	-12.0	
BVGDO	Gate-to-Drain Breakdown Voltage Igd= -2.4 mA	V	-9.0	-12.0	
Rth	Thermal Resistance	$^\circ\text{C/W}$		30	

**SOT-89 Outline Diagram**

OUTLINE DRAWING



**1: Gate; 2,4: Source; 3: Drain**  
**Dimensions in mm/inch**

**Typical Scattering Parameters:**  
(V<sub>dd</sub>=6.5V I<sub>ds</sub>~2600mA T<sub>a</sub> =25°C Reference Planes at Leads)

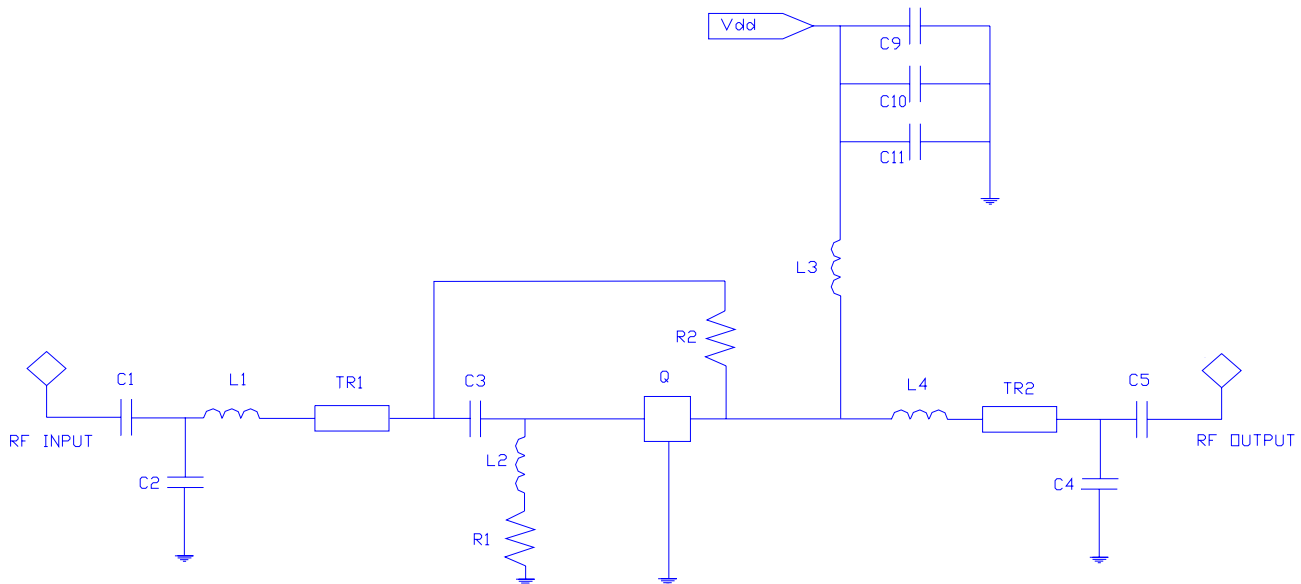
F[GHz]	S11		S21		S12		S22	
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
0.05	0.95	-33.45	24.11	150.65	0.01	58.41	0.36	-65.44
0.25	0.88	-62.59	13.37	142.80	0.03	44.28	0.29	-91.14
0.50	0.88	-109.60	9.70	120.68	0.051	30.07	0.38	-140.00
0.75	0.80	-130.20	7.41	108.29	0.055	29.70	0.35	-160.16
1.00	0.76	-153.03	5.88	99.22	0.060	29.41	0.33	-176.88
1.25	0.74	-165.44	5.03	86.58	0.063	30.02	0.32	171.21
1.50	0.72	179.50	4.18	77.79	0.069	30.60	0.31	159.02
1.75	0.72	170.11	3.70	70.42	0.075	30.82	0.31	148.91
2.00	0.71	156.68	3.24	63.43	0.081	29.90	0.32	135.45
2.25	0.72	147.77	2.93	53.60	0.087	27.99	0.33	125.97
2.50	0.73	135.27	2.63	47.82	0.091	22.03	0.21	114.01
2.75	0.73	127.20	2.30	43.30	0.095	19.52	0.35	106.46
3.00	0.74	116.66	2.00	34.18	0.097	17.90	0.37	97.15
3.25	0.74	120.53	1.96	31.93	0.097	11.70	0.40	91.37
3.50	0.74	120.44	1.86	29.16	0.097	11.93	0.42	86.02
3.75	0.74	115.26	1.66	25.29	0.097	12.12	0.43	83.09
4.00	0.74	113.50	1.58	20.54	0.098	15.27	0.45	78.71

## APPLICATION CIRCUIT INFORMATION

The information provided in this section is intended to demonstrate various applications for the MwT-1789SB. Given below are circuit schematics and list of materials for the designs. The typical RF performance is also provided.

### (I) FEEDBACK CIRCUIT CONFIGURATION

#### CIRCUIT SCHEMATIC



## BILL OF MATERIALS:

Reference Designation	Value				Unit	Part	Size
	0.80-1.00	1.90-2.10	2.40-2.60	3.50-3.70			
C11	100	100	100	100	pF	Chip Capacitor	0505
C10	1000	1000	1000	1000	pF	Chip Capacitor	0505
C9	0.1	0.1	0.1	0.1	μF	Chip Capacitor	0505
C1 C5	33	33	33	22	pF	Chip Capacitor	0505
C2	0.8	2.0	1.2	1.0	pF	Chip Capacitor	0505
C3	100	33	33	22	pF	Chip Capacitor	0505
C4	4.3	1.2	0.5	1.0	pF	Chip Capacitor	0505
L1	4.7	0	1.2	5.1	nH	Chip Inductor	0603
L3	100	100	10	10	nH	Chip Inductor	0603
L4	2.5	0	0	0	nH	Chip Inductor	0603
R1	1000	1000	1000	1000	Ohm	Chip Resistor	0603
R2	280	330	300	280	Ohm	Chip Resistor	0603
TR1	0	0	25	0	Deg	50 Ohm TRL	-
TR2	0	0	15	30	Deg	50 Ohm TRL	-
Q	MWT-1789SB	MWT-1789SB	MWT-1789SB	MWT-1789SB	-	MESFET	SOT89

## TYPICAL RF PERFORMANCE:

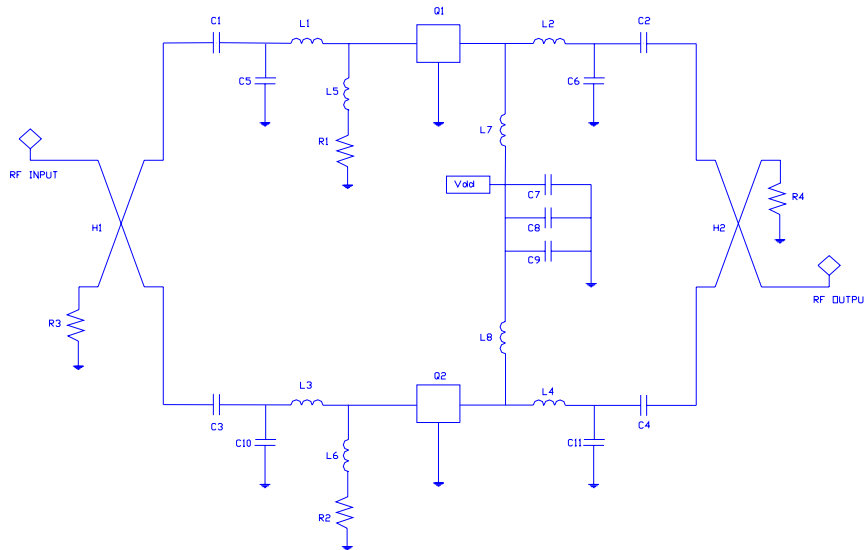
**(A) For High Linearity Applications**  
Vdd = 6.5V, Ids = 260 mA, Ta = 25 °C

FREQ (MHz)	800-1000	1900-2100	2400-2600	3500-3700
SSG (dB)	18	16	13	13
R/L, In (dB)	-10	-11	-11	-10
R/L, Out (dB)	-9	-11	-11	-10
NF (dB)	2.5	2.5	2.7	3.0
P1dB (dBm)	27	27	27	27
IP3 (dBm)	43	43	43	43

**(B) For Low Noise Applications**  
Vdd = 5.0V, Ids = 100 mA, Ta = 25 °C

FREQ (MHz)	800-1000	1900-2100	2400-2600	3500-3700
SSG (dB)	16.0	14.0	13.0	12.5
R/L, In (dB)	-9	-9	-9	-8
R/L, Out (dB)	-10	-10	-10	-10
NF (dB)	1.7	1.8	2.3	2.6
P1dB (dBm)	22.5	22.5	22.5	22
IP3 (dBm)	38	38	38	37

**(II) BALANCED CIRCUIT CONFIGURATION  
CIRCUIT SCHEMATIC**



**BILL OF MATERIALS:**

Reference Designation	Value		Unit	Part	Size
	0.87-0.96	1.93-1.99			
C7	100	100	GHz	Chip Capacitor	0603
C8	1000	1000	pF	Chip Capacitor	0603
C9	0.1	0.1	uF	Chip Capacitor	1206
C1, C2, C3, C4	100	22	pF	Chip Capacitor	0603
C5, C10	0.5	1.2	pF	Chip Capacitor	0603
C6, C11	1.6	1.2	pF	Chip Capacitor	0603
L1, L3	6.8	5.1	nH	Chip Inductor	0603
L2, L4	5.1	1.8	nH	Chip Inductor	0603
L5, L6, L7, L8	100	82	nH	Chip Inductor	0603
R1, R2	1000	1000	Ohm	Chip Resistor	0603
R3, R4	50	50	Ohm	Chip Resistor	0603
H1, H2	-	-	-	Quad. Hybrid	0.35" x 0.56"
Q1, Q2	MWT-1789SB	MWT-1789SB	-	MESFET	SOT89

**TYPICAL RF PERFORMANCE:**

(Vdd=5.0V, Ids~200mA, Ta=25°C)

Freq MHZ	Gain dB	$\Delta G$ dB	NF dB	P1dB dBm	IP3 dBm	VSWR	
						In	Out
870-960	17	+/- 0.3	1.1	25	41	1.2:1	1.2:1
1930-1990	15	+/- 0.2	1.4	25	41	1.2:1	1.2:1

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