

FEATURES

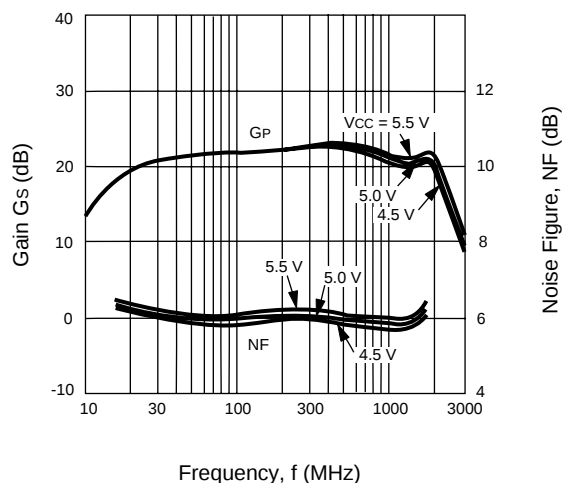
- **HIGH OUTPUT POWER:** +18 dBm PSAT
- **EXCELLENT FREQUENCY RESPONSE:**
2.0 GHz TYP at 3 dB Down
- **HIGH POWER GAIN:** 23 dB TYP at 500 MHz
- **SINGLE SUPPLY VOLTAGE:** 5 V
- **AVAILABLE IN TAPE AND REEL**

DESCRIPTION

The UPC1678GV is a silicon monolithic integrated circuit designed as a wide-band amplifier covering the HF to UHF bands. The device features high output power, 18 dBm TYP, high gain, 23 dB TYP and operates from a single 5 volt supply.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

NOISE FIGURE AND GAIN
vs. FREQUENCY AND VOLTAGE



ELECTRICAL CHARACTERISTICS (TA = 25°C, VCC = +5 V, f = 500 MHz, ZL = ZS = 50 Ω)

PART NUMBER PACKAGE OUTLINE			UPC1678GV S08		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
Icc	Circuit Current at No Input Signal	mA	40	49	60
Gs	Small Signal Gain	dB	21	23	25
f3dB	Upper Limit Operating Frequency at 3 dB down below the Gain at 100 MHz	MHz	1700	2000	
PSAT	Saturated Output Power, PIN = +3 dBm	dBm	+15.5	+17.5	
NF	Noise Figure	dB	—	6.0	8.0
RLIN	Input Return Loss	dB	11	14	
RLOUT	Output Return Loss	dB	1	4	
ISOL	Isolation	dB	30	35	

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Power Supply Voltage	V	-0.5 to 6.0
P _{IN}	Input Power	dBm	+10
P _T	Total Power Dissipation ²	mW	330
T _{OP}	Operating Temperature	°C	-45 to +85
T _{STG}	Storage Temperature	°C	-55 to +150

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on 50 x 50 x 1.6 mm glass epoxy PWB at T_A = +85°C.

RECOMMENDED OPERATING CONDITIONS

SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	4.5	5.0	5.5
T _{OP}	Operating Temperature	°C	-40	+25	+85

PIN DESCRIPTIONS

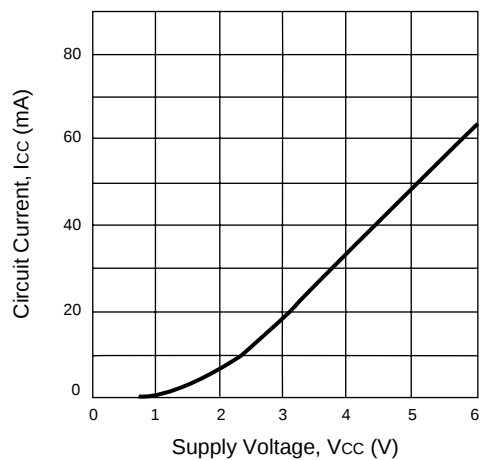
Pin No.	Pin Name	Applied Voltage (V)	Description	Internal Equivalent Circuit
1	Input	—	Signal input pin. An internal matching circuit, configured with resistors, enables a 50 Ω connection over a wide band. A multi-feedback circuit is designed to cancel the deviations of h _{FE} and resistance. This pin must be coupled to the signal source with a blocking capacitor.	
5	Output	Voltage same as V _{CC} through external inductor	Signal output pin. This output is designed as an open collector for Darlington transistors. Connect an inductor between this pin and V _{CC} pin to supply current to the internal output transistors. The inductor should be selected for high frequency use and small DC resistance.	
8	V _{CC}	4.5 to 5.5	Power supply pin. This pin should be externally equipped with a bypass capacitor to minimize ground impedance.	
6	GND	0	Ground pins of internal input stage. Form a ground pattern as wide as possible to minimize ground impedance.	
7				
2	GND	0	Ground pins of internal output stage. All the ground pins including pins 6 and 7 must be connected together with a wide ground pattern to decrease impedance difference.	
3				
4				

Note:

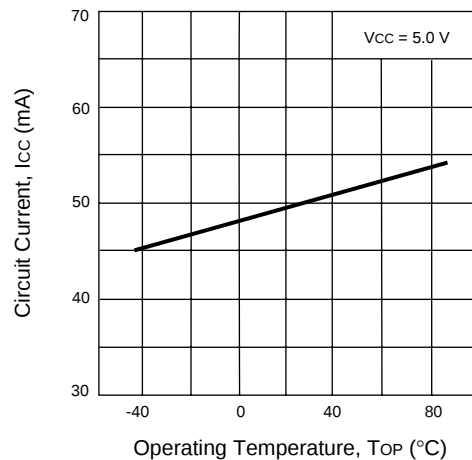
Pin Voltage for Pin 1 is 1.17, measured at V_{CC} = V_{OUT} = 5.0 V.

TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)

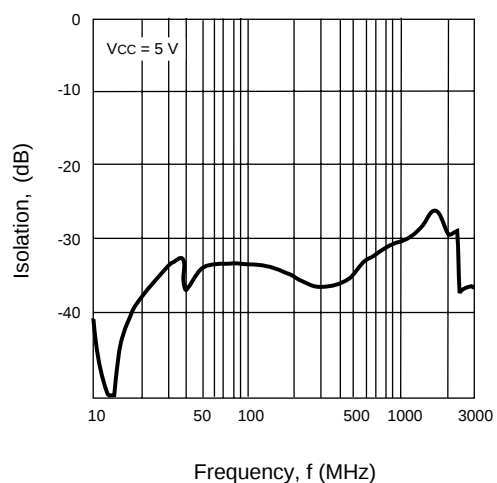
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



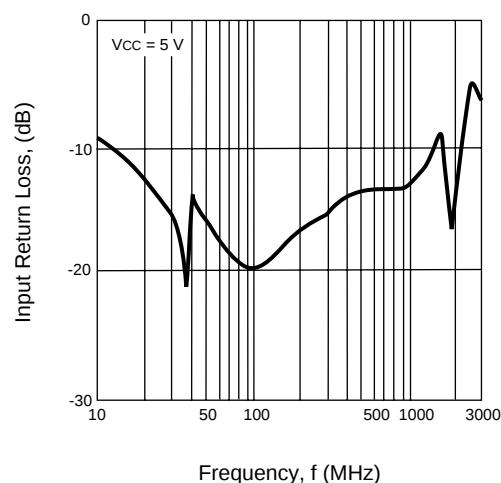
CIRCUIT CURRENT vs. OPERATING TEMPERATURE



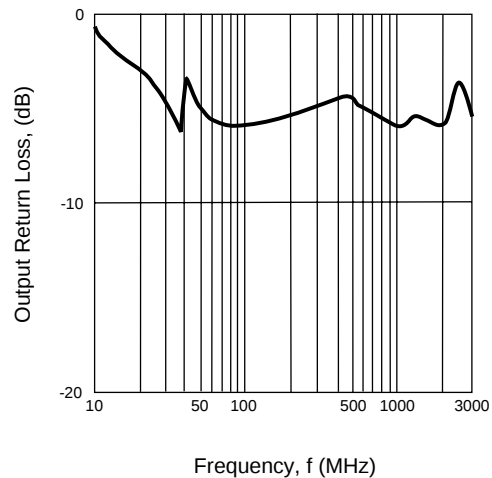
ISOLATION vs. FREQUENCY



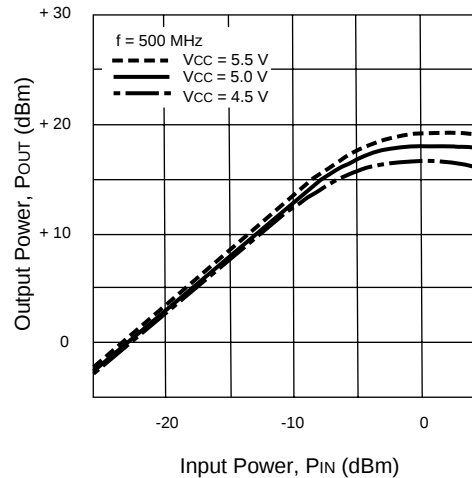
INPUT RETURN LOSS vs. FREQUENCY



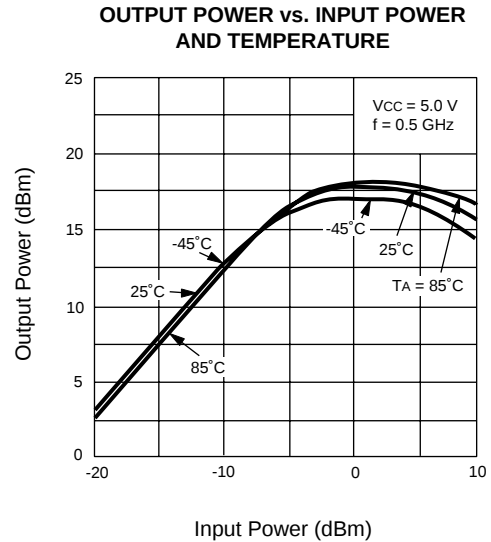
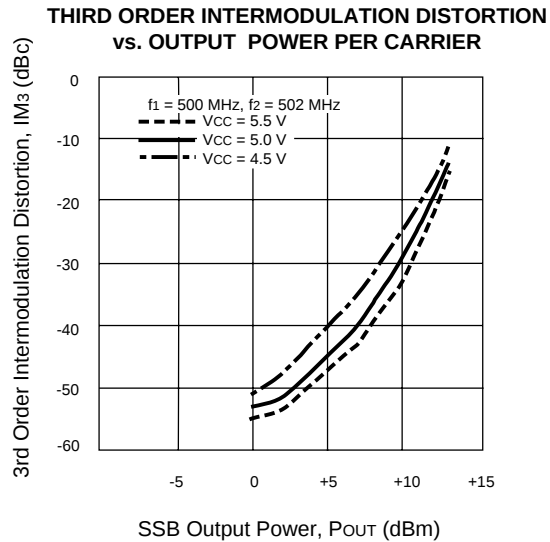
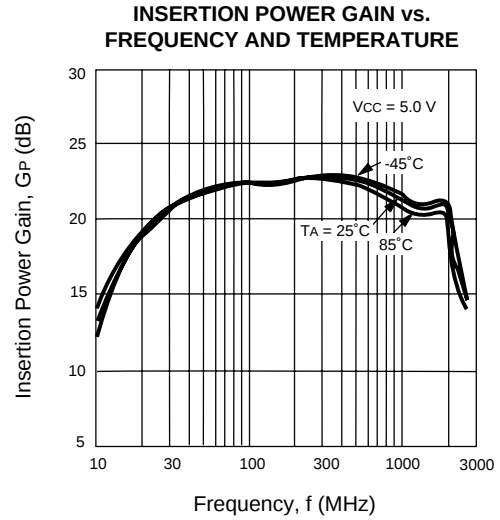
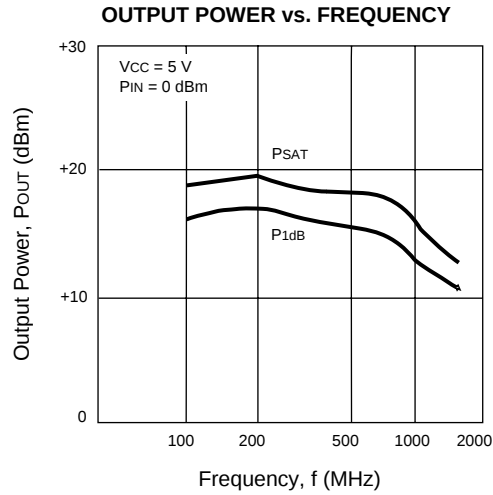
OUTPUT RETURN LOSS vs. FREQUENCY



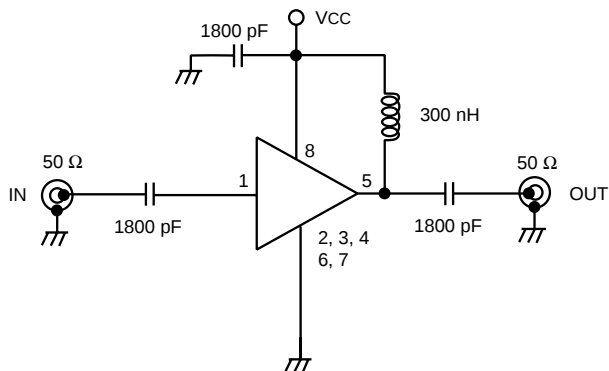
OUTPUT POWER vs. INPUT POWER



TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)



TEST CIRCUIT

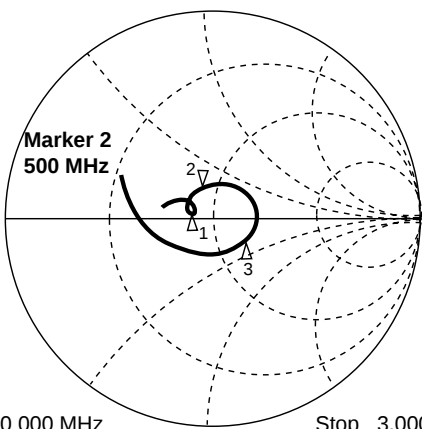


Precautions: 1) These devices are ESD sensitive. Use proper precautionary measures when handling and installing these devices.

TYPICAL SCATTERING PARAMETERS (V_{CC} = 5.0 V, T_A = 25°C)

S₁₁ Frequency

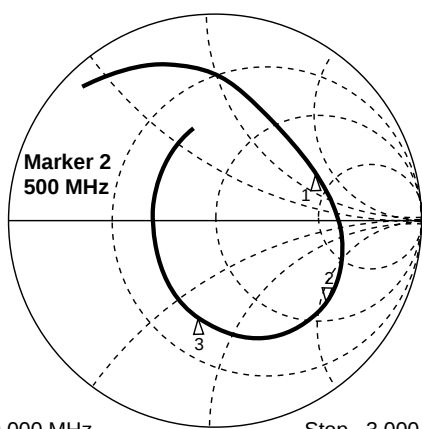
- 1: 40.846 Ω
1.9785 Ω
100 MHz
- 2: 43.174 Ω
12.344 Ω
500 MHz
- 3: 66.441 Ω
-14.414 Ω
1.7 GHz



Start 10.000 000 MHz Stop 3,000.000 MHz

S₂₂ Frequency

- 1: 121.86 Ω
71.563 Ω
100 MHz
- 2: 77.645 Ω
-111.17 Ω
500 MHz
- 3: 26.904 Ω
-34.393 Ω
1.7 GHz



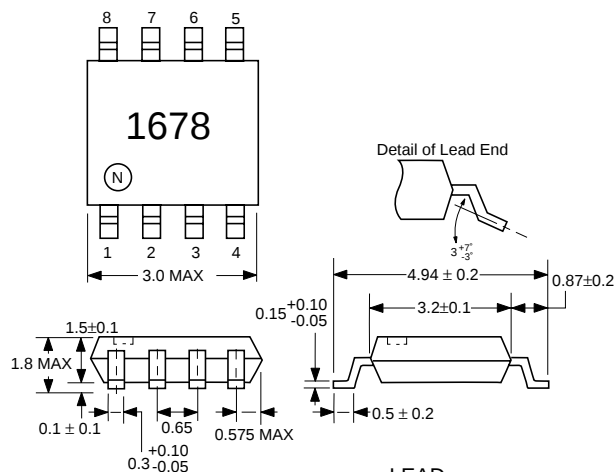
Start 10.000 000 MHz Stop 3,000.000 MHz

UPC1678GV
V_{CC} = 5 V, I_{CC} = 50 mA

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	S ₂₁ (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.05	0.136	157	10.2	36	0.018	3	0.683	89	1.59	23.0
0.10	0.106	164	12.1	18	0.025	26	0.609	53	1.25	23.8
0.20	0.126	165	13.2	3	0.020	15	0.621	22	1.34	24.6
0.40	0.174	144	14.4	-17	0.017	50	0.673	-10	1.24	26.4
0.60	0.184	119	15.0	-35	0.024	71	0.657	-37	0.85	27.9
0.80	0.150	107	14.6	-52	0.033	75	0.619	-64	0.78	26.5
1.00	0.102	115	15.1	-70	0.038	77	0.599	-89	0.78	26.0
1.20	0.112	148	14.0	-88	0.040	83	0.585	-116	0.81	25.4
1.40	0.169	151	12.4	-114	0.046	92	0.542	-142	0.81	24.4
1.60	0.180	137	11.3	-131	0.054	99	0.449	-163	0.86	23.2
1.80	0.146	121	7.6	-144	0.063	101	0.335	-177	1.10	18.8
2.00	0.072	89	6.2	-159	0.073	102	0.224	-177	1.25	16.2
2.20	0.045	-37	4.6	-157	0.081	100	0.192	-163	1.49	13.4
2.40	0.137	-84	3.9	-164	0.085	97	0.206	-157	1.60	12.1
2.50	0.180	-95	3.9	-161	0.088	95	0.219	-158	1.54	12.2

OUTLINE DIMENSIONS (Units in mm)

UPC1678GV
PACKAGE OUTLINE S08



- LEAD
CONNECTIONS
- | | |
|----------|-----------|
| 1. Input | 5. Output |
| 2. GND | 6. GND |
| 3. GND | 7. GND |
| 4. GND | 8. Vcc |

ORDERING INFORMATION

PART NUMBER	QTY
UPC1678GV-E1	1000/REEL

Note: Embossed tape, 8 mm wide. Pin 1 is in tape pull-out direction.