MIC5840

POWER MODULE

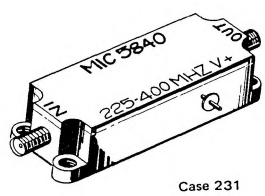
Advance Information

WIDEBAND POWER AMPLIFIER MODULE

The MIC5840 wideband solid-state amplifier is designed to operate as a driver or final amplifier in UHF military communications equipment. Thin-film inductors, ceramic capacitors and a special transistor carrier are utilized in this small size hermetically sealed module.

- Power Output –
  6 W (Min), f = 225 to 400 MHz
  7.5 W (Typ), f = 300 MHz
- Power Gain –
  5 dB (Min), f = 225 to 400 MHz
  8.5 dB (Typ), f = 300 MHz
- Capability For Amplitude Modulation
- Operating Temperature Range – -55 to +80°C

225 MHz to 400 MHz WIDEBAND POWER AMPLIFIER MODULE



Case 231

FIGURE 1 – SCHEMATIC DIAGRAM

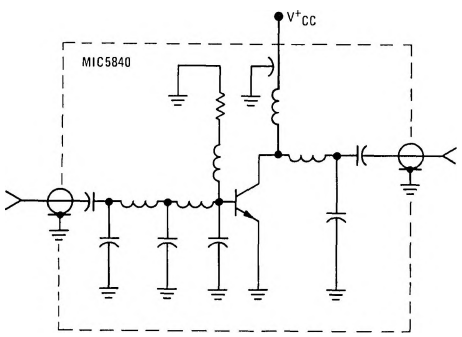
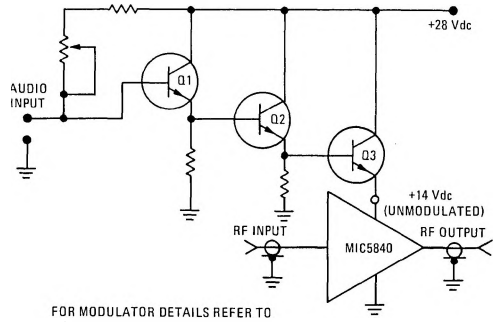


FIGURE 2 – AMPLITUDE MODULATION OF MIC5840 USING SERIES MODULATOR



FOR MODULATOR DETAILS REFER TO MOTOROLA APPLICATION NOTE AN-481

MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Supply Current	I	1.5	Adc
Supply Voltage	V^+	35	Vdc
Power Dissipation (Total Module) Derate above T_A = 25°C	P_D	15 90	Watts mW/°C
Operating Temperature Range	T_A	-55 to +80	°C
Storage Temperature Range	T_{stg}	-65 to +125	°C

See Packaging Information Section for outline dimensions.

ELECTRICAL CHARACTERISTICS (V^+ = 26 Vdc, Frequency Range = 225 to 400 MHz, P_{out} = 6 Watts, T_A = 25°C unless otherwise noted).

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency of Operation	f	225	–	400	MHz
Power Gain (50 Ohm Source and Load)	G_{PE}	5.0	7.0	–	dB
Collector Efficiency	η	30	–	–	%
Input Voltage Standing-Wave Ratio	VSWR				–
(f = 225 MHz to 275 MHz)		–	–	9:1	
(f = above 275 MHz)		–	–	3.5:1	
Second Harmonic (referenced to fundamental)					dB
(f = 225 MHz to 275 MHz)		8.0	–	–	
(f = above 275 MHz)		10	–	–	

TYPICAL CHARACTERISTICS

(V^+ = 26 V, P_{in} = 1.0 Watt, T_A = 25°C unless otherwise noted).

FIGURE 3 – OUTPUT POWER versus FREQUENCY

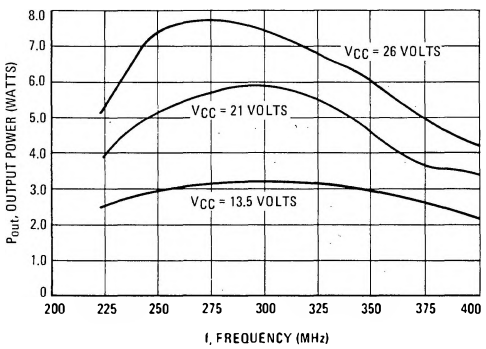


FIGURE 4 – OUTPUT POWER versus INPUT POWER

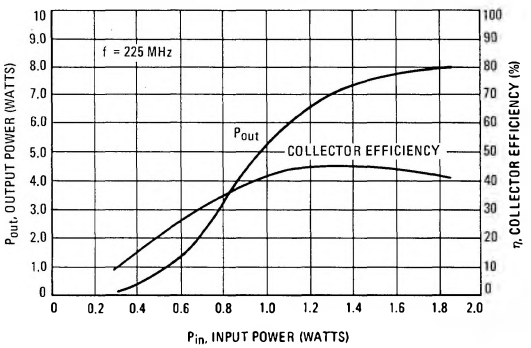


FIGURE 5 – OUTPUT POWER versus INPUT POWER

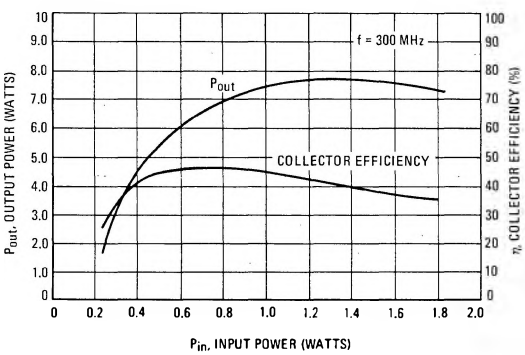
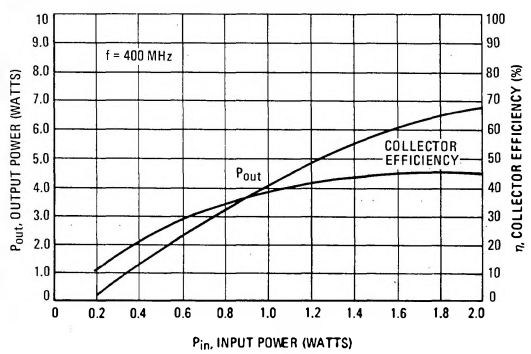


FIGURE 6 – OUTPUT POWER versus INPUT POWER



TYPICAL CHARACTERISTICS (continued)

(V^+ = 26 V, P_{in} = 1.0 Watt unless otherwise noted.)

FIGURE 7 – OUTPUT POWER versus SUPPLY VOLTAGE

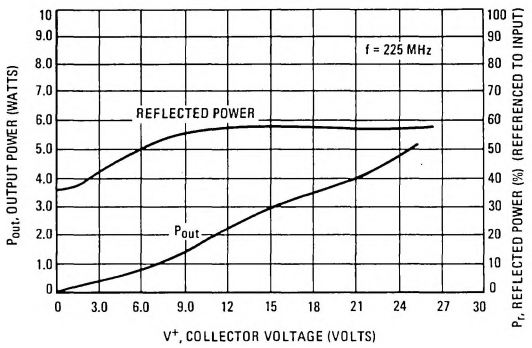


FIGURE 8 – OUTPUT POWER versus SUPPLY VOLTAGE

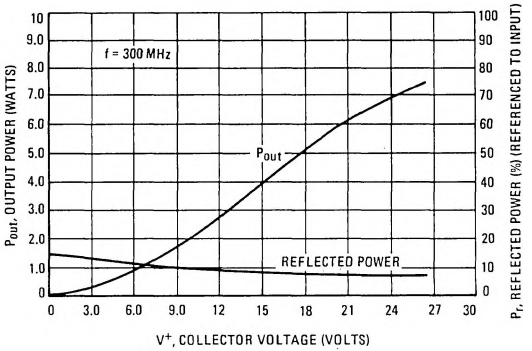


FIGURE 9 – OUTPUT POWER versus SUPPLY VOLTAGE

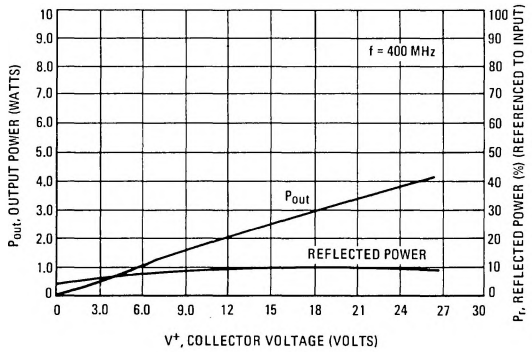
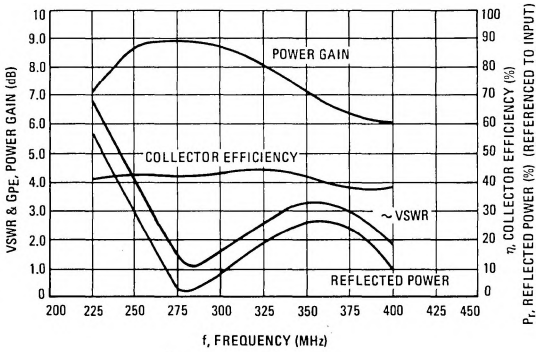


FIGURE 10 – COLLECTOR EFFICIENCY REFLECTED POWER VSWR AND POWER GAIN versus FREQUENCY



APPLICATIONS INFORMATION

The MIC5840 is a solid-state wideband amplifier module designed to operate as a driver or final amplifier in wideband UHF military communications equipment. The unit is capable of CW or AM operation. Its small size and electrical uniformity are achieved by using thin-film technology and a state-of-the-art NPN balanced-emitter UHF transistor. Unit weight≈ 1.0 ounce.

This hybrid module is hermetically sealed in an aluminum housing, with OSM®RF female connectors at the input and output terminals, and an internally RF bypassed pin for connection of the supply voltage (solder lug). Wideband input and output matching of the UHF transistor is accomplished by low loss thin-film inductors and ceramic chip capacitors mounted on alumina substrates. The transistor die is bonded to a beryllium oxide (BeO) carrier. These alumina substrates and the BeO carrier are then bonded to the aluminum chassis with all interconnections fabricated of gold ribbon or wire.

Figure 1 shows a schematic diagram of the MIC5840. RF drive from a 50-ohm source, a 50-ohm load impedance and a dc power source are required for CW operation from 225-400 MHz. Typical performance for this type of operation is shown in Figures 3 thru 10.

The MIC5840 can also be used for applications requiring high level amplitude modulation. As in most solid-state amplifiers of this type, the modulation is accomplished by varying the collector supply voltage in accordance with the modulating signal waveform. This arrangement is shown in Figure 2 where a series transistor modulator is used to vary the supply voltage applied to the MIC5840. The use of the series transistor modulator eliminates the need for a bulky audio power transformer. In this configuration, one half the dc supply voltage is dropped across Q3 of the modulator when no signal is applied to the audio input. When an audio signal is present at Q1, voltage applied to the MIC5840 is modulated. Since the gain of the MIC5840 is proportional to the applied voltage (Figures 7 thru 9) the RF output power is similarly modulated. During a modulating peak, care should be taken never to exceed the 35 Vdc maximum voltage rating. For the arrangement shown in Figure 2 up-modulation from a 14-volt quiescent value to peak value of 28 Vdc typically produces 50% up-modulation in the output power of the RF amplifier (3 W carrier). Since 100% up-modulation can seldom be achieved using only high level collector voltage modulation of a single stage amplifier, it is usually necessary to modulate the RF drive signal to some extent. Using driver stage modulation, the up-modulation capability of the MIC5840 can be made to approach 100%.

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