



Advance Information

Dual-Band/Dual-Mode pHEMT GaAs IPA

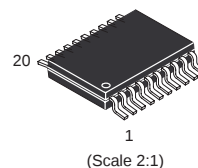
The MRFIC1856 is designed for dual-band subscriber equipment applications at 3.6 V in the cellular (800 MHz) and PCS (1900 MHz) bands. The device incorporates two pHEMT GaAs amplifier chains in one package, allowing the most flexibility and highest performance while reducing board space. Target applications include dual-band/dual-mode handsets for TDMA/AMPS and PCS TDMA cellular phones.

- Designed to Operate in Frequency Ranges of:
824 to 849 MHz TDMA/AMPS
1850 to 1910 MHz PCS TDMA
- 3.6 V Operation
- 30 dBm Output Power PCS TDMA
- 31 dBm Output Power TDMA Cellular
- 31 dBm Output Power AMPS

MRFIC1856

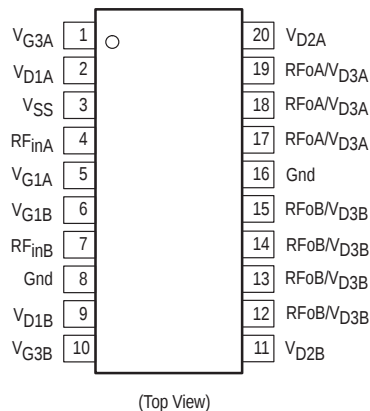
DUAL-BAND/DUAL-MODE GaAs INTEGRATED POWER AMPLIFIER

SEMICONDUCTOR TECHNICAL DATA

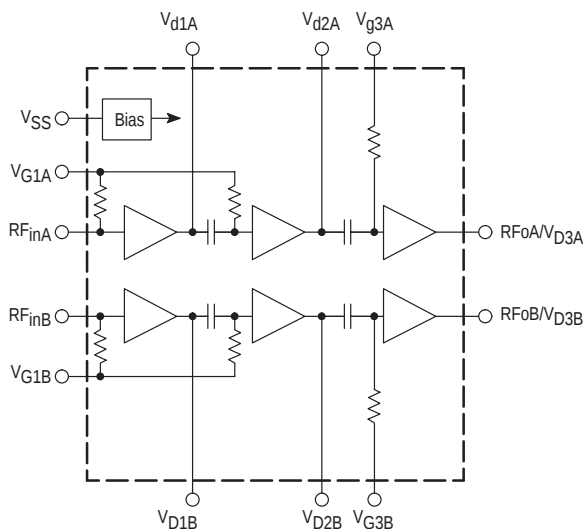


PLASTIC PACKAGE
CASE 948M
(TSSOP-20EP, Tape & Reel Only)

PIN CONNECTIONS



Simplified Block Diagram



ORDERING INFORMATION

Device	Operating Temp Range	Package
MRFIC1856R2	T _C = -35 to 85°C	TSSOP-20EP

MRFIC1856

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_D	4.8	Vdc
RF Input Power	P_{in}	15	dBm
Gate Voltage	V_g	–6 to –0.3	Vdc
Storage Temperature Range	T_{stg}	–65 to 150	°C
Operating Case Temperature	T_C	–35 to 85	°C
Thermal Resistance, Junction to Case	$R_{\theta JC}$	15	°C/W

NOTES: 1. Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics tables.
2. ESD (electrostatic discharge) immunity meets Human Body Model (HBM) ≤ 100 V and Machine Model (MM) < 50 V. Additional ESD data available upon request.

RECOMMENDED OPERATING CONDITIONS

Characteristics	Symbol	Limit	Unit
Frequency Range – TDMA/AMPS	f_{RF}	824 to 849	MHz
Frequency Range – PCS TDMA	f_{RF}	1850 to 1910	MHz
Supply Voltage Range	$V_{D1,2,3A}, V_{D1,2,3B}$	3.0 to 4.8	Vdc
Negative Supply Voltage	V_G	–4.5 to –2.5	Vdc

ELECTRICAL CHARACTERISTICS ($V_{D1,2,3A} = 3.6$ V, $T_A = 25^\circ\text{C}$, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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TDMA CELLULAR PERFORMANCE ($P_{out} = 31$ dBm, $f = 840$ MHz)

Quiescent Supply Current	I_{DQ}	–	–	300	mA
Negative Supply Current	I_{SS}	–	–	3.0	mA
Efficiency	PAE	40	45	–	%
Gain	G_P	29	–	–	
Adj Channel Power (± 30 kHz)	ACP	–	–	–29	dBc
Alt Channel Power (± 60 kHz)	ALT	–	–	–48	dBc
Rx Band Noise (30 kHz BW)	–	–	–92	–	dBm
Harmonic Output Power $2f_0$ $3f_0$	–	– –	– –	–34 –40	dBc
Spurious Output, 10:1 VSWR, all angles on output	–	–	–	–60	dBc

AMPS PERFORMANCE ($P_{out} = 31$ dBm, $f = 840$ MHz)

Quiescent Supply Current	I_{DQ}	–	–	300	mA
Negative Supply Current	I_{SS}	–	–	3.0	mA
Efficiency ($P_{out} = 31$ dBm)	PAE	–	48	–	%
Gain	G_P	30	–	–	
Harmonic Output Power $2f_0$ $3f_0$	–	– –	– –	–34 –40	dBc
Rx Band Noise (30 kHz BW)	–	–	–92	–	dBm
Spurious Output, 10:1 VSWR, all angles on output	–	–	–	–60	dBc

PCS TDMA PERFORMANCE ($P_{out} = 30$ dBm, $f = 1.88$ GHz)

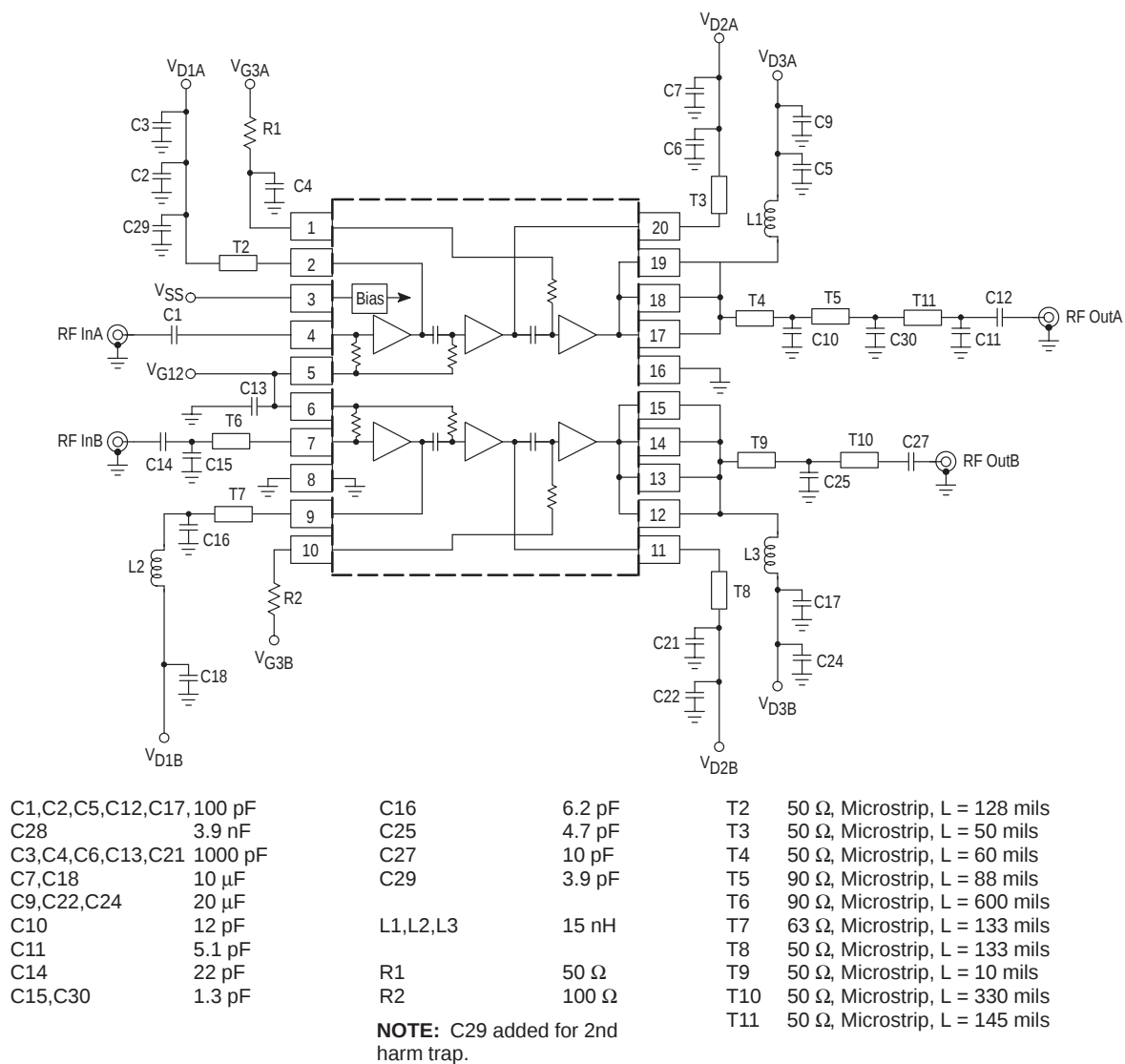
Quiescent Supply Current	–	–	–	300	mA
Negative Supply Current	–	–	–	3.0	mA
Efficiency	–	30	35	–	%
Gain	–	28	–	–	

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ELECTRICAL CHARACTERISTICS (continued) ($V_{D1,2,3A} = 3.6\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted)

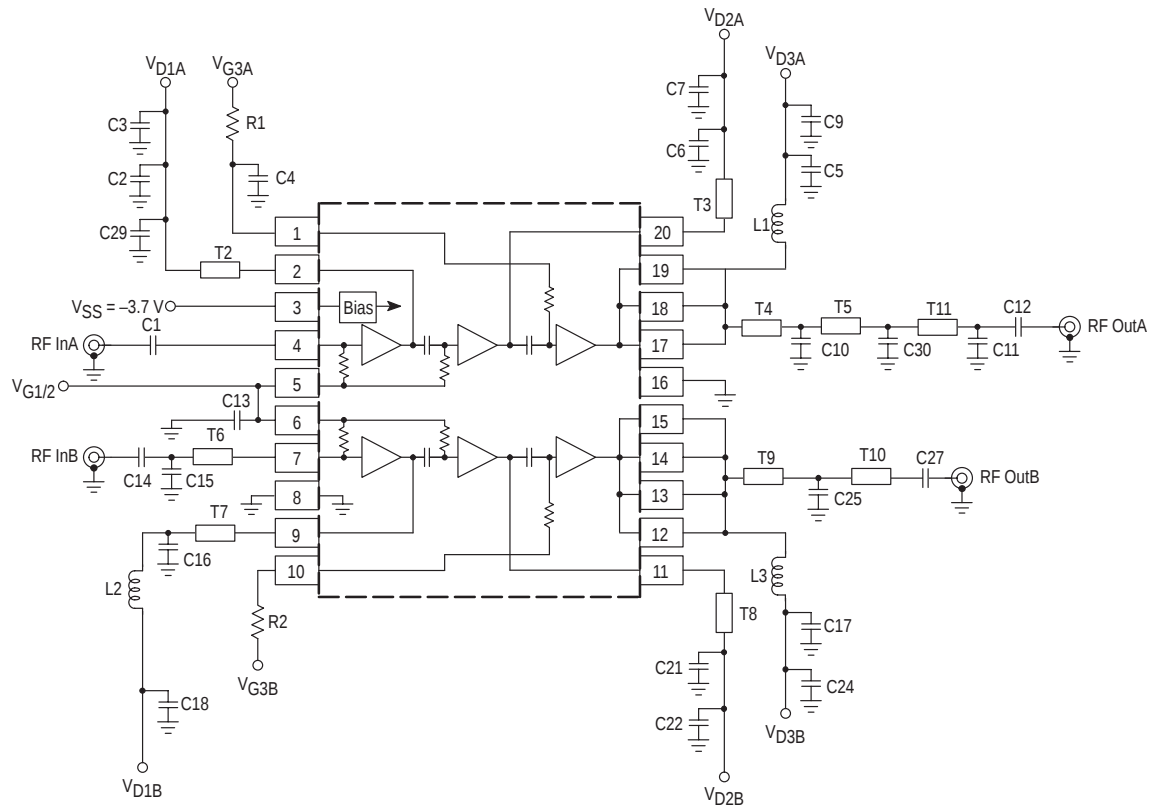
Characteristic	Symbol	Min	Typ	Max	Unit
PCS TDMA PERFORMANCE (continued) ($P_{\text{out}} = 30\text{ dBm}$, $f = 1.88\text{ GHz}$)					
Adj Channel Power ($\pm 30\text{ kHz}$)	—	—	—	−29	dBc
Alt Channel Power ($\pm 60\text{ kHz}$)	—	—	—	−48	dBc
Rx Band Noise (30 kHz BW)	—	—	−94	—	dBm
Harmonic Output Power	—	—	—	—	dBc
$2f_0$	—	—	—	−40	
$3f_0$	—	—	—	−40	
Spurious Output, 10:1 VSWR, all angles on output	—	—	—	−60	dBc

Figure 1. 3.6 V Applications Circuit



MRFIC1856

Figure 2. 4.8 V Applications Circuit



C1,C2,C5,C12,C17, 100 pF	C16	6.8 pF	T2	50 Ω , Microstrip, L = 128 mils
C28	C25	4.3 pF	T3	50 Ω , Microstrip, L = 50 mils
C3,C4,C6,C13,C21 1000 pF	C27	10 pF	T4	50 Ω , Microstrip, L = 60 mils
C7,C18	C29	3.9 pF	T5	90 Ω , Microstrip, L = 88 mils
C9,C22,C24	L1,L2,L3	15 nH	T6	90 Ω , Microstrip, L = 600 mils
C10			T7	63 Ω , Microstrip, L = 133 mils
C11			T8	50 Ω , Microstrip, L = 133 mils
C14	R1	50 Ω	T9	50 Ω , Microstrip, L = 10 mils
C15,C30	R2	100 Ω	T10	50 Ω , Microstrip, L = 330 mils
			T11	50 Ω , Microstrip, L = 145 mils

TDMA PERFORMANCE

Figure 3. Gain versus Frequency

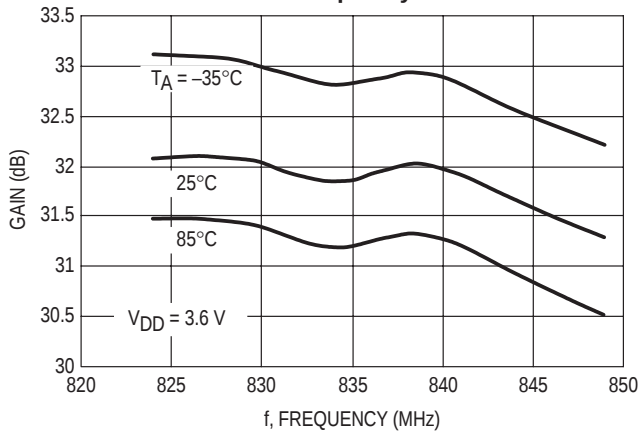


Figure 4. Gain versus Frequency

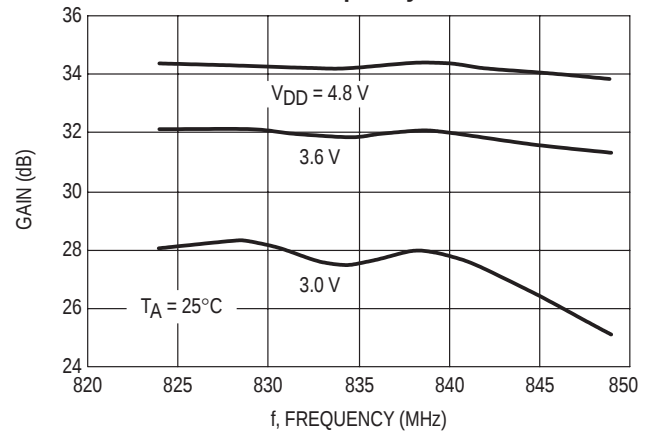


Figure 5. Output Power versus Input Power

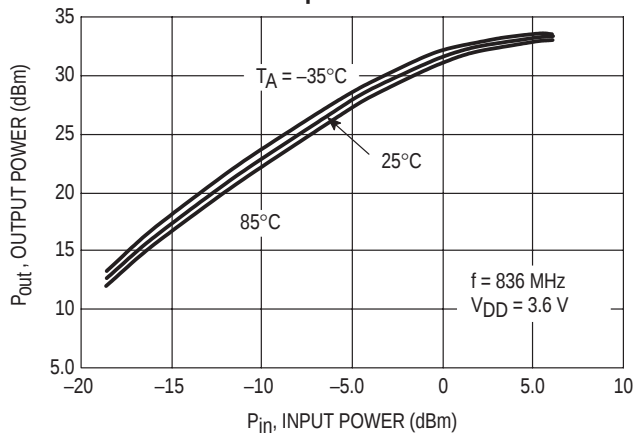


Figure 6. Output Power versus Input Power

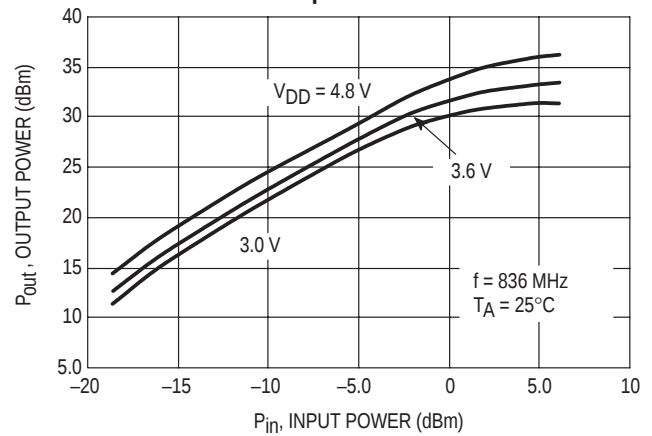


Figure 7. Adjacent Channel Power versus Output Power

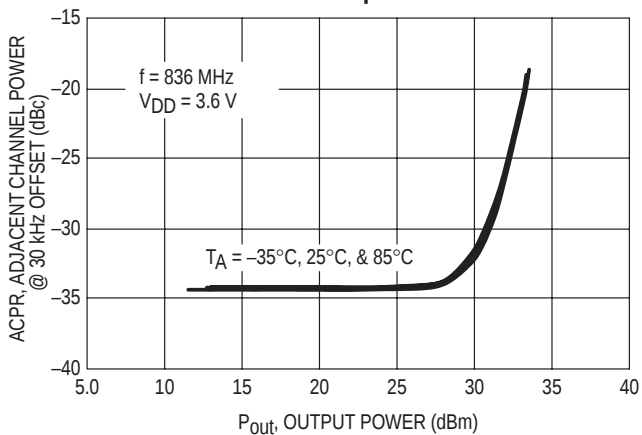
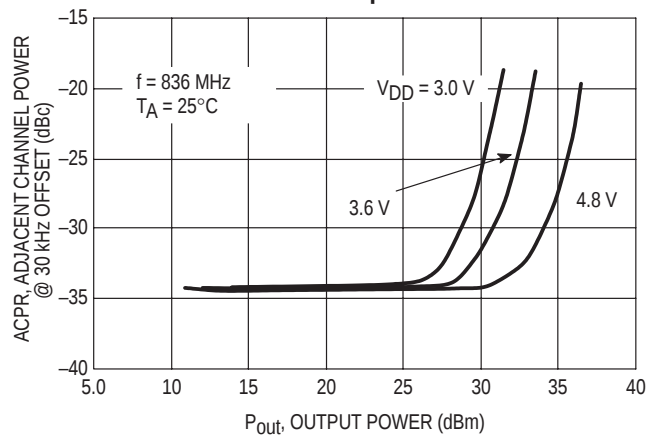


Figure 8. Adjacent Channel Power versus Output Power



TDMA PERFORMANCE

Figure 9. Alternate Channel Power versus Output Power

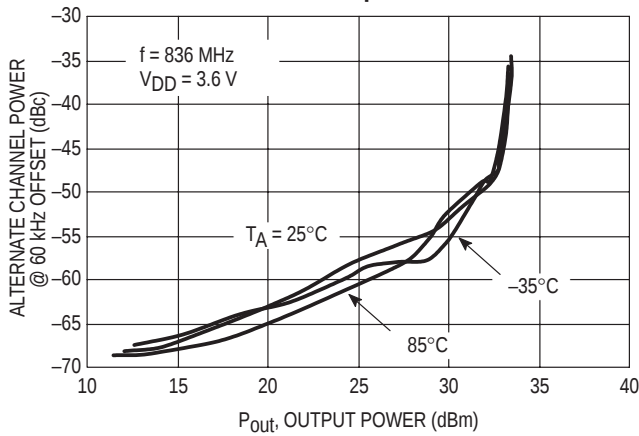


Figure 10. Alternate Channel Power versus Output Power

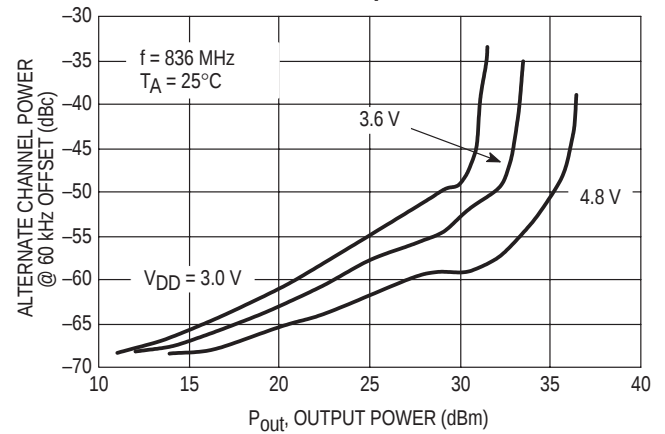


Figure 11. Gain versus Frequency

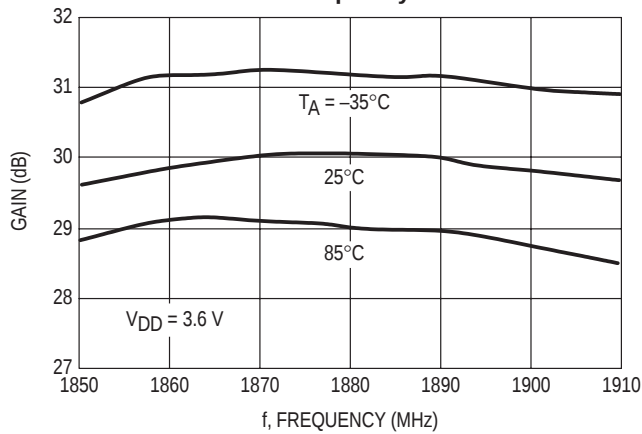


Figure 12. Gain versus Frequency

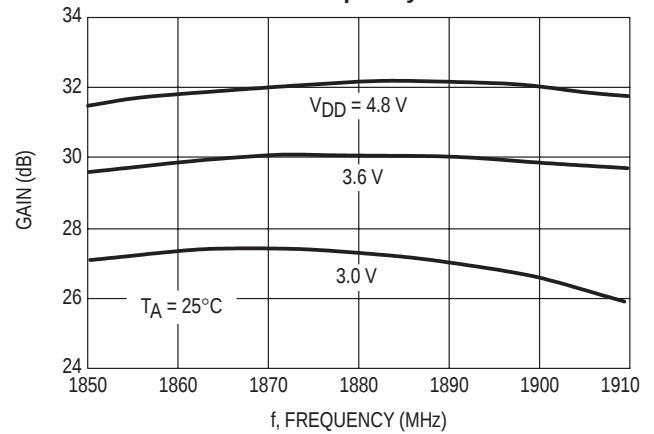


Figure 13. Output Power versus Input Power

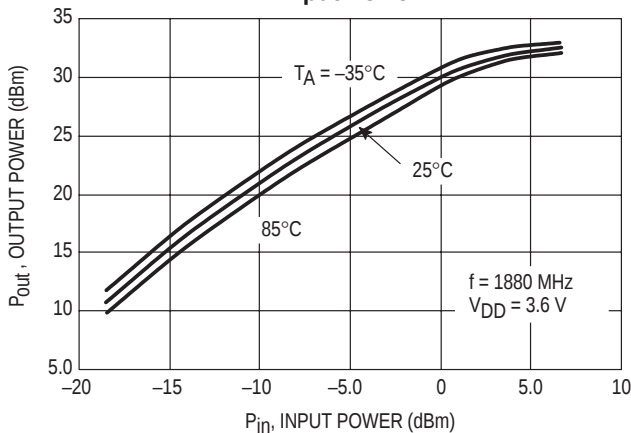
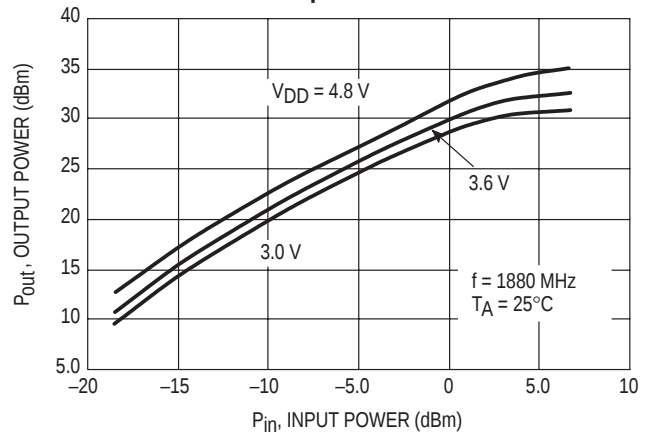


Figure 14. Output Power versus Input Power



TDMA PERFORMANCE

Figure 15. Adjacent Channel Power versus Output Power

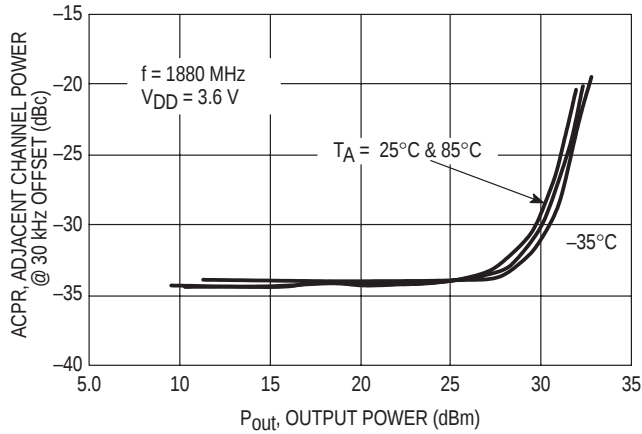


Figure 16. Adjacent Channel Power versus Output Power

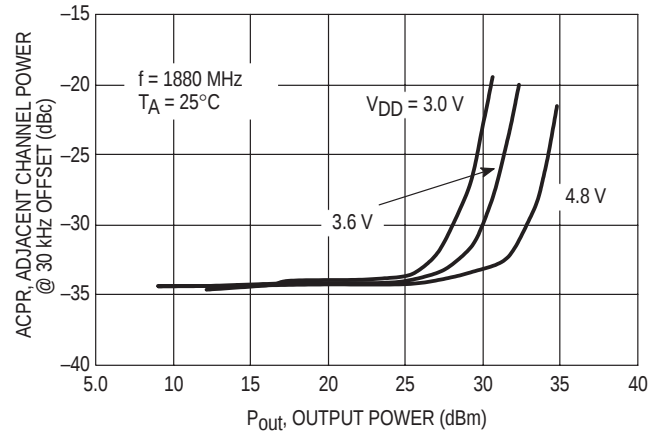


Figure 17. Alternate Channel Power versus Output Power

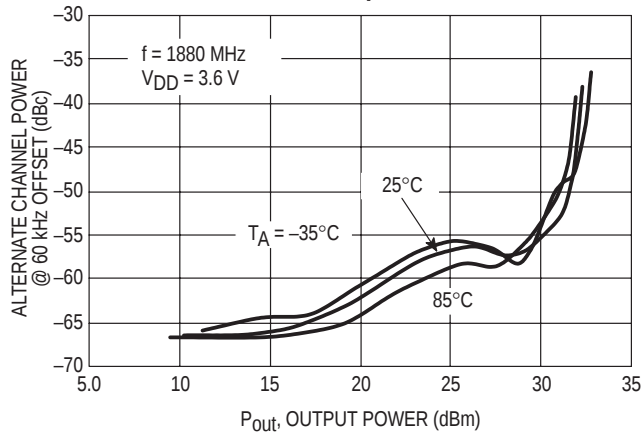
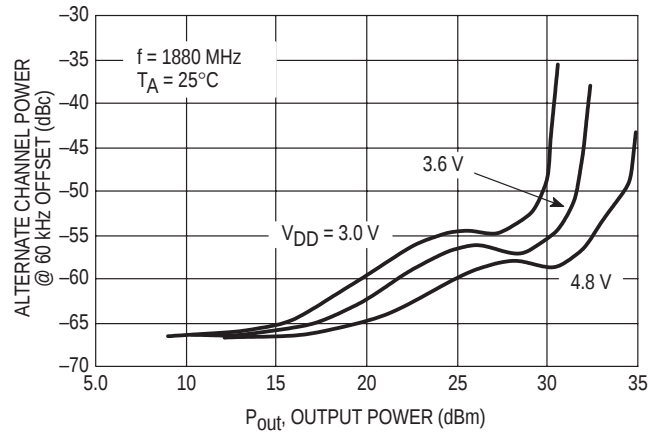


Figure 18. Alternate Channel Power versus Output Power



OUTLINE DIMENSIONS

DIM	MILLIMETERS	
	MIN	MAX
A	—	1.20
A1	0.00	0.10
b	0.19	0.30
b1	0.19	0.25
c	0.09	0.20
c1	0.09	0.16
D	6.40	6.60
E	6.40 BSC	
E1	4.30	4.50
e	0.65 BSC	
L	0.50	0.75
P	—	4.80
P1	—	3.00
R	0.27	0.37
θ	0°	8°

MRFIC1856/D