

The RF Line

NPN Silicon

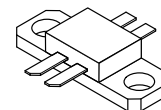
RF Power Transistor

MRF897R

Designed for 24 Volt UHF large-signal, common emitter, class-AB linear amplifier applications in industrial and commercial FM/AM equipment operating in the range 800-970 MHz.

- Specified 24 Volt, 900 MHz Characteristics
 - Output Power = 30 Watts
 - Minimum Gain = 10.5 dB @ 900 MHz, class-AB
 - Minimum Efficiency = 30% @ 900 MHz, 30 Watts (PEP)
 - Maximum Intermodulation Distortion -30 dBc @ 30 Watts (PEP)
- Characterized with Series Equivalent Large-Signal Parameters from 800 to 960 MHz
- Silicon Nitride Passivated
- 100% Tested for Load Mismatch Stress at all Phase Angles with 5:1 VSWR @ 26 Vdc, and Rated Output Power
- Gold Metalized, Emitter Ballasted for Long Life and Resistance to Metal-Migration
- Circuit Board Photomaster Available by Ordering Document MRF897RPHT/D from Motorola Literature Distribution.

30 W, 900 MHz
RF POWER
TRANSISTOR
NPN SILICON



CASE 395B-01, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	30	Vdc
Collector-Emitter Voltage	V_{CES}	60	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	4.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	105 0.60	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.67	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = 50 \text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	30	33	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 50 \text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	60	80	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5 \text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	4.7	—	Vdc
Collector Cutoff Current ($V_{CE} = 30 \text{ Vdc}$, $V_{BE} = 0$, $T_C = 25^\circ\text{C}$)	I_{CES}	—	—	10.0	mAdc

ON CHARACTERISTICS

DC Current Gain ($I_{CE} = 1.0 \text{ Adc}$, $V_{CE} = 5 \text{ Vdc}$)	h_{FE}	30	80	120	—
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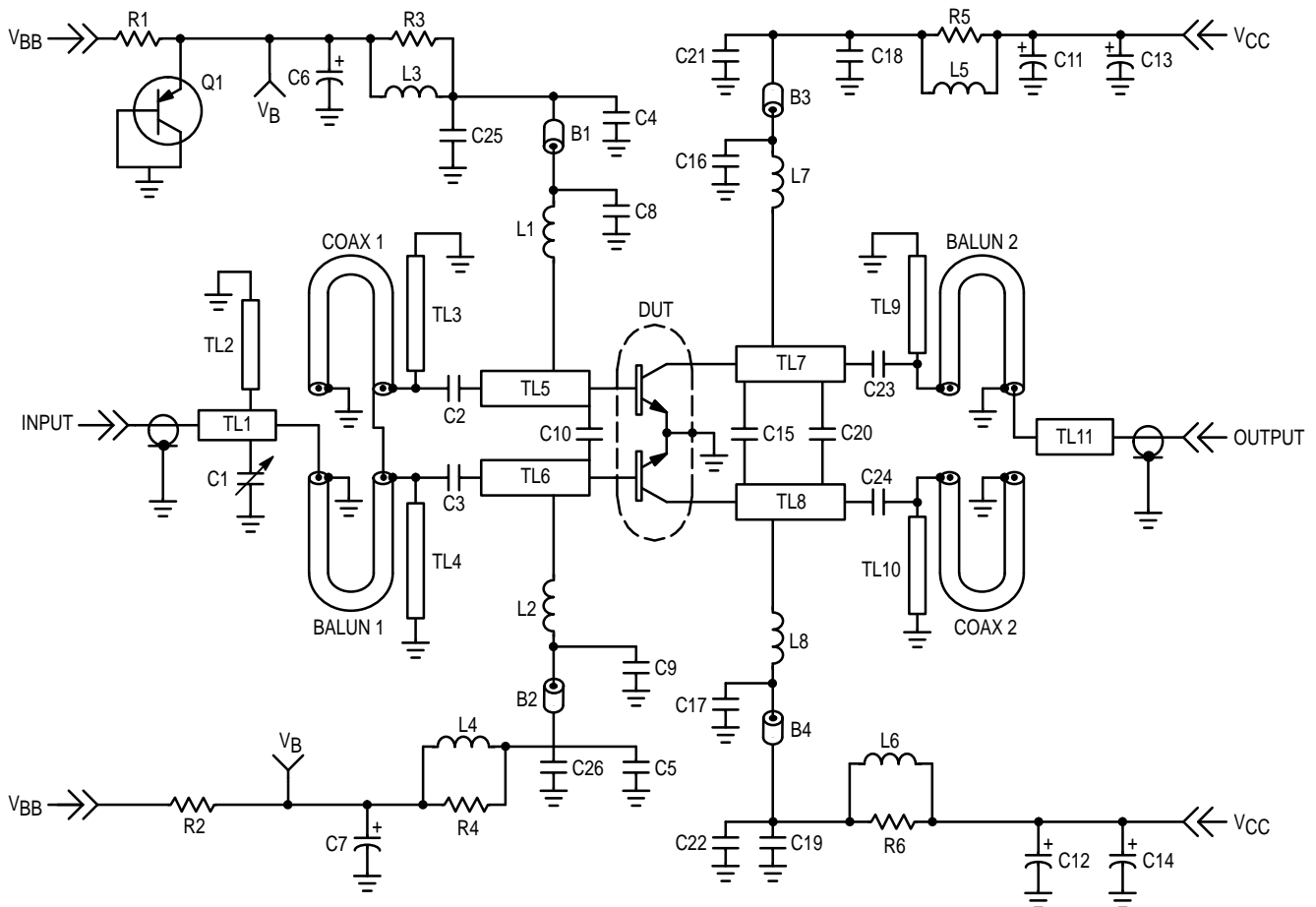
DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 24 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{ob}	14	21	28	pF
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(continued)

ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL CHARACTERISTICS					
Common-Emitter Amplifier Power Gain ($V_{CC} = 24\text{ Vdc}$, $P_{Out} = 30\text{ Watts (PEP)}$, $I_{CQ} = 125\text{ mA}$, $f_1 = 900\text{ MHz}$, $f_2 = 900.1\text{ MHz}$)	G_{pe}	10.5	12.0	—	dB
Collector Efficiency ($V_{CC} = 24\text{ Vdc}$, $P_{Out} = 30\text{ Watts (PEP)}$, $I_{CQ} = 125\text{ mA}$, $f_1 = 900\text{ MHz}$, $f_2 = 900.1\text{ MHz}$)	η	30	38	—	%
Intermodulation Distortion ($V_{CC} = 24\text{ Vdc}$, $P_{Out} = 30\text{ Watts (PEP)}$, $I_{CQ} = 125\text{ mA}$, $f_1 = 900\text{ MHz}$, $f_2 = 900.1\text{ MHz}$)	IMD	—	-37	-30	dBc
Output Mismatch Stress ($V_{CC} = 26\text{ Vdc}$, $P_{Out} = 30\text{ Watts (PEP)}$, $I_{CQ} = 125\text{ mA}$, $f_1 = 900\text{ MHz}$, $f_2 = 900.1\text{ MHz}$, Load VSWR = 5:1 (all phase angles))	ψ	No Degradation in Output Power			



B1, B2, B3, B4 — Short Ferrite Bead, Fair Rite #2743019447
 C1 — 0.8–8.0 pF Var Capacitor, Johansen Gigatrim
 C2, C3, C23, C24 — 43 pF, 100 mil, ATC Chip Capacitor
 C4, C5, C21, C22 — 1000 pF, 100 mil, ATC Chip Capacitor
 C6, C7, C11, C12 — 10 μF , Electrolytic Capacitor, Panasonic
 C8, C9, C16, C17 — 100 pF, 100 mil, ATC Chip Capacitor
 C10 — 9.1 pF, 50 mil, ATC Chip Capacitor
 C13 — 250 μF Electrolytic Capacitor, Mallory
 C14, C18, C19, C25 — 0.1 μF , Chip Capacitor, Kemet
 C15 — 1.1 pF, 50 mil, ATC Chip Capacitor
 C20 — 6.8 pF, 100 mil, ATC Chip Capacitor
 L1, L2, L3, L4, L5, L6, L7, L8 — 5 Turns 20 AWG, IDIA 0.126" Choke, Taylor Spring 46 nH

N1, N2 — Type N Flange Mount, Omni Spectra 3052–1648–10
 Q1 — Bias Transistor BD136 PNP
 R1, R12 — 27 Ohm, 2.0 W
 R3, R4, R5, R6 — 4.0 x 39 Ohm, 1/8 W, Chips Resistors in Parallel, Rohm 390–J
 SB1 — 0.15" x 0.3" x 0.03" Cu
 TL1–TL11 — Microstrip Line, See Photomaster
 Balun1, Balun2, Coax 1, Coax 2 — 2.20" 50 Ohm, 0.086" o.d. semi-rigid coax, Micro Coax UT–85–M17
 Circuit Board — 1/32" Glass Teflon, Arlon GX–0300–55–22, $\epsilon_r = 2.55$

Figure 1. 840–900 MHz Test Circuit Schematic

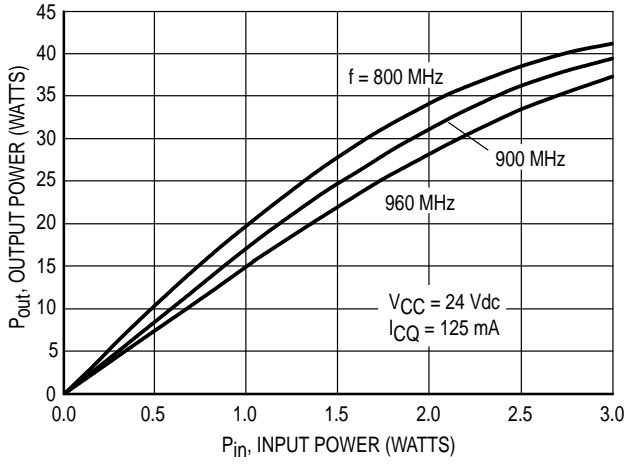


Figure 2. Output Power versus Input Power

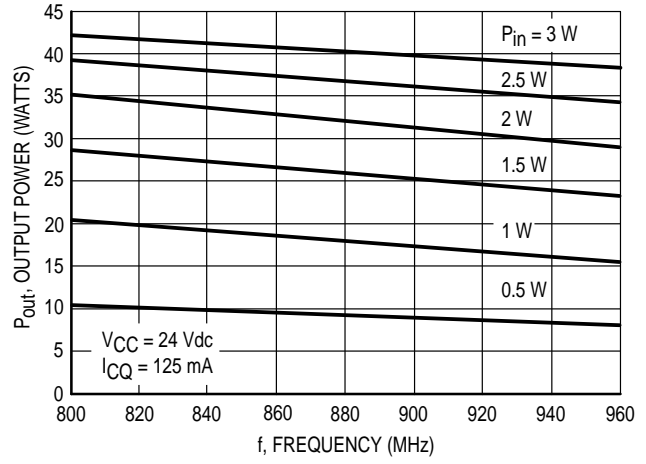


Figure 3. Output Power versus Frequency

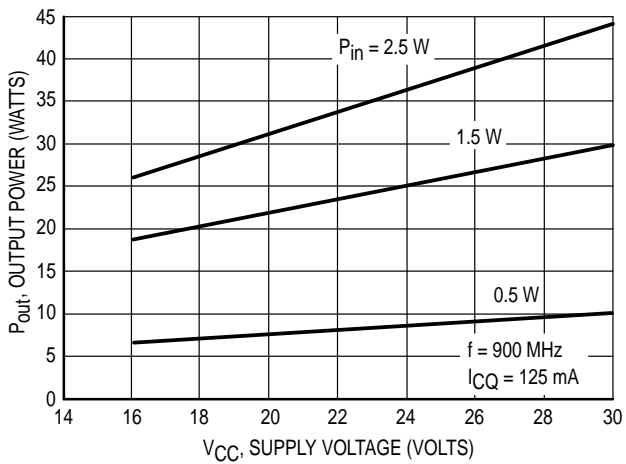


Figure 4. Output Power versus Supply Voltage

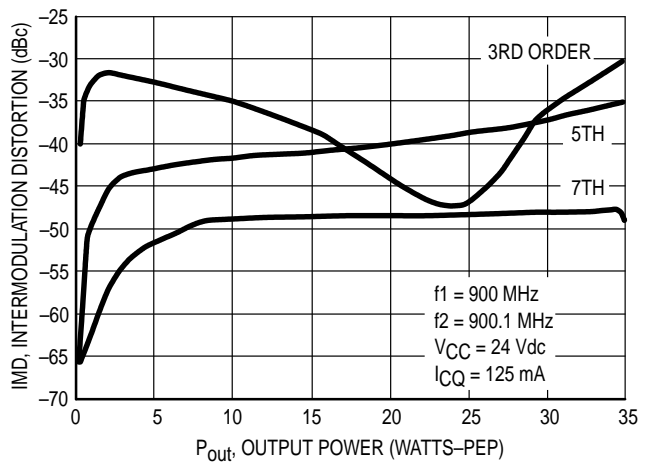


Figure 5. Intermodulation versus Output Power

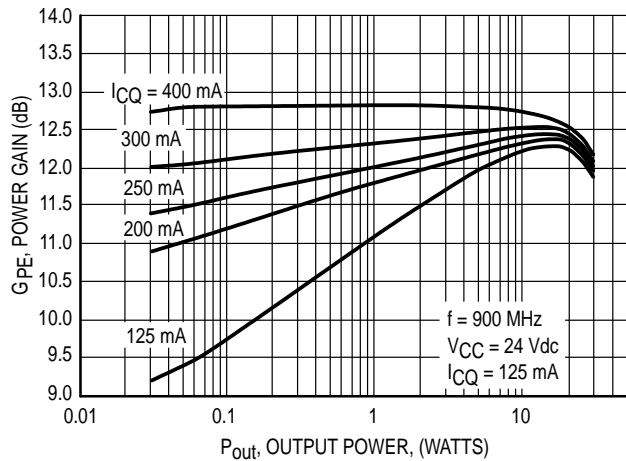


Figure 6. Power Gain versus Output Power

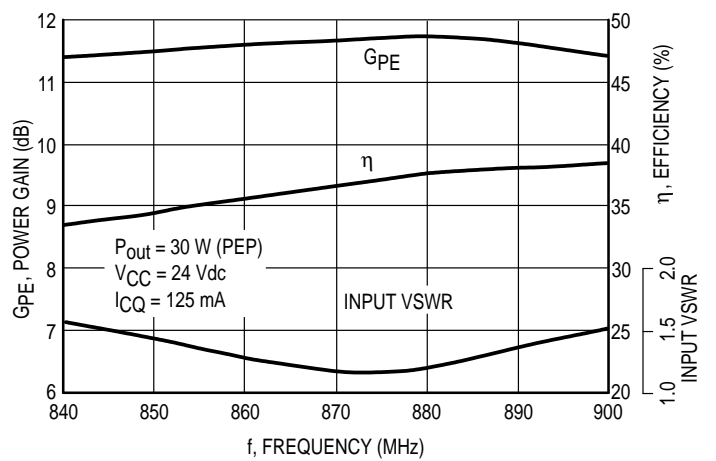
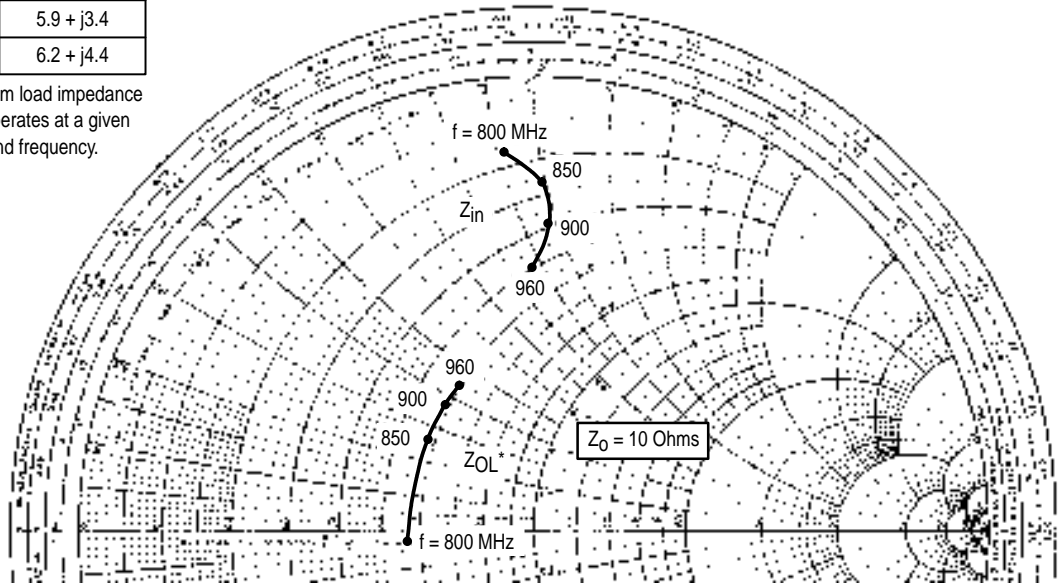


Figure 7. Broadband Test Fixture Performance

$P_{out} = 30 \text{ W (PEP)}, V_{CC} = 24 \text{ V}$

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
800	$1.7 + j9.2$	$5.9 - j0.4$
850	$2.6 + j10$	$5.7 + j2.6$
900	$4 + j9.9$	$5.9 + j3.4$
950	$5 + j8.8$	$6.2 + j4.4$

Z_{OL}^* = Conjugate of the optimum load impedance into which the device operates at a given output power, voltage and frequency.



NOTE: Z_{in} & Z_{OL}^* are given from base-to-base and collector-to-collector respectively.

Figure 8. Series Equivalent Input/Output Impedances

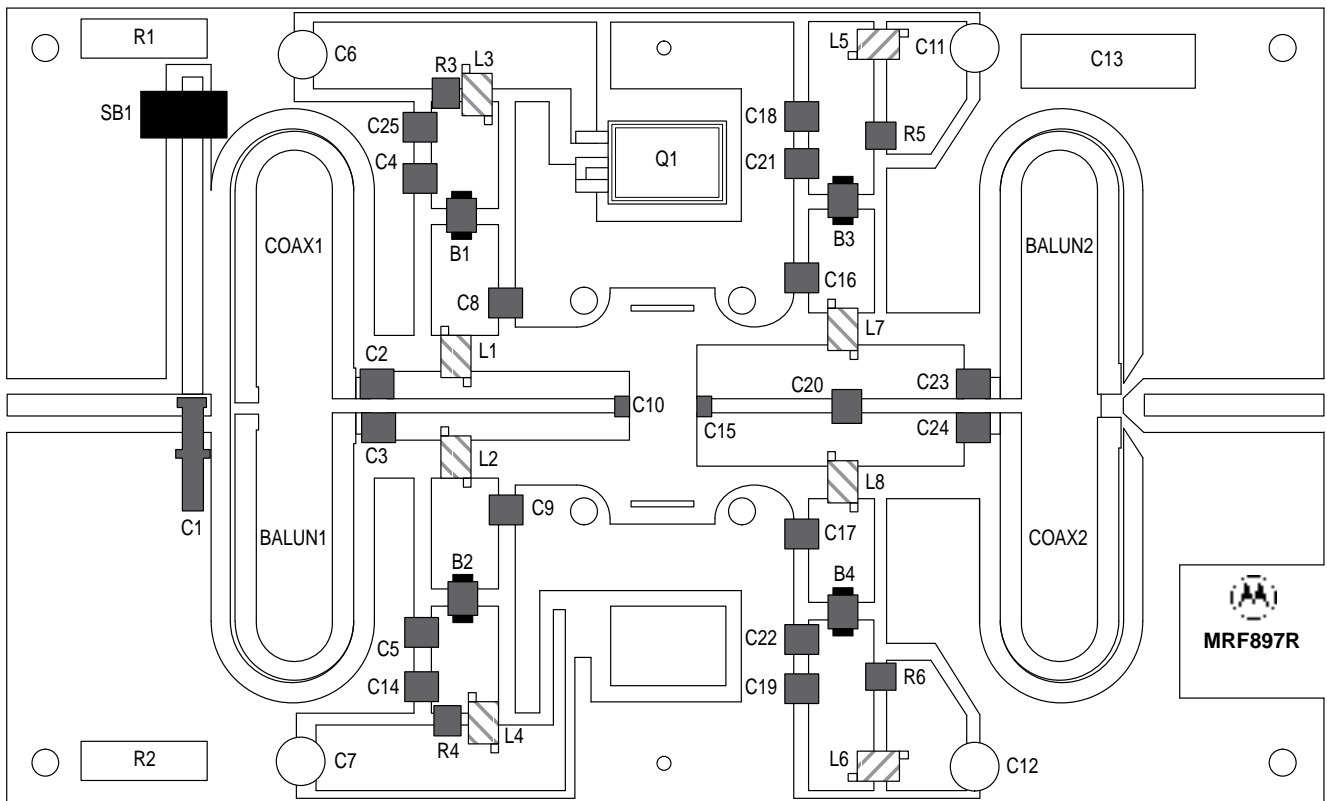
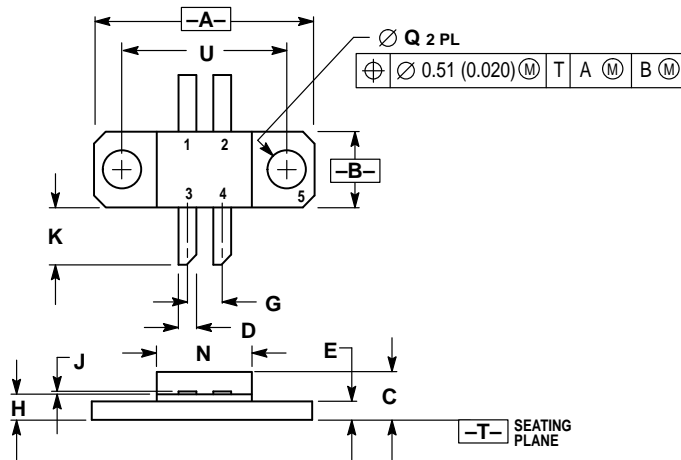


Figure 9. 840–900 MHz Test Circuit Component Layout

PACKAGE DIMENSIONS




- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.739	0.750	18.77	19.05
B	0.240	0.260	6.10	6.60
C	0.165	0.198	4.19	5.03
D	0.055	0.065	1.40	1.65
E	0.055	0.070	1.40	1.78
G	0.110	0.130	2.79	3.30
H	0.079	0.091	2.01	2.31
J	0.003	0.005	0.08	0.13
K	0.180	0.220	4.57	5.59
N	0.315	0.330	8.00	8.38
Q	0.125	0.135	3.18	3.42
U	0.560 BSC		14.22 BSC	

- STYLE 1:
 PIN 1. BASE
 2. BASE
 3. COLLECTOR
 4. COLLECTOR
 5. EMITTER

**CASE 395B-01
 ISSUE A**

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MRF897R/D

