

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

Designed for broadband commercial and industrial applications with frequencies from 865 to 895 MHz. The high gain and broadband performance of these devices make them ideal for large-signal, common-source amplifier applications in 26 volt base station equipment.

- Typical CDMA Performance @ 880 MHz, 26 Volts, $I_{DQ} = 700$ mA
IS-95 CDMA Pilot, Sync, Paging, Traffic Codes 8 Through 13
Output Power — 20 Watts
Power Gain — 17.9 dB
Efficiency — 28%
Adjacent Channel Power —
750 kHz: -45.0 dBc @ 30 kHz BW
1.98 MHz: -60.0 dBc @ 30 kHz BW
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 880 MHz, 90 Watts CW Output Power

Features

- Internally Matched for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Low Gold Plating Thickness on Leads, 40 μ " Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.

MRF9085LR3
MRF9085LSR3

880 MHz, 90 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFETs

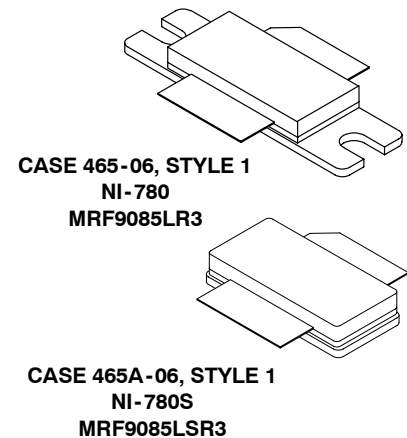


Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	- 0.5, +65	Vdc
Gate-Source Voltage	V_{GS}	- 0.5, +15	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25 $^\circ\text{C}$	P_D	250 1.43	W W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 65 to +150	$^\circ\text{C}$
Case Operating Temperature	T_C	150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.7	$^\circ\text{C}/\text{W}$

Table 3. ESD Protection Characteristics

Test Conditions	Class
Human Body Model	1 (Minimum)
Machine Model MRF9085LR3 MRF9085LSR3	M2 (Minimum) M1 (Minimum)

Table 4. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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Off Characteristics

Zero Gate Voltage Drain Leakage Current ($V_{DS} = 65\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current ($V_{GS} = 5\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	—	—	1	μAdc

On Characteristics

Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 300\text{ }\mu\text{Adc}$)	$V_{GS(th)}$	2.0	—	4.0	Vdc
Gate Quiescent Voltage ($V_{DS} = 26\text{ Vdc}$, $I_D = 700\text{ mAdc}$)	$V_{GS(Q)}$	—	3.7	—	Vdc
Drain-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 2\text{ Adc}$)	$V_{DS(on)}$	—	0.19	0.4	Vdc
Forward Transconductance ($V_{DS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$)	g_{fs}	—	8.0	—	S

Dynamic Characteristics ⁽¹⁾

Output Capacitance ($V_{DS} = 26\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$)	C_{oss}	—	73	—	pF
Reverse Transfer Capacitance ($V_{DS} = 26\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$)	C_{rss}	—	2.9	—	pF

1. Part is internally input matched.

(continued)

Table 4. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Functional Tests (In Freescale Test Fixture, 50 ohm system)					
Two - Tone Common-Source Amplifier Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$, $f_2 = 880.1\text{ MHz}$)	G_{ps}	17	17.9	—	dB
Two - Tone Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$, $f_2 = 880.1\text{ MHz}$)	η	36	40	—	%
3rd Order Intermodulation Distortion ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$, $f_2 = 880.1\text{ MHz}$)	IMD	—	-31	-28	dBc
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$, $f_2 = 880.1\text{ MHz}$)	IRL	—	-21	-9	dB
Two - Tone Common - Source Amplifier Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 865.0\text{ MHz}$, $f_2 = 865.1\text{ MHz}$)	G_{ps}	—	17.9	—	dB
Two - Tone Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 865.0\text{ MHz}$, $f_2 = 865.1\text{ MHz}$)	η	—	40.0	—	%
3rd Order Intermodulation Distortion ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 865.0\text{ MHz}$, $f_2 = 865.1\text{ MHz}$)	IMD	—	-31	—	dBc
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 865.0\text{ MHz}$, $f_2 = 865.1\text{ MHz}$)	IRL	—	-16	—	dB
Power Output, 1 dB Compression Point, CW ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$)	P_{1dB}	—	105	—	W
Common - Source Amplifier Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W CW}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$)	G_{ps}	—	17.5	—	dB
Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W CW}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 880.0\text{ MHz}$)	η	—	51	—	%
Power Output, 1 dB Compression Point, CW ⁽¹⁾ ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 700\text{ mA}$, $f_1 = 960\text{ MHz}$)	P_{1dB}	—	105	—	W

1. These values are derived from a 960 MHz optimized test fixture. Values are not applicable to Figures 1 and 2.

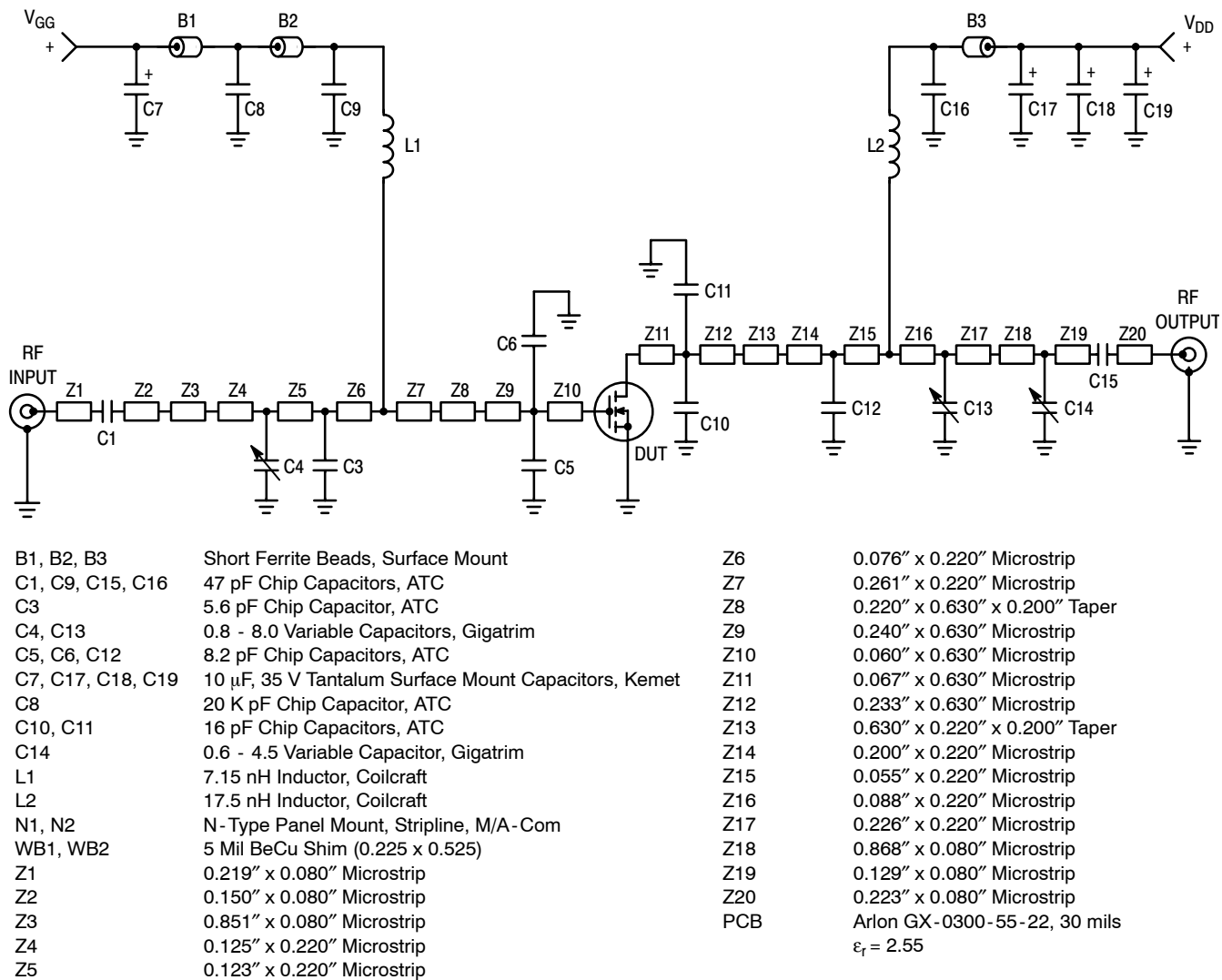
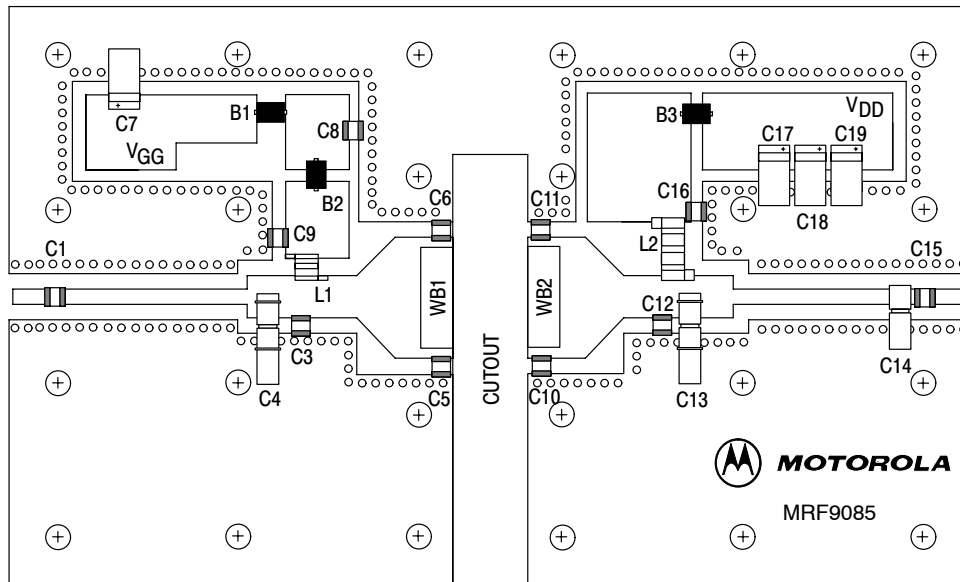


Figure 1. 865-895 MHz Broadband Test Circuit Schematic



Freescall has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescall Semiconductor signature/logo. PCBs may have either Motorola or Freescall markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 2. 865-895 MHz Broadband Test Circuit Component Layout

TYPICAL CHARACTERISTICS

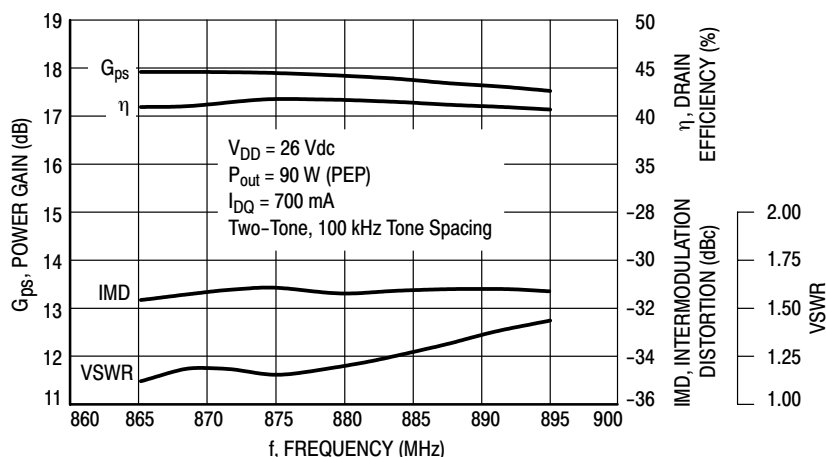


Figure 3. Class AB Broadband Circuit Performance

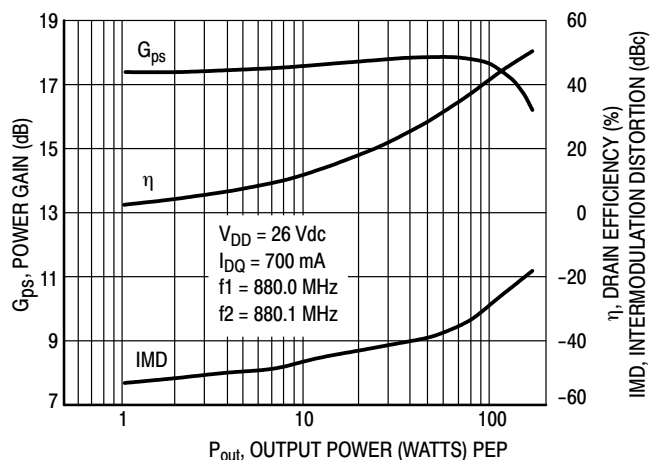


Figure 4. Power Gain, Efficiency, IMD versus Output Power

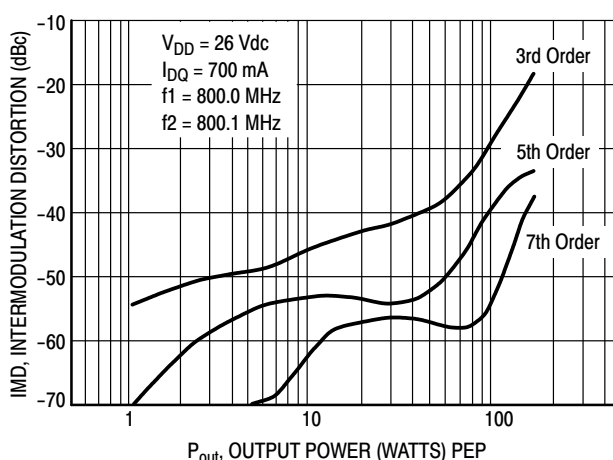


Figure 5. Intermodulation Distortion Products versus Output Power

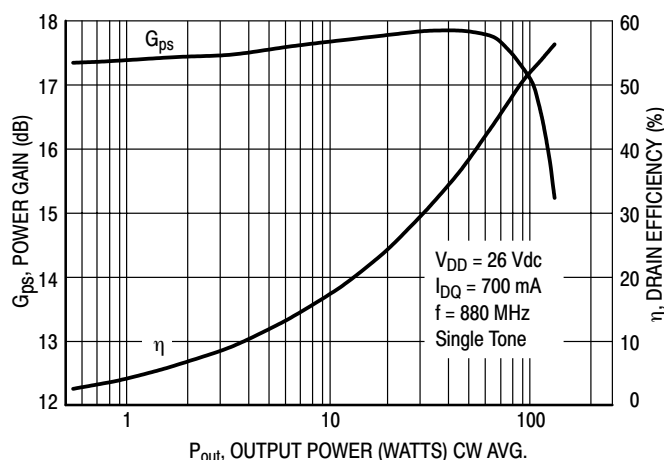


Figure 6. Power Gain, Efficiency versus Output Power

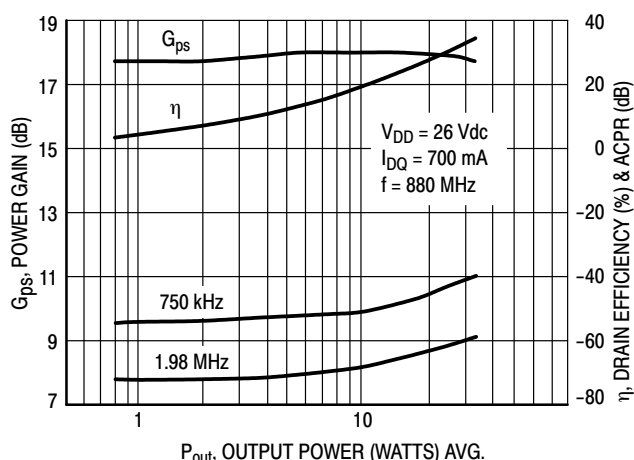
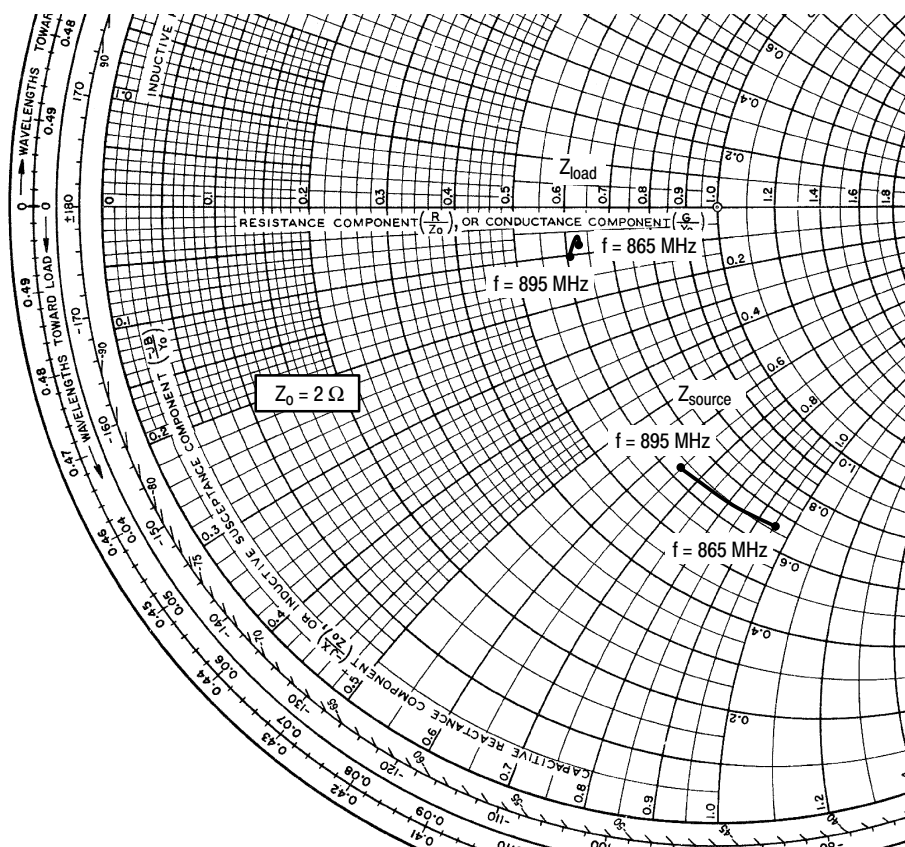


Figure 7. Power Gain, Efficiency, ACPR versus Output Power



$V_{DD} = 26 \text{ V}$, $I_{DQ} = 700 \text{ mA}$, $P_{\text{out}} = 90 \text{ W PEP}$

f MHz	Z_{source} Ω	Z_{load} Ω
865	$1.35 - j1.92$	$1.26 - j0.15$
880	$1.33 - j1.66$	$1.26 - j0.10$
895	$1.28 - j1.30$	$1.21 - j0.20$

Z_{source} = Test circuit impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.

Note: Z_{load} was chosen based on tradeoffs between gain, output power, drain efficiency and intermodulation distortion.

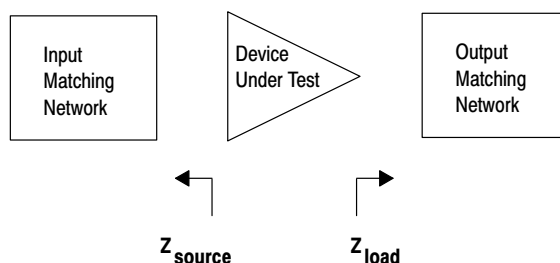


Figure 8. Series Equivalent Source and Load Impedance

NOTES

ARCHIVE INFORMATION

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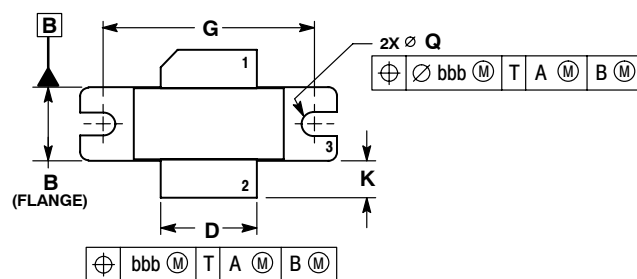
ARCHIVE INFORMATION

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PACKAGE DIMENSIONS



NOTES:

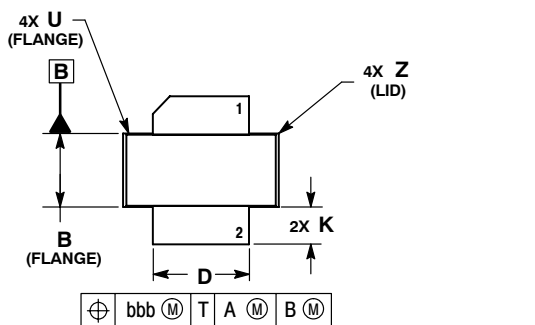
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	1.100 BSC		27.94 BSC	
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.66	19.96
N	0.772	0.788	19.60	20.00
Q	Ø.118	Ø.138	Ø.300	Ø.351
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

STYLE 1:

- PIN 1. DRAIN
- GATE
- SOURCE

CASE 465-06
ISSUE G
NI-780
MRF9085LR3



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.805	0.815	20.45	20.70
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.61	20.02
N	0.772	0.788	19.61	20.02
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
U	---	0.040	---	1.02
Z	---	0.030	---	0.76
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

STYLE 1:

- PIN 1. DRAIN
- GATE
- SOURCE

CASE 465A-06
ISSUE H
NI-780S
MRF9085LSR3

MRF9085LR3 MRF9085LSR3

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