

# RF Power Field Effect Transistors

## N-Channel Enhancement-Mode Lateral MOSFETs

Designed for GSM and GSM EDGE base station applications with frequencies from 1800 to 2000 MHz. Suitable for TDMA, CDMA and multicarrier amplifier applications. To be used in Class AB for PCN-PCS/cellular radio and WLL applications. Specified for GSM-GSM EDGE 1805-1880 MHz.

- GSM and GSM EDGE Performance, Full Frequency Band (1805-1880 MHz)  
Power Gain - 15 dB (Typ) @ 85 Watts CW  
Efficiency - 52% (Typ) @ 85 Watts CW
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 1840 MHz, 85 Watts CW Output Power

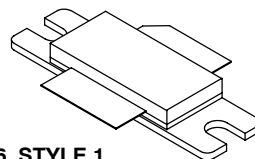
### Features

- 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
- Available with Low Gold Plating Thickness on Leads. L Suffix Indicates 40μ" Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.

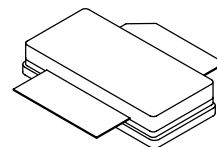
**MRF18085ALR3**  
**MRF18085ALSR3**

**1805-1880 MHz, 85 W, 26 V**  
**GSM/GSM EDGE**  
**LATERAL N-CHANNEL**  
**RF POWER MOSFETs**

**CASE 465-06, STYLE 1**  
**NI-780**  
**MRF18085ALR3**



**CASE 465A-06, STYLE 1**  
**NI-780S**  
**MRF18085ALSR3**



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**Table 1. Maximum Ratings**

Rating	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	-0.5, +65	Vdc
Gate-Source Voltage	V <sub>GS</sub>	-0.5, +15	Vdc
Total Device Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	273 1.56	W W/°C
Storage Temperature Range	T <sub>stg</sub>	- 65 to +150	°C
Case Operating Temperature	T <sub>C</sub>	150	°C
Operating Junction Temperature	T <sub>J</sub>	200	°C

**Table 2. Thermal Characteristics**

Characteristic	Symbol	Value (1)	Unit
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	0.79	°C/W

**Table 3. ESD Protection Characteristics**

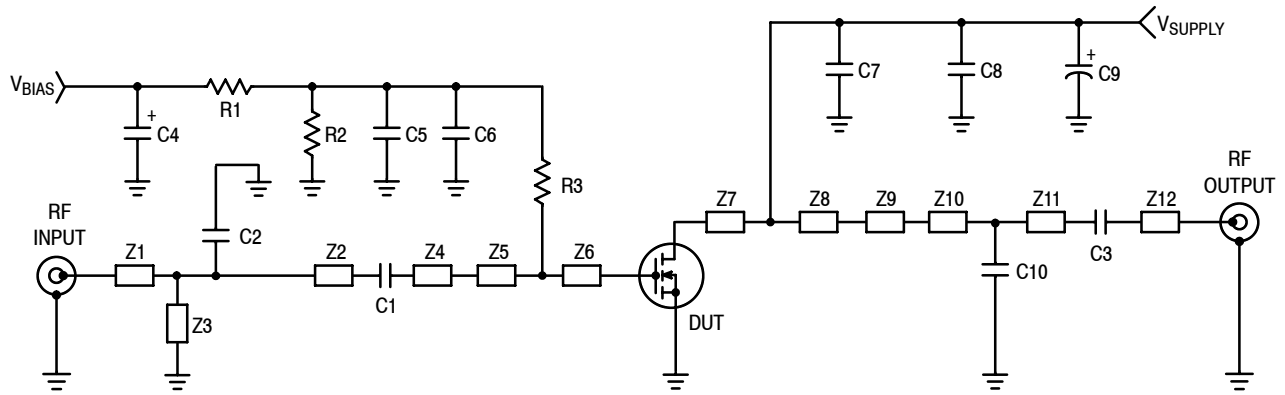
Test Conditions	Class
Human Body Model	1 (Minimum)
Machine Model	M3 (Minimum)

1. Refer to AN1955/D, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.freescale.com/rf>.  
Select Documentation/Application Notes - AN1955.

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

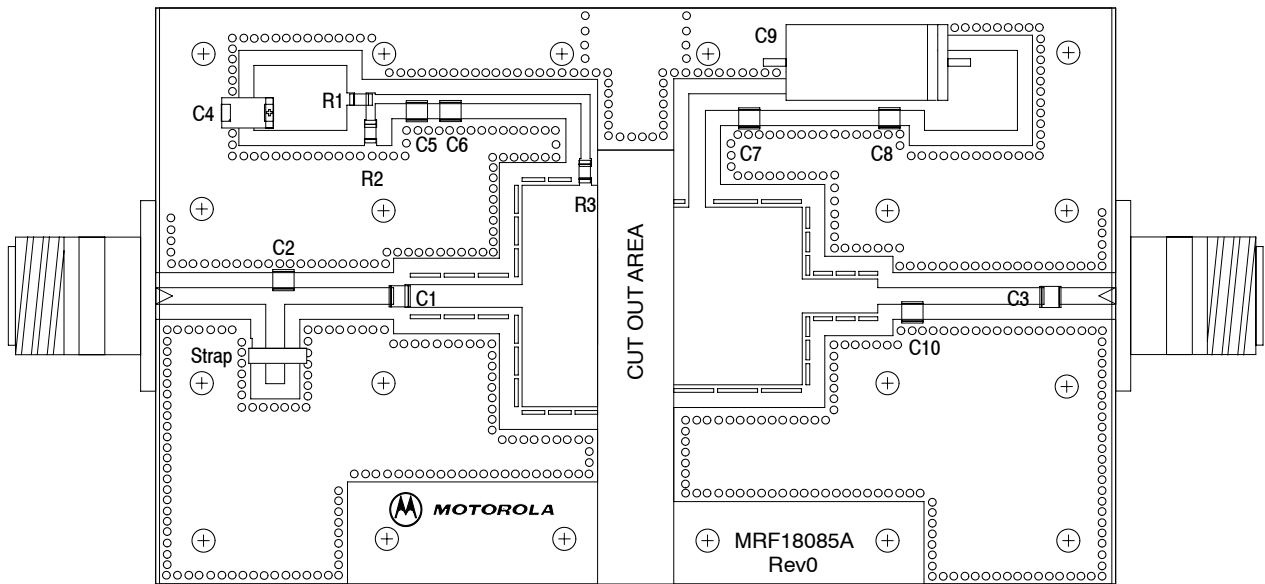
Characteristic	Symbol	Min	Typ	Max	Unit
<b>Off Characteristics</b>					
Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 100\ \mu\text{Adc}$ )	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )	$I_{DSS}$	—	—	10	$\mu\text{Adc}$
Gate-Source Leakage Current ( $V_{GS} = 5\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	—	—	1	$\mu\text{Adc}$
<b>On Characteristics</b>					
Gate Threshold Voltage ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 200\ \mu\text{Adc}$ )	$V_{GS(th)}$	2	—	4	Vdc
Gate Quiescent Voltage ( $V_{DS} = 26\text{ Vdc}$ , $I_D = 600\ \text{mAdc}$ )	$V_{GS(Q)}$	2.5	3.9	4.5	Vdc
Drain-Source On-Voltage ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 2\text{ Adc}$ )	$V_{DS(on)}$	—	0.15	—	Vdc
<b>Dynamic Characteristics</b>					
Reverse Transfer Capacitance (1) ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{rss}$	—	3.6	—	pF
<b>Functional Tests</b> (In Freescale Test Fixture, 50 ohm system)					
Common-Source Amplifier Power Gain @ 85 W (2) ( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 800\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	$G_{ps}$	13.5	15	—	dB
Drain Efficiency @ 85 W (2) ( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 800\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	$\eta$	48	52	—	%
Input Return Loss @ 85 W (2) ( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 800\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	IRL	—	-12	-9	dB
Power Output, 1 dB Compression Point ( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 800\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	P1dB	83	90	—	Watts

1. Part is internally matched both on input and output.
2. To meet application requirements, Freescale test fixtures have been designed to cover the full GSM1800 band, ensuring batch-to-batch consistency.



C1, C3, C6, C7	10 pF Chip Capacitors, ATC	Z4	0.610" x 0.118" Microstrip
C2	1.8 pF Chip Capacitor, ATC	Z5	0.331" x 1.153" Microstrip
C4	10 $\mu$ F, 35 V Tantalum Capacitor, AVX	Z6	0.063" x 1.153" Microstrip
C5, C8	1 nF Chip Capacitors, ATC	Z7	0.122" x 0.925" Microstrip
C9	220 $\mu$ F, 63 V Electrolytic Capacitor, Radial, Philips	Z8	0.547" x 0.925" Microstrip
C10	0.3 pF Chip Capacitor, ATC	Z9	0.394" x 0.177" Microstrip
R1, R2	10 k $\Omega$ , 1/4 W Chip Resistors (1206)	Z10	0.180" x 0.087" Microstrip
R3	1.0 k $\Omega$ , 1/4 W Chip Resistor (1206)	Z11	0.686" x 0.087" Microstrip
Z1	0.671" x 0.087" Microstrip	Z12	0.294" x 0.087" Microstrip
Z2	0.568" x 0.087" Microstrip	PCB	Taconic TLX8, 30 mils, $\epsilon_r = 2.55$
Z3	0.500" x 0.098" Microstrip Shorted Stub		

Figure 1. 1805-1880 MHz Test Fixture Schematic



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

Figure 2. 1805-1880 MHz Test Fixture Component Layout

### TYPICAL CHARACTERISTICS

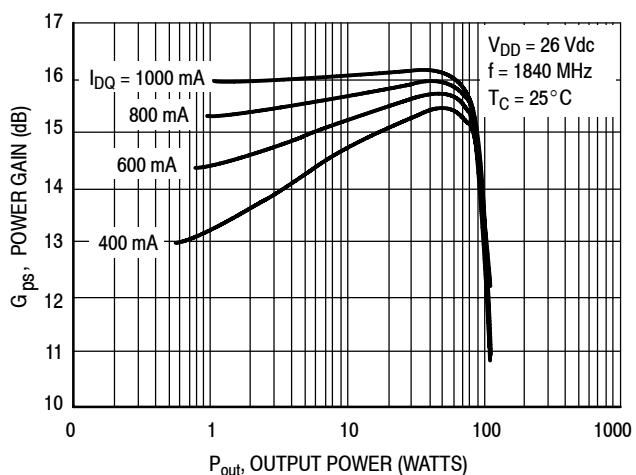


Figure 3. Power Gain versus Output Power

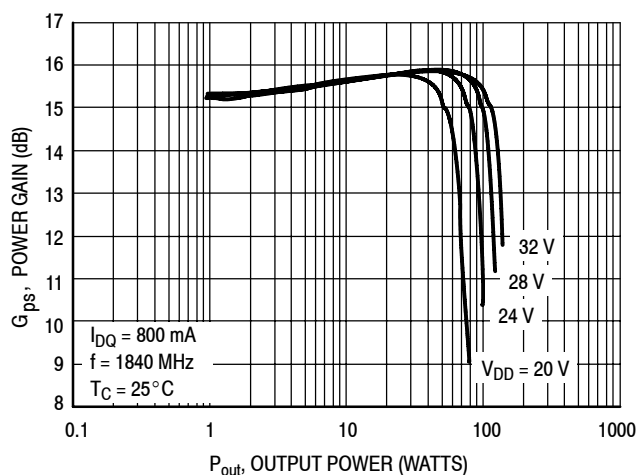


Figure 4. Power Gain versus Output Power

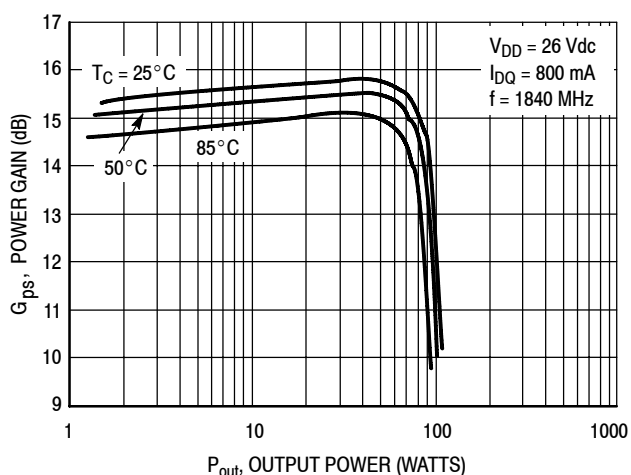


Figure 5. Power Gain versus Output Power

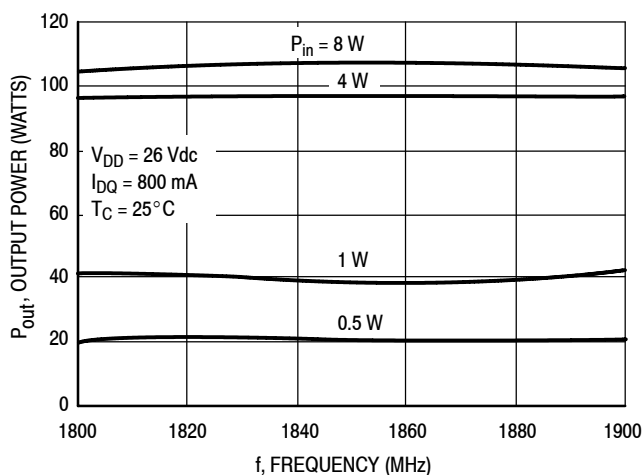


Figure 6. Output Power versus Frequency

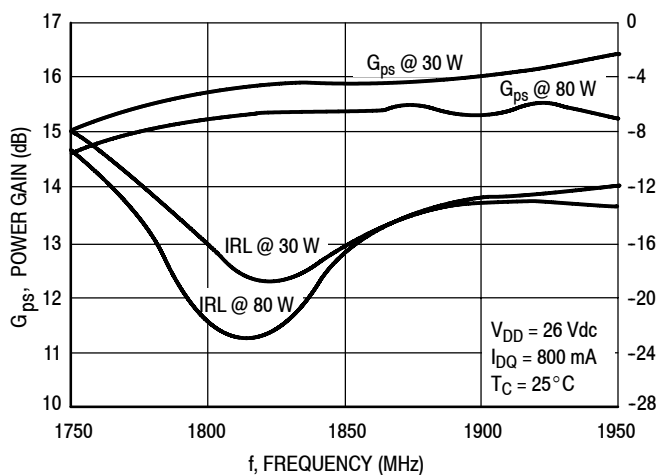


Figure 7. Power Gain versus Frequency

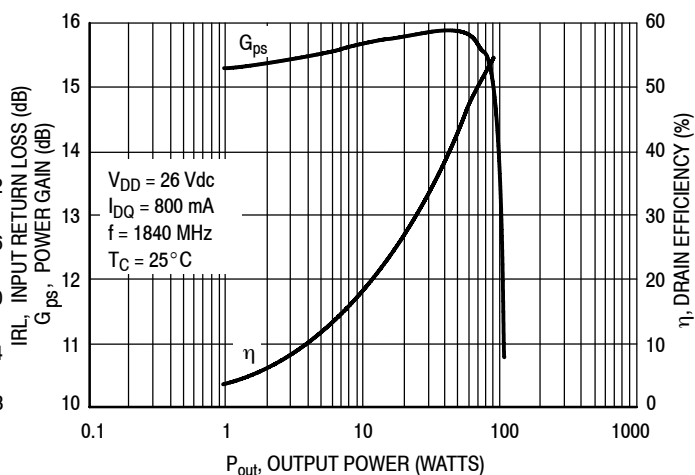
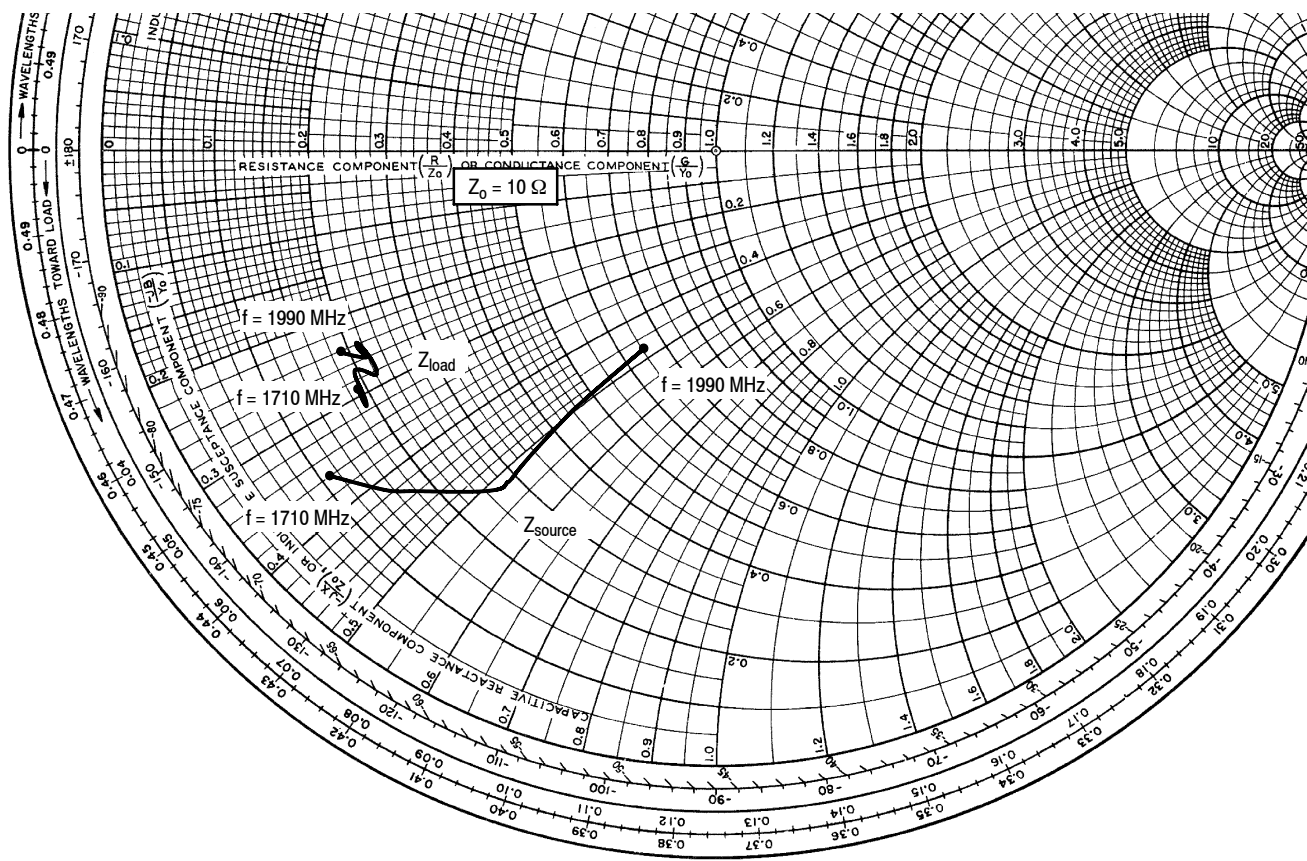


Figure 8. Power Gain and Efficiency versus Output Power

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$V_{DD} = 26\text{ V}$ ,  $I_{DQ} = 800\text{ mA}$ ,  $P_{out} = 85\text{ W CW}$

f MHz	$Z_{source}$ $\Omega$	$Z_{load}$ $\Omega$
1710	$1.13 - j3.62$	$1.79 - j2.88$
1785	$1.61 - j4.23$	$1.82 - j3.15$
1805	$1.69 - j4.34$	$1.90 - j2.66$
1880	$2.83 - j5.25$	$2.09 - j2.77$
1930	$3.00 - j5.18$	$2.01 - j2.44$
1960	$4.39 - j4.97$	$2.01 - j2.57$
1990	$6.59 - j4.74$	$1.79 - j2.37$

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

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

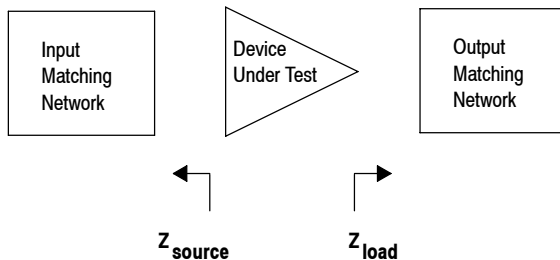
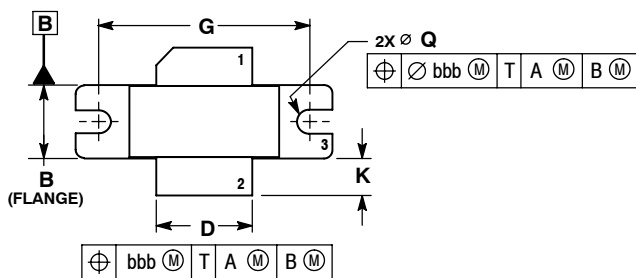


Figure 9. Series Equivalent Source and Load Impedance

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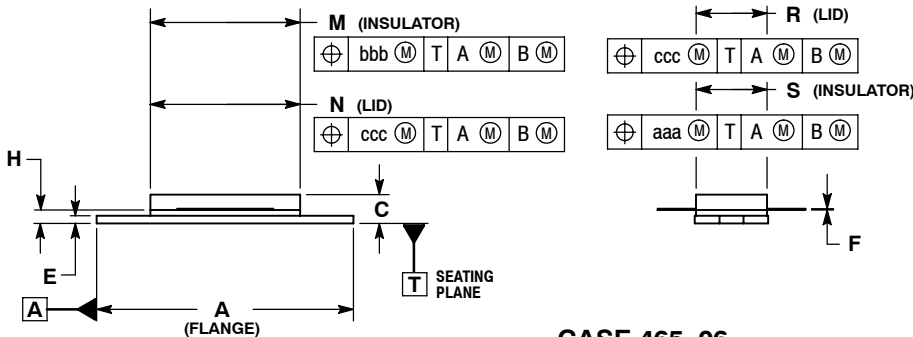
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### PACKAGE DIMENSIONS



- 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.

DIM	INCHES		MILLIMETERS	
	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	

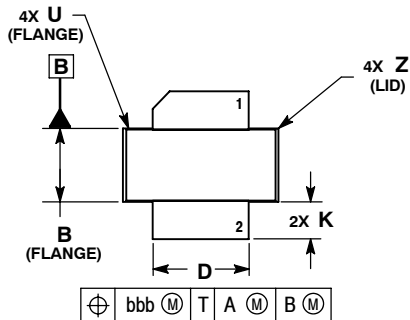


**CASE 465-06  
ISSUE G  
NI-780  
MRF18085ALR3**

- STYLE 1:  
PIN 1. DRAIN  
2. GATE  
3. SOURCE

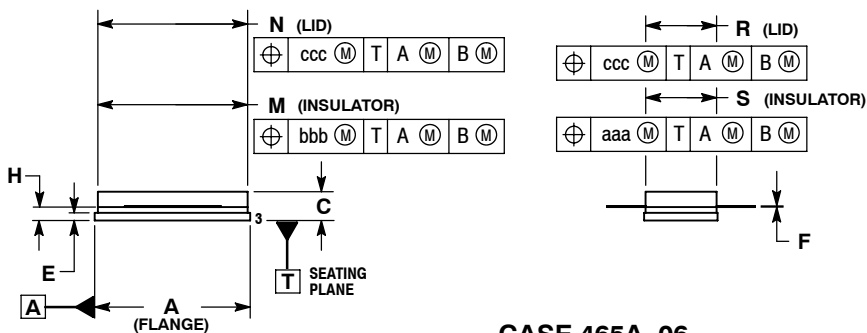
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  3. DELETED
  4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

DIM	INCHES		MILLIMETERS	
	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	



**CASE 465A-06  
ISSUE H  
NI-780S  
MRF18085ALSR3**

- STYLE 1:  
PIN 1. DRAIN  
2. GATE  
5. SOURCE

## REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
6	Dec. 2010	<ul style="list-style-type: none"> <li>• MRF18085A Rev. 6 data sheet archived. Data sheet split due to change in part life cycle. See MRF18085A-1 Rev. 7 for MRF18085ALR3 and MRF18085A-2 Rev. 8 for MRF18085ALSR3.</li> </ul>

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