

# The RF Line

## NPN Silicon

### High-Frequency Transistor

- Tape and reel packaging available for MRF3866R2:  
R2 suffix = 2,500 units per reel

**MRF3866R2**

**$I_C = 400$  mA  
HIGH-FREQUENCY  
TRANSISTORS  
NPN SILICON**

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	30	Vdc
Collector-Base Voltage	$V_{CBO}$	55	Vdc
Emitter-Base Voltage	$V_{EBO}$	3.5	Vdc
Collector Current — Continuous	$I_C$	0.4	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 12	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
Maximum Junction Temperature	$T_{Jmax}$	150	$^\circ\text{C}$



**CASE 751-05, STYLE 1  
(SO-8)**

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	125	$^\circ\text{C/W}$

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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 5.0$ mAdc, $R_{BE} = 10 \Omega$ )	$V_{(BR)CER}$	55	—	Vdc
Collector-Emitter Sustaining Voltage ( $I_C = 5.0$ mAdc, $I_B = 0$ )	$V_{CEO(sus)}$	30	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 100 \mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	3.5	—	Vdc
Collector Cutoff Current ( $V_{CE} = 28$ Vdc, $I_B = 0$ )	$I_{CEO}$	—	0.02	mAdc
Collector Cutoff Current ( $V_{CE} = 30$ Vdc, $V_{BE} = -1.5$ Vdc (Rev.), $T_C = 150^\circ\text{C}$ ) ( $V_{CE} = 55$ Vdc, $V_{BE} = -1.5$ Vdc (Rev.))	$I_{CEX}$	— —	5.0 0.1	mAdc
Emitter Cutoff Current ( $V_{BE} = 3.5$ Vdc, $I_C = 0$ )	$I_{EBO}$	—	0.1	mAdc

(continued)

(Replaces MPS3866/D)



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

Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = 360\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ ) (1) ( $I_C = 50\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	5.0 10	— 200	—
Collector–Emitter Saturation Voltage ( $I_C = 100\text{ mA}$ , $I_B = 20\text{ mA}$ )	$V_{CE(sat)}$	—	1.0	Vdc

**SMALL–SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = 50\text{ mA}$ , $V_{CE} = 15\text{ Vdc}$ , $f = 200\text{ MHz}$ )	$f_T$	500	—	MHz
Output Capacitance ( $V_{CB} = 28\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	—	3.0	pF

**FUNCTIONAL TEST**

Amplifier Power Gain ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 1.0\text{ W}$ , $f = 400\text{ MHz}$ )	$G_{pe}$	10	—	dB
Collector Efficiency ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 1.0\text{ W}$ , $f = 400\text{ MHz}$ )	$\eta$	45	—	%

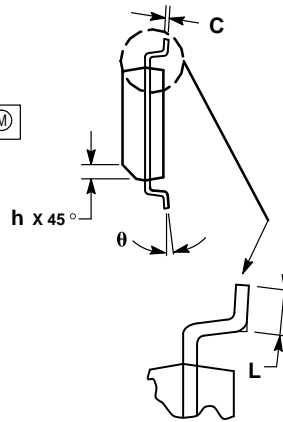
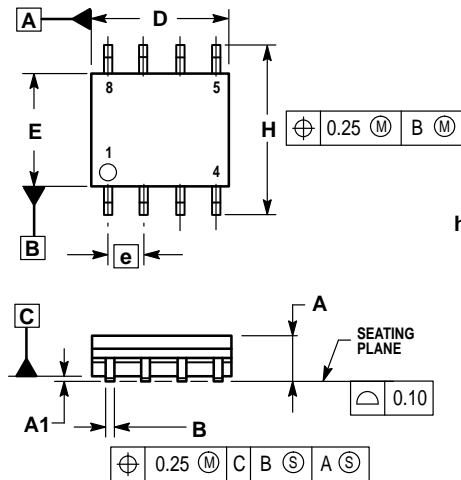
NOTE:

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

$V_{CE}$ (Volts)	$I_C$ (mA)	$f$ (MHz)	$S_{11}$		$S_{21}$		$S_{12}$		$S_{22}$	
			$S_{11}$	$\angle \phi$	$S_{21}$	$\angle \phi$	$S_{12}$	$\angle \phi$	$S_{22}$	$\angle \phi$
15	50	100	0.67	–166	13.75	92	0.016	44	0.32	–27
		200	0.69	–176	6.93	81	0.024	53	0.30	–24
		300	0.70	177	4.57	73	0.032	57	0.32	–31
		400	0.71	172	3.38	67	0.042	59	0.34	–37
		500	0.72	168	2.66	61	0.049	59	0.37	–45
		600	0.72	164	2.17	54	0.056	61	0.40	–53
		700	0.72	160	1.85	49	0.061	63	0.43	–60
		800	0.72	155	1.61	44	0.068	65	0.47	–66
		900	0.71	151	1.40	39	0.075	64	0.50	–73
		1000	0.70	146	1.25	34	0.084	68	0.53	–79

**Table 1. MRF3866R2 Common Emitter S–Parameters**

## PACKAGE DIMENSIONS



### NOTES:


1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.18	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
$\theta$	0°	7°

### STYLE 1:

- PIN 1: EMITTER
2. COLLECTOR
  3. COLLECTOR
  4. EMITTER
  5. EMITTER
  6. BASE
  7. BASE
  8. EMITTER

**CASE 751-05  
ISSUE S**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

**How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
P.O. Box 5405, Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

**JAPAN:** Nippon Motorola Ltd.: SPD, Strategic Planning Office, 4-32-1,  
Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan. 81-3-5487-8488

**Mfax™:** RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609  
– US & Canada ONLY 1-800-774-1848

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

**INTERNET:** <http://motorola.com/sps>



**MOTOROLA**



**MRF3866/D**