MRFG35030R5
Rev. 2, 3/2005

RoHS

Gallium Arsenide PHEMT

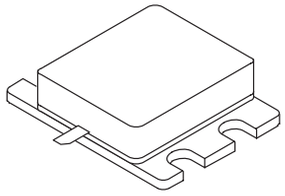
RF Power Field Effect Transistor

Designed for WLL base station applications with frequencies from 3400 to 3600 MHz. Suitable for TDMA and CDMA amplifier applications. To be used in Class AB applications.

- Typical Single−Carrier W−CDMA Performance: V_{DD} = 12 Volts, I_{DQ} = 650 mA, P_{out} = 3 Watts Avg., f = 3550 MHz, Channel Bandwidth = 3.84 MHz, Peak/Avg. = 8.5 dB @ 0.01% Probability on CCDF.
  - Power Gain —12 dB
  - Drain Efficiency — 21%
  - ACPR @ 5 MHz Offset — −41 dBc @ 3.84 MHz Channel Bandwidth
- Internally Matched, Controlled Q, for Ease of Use
- High Gain, High Efficiency and High Linearity
- Excellent Thermal Stability
- In Tape and Reel. R5 Suffix = 50 Units per 56 mm, 13 inch Reel.

MRFG35030R5

3550 MHz, 30 W, 12 V
SINGLE W−CDMA
POWER FET
GaAs PHEMT



CASE 1490−02, STYLE 1

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain−Source Voltage	V_{DSS}	15	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	79 0.53	W W/°C
Gate−Source Voltage	V_{GS}	− 5	Vdc
RF Input Power	P_{in}	37	dBm
Storage Temperature Range	T_{stg}	− 40 to +175	°C
Channel Temperature (1)	T_{ch}	175	°C
Operating Case Temperature Range	T_C	− 20 to +90	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.9	°C/W

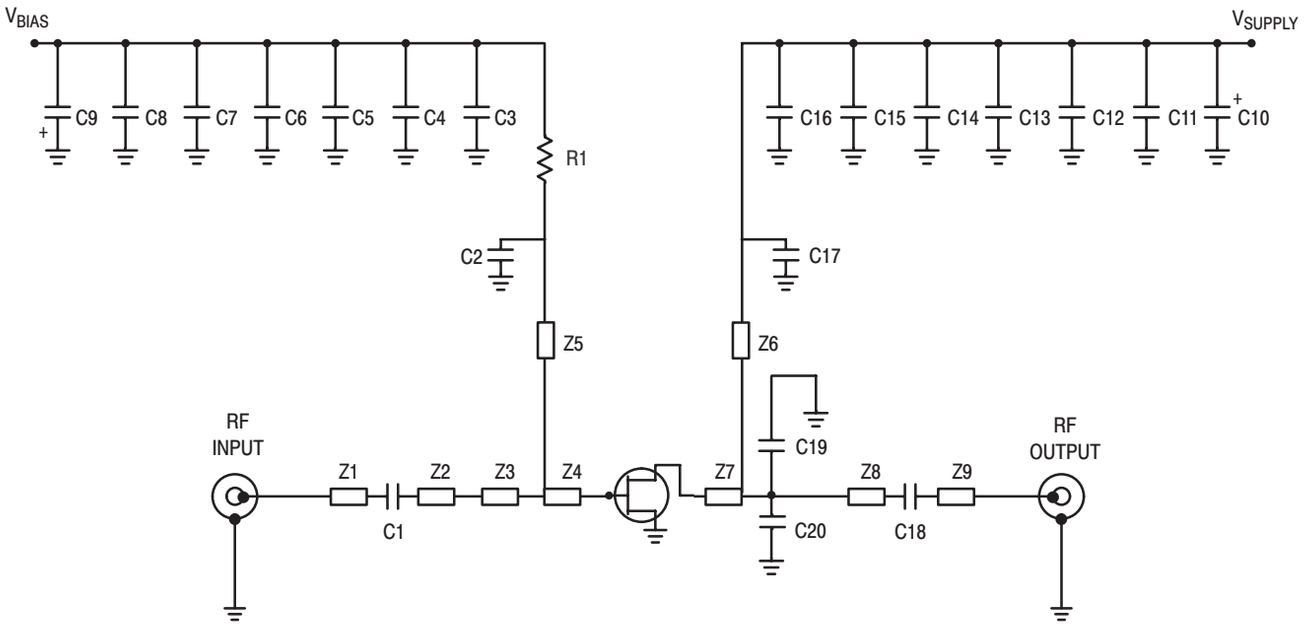
1. For reliable operation, the operating channel temperature should not exceed 150°C.

freescale semiconductor

Table 3. Electrical Characteristics (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
DC Characteristics					
Off State Drain Current (V_{DS} = 3.5 Vdc, V_{GS} = −2 Vdc)	I_{DSO}	—	15	425	μAdc
Off State Current (V_{DS} = 28.5 Vdc, V_{GS} = −2.5 Vdc)	I_{DSX}	—	5	42.5	mAdc
Gate−Source Cut−off Voltage (V_{DS} = 3.5 Vdc, I_{DS} = 1 mA/mm)	$V_{GS(th)}$	−0.7	−0.85	−1.1	Vdc
Functional Tests (In Freescale Test Fixture, 50 ohm system) (1) V_{DD} = 12 Vdc, I_{DQ} = 650 mA, P_{out} = 3 W Avg., f = 3550 MHz, Single−carrier W−CDMA, 3.84 MHz Channel Bandwidth Carrier. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset. Peak/Avg. = 8.5 dB @ 0.01% Probability on CCDF.					
Power Gain	G_{ps}	10	12	—	dB
Drain Efficiency	η_D	17	21	—	%
Adjacent Channel Power Ratio	ACPR	—	−41	−36	dBc
Typical RF Performance (In Freescale Test Fixture, 50 ohm system) V_{DD} = 12 Vdc, I_{DQ} = 650 mA, f = 3550 MHz					
Output Power, 1 dB Compression Point, CW	P1dB	—	30	—	W

1. Measurements made with device in test fixture.

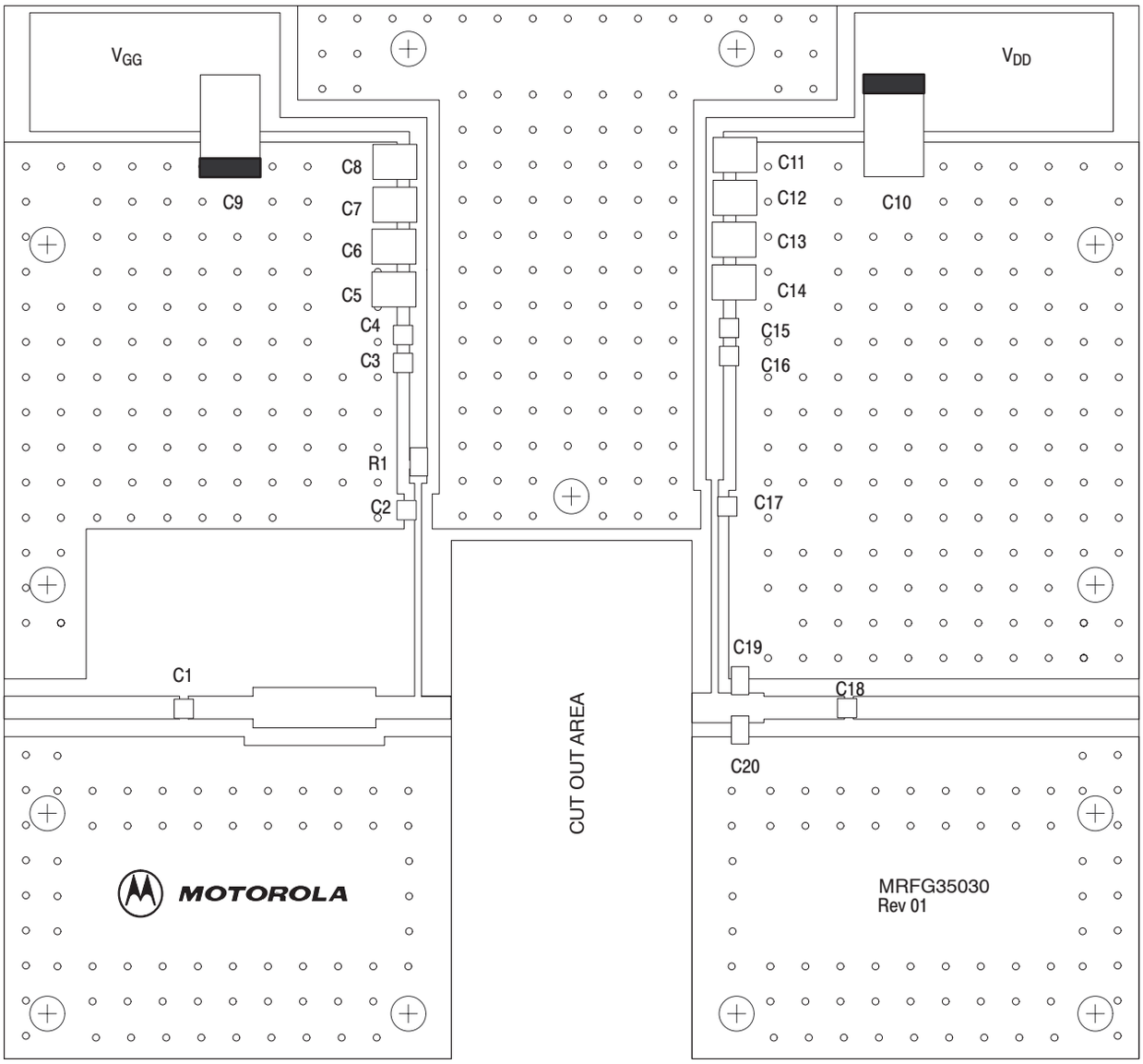


Z1	0.065″ x 0.500″ Microstrip	Z7	0.085″ x 0.205″ Microstrip
Z2	0.065″ x 0.185″ Microstrip	Z8	0.065″ x 0.230″ Microstrip
Z3	0.115″ x 0.350″ Microstrip	Z9	0.065″ x 0.814″ Microstrip
Z4	0.065″ x 0.215″ Microstrip	PCB	Rogers RO4350, 0.030″, ε_r = 3.5
Z5, Z6	0.020″ x 0.527″ Microstrip		

Figure 1. MRFG35030 Test Circuit Schematic

Table 4. MRFG35030 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2, C17	6.8 pF Chip Capacitors	100A6R8CP500X	ATC
C3, C16	10 pF Chip Capacitors	100A100JP500X	ATC
C4, C15	100 pF Chip Capacitors	100A101JP500X	ATC
C5, C14	100 pF Chip Capacitors	100B101JP500X	ATC
C6, C13	1000 pF Chip Capacitors	100B102JP500X	ATC
C7, C12	0.1 μF Chip Capacitors	CDR33BX104AKWS	Newark
C8, C11	39K Chip Capacitors	200B393KP50X	ATC
C9, C10	22 μF, 35 V Tantalum Capacitors	T491X226K035AS	ATC
C18	1.0 pF Chip Capacitor	08051J1R0BBT	AVX
C19	0.7 pF Chip Capacitor	08051J0R7BBT	AVX
C20	0.3 pF Chip Capacitor	08051J0R3BBT	AVX
R1	10 Ω, 1/4 W, 1% Resistor	D55342M07B10J0R	Dale



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. MRFG35030 Test Circuit Component Layout

TYPICAL CHARACTERISTICS

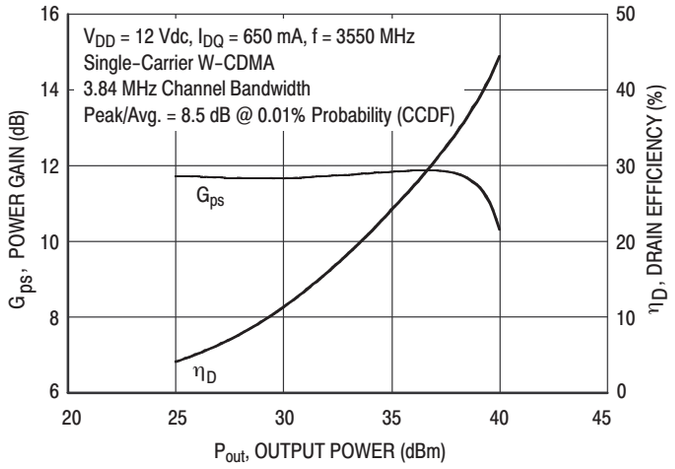


Figure 3. Single−Carrier W−CDMA Power Gain and Drain Efficiency versus Output Power

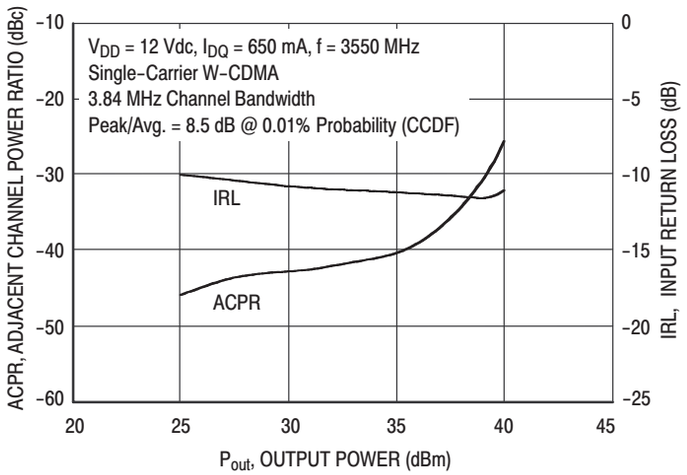


Figure 4. Single−Carrier W−CDMA Adjacent Channel Power Ratio and Input Return Loss versus Output Power

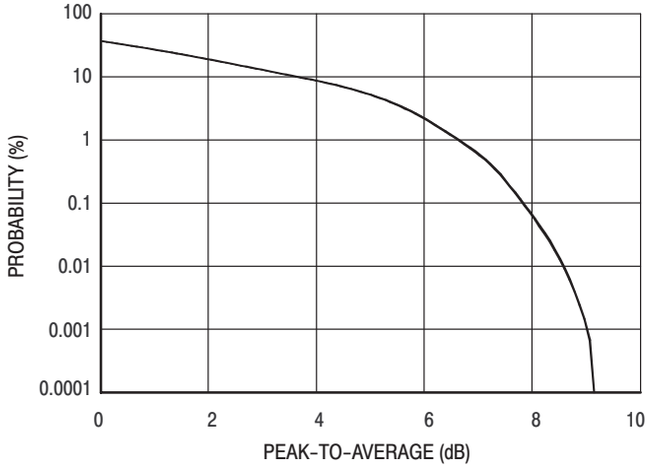


Figure 5. CCDF W−CDMA 3GPP, Test Model 1, 64 DPCH, 67% Clipping, Single−Carrier Test Signal

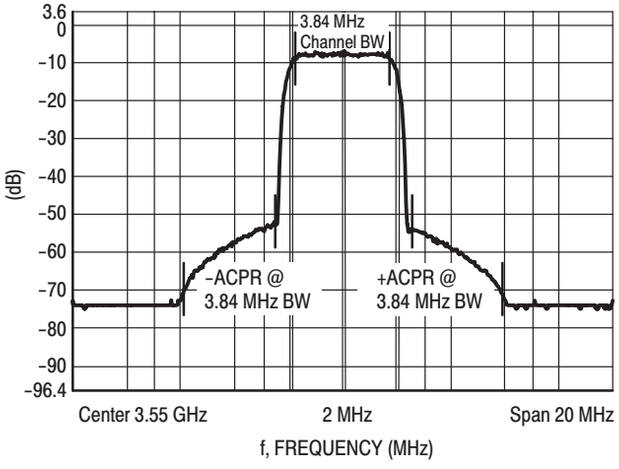
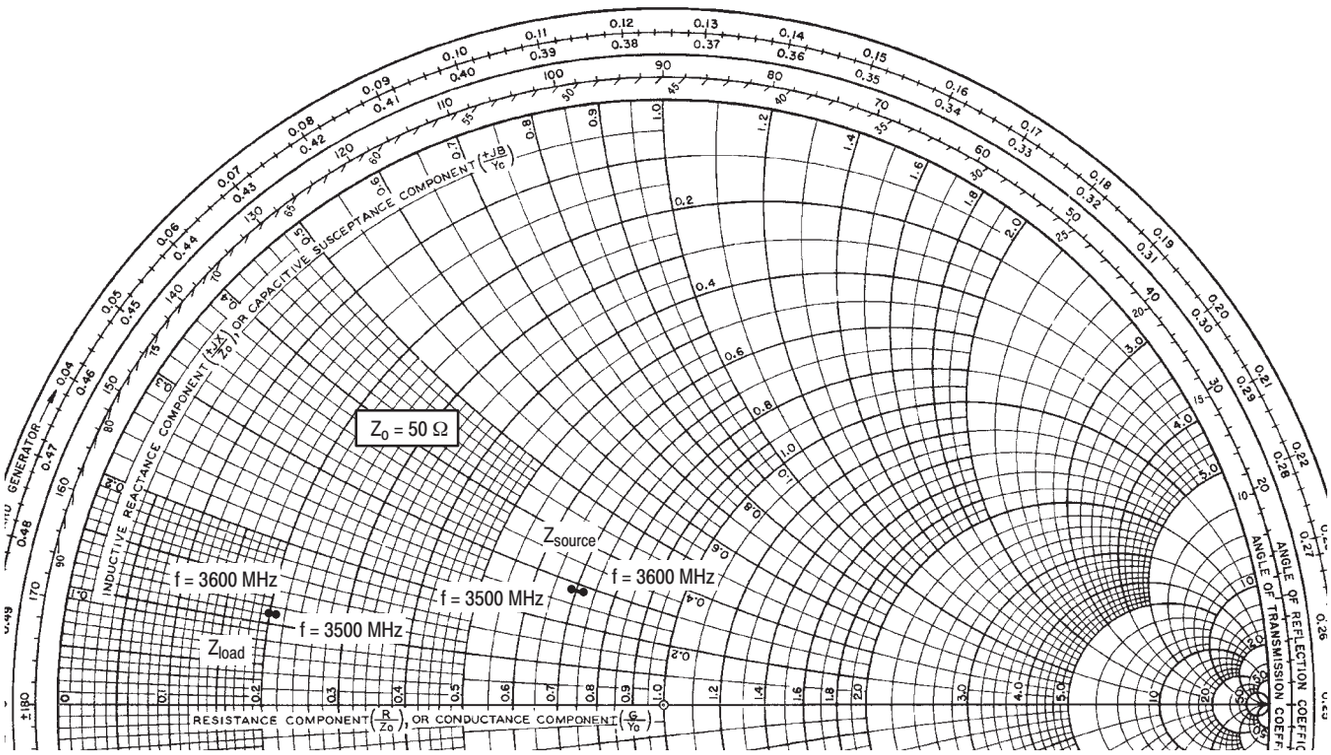


Figure 6. Single-Carrier W-CDMA Spectrum



V_{DD} = 12 Vdc, I_{DQ} = 650 mA, P_{out} = 3 W Avg.

f MHz	Z_{source} Ω	Z_{load} Ω
3500	34.459 + j13.83	10.322 + j5.42
3550	35.460 + j14.19	10.400 + j5.44
3600	36.000 + j14.12	10.100 + j5.72

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

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

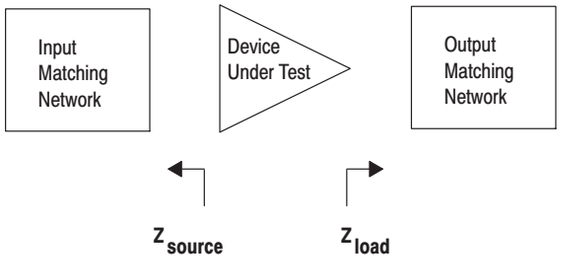


Figure 7. Series Equivalent Source and Load Impedance

Table 5. Class AB Common Source S−Parameters at V_{DD} = 12 Vdc, I_{DQ} = 650 mA

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	∠ ϕ	$\|S_{21}\|$	∠ ϕ	$\|S_{12}\|$	∠ ϕ	$\|S_{22}\|$	∠ ϕ
1.00	0.96	146.14	0.80	26.33	0.01	−26.74	0.88	164.54
1.05	0.96	143.94	0.80	22.43	0.01	−28.86	0.88	162.97
1.10	0.96	141.83	0.80	18.46	0.01	−31.83	0.88	161.29
1.15	0.96	139.54	0.80	14.44	0.01	−34.90	0.88	159.77
1.20	0.96	137.28	0.80	10.43	0.01	−37.88	0.88	158.47
1.25	0.96	134.74	0.80	6.28	0.01	−40.90	0.88	157.36
1.30	0.95	132.06	0.81	2.08	0.01	−44.27	0.88	156.46
1.35	0.95	129.35	0.82	−2.17	0.01	−47.36	0.87	155.56
1.40	0.95	126.57	0.84	−6.49	0.01	−51.09	0.86	154.65
1.45	0.95	123.71	0.86	−10.87	0.01	−55.57	0.85	153.72
1.50	0.95	120.59	0.89	−15.96	0.01	−59.77	0.84	151.32
1.55	0.94	117.35	0.92	−20.65	0.01	−64.36	0.83	150.22
1.60	0.94	113.90	0.95	−25.47	0.01	−68.43	0.82	149.03
1.65	0.94	110.38	0.99	−30.41	0.01	−72.98	0.80	147.80
1.70	0.93	106.54	1.03	−35.59	0.01	−78.34	0.79	146.32
1.75	0.93	102.65	1.08	−41.07	0.01	−83.48	0.78	144.63
1.80	0.93	98.32	1.14	−46.87	0.01	−88.75	0.77	142.65
1.85	0.92	93.83	1.19	−53.00	0.01	−94.75	0.76	140.48
1.90	0.92	89.08	1.26	−59.40	0.01	−100.91	0.75	138.36
1.95	0.91	84.07	1.32	−66.00	0.01	−106.97	0.73	136.24
2.00	0.91	78.68	1.39	−72.86	0.02	−113.46	0.72	134.10
2.05	0.90	73.15	1.46	−79.86	0.02	−120.27	0.70	132.02
2.10	0.90	67.33	1.54	−87.14	0.02	−127.45	0.68	130.09
2.15	0.89	61.07	1.62	−94.66	0.02	−135.04	0.65	127.98
2.20	0.89	54.56	1.71	−102.36	0.02	−142.85	0.63	125.90
2.25	0.89	47.64	1.80	−110.40	0.02	−150.91	0.60	123.85
2.30	0.89	40.29	1.89	−118.62	0.02	−159.34	0.56	121.74
2.35	0.89	32.60	1.99	−127.18	0.03	−168.04	0.53	119.56
2.40	0.89	24.42	2.09	−135.99	0.03	−177.20	0.49	117.39
2.45	0.88	16.02	2.20	−145.15	0.03	173.58	0.44	115.36
2.50	0.88	7.28	2.30	−154.53	0.03	163.81	0.40	113.49
2.55	0.88	−1.82	2.40	−164.19	0.03	153.87	0.35	111.97
2.60	0.88	−10.92	2.49	−174.07	0.03	143.74	0.30	111.53
2.65	0.88	−20.24	2.58	175.96	0.04	133.49	0.25	112.88
2.70	0.88	−29.71	2.66	165.78	0.04	122.87	0.21	117.12
2.75	0.87	−39.08	2.73	155.55	0.04	112.29	0.16	126.44
2.80	0.86	−48.39	2.79	145.30	0.04	101.82	0.14	143.32
2.85	0.85	−57.62	2.84	135.00	0.04	91.15	0.13	165.50
2.90	0.83	−66.46	2.89	124.74	0.04	80.47	0.16	−175.99
2.95	0.81	−75.13	2.93	114.46	0.05	69.79	0.20	−164.66
3.00	0.79	−83.52	2.98	104.21	0.05	59.07	0.24	−158.95
3.05	0.76	−91.51	3.02	93.91	0.05	48.50	0.29	−156.30
3.10	0.72	−99.34	3.06	83.64	0.05	37.72	0.35	−155.52
3.15	0.69	−106.90	3.11	73.20	0.05	26.81	0.40	−156.12
3.20	0.64	−114.08	3.17	62.60	0.05	15.81	0.45	−157.58
3.25	0.59	−120.87	3.24	51.75	0.06	4.40	0.50	−160.01
3.30	0.53	−127.33	3.31	40.49	0.06	−7.27	0.55	−163.32

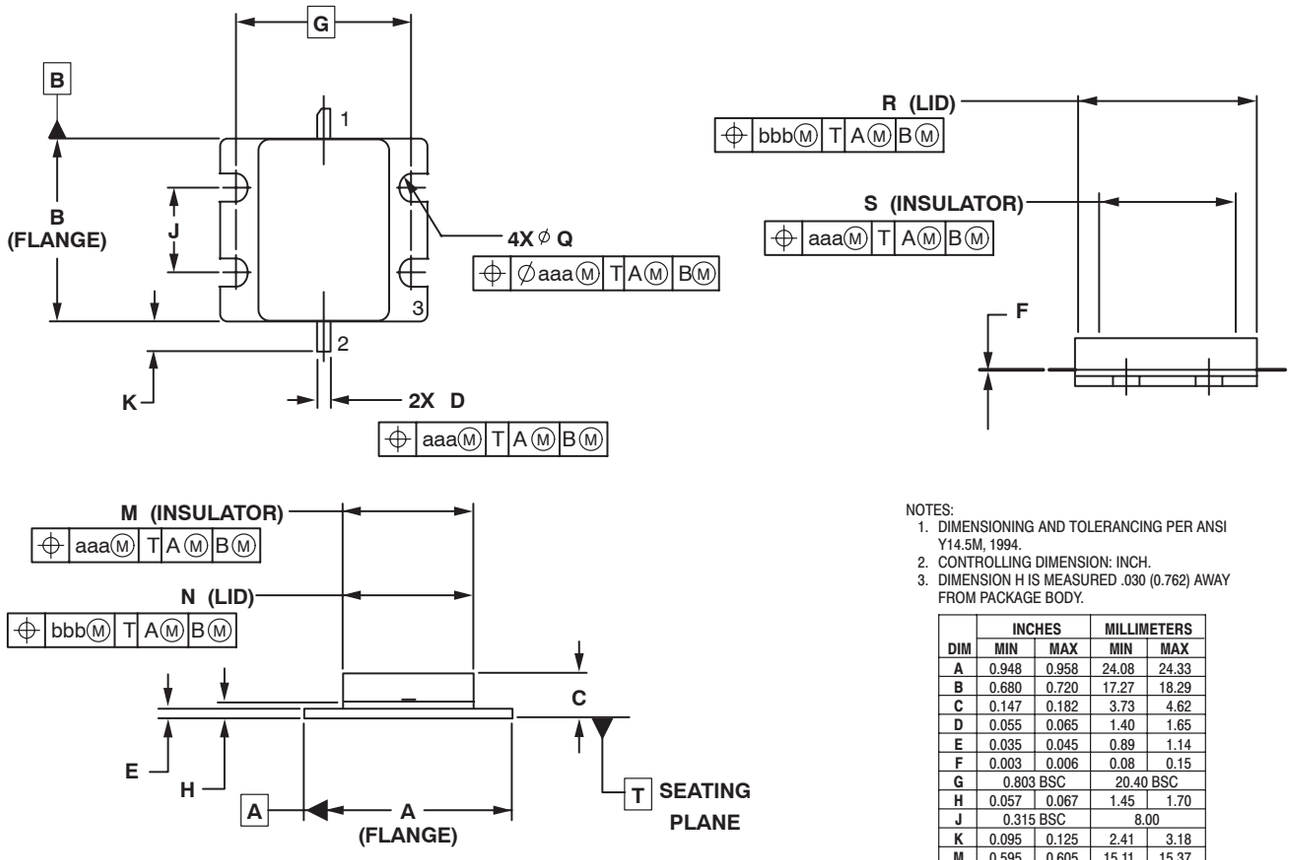
Table 5. Class AB Common Source S−Parameters at V_{DD} = 12 Vdc, I_{DQ} = 650 mA (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	∠ ϕ	$\|S_{21}\|$	∠ ϕ	$\|S_{12}\|$	∠ ϕ	$\|S_{22}\|$	∠ ϕ
3.35	0.46	−132.64	3.37	28.77	0.06	−19.38	0.59	−167.40
3.40	0.38	−136.44	3.44	16.54	0.06	−32.21	0.64	−172.25
3.45	0.29	−136.21	3.48	3.73	0.06	−45.19	0.68	−177.89
3.50	0.22	−127.35	3.51	−9.59	0.07	−58.78	0.71	175.79
3.55	0.18	−102.40	3.50	−23.47	0.07	−73.20	0.73	168.90
3.60	0.22	−76.34	3.45	−37.84	0.07	−88.01	0.73	161.51
3.65	0.32	−66.79	3.36	−52.56	0.07	−103.17	0.71	153.97
3.70	0.43	−66.93	3.22	−67.50	0.06	−118.63	0.66	146.50
3.75	0.54	−71.16	3.03	−82.42	0.06	−134.11	0.59	139.64
3.80	0.64	−77.27	2.80	−97.34	0.06	−149.56	0.50	133.98
3.85	0.73	−84.04	2.55	−111.69	0.05	−164.55	0.40	130.85
3.90	0.80	−90.75	2.29	−125.67	0.05	−179.15	0.29	133.09
3.95	0.85	−97.18	2.03	−138.92	0.04	166.69	0.20	146.65
4.00	0.90	−103.05	1.79	−151.47	0.04	153.98	0.17	177.35
4.05	0.93	−108.56	1.56	−163.31	0.03	141.83	0.22	−158.21
4.10	0.95	−113.68	1.35	−174.50	0.03	130.44	0.29	−149.29
4.15	0.96	−118.39	1.17	175.04	0.03	119.35	0.38	−147.85
4.20	0.97	−122.39	1.01	165.37	0.02	108.97	0.45	−149.63
4.25	0.98	−126.23	0.87	156.24	0.02	99.25	0.52	−152.98
4.30	0.98	−129.72	0.75	147.79	0.02	90.59	0.58	−157.04
4.35	0.98	−132.86	0.65	139.97	0.02	83.55	0.63	−161.14
4.40	0.99	−135.98	0.57	132.62	0.01	76.85	0.68	−165.09
4.45	0.99	−138.73	0.49	125.76	0.01	69.46	0.72	−168.90
4.50	0.99	−141.42	0.43	119.49	0.01	62.85	0.76	−172.28
4.55	0.99	−144.00	0.37	113.69	0.01	56.84	0.79	−175.36
4.60	0.99	−146.52	0.33	108.35	0.01	51.52	0.82	−178.09
4.65	0.99	−148.89	0.29	103.42	0.01	46.39	0.85	179.48
4.70	0.99	−151.15	0.26	98.73	0.01	42.21	0.87	177.24
4.75	1.00	−153.53	0.24	94.28	0.01	37.59	0.89	175.01
4.80	1.00	−155.94	0.21	89.98	0.01	34.26	0.90	172.99
4.85	1.00	−158.19	0.19	85.78	0.01	30.24	0.91	170.86
4.90	1.00	−160.43	0.18	81.45	0.01	27.16	0.92	168.57
4.95	0.99	−162.40	0.16	78.17	0.01	25.24	0.92	165.89
5.00	1.00	−164.61	0.15	74.76	0.01	22.43	0.93	163.33

NOTES

NOTES

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED .030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.948	0.958	24.08	24.33
B	0.680	0.720	17.27	18.29
C	0.147	0.182	3.73	4.62
D	0.055	0.065	1.40	1.65
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	0.803 BSC		20.40 BSC	
H	0.057	0.067	1.45	1.70
J	0.315 BSC		8.00	
K	0.095	0.125	2.41	3.18
M	0.595	0.605	15.11	15.37
N	0.594	0.606	15.09	15.39
Q	0.092	0.112	2.34	2.84
R	0.678	0.692	17.22	17.58
S	0.680	0.690	17.27	17.23
aaa	0.004		0.10	
bbb	0.015		0.38	

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

CASE 1490–02
ISSUE A

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