The RF GaAs Line

Gallium Arsenide PHEMT

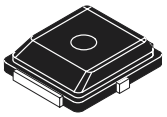
RF Power Field Effect Transistor

MRFG35003M6T1

Designed for 3.5 GHz WLL/MMDS/BWA or UMTS applications. Characterized from 0.5 to 5.0 GHz. Device is unmatched and is characterized for use in Class AB Customer Premise Equipment (CPE) applications.

- Typical W–CDMA Performance: –42 dBc ACPR, 3.55 GHz, 6 Volts, I_{DQ} = 180 mA
  - Output Power — 450 mWatts
  - Power Gain — 9 dB
  - Efficiency — 24%
- 3 Watts P1dB @ 3.55 GHz
- Excellent Phase Linearity and Group Delay Characteristics
- High Gain, High Efficiency and High Linearity
- In Tape and Reel. T1 Suffix = 1000 Units per 12 mm, 7 inch Reel.

3.5 GHz, 3 W, 6 V
POWER FET
GaAs PHEMT



CASE 466–02, STYLE 1
PLD–1.5
PLASTIC

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DSS}	8	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	22.7(2) 0.15(2)	Watts W/°C
Gate–Source Voltage	V_{GS}	– 5	Vdc
RF Input Power	P_{in}	24	dBm
Storage Temperature Range	T_{stg}	– 65 to +150	°C
Channel Temperature(1)	T_{ch}	175	°C
Operating Case Temperature Range	T_C	– 20 to +85	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	6.6(2)	°C/W

MOISTURE SENSITIVITY LEVEL

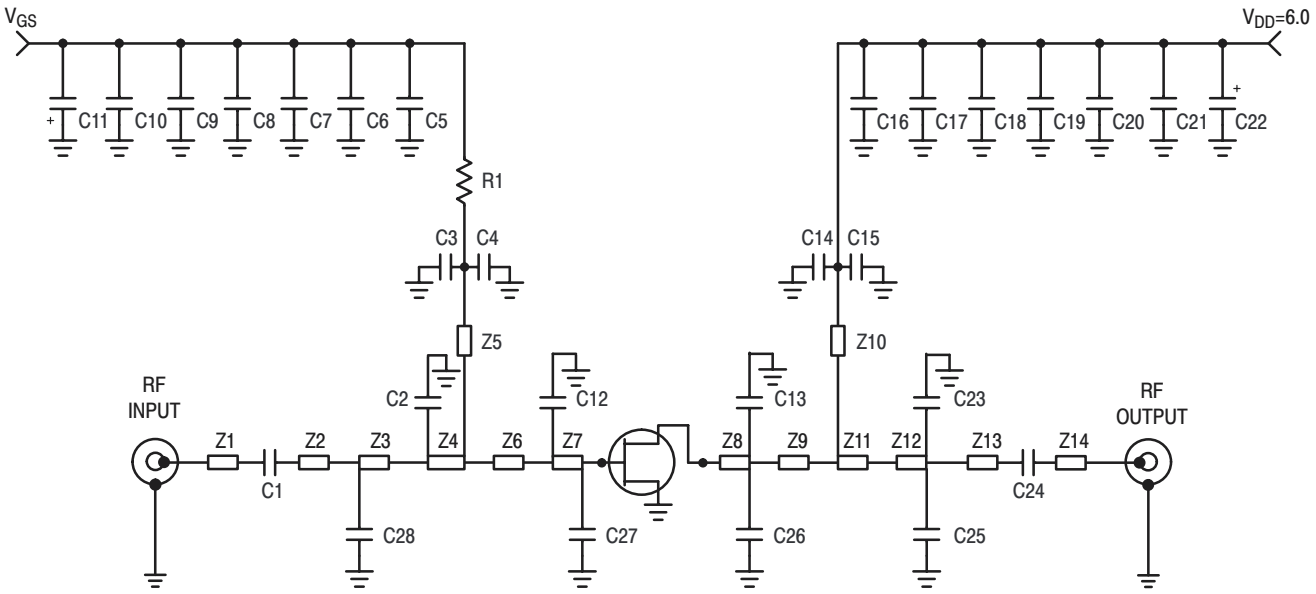
Test Methodology	Rating
Per JESD 22–A113	1

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

MOTOROLA intelligence everywhere™ digital dna™

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Saturated Drain Current (V_{DS} = 3.5 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	2.9	—	Adc
Off State Leakage Current (V_{GS} = –0.4 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	< 1.0	100	μAdc
Off State Drain Current (V_{DS} = 6 Vdc, V_{GS} = –1.9 Vdc)	I_{DSO}	—	0.02	1.0	mAdc
Off State Current (V_{DS} = 20 Vdc, V_{GS} = –2.5 Vdc)	I_{DSX}	—	1.0	15	mAdc
Gate–Source Cut–off Voltage (V_{DS} = 3.5 Vdc, I_{DS} = 15 mA)	$V_{GS(th)}$	–1.2	–1.0	–0.7	Vdc
Quiescent Gate Voltage (V_{DS} = 6 Vdc, I_{DQ} = 180 mA)	$V_{GS(Q)}$	–1.1	–0.9	–0.7	Vdc
Power Gain (V_{DD} = 6 Vdc, I_{DQ} = 180 mA, f = 3.55 GHz)	G_{ps}	8	9	—	dB
Output Power, 1 dB Compression Point (V_{DD} = 6 Vdc, I_{DQ} = 180 mA, f = 3.55 GHz)	P1dB	—	3	—	W
Drain Efficiency (V_{DD} = 6 Vdc, I_{DQ} = 180 mA, P_{out} = 450 mW, f = 3.55 GHz. Tune for Maximum P_{out})	η_D	22	24	—	%
Adjacent Channel Power Ratio (V_{DD} = 6 Vdc, P_{out} = 450 mW Avg., I_{DQ} = 180 mA, f = 3.55 GHz, W–CDMA, 8.5 P/A @ 0.01% Probability, 64 CH, 3.84 MCPS)	ACPR	—	–42	–38	dBc



Z1, Z14	0.044″ x 0.125″ Microstrip	Z8	0.439″ x 0.136″ Microstrip
Z2	0.440″ x 0.105″ Microstrip	Z9	0.062″ x 0.280″ Microstrip
Z3	0.340″ x 0.357″ Microstrip	Z11	0.349″ x 0.302″ Microstrip
Z4	0.380″ x 0.426″ Microstrip	Z12	0.055″ x 0.130″ Microstrip
Z5, Z10	0.527″ x 0.015″ Microstrip	Z13	0.044″ x 0.502″ Microstrip
Z6	0.027″ x 0.347″ Microstrip	PCB	Rogers 4350, 0.020″, ε_r = 3.50
Z7	0.538″ x 0.115″ Microstrip		

Figure 1. 3.5 GHz Test Circuit Schematic

Table 1. 3.5 GHz Test Circuit Component Designations and Values

Designation	Description
C1	12 pF Chip Capacitor, B Case, ATC
C2	0.1 pF Chip Capacitor (0805), AVX
C3, C4, C14, C15	3.9 pF Chip Capacitors (0805), AVX
C5, C16	10 pF Chip Capacitors, A Case, ATC
C6, C17	100 pF Chip Capacitors, A Case, ATC
C7, C18	100 pF Chip Capacitors, B Case, ATC
C8, C19	1000 pF Chip Capacitors, B Case, ATC
C9, C20	3.9 μF Chip Capacitors, B Case, ATC
C10, C21	0.1 μF Chip Capacitors, B Case, ATC
C11, C22	22 μF, 35 V Tantalum Surface Mount Capacitor, Newark
C12, C13, C26, C27	0.3 pF Chip Capacitors (0805), AVX
C23, C25, C28	1.0 pF Chip Capacitors (0805), AVX
C24	7.5 pF Chip Capacitor, B Case, ATC
R1	50 Ω Chip Resistor, Newark

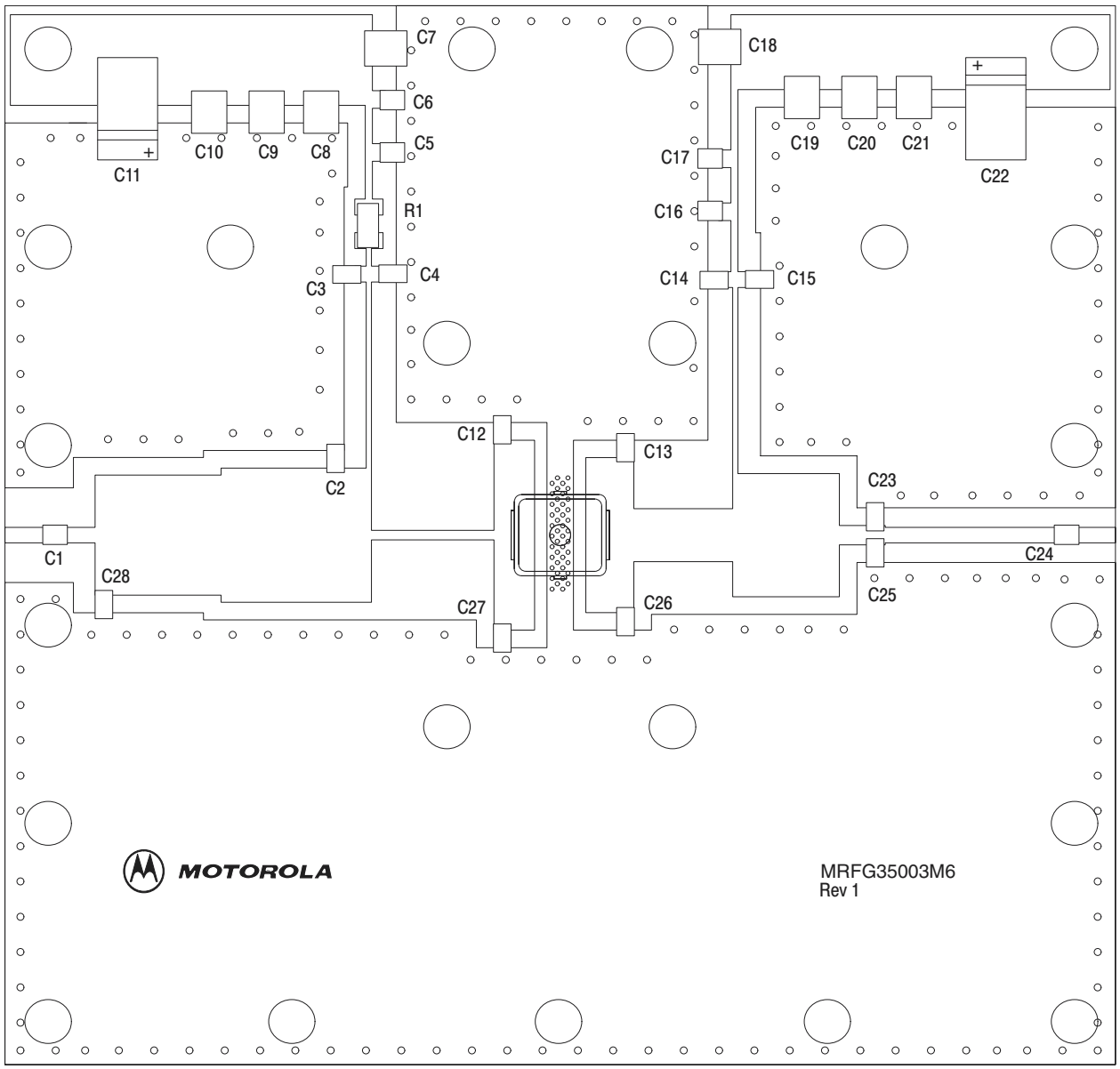


Figure 2. 3.5 GHz Test Circuit Component Layout

TYPICAL CHARACTERISTICS

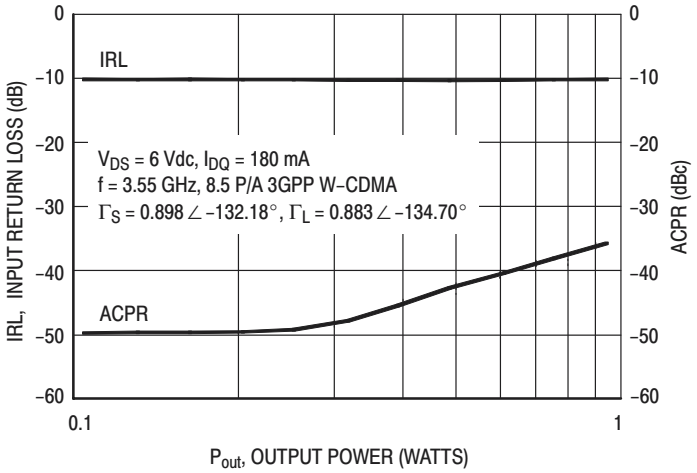


Figure 3. W–CDMA ACPR and Input Return Loss versus Output Power

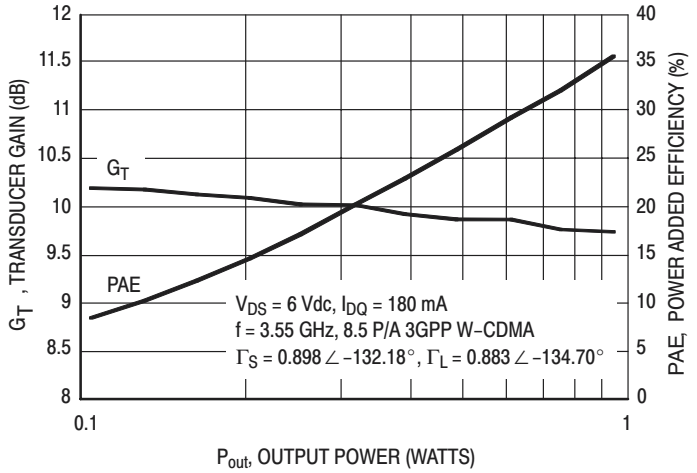


Figure 4. Transducer Gain and Power Added Efficiency versus Output Power

NOTE: All data is referenced to package lead interface. Γ_S and Γ_L are the impedances presented to the DUT. All data is generated from load pull, not from the test circuit shown.

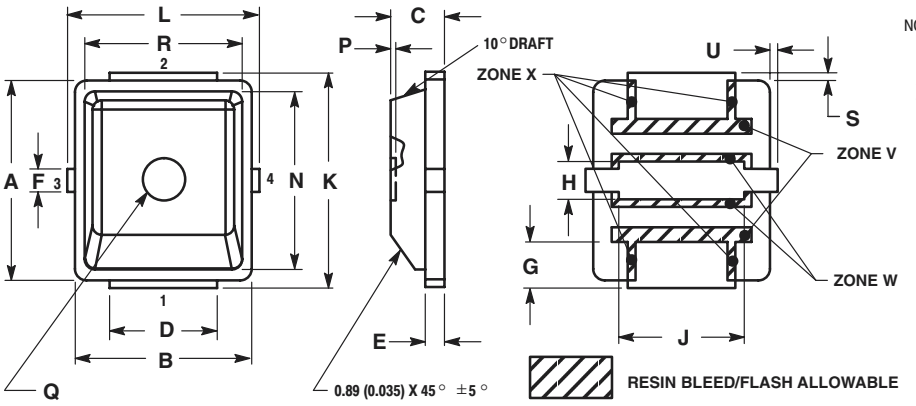
Table 2. Class AB Common Source S–Parameters at V_{DS} = 6 Vdc, I_{DQ} = 180 mA

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
0.5	0.954	–176.79	3.859	84.89	0.016	9.07	0.847	178.96
0.55	0.953	–177.98	3.527	83.61	0.016	8.90	0.846	178.38
0.6	0.952	–179.13	3.250	82.29	0.016	8.49	0.846	177.74
0.65	0.952	179.80	3.019	80.95	0.016	8.44	0.845	177.07
0.7	0.952	178.89	2.818	79.74	0.016	8.51	0.844	176.28
0.75	0.951	177.96	2.643	78.49	0.016	8.53	0.844	175.55
0.8	0.952	177.03	2.491	77.11	0.017	8.75	0.843	174.77
0.85	0.952	176.22	2.354	75.85	0.017	8.61	0.842	173.93
0.9	0.951	175.46	2.234	74.67	0.017	8.62	0.842	173.12
0.95	0.951	174.66	2.124	73.38	0.017	8.56	0.841	172.27
1	0.952	173.92	2.025	72.17	0.017	8.48	0.841	171.37
1.05	0.951	173.18	1.934	70.97	0.017	8.47	0.841	170.50
1.1	0.951	172.40	1.851	69.68	0.017	8.93	0.841	169.75
1.15	0.951	171.63	1.774	68.46	0.017	8.90	0.840	168.89
1.2	0.951	170.90	1.704	67.25	0.018	8.79	0.841	168.10
1.25	0.950	170.06	1.638	65.98	0.018	8.80	0.841	167.34
1.3	0.951	169.23	1.576	64.74	0.018	8.44	0.840	166.61
1.35	0.946	168.58	1.518	63.62	0.018	8.76	0.838	166.13
1.4	0.952	167.47	1.463	62.45	0.018	9.00	0.845	165.24
1.45	0.949	166.77	1.411	61.29	0.018	8.57	0.841	164.98
1.5	0.949	163.72	1.360	60.14	0.018	8.15	0.842	166.78
1.55	0.948	162.94	1.317	59.12	0.018	8.28	0.843	166.27
1.6	0.947	162.21	1.276	58.03	0.018	8.51	0.843	165.71
1.65	0.950	161.60	1.237	56.92	0.018	8.31	0.843	165.16
1.7	0.951	160.97	1.201	55.93	0.018	8.40	0.844	164.60
1.75	0.950	160.44	1.167	54.89	0.018	8.35	0.844	164.10
1.8	0.950	159.95	1.135	53.83	0.019	8.44	0.844	163.47
1.85	0.952	159.46	1.105	52.85	0.019	8.61	0.843	162.87
1.9	0.951	159.01	1.076	51.92	0.019	8.34	0.844	162.37
1.95	0.950	158.58	1.049	50.84	0.019	7.93	0.843	161.77
2	0.952	158.25	1.024	49.95	0.019	8.02	0.843	161.24
2.05	0.951	157.84	1.000	49.06	0.019	7.86	0.844	160.75
2.1	0.951	157.48	0.979	48.17	0.019	7.67	0.845	160.26
2.15	0.952	157.17	0.959	47.22	0.019	7.24	0.843	159.69
2.2	0.952	156.89	0.939	46.34	0.020	6.89	0.843	159.08
2.25	0.952	156.63	0.921	45.44	0.020	6.73	0.844	158.58
2.3	0.952	156.35	0.904	44.48	0.020	6.86	0.843	158.07
2.35	0.953	155.98	0.888	43.57	0.020	6.83	0.842	157.42
2.4	0.951	155.66	0.873	42.68	0.020	6.80	0.842	156.97
2.45	0.952	155.28	0.860	41.72	0.020	6.74	0.842	156.47
2.5	0.952	154.86	0.848	40.82	0.020	6.73	0.840	155.83
2.55	0.950	154.44	0.836	39.90	0.021	6.72	0.841	155.29
2.6	0.949	153.93	0.826	38.89	0.021	6.86	0.840	154.74
2.65	0.950	153.36	0.815	37.85	0.021	6.74	0.838	154.18
2.7	0.949	152.82	0.806	36.81	0.022	6.24	0.838	153.62
2.75	0.946	152.08	0.797	35.75	0.022	5.69	0.839	153.16

Table 2. Class AB Common Source S–Parameters at V_{DS} = 6 Vdc, I_{DQ} = 180 mA (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
2.8	0.946	151.55	0.787	34.63	0.022	4.64	0.836	152.55
2.85	0.946	150.81	0.778	33.54	0.023	3.61	0.836	152.02
2.9	0.945	150.11	0.770	32.46	0.023	2.16	0.837	151.54
2.95	0.945	149.30	0.762	31.37	0.023	1.54	0.835	150.98
3	0.945	148.44	0.754	30.25	0.023	1.03	0.835	150.40
3.05	0.944	147.58	0.747	29.09	0.023	0.48	0.837	149.89
3.1	0.943	146.55	0.739	27.89	0.023	0.15	0.835	149.35
3.15	0.943	145.54	0.732	26.69	0.023	–0.33	0.834	148.72
3.2	0.944	144.52	0.725	25.53	0.023	–0.41	0.836	148.13
3.25	0.941	143.47	0.718	24.33	0.023	–0.52	0.835	147.62
3.3	0.941	142.43	0.711	23.09	0.023	–1.22	0.834	147.01
3.35	0.941	141.33	0.704	21.89	0.023	–1.40	0.834	146.44
3.4	0.940	140.22	0.697	20.67	0.024	–1.31	0.834	145.89
3.45	0.939	139.25	0.689	19.44	0.024	–1.58	0.832	145.40
3.5	0.940	138.09	0.682	18.26	0.024	–1.85	0.833	144.66
3.55	0.940	137.05	0.675	17.08	0.024	–2.29	0.834	144.11
3.6	0.939	136.07	0.668	15.88	0.025	–2.75	0.832	143.59
3.65	0.941	135.06	0.661	14.68	0.025	–3.55	0.831	142.91
3.7	0.939	134.20	0.653	13.50	0.025	–4.69	0.832	142.34
3.75	0.939	133.35	0.646	12.39	0.025	–5.45	0.831	141.92
3.8	0.939	132.47	0.639	11.29	0.025	–6.34	0.830	141.27
3.85	0.940	131.67	0.632	10.20	0.025	–6.85	0.831	140.64
3.9	0.939	130.89	0.625	9.15	0.025	–6.90	0.831	140.02
3.95	0.940	130.26	0.619	8.10	0.025	–6.60	0.830	139.40
4	0.941	129.57	0.613	7.10	0.025	–6.63	0.830	138.76
4.05	0.941	128.98	0.608	6.11	0.026	–6.67	0.831	138.17
4.1	0.942	128.44	0.602	5.10	0.026	–7.00	0.830	137.56
4.15	0.942	128.03	0.598	4.14	0.026	–7.30	0.828	136.87
4.2	0.941	127.57	0.593	3.17	0.027	–7.73	0.828	136.20
4.25	0.940	127.14	0.589	2.15	0.027	–8.12	0.827	135.56
4.3	0.941	126.75	0.585	1.21	0.027	–8.11	0.826	134.85
4.35	0.941	126.39	0.581	0.25	0.027	–8.33	0.826	134.13
4.4	0.939	125.97	0.578	–0.74	0.028	–8.73	0.825	133.44
4.45	0.939	125.64	0.575	–1.67	0.028	–8.92	0.823	132.68
4.5	0.939	125.36	0.573	–2.59	0.029	–9.42	0.823	131.92
4.55	0.938	124.98	0.571	–3.50	0.029	–9.66	0.823	131.23
4.6	0.938	124.55	0.570	–4.53	0.030	–10.28	0.822	130.45
4.65	0.938	124.20	0.571	–5.52	0.030	–10.87	0.821	129.60
4.7	0.937	123.76	0.570	–6.60	0.031	–11.91	0.821	128.79
4.75	0.935	123.17	0.569	–7.76	0.031	–13.22	0.819	127.98
4.8	0.935	122.58	0.569	–8.89	0.031	–14.16	0.817	127.09
4.85	0.934	121.93	0.570	–9.98	0.031	–14.45	0.817	126.23
4.9	0.932	121.14	0.570	–11.17	0.032	–14.82	0.816	125.41
4.95	0.932	120.43	0.571	–12.37	0.032	–14.82	0.815	124.46
5	0.929	119.55	0.573	–13.61	0.032	–14.83	0.815	123.55

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. RESIN BLEED/FLASH ALLOWABLE IN ZONE V, W, AND X.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.255	0.265	6.48	6.73
B	0.225	0.235	5.72	5.97
C	0.065	0.072	1.65	1.83
D	0.130	0.150	3.30	3.81
E	0.021	0.026	0.53	0.66
F	0.026	0.044	0.66	1.12
G	0.050	0.070	1.27	1.78
H	0.045	0.063	1.14	1.60
J	0.160	0.180	4.06	4.57
K	0.273	0.285	6.93	7.24
L	0.245	0.255	6.22	6.48
N	0.230	0.240	5.84	6.10
P	0.000	0.008	0.00	0.20
Q	0.055	0.063	1.40	1.60
R	0.200	0.210	5.08	5.33
S	0.006	0.012	0.15	0.31
U	0.006	0.012	0.15	0.31
ZONE V	0.000	0.021	0.00	0.53
ZONE W	0.000	0.010	0.00	0.25
ZONE X	0.000	0.010	0.00	0.25

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

CASE 466–02
ISSUE B
PLD–1.5
PLASTIC

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