The RF Sub–Micron MOSFET Line

RF Power Field Effect Transistor

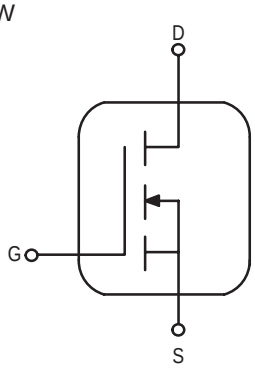
N–Channel Enhancement–Mode Lateral MOSFET

MRF6522-5R1

960 MHz, 5.0 W, 26 V
LATERAL N–CHANNEL
RF POWER MOSFET

Designed for Class A and Class AB common source, linear power amplifiers in the 960 MHz range. The MRF6522–5R1 has been specifically designed for use in Communications Network (GSM) base stations. The package offers the advantage of SMD.

- Specified 26 Volts, 960 MHz, Class AB Characteristics
  Output Power = 5.0 Watts CW
  Power Gain = 17 dB Min @ 960 MHz, 5.0 Watts CW
  Efficiency = 50% Min @ 960 MHz, 5.0 Watts CW
- Excellent Thermal Stability
- Characterized with Series Equivalent Large–Signal Impedance Parameters
- S–Parameter Characterization at High Bias Levels
- Bottom Side Source Eliminates DC Isolators, Reducing Common Mode Inductances
- Available in Tape and Reel. R1 Suffix = 500 Units per 12 mm, 7 inch Reel.



CASE 458C–02, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DSS}	65	Vdc
Gate–Source Voltage	V_{GS}	±20	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	11.7 0.067	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C
Operating Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1)	$R_{\theta JC}$	6.86	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 0.2 mA)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 26 Vdc, V_{GS} = 0)	I_{DSS}	—	—	1.0	μAdc
Gate–Source Leakage Current (V_{GS} = 20 Vdc, V_{DS} = 0)	I_{GSS}	—	—	1.0	μAdc

(1) Thermal resistance is determined under specified RF operating condition.

NOTE – **CAUTION** – MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

MOTOROLA

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = 10 V, I_D = 20 μA)	$V_{GS(th)}$	1.25	3.0	4.0	Vdc
Gate Quiescent Voltage (V_{DS} = 26 Vdc, I_D = 50 mA)	$V_{GS(Q)}$	2.25	4.0	5.0	Vdc
Drain–Source On–Voltage (V_{GS} = 10 V, I_D = 0.25 A)	$V_{DS(on)}$	—	—	0.7	Vdc
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 26 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}	—	6.0	—	pF
Output Capacitance (V_{DS} = 26 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{oss}	—	3.7	—	pF
Reverse Transfer Capacitance (V_{DS} = 26 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{rss}	—	0.3	—	pF
FUNCTIONAL TESTS (In Motorola Test Fixture)					
Common–Source Power Gain (V_{DS} = 26 V, P_{out} = 5.0 W CW, I_{DQ} = 50 mA, f = 960 MHz)	G_{ps}	17	19	—	dB
Drain Efficiency (V_{DS} = 26 V, P_{out} = 5.0 W CW, I_{DQ} = 50 mA, f = 960 MHz)	η	50	55	—	%
Input Return Loss (V_{DS} = 26 V, P_{out} = 5.0 W CW, I_{DQ} = 50 mA, f = 960 MHz)	IRL	—	—	–9	dB

TYPICAL CHARACTERISTICS

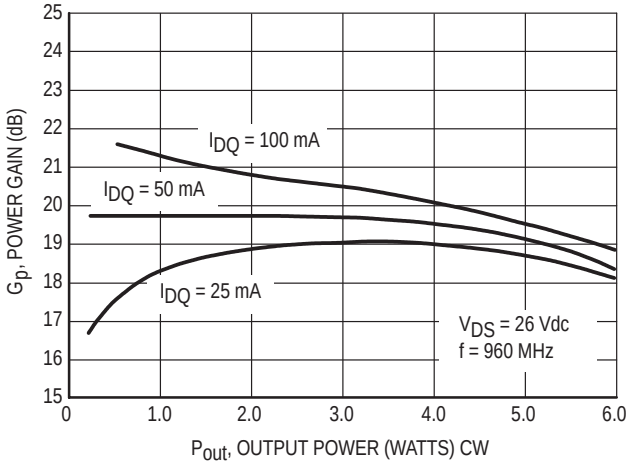


Figure 1. Power Gain versus Output Power

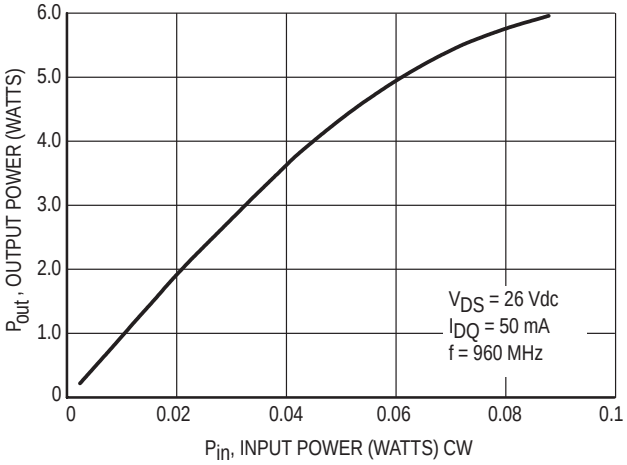


Figure 2. Output Power versus Input Power

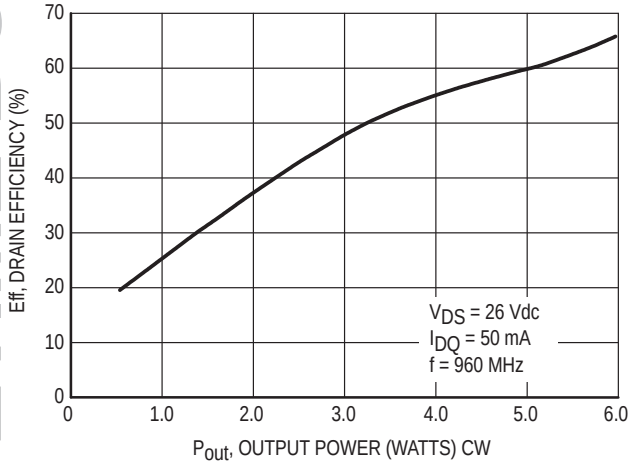


Figure 3. Drain Efficiency versus Output Power

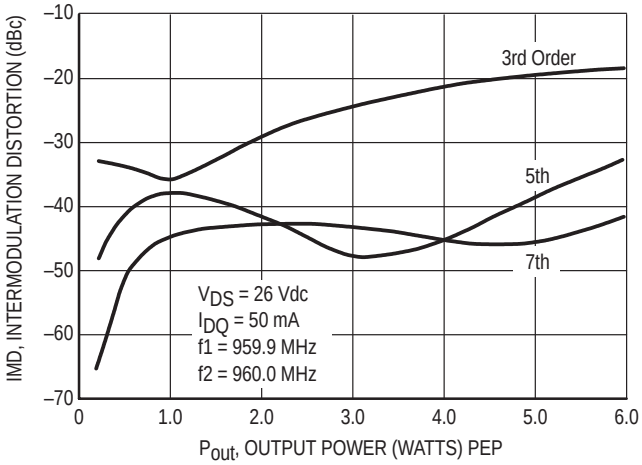
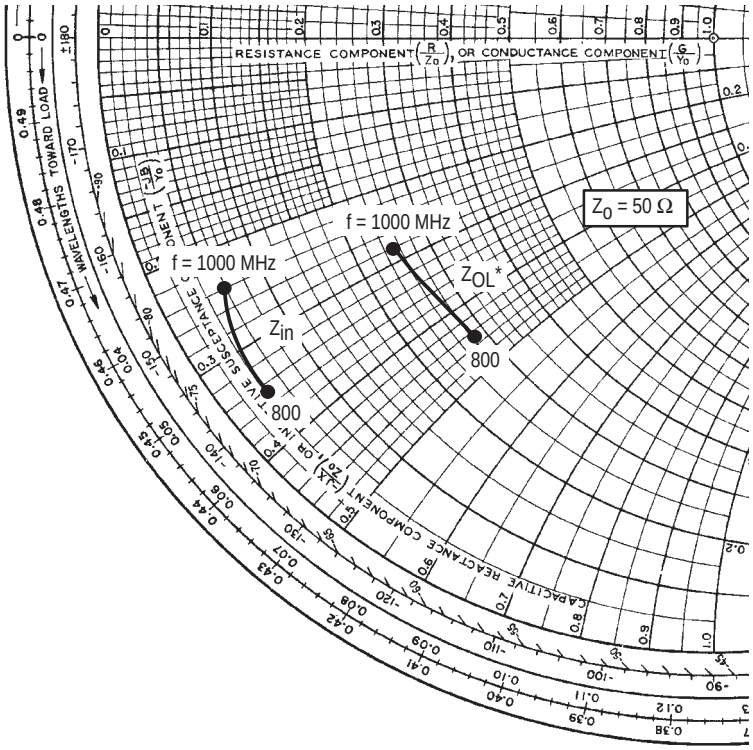


Figure 4. Intermodulation Distortion Products versus Output Power



f MHz	Z_{in} Ohms	Z_{OL}* Ohms
800	2.40 – j17.4	14.7 – j22.8
825	2.46 – j16.4	14.1 – j20.8
850	2.50 – j15.8	14.0 – j19.5
875	2.56 – j15.2	13.9 – j17.9
900	2.60 – j14.7	13.8 – j17.3
925	2.71 – j13.7	13.7 – j16.9
950	2.78 – j13.2	13.2 – j15.6
975	2.88 – j12.6	12.9 – j14.4
1000	3.06 – j11.9	12.9 – j14.2

Z_{in} = Complex conjugate of source impedance.

Z_{OL}* = Complex conjugate of the optimum load impedance into which the device operates at a given output power, voltage, current and frequency.

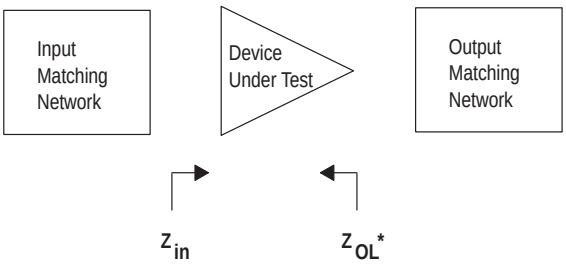


Figure 5. Series Equivalent Input and Output Impedance

Table 1. Common Source S–Parameters at V_{DS} = 12 Vdc, I_D = 50 mAdc

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
0.500	0.786	–114	5.16	87	0.074	2	0.711	–100
0.525	0.782	–117	4.94	84	0.073	–1	0.709	–102
0.550	0.779	–120	4.74	82	0.074	–2	0.707	–105
0.575	0.777	–122	4.55	79	0.073	–5	0.706	–107
0.600	0.776	–124	4.37	77	0.073	–7	0.707	–109
0.625	0.775	–127	4.20	75	0.073	–9	0.707	–111
0.650	0.774	–129	4.03	73	0.072	–12	0.707	–113
0.675	0.774	–131	3.89	70	0.072	–13	0.710	–115
0.700	0.773	–133	3.74	68	0.071	–14	0.711	–117
0.725	0.774	–134	3.61	66	0.071	–16	0.712	–119
0.750	0.775	–136	3.48	64	0.070	–18	0.715	–120
0.775	0.775	–138	3.36	63	0.069	–20	0.717	–122
0.800	0.776	–139	3.25	61	0.069	–21	0.720	–124
0.825	0.777	–141	3.14	59	0.068	–23	0.723	–125
0.850	0.778	–143	3.03	57	0.067	–25	0.728	–128
0.875	0.779	–144	2.93	55	0.067	–26	0.730	–129
0.900	0.780	–146	2.84	53	0.066	–28	0.733	–130
0.925	0.781	–147	2.75	51	0.064	–29	0.737	–132
0.950	0.783	–149	2.66	50	0.065	–30	0.740	–133
0.975	0.785	–150	2.58	48	0.063	–32	0.742	–134
1.000	0.786	–151	2.51	47	0.063	–33	0.745	–136

Table 2. Common Source S–Parameters at V_{DS} = 12 Vdc, I_D = 100 mAdc

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
0.500	0.757	–122	6.36	86	0.066	2	0.652	–107
0.525	0.754	–124	6.09	84	0.065	–1	0.650	–109
0.550	0.752	–127	5.84	81	0.065	–3	0.649	–111
0.575	0.750	–129	5.60	79	0.065	–5	0.648	–113
0.600	0.749	–131	5.37	77	0.065	–7	0.649	–115
0.625	0.748	–133	5.16	75	0.065	–8	0.650	–117
0.650	0.747	–135	4.96	73	0.065	–10	0.651	–119
0.675	0.747	–137	4.78	71	0.064	–12	0.654	–121
0.700	0.746	–139	4.60	69	0.064	–14	0.655	–123
0.725	0.747	–140	4.43	67	0.062	–15	0.658	–124
0.750	0.747	–142	4.28	65	0.062	–17	0.660	–126
0.775	0.748	–144	4.13	63	0.062	–18	0.663	–127
0.800	0.748	–145	3.99	61	0.062	–20	0.667	–129
0.825	0.749	–147	3.86	60	0.061	–21	0.670	–130
0.850	0.751	–148	3.73	58	0.060	–22	0.674	–132
0.875	0.751	–150	3.61	56	0.060	–25	0.679	–134
0.900	0.752	–151	3.50	54	0.059	–25	0.681	–135
0.925	0.755	–152	3.39	53	0.058	–27	0.686	–136
0.950	0.756	–154	3.29	51	0.058	–28	0.689	–137
0.975	0.757	–155	3.19	50	0.056	–29	0.692	–139
1.000	0.760	–156	3.10	48	0.056	–30	0.695	–140

Table 3. Common Source S–Parameters at V_{DS} = 12 Vdc, I_D = 200 mAdc

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
0.500	0.743	–128	7.18	85	0.059	1	0.607	–113
0.525	0.740	–130	6.87	83	0.059	–1	0.607	–115
0.550	0.739	–132	6.58	81	0.060	–3	0.608	–117
0.575	0.736	–134	6.30	79	0.059	–4	0.608	–119
0.600	0.735	–137	6.05	76	0.059	–7	0.610	–121
0.625	0.735	–138	5.81	74	0.059	–8	0.610	–123
0.650	0.734	–140	5.58	72	0.059	–10	0.612	–124
0.675	0.734	–142	5.38	71	0.058	–11	0.615	–126
0.700	0.733	–144	5.18	69	0.057	–12	0.616	–128
0.725	0.733	–145	4.99	67	0.057	–14	0.620	–129
0.750	0.734	–147	4.82	65	0.057	–16	0.622	–130
0.775	0.735	–148	4.66	64	0.056	–17	0.626	–132
0.800	0.735	–150	4.50	62	0.056	–18	0.630	–133
0.825	0.736	–151	4.35	60	0.055	–19	0.633	–135
0.850	0.737	–153	4.21	58	0.054	–21	0.638	–136
0.875	0.739	–154	4.07	57	0.054	–22	0.642	–138
0.900	0.739	–155	3.95	55	0.053	–24	0.645	–139
0.925	0.741	–156	3.83	53	0.053	–25	0.649	–140
0.950	0.742	–158	3.71	52	0.053	–26	0.653	–141
0.975	0.744	–159	3.61	51	0.052	–27	0.656	–142
1.000	0.746	–160	3.51	49	0.051	–28	0.661	–143

Table 4. Common Source S–Parameters at V_{DS} = 26 Vdc, I_D = 50 mAdc

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
0.500	0.847	–109	6.45	93	0.047	10	0.729	–80
0.525	0.844	–112	6.20	90	0.047	7	0.726	–83
0.550	0.841	–114	5.98	88	0.046	5	0.724	–85
0.575	0.838	–117	5.75	85	0.047	2	0.722	–88
0.600	0.836	–119	5.54	83	0.047	1	0.721	–90
0.625	0.834	–122	5.36	80	0.047	–2	0.720	–92
0.650	0.831	–124	5.16	78	0.047	–4	0.721	–94
0.675	0.831	–126	4.98	76	0.046	–6	0.722	–96
0.700	0.829	–128	4.81	73	0.045	–8	0.721	–98
0.725	0.827	–130	4.64	71	0.045	–10	0.724	–100
0.750	0.828	–132	4.49	69	0.045	–11	0.725	–102
0.775	0.827	–134	4.35	67	0.045	–12	0.727	–104
0.800	0.826	–136	4.21	65	0.044	–15	0.730	–106
0.825	0.826	–138	4.08	63	0.043	–16	0.731	–107
0.850	0.826	–140	3.94	61	0.043	–18	0.734	–110
0.875	0.826	–141	3.82	59	0.042	–19	0.738	–111
0.900	0.826	–143	3.71	57	0.042	–19	0.740	–113
0.925	0.827	–145	3.59	55	0.041	–22	0.743	–115
0.950	0.827	–146	3.49	54	0.041	–24	0.745	–116
0.975	0.828	–148	3.39	52	0.040	–25	0.747	–117
1.000	0.828	–149	3.30	50	0.039	–26	0.751	–119

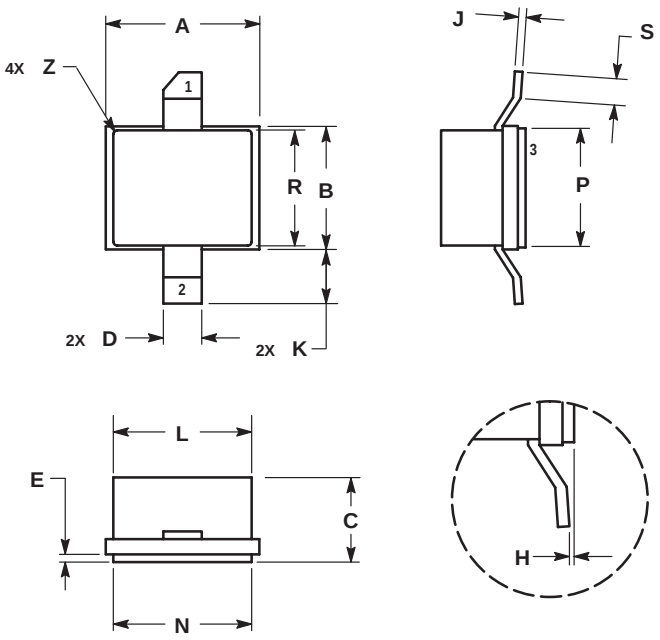
Table 5. Common Source S–Parameters at V_{DS} = 26 Vdc, I_D = 150 mAdc

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
0.500	0.826	–117	8.37	91	0.039	8	0.626	–85
0.525	0.822	–120	8.04	89	0.039	7	0.625	–88
0.550	0.818	–122	7.74	86	0.039	6	0.623	–90
0.575	0.815	–125	7.43	84	0.039	3	0.622	–92
0.600	0.813	–127	7.16	81	0.038	1	0.624	–94
0.625	0.811	–130	6.90	79	0.038	–1	0.624	–96
0.650	0.808	–132	6.65	77	0.038	–3	0.626	–98
0.675	0.808	–134	6.41	75	0.038	–5	0.627	–100
0.700	0.807	–136	6.19	73	0.038	–5	0.629	–102
0.725	0.806	–138	5.97	71	0.037	–8	0.631	–104
0.750	0.805	–139	5.78	69	0.037	–10	0.635	–106
0.775	0.805	–141	5.59	67	0.037	–11	0.637	–107
0.800	0.804	–143	5.41	65	0.036	–11	0.640	–109
0.825	0.805	–145	5.24	63	0.036	–13	0.643	–111
0.850	0.804	–146	5.07	61	0.034	–14	0.648	–113
0.875	0.805	–148	4.92	59	0.035	–16	0.652	–114
0.900	0.803	–149	4.77	58	0.034	–17	0.655	–116
0.925	0.805	–151	4.63	56	0.034	–18	0.659	–117
0.950	0.806	–152	4.50	54	0.033	–19	0.663	–119
0.975	0.806	–154	4.37	53	0.032	–21	0.666	–120
1.000	0.807	–155	4.25	51	0.031	–22	0.671	–121

Table 6. Common Source S–Parameters at V_{DS} = 26 Vdc, I_D = 300 mAdc

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	ϕ	$\|S_{21}\|$	ϕ	$\|S_{12}\|$	ϕ	$\|S_{22}\|$	ϕ
0.500	0.827	–119	8.39	90	0.036	8	0.612	–84
0.525	0.824	–122	8.06	88	0.036	7	0.612	–86
0.550	0.821	–124	7.74	85	0.036	4	0.611	–89
0.575	0.818	–127	7.44	83	0.036	3	0.611	–91
0.600	0.816	–129	7.17	80	0.035	1	0.612	–93
0.625	0.814	–132	6.90	78	0.035	–1	0.613	–95
0.650	0.812	–134	6.65	76	0.036	–3	0.615	–97
0.675	0.811	–136	6.41	74	0.035	–5	0.617	–99
0.700	0.809	–138	6.19	72	0.035	–6	0.619	–101
0.725	0.809	–139	5.97	70	0.034	–8	0.622	–102
0.750	0.809	–141	5.77	68	0.034	–8	0.625	–104
0.775	0.808	–143	5.58	66	0.034	–10	0.628	–106
0.800	0.808	–145	5.40	64	0.033	–11	0.632	–108
0.825	0.808	–146	5.23	62	0.033	–13	0.635	–109
0.850	0.808	–148	5.06	60	0.032	–15	0.640	–111
0.875	0.808	–150	4.90	58	0.032	–16	0.644	–113
0.900	0.808	–151	4.76	56	0.032	–17	0.647	–114
0.925	0.808	–152	4.62	55	0.031	–18	0.652	–116
0.950	0.809	–154	4.48	53	0.030	–19	0.657	–117
0.975	0.809	–155	4.36	51	0.029	–20	0.659	–119
1.000	0.810	–157	4.23	50	0.029	–22	0.664	–120

PACKAGE DIMENSIONS



NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION H (PACKAGE COPLANARITY): THE BOTTOM OF LEADS AND REFERENCE PLANE T MUST BE COPLANAR WITHIN DIMENSION H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.197	0.203	5.004	5.156
B	0.157	0.163	3.988	4.140
C	0.085	0.110	2.159	2.794
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
H	0.000	0.004	0.000	0.102
J	0.004	0.010	0.102	0.254
K	0.050	0.090	1.270	2.286
L	0.177	0.183	4.496	4.648
N	0.180	0.200	4.572	5.080
P	0.140	0.160	3.556	4.064
R	0.147	0.153	3.734	3.886
Z	—	0.020	—	0.508

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

CASE 458C–02
ISSUE C

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