

MRFG35005NT1 replaced by MRFG35005ANT1.

# Gallium Arsenide PHEMT

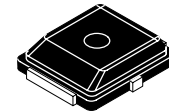
## RF Power Field Effect Transistor

Designed for WLL/MMDS/BWA or UMTS driver applications with frequencies from 1.8 to 3.6 GHz. Device is unmatched and is suitable for use in Class AB linear base station applications.

- Typical W-CDMA Performance: -42 dBc ACPR, 3.55 GHz, 12 Volts,  $I_{DQ} = 80$  mA, 5 MHz Offset/3.84 MHz BW, 64 DPCH (8.5 dB P/A @ 0.01% Probability)  
Output Power — 450 mWatt  
Power Gain — 11 dB  
Efficiency — 25%
- 4.5 Watts P1dB @ 3.55 GHz
- Excellent Phase Linearity and Group Delay Characteristics
- High Gain, High Efficiency and High Linearity
- N Suffix Indicates Lead-Free Terminations. RoHS Compliant.
- In Tape and Reel. T1 Suffix = 1000 Units per 12 mm, 7 inch Reel.

**MRFG35005NT1**

**3.5 GHz, 4.5 W, 12 V  
POWER FET  
GaAs PHEMT**



**CASE 466-03, STYLE 1  
PLD-1.5  
PLASTIC**

**Table 1. Maximum Ratings**

| Rating                                                                                 | Symbol    | Value                                      | Unit                     |
|----------------------------------------------------------------------------------------|-----------|--------------------------------------------|--------------------------|
| Drain-Source Voltage                                                                   | $V_{DSS}$ | 15                                         | Vdc                      |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$     | 10.5 <sup>(2)</sup><br>0.07 <sup>(2)</sup> | W<br>W/ $^\circ\text{C}$ |
| Gate-Source Voltage                                                                    | $V_{GS}$  | -5                                         | Vdc                      |
| RF Input Power                                                                         | $P_{in}$  | 30                                         | dBm                      |
| Storage Temperature Range                                                              | $T_{stg}$ | -65 to +150                                | $^\circ\text{C}$         |
| Channel Temperature <sup>(1)</sup>                                                     | $T_{ch}$  | 175                                        | $^\circ\text{C}$         |
| Operating Case Temperature Range                                                       | $T_C$     | -20 to +85                                 | $^\circ\text{C}$         |

**Table 2. Thermal Characteristics**

| Characteristic                                   | Symbol          | Value               | Unit               |
|--------------------------------------------------|-----------------|---------------------|--------------------|
| Thermal Resistance, Junction to Case<br>Class AB | $R_{\theta JC}$ | 14.2 <sup>(2)</sup> | $^\circ\text{C/W}$ |

**Table 3. Moisture Sensitivity Level**

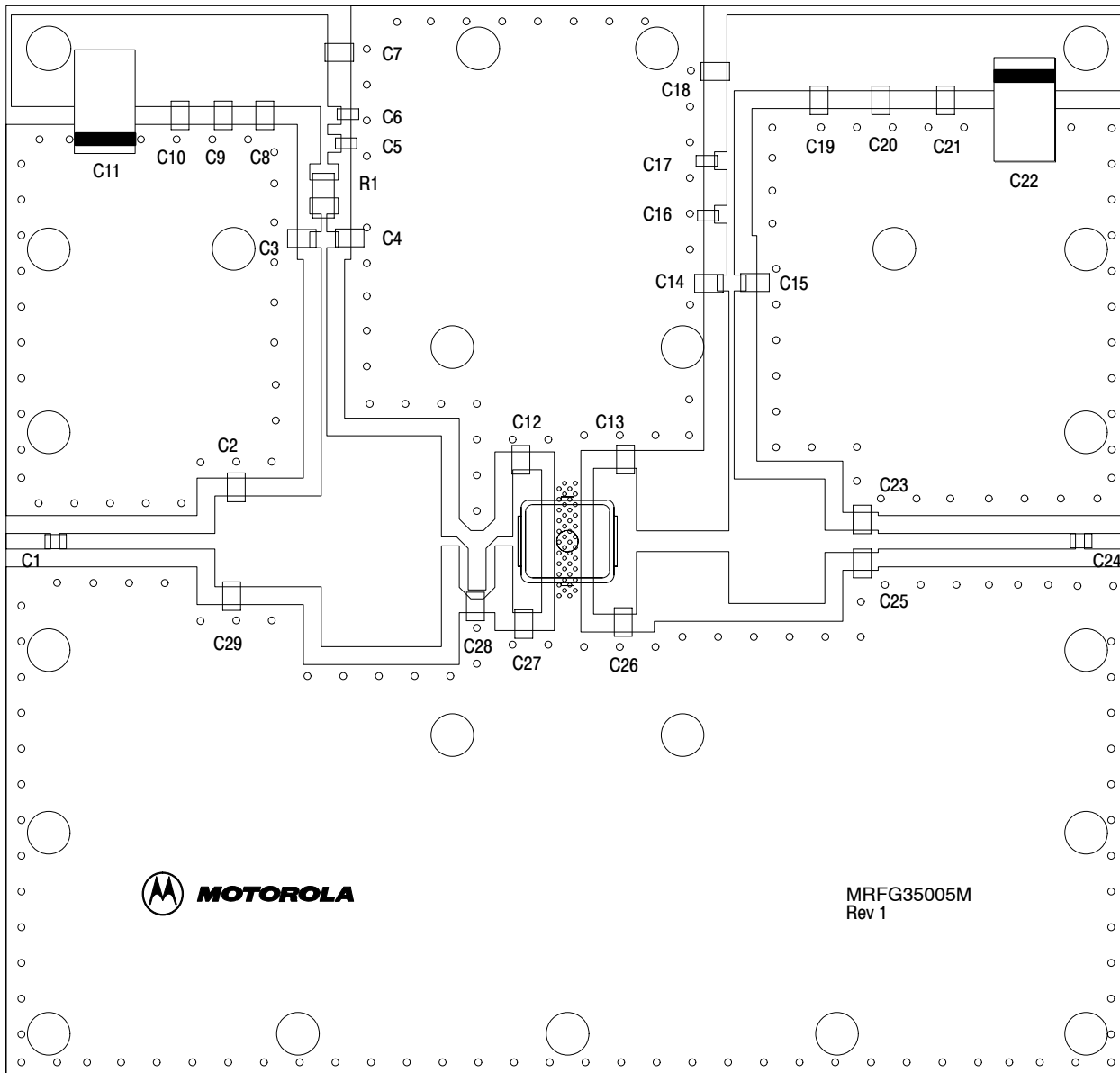
| Test Methodology                      | Rating | Package Peak Temperature | Unit             |
|---------------------------------------|--------|--------------------------|------------------|
| Per JESD 22-A113, IPC/JEDEC J-STD-020 | 1      | 260                      | $^\circ\text{C}$ |

1. For reliable operation, the operating channel temperature should not exceed  $150^\circ\text{C}$ .
2. Simulated.

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

| Characteristic                                                                                                                                                                                               | Symbol       | Min  | Typ   | Max  | Unit            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|-------|------|-----------------|
| Saturated Drain Current<br>( $V_{DS} = 3.5\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )                                                                                                                           | $I_{DSS}$    | —    | 1.7   | —    | Adc             |
| Off State Leakage Current<br>( $V_{GS} = -0.4\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )                                                                                                                        | $I_{GSS}$    | —    | < 1.0 | 100  | $\mu\text{Adc}$ |
| Off State Drain Current<br>( $V_{DS} = 12\text{ Vdc}$ , $V_{GS} = -2.5\text{ Vdc}$ )                                                                                                                         | $I_{DSO}$    | —    | —     | 600  | $\mu\text{Adc}$ |
| Off State Current<br>( $V_{DS} = 28.5\text{ Vdc}$ , $V_{GS} = -2.5\text{ Vdc}$ )                                                                                                                             | $I_{DSX}$    | —    | < 1.0 | 9    | mAdc            |
| Gate-Source Cut-off Voltage<br>( $V_{DS} = 3.5\text{ Vdc}$ , $I_{DS} = 8.7\text{ mA}$ )                                                                                                                      | $V_{GS(th)}$ | -1.2 | -0.9  | -0.7 | Vdc             |
| Quiescent Gate Voltage<br>( $V_{DS} = 12\text{ Vdc}$ , $I_D = 80\text{ mA}$ )                                                                                                                                | $V_{GS(Q)}$  | -1.1 | -0.8  | -0.6 | Vdc             |
| Power Gain<br>( $V_{DD} = 12\text{ Vdc}$ , $I_{DQ} = 80\text{ mA}$ , $f = 3.55\text{ GHz}$ )                                                                                                                 | $G_{ps}$     | 10   | 11    | —    | dB              |
| Output Power, 1 dB Compression Point<br>( $V_{DD} = 12\text{ Vdc}$ , $I_{DQ} = 80\text{ mA}$ , $f = 3.55\text{ GHz}$ )                                                                                       | $P_{1dB}$    | —    | 4.5   | —    | W               |
| Drain Efficiency<br>( $V_{DD} = 12\text{ Vdc}$ , $I_{DQ} = 80\text{ mA}$ , $P_{out} = 450\text{ mW Avg.}$ ,<br>$f = 3.55\text{ GHz}$ )                                                                       | $\eta_D$     | 22   | 25    | —    | %               |
| Adjacent Channel Power Ratio<br>( $V_{DD} = 12\text{ Vdc}$ , $P_{out} = 450\text{ mW Avg.}$ , $I_{DQ} = 80\text{ mA}$ ,<br>$f = 3.55\text{ GHz}$ , W-CDMA, 8.5 P/A @ 0.01% Probability,<br>64 CH, 3.84 MCPS) | ACPR         | —    | -42   | -39  | dBc             |

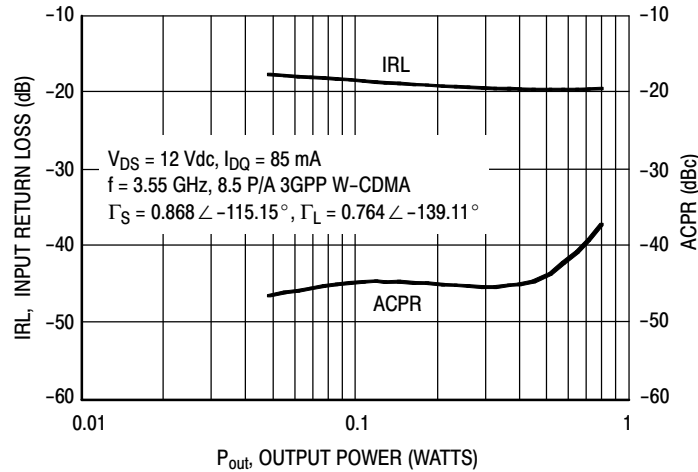




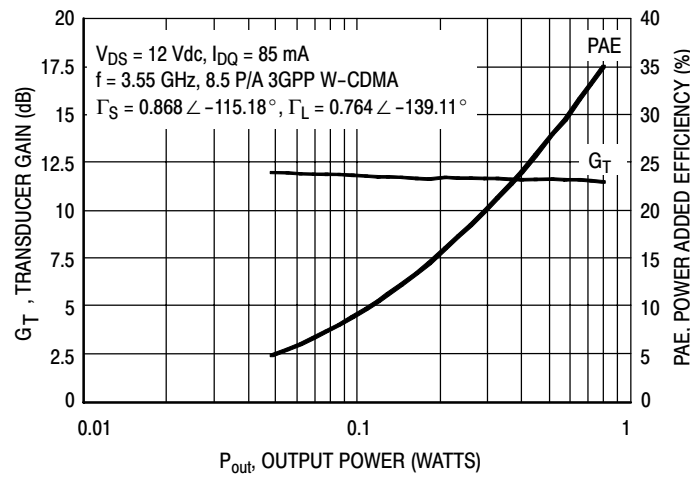
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**Figure 2. 3.5 GHz Test Circuit Component Layout**

## 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.  $\Gamma_S$  and  $\Gamma_L$  are the impedances presented to the DUT. All data is generated from load pull, not from the test circuit shown.

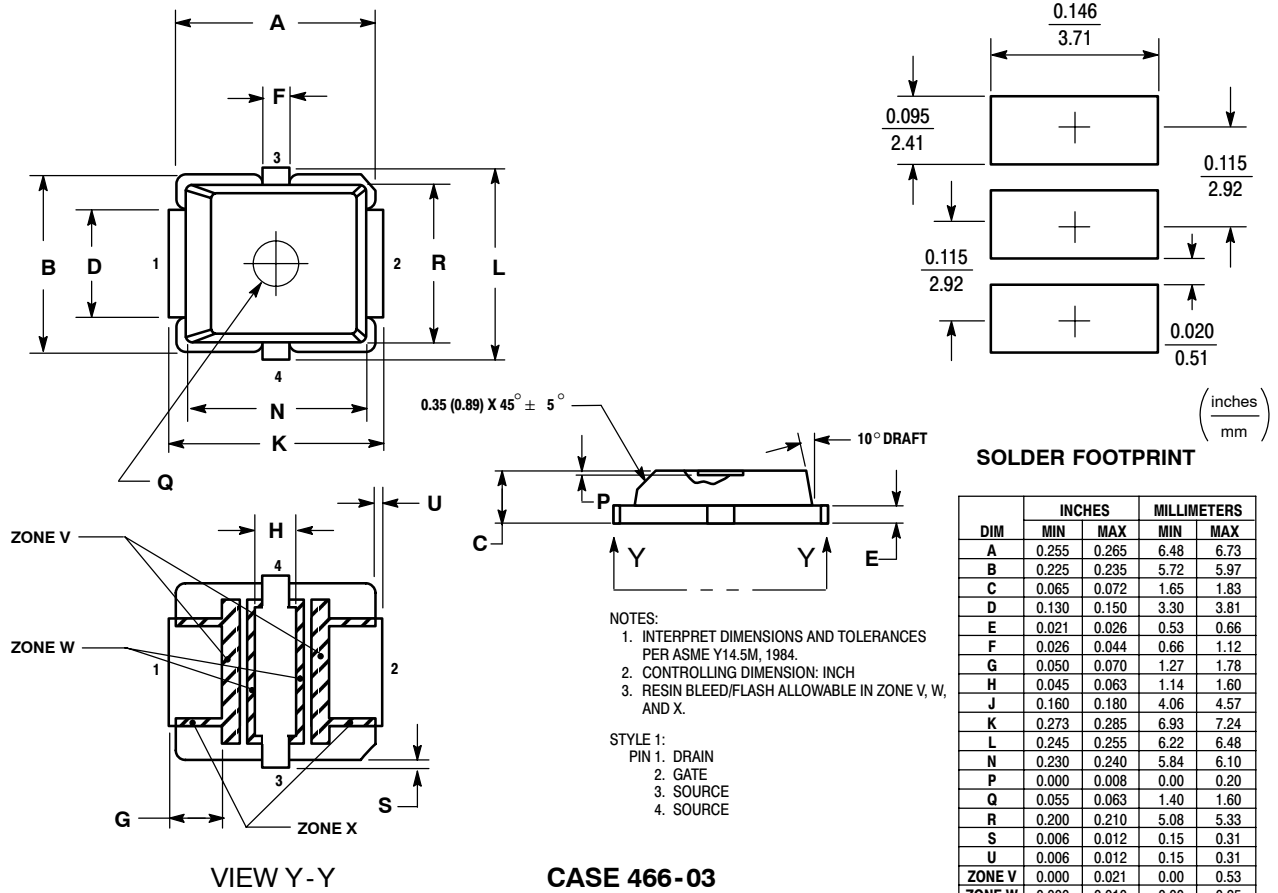
**Table 6. Class AB Common Source S-Parameters at  $V_{DS} = 12$  Vdc,  $I_{DQ} = 85$  mA**

| f<br>GHz | S <sub>11</sub> |         | S <sub>21</sub> |       | S <sub>12</sub> |        | S <sub>22</sub> |         |
|----------|-----------------|---------|-----------------|-------|-----------------|--------|-----------------|---------|
|          | S <sub>11</sub> | ∠ φ     | S <sub>21</sub> | ∠ φ   | S <sub>12</sub> | ∠ φ    | S <sub>22</sub> | ∠ φ     |
| 0.50     | 0.903           | -171.71 | 7.441           | 83.44 | 0.029           | 4.18   | 0.604           | -171.44 |
| 0.55     | 0.903           | -173.53 | 6.807           | 81.55 | 0.030           | 3.31   | 0.603           | -172.51 |
| 0.60     | 0.901           | -175.37 | 6.268           | 79.64 | 0.030           | 2.49   | 0.602           | -173.76 |
| 0.65     | 0.901           | -177.11 | 5.817           | 77.76 | 0.030           | 1.53   | 0.602           | -175.04 |
| 0.70     | 0.902           | -178.58 | 5.441           | 75.93 | 0.030           | 0.64   | 0.602           | -176.15 |
| 0.75     | 0.900           | 179.95  | 5.096           | 74.17 | 0.030           | -0.21  | 0.600           | -177.32 |
| 0.80     | 0.901           | 178.58  | 4.804           | 72.37 | 0.030           | -0.90  | 0.600           | -178.45 |
| 0.85     | 0.901           | 177.36  | 4.516           | 70.46 | 0.030           | -1.80  | 0.600           | -179.44 |
| 0.90     | 0.899           | 176.17  | 4.293           | 68.89 | 0.030           | -2.30  | 0.599           | 179.38  |
| 0.95     | 0.899           | 174.93  | 4.089           | 67.19 | 0.030           | -3.17  | 0.600           | 178.20  |
| 1.00     | 0.901           | 173.84  | 3.900           | 65.58 | 0.030           | -4.01  | 0.600           | 177.19  |
| 1.05     | 0.900           | 172.74  | 3.730           | 63.88 | 0.030           | -4.63  | 0.600           | 176.10  |
| 1.10     | 0.899           | 171.57  | 3.567           | 62.18 | 0.031           | -5.38  | 0.600           | 175.06  |
| 1.15     | 0.900           | 170.42  | 3.423           | 60.54 | 0.031           | -6.01  | 0.601           | 174.08  |
| 1.20     | 0.899           | 169.31  | 3.284           | 58.91 | 0.031           | -6.66  | 0.601           | 173.04  |
| 1.25     | 0.898           | 168.10  | 3.154           | 57.19 | 0.031           | -7.52  | 0.602           | 171.90  |
| 1.30     | 0.901           | 166.96  | 3.040           | 55.59 | 0.031           | -8.14  | 0.602           | 171.14  |
| 1.35     | 0.897           | 165.99  | 2.928           | 54.05 | 0.031           | -8.73  | 0.600           | 170.54  |
| 1.40     | 0.903           | 164.48  | 2.821           | 52.41 | 0.031           | -9.30  | 0.606           | 169.31  |
| 1.45     | 0.901           | 163.52  | 2.720           | 50.95 | 0.031           | -9.89  | 0.606           | 168.98  |
| 1.50     | 0.900           | 160.23  | 2.618           | 49.25 | 0.030           | -10.77 | 0.607           | 170.81  |
| 1.55     | 0.900           | 159.17  | 2.537           | 47.79 | 0.030           | -11.27 | 0.609           | 170.02  |
| 1.60     | 0.899           | 158.30  | 2.456           | 46.40 | 0.030           | -11.82 | 0.609           | 169.38  |
| 1.65     | 0.902           | 157.39  | 2.386           | 44.91 | 0.030           | -12.27 | 0.609           | 168.87  |
| 1.70     | 0.903           | 156.46  | 2.317           | 43.49 | 0.030           | -12.67 | 0.610           | 168.03  |
| 1.75     | 0.902           | 155.63  | 2.251           | 41.97 | 0.030           | -13.06 | 0.613           | 167.41  |
| 1.80     | 0.903           | 154.92  | 2.195           | 40.59 | 0.030           | -13.50 | 0.612           | 166.88  |
| 1.85     | 0.904           | 154.09  | 2.137           | 39.12 | 0.030           | -13.91 | 0.613           | 165.94  |
| 1.90     | 0.904           | 153.38  | 2.080           | 37.80 | 0.030           | -14.35 | 0.615           | 165.27  |
| 1.95     | 0.903           | 152.74  | 2.030           | 36.43 | 0.030           | -14.79 | 0.615           | 164.72  |
| 2.00     | 0.906           | 152.00  | 1.984           | 34.98 | 0.030           | -15.36 | 0.615           | 163.90  |
| 2.05     | 0.905           | 151.41  | 1.937           | 33.71 | 0.030           | -15.79 | 0.618           | 163.26  |
| 2.10     | 0.904           | 150.85  | 1.897           | 32.47 | 0.031           | -16.26 | 0.619           | 162.83  |
| 2.15     | 0.906           | 150.13  | 1.860           | 31.10 | 0.031           | -16.74 | 0.617           | 162.02  |
| 2.20     | 0.906           | 149.60  | 1.822           | 29.77 | 0.031           | -17.43 | 0.619           | 161.22  |
| 2.25     | 0.905           | 149.11  | 1.788           | 28.49 | 0.031           | -17.97 | 0.620           | 160.82  |
| 2.30     | 0.906           | 148.41  | 1.761           | 27.10 | 0.031           | -18.45 | 0.619           | 160.12  |
| 2.35     | 0.906           | 147.74  | 1.729           | 25.78 | 0.031           | -18.73 | 0.620           | 159.20  |
| 2.40     | 0.904           | 147.11  | 1.701           | 24.47 | 0.031           | -19.16 | 0.620           | 158.79  |
| 2.45     | 0.903           | 146.23  | 1.677           | 22.98 | 0.031           | -19.61 | 0.620           | 158.15  |
| 2.50     | 0.902           | 145.41  | 1.651           | 21.58 | 0.031           | -20.07 | 0.619           | 157.20  |
| 2.55     | 0.901           | 144.66  | 1.632           | 20.17 | 0.031           | -20.42 | 0.621           | 156.64  |
| 2.60     | 0.899           | 143.78  | 1.612           | 18.88 | 0.032           | -20.71 | 0.619           | 156.02  |
| 2.65     | 0.899           | 142.76  | 1.591           | 17.38 | 0.032           | -21.29 | 0.618           | 155.10  |
| 2.70     | 0.898           | 141.87  | 1.571           | 15.88 | 0.032           | -21.77 | 0.619           | 154.49  |
| 2.75     | 0.894           | 140.80  | 1.554           | 14.50 | 0.033           | -22.47 | 0.618           | 154.05  |
| 2.80     | 0.895           | 139.70  | 1.539           | 12.83 | 0.033           | -23.36 | 0.616           | 153.08  |

**Table 6. Class AB Common Source S-Parameters at  $V_{DS} = 12 \text{ Vdc}$ ,  $I_{DQ} = 85 \text{ mA}$  (continued)**

| f<br>GHz | S <sub>11</sub> |        | S <sub>21</sub> |        | S <sub>12</sub> |        | S <sub>22</sub> |        |
|----------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|--------|
|          | S <sub>11</sub> | ∠ φ    | S <sub>21</sub> | ∠ φ    | S <sub>12</sub> | ∠ φ    | S <sub>22</sub> | ∠ φ    |
| 2.85     | 0.895           | 138.63 | 1.522           | 11.37  | 0.034           | -24.77 | 0.618           | 152.46 |
| 2.90     | 0.893           | 137.48 | 1.507           | 9.90   | 0.034           | -26.15 | 0.618           | 151.97 |
| 2.95     | 0.893           | 136.05 | 1.493           | 8.24   | 0.034           | -27.11 | 0.616           | 150.93 |
| 3.00     | 0.894           | 134.72 | 1.478           | 6.55   | 0.034           | -27.92 | 0.618           | 150.06 |
| 3.05     | 0.892           | 133.46 | 1.465           | 4.95   | 0.034           | -28.51 | 0.617           | 149.53 |
| 3.10     | 0.890           | 131.81 | 1.453           | 3.30   | 0.034           | -29.31 | 0.616           | 148.45 |
| 3.15     | 0.892           | 130.31 | 1.436           | 1.60   | 0.034           | -29.98 | 0.616           | 147.51 |
| 3.20     | 0.891           | 128.98 | 1.421           | 0.04   | 0.034           | -30.69 | 0.617           | 146.90 |
| 3.25     | 0.888           | 127.31 | 1.409           | -1.72  | 0.034           | -31.47 | 0.615           | 145.95 |
| 3.30     | 0.890           | 125.83 | 1.394           | -3.40  | 0.034           | -32.45 | 0.616           | 145.01 |
| 3.35     | 0.889           | 124.49 | 1.380           | -4.89  | 0.034           | -33.06 | 0.616           | 144.44 |
| 3.40     | 0.887           | 122.78 | 1.367           | -6.59  | 0.034           | -33.59 | 0.615           | 143.59 |
| 3.45     | 0.889           | 121.40 | 1.352           | -8.31  | 0.034           | -34.06 | 0.615           | 142.69 |
| 3.50     | 0.888           | 119.96 | 1.338           | -9.91  | 0.035           | -34.46 | 0.616           | 141.92 |
| 3.55     | 0.887           | 118.32 | 1.328           | -11.56 | 0.035           | -35.34 | 0.615           | 141.09 |
| 3.60     | 0.888           | 116.96 | 1.313           | -13.16 | 0.035           | -36.09 | 0.613           | 140.03 |
| 3.65     | 0.887           | 115.68 | 1.299           | -14.69 | 0.036           | -36.68 | 0.613           | 139.19 |
| 3.70     | 0.887           | 114.24 | 1.287           | -16.36 | 0.036           | -37.71 | 0.612           | 138.40 |
| 3.75     | 0.887           | 113.05 | 1.274           | -17.90 | 0.036           | -38.84 | 0.612           | 137.36 |
| 3.80     | 0.888           | 111.84 | 1.262           | -19.43 | 0.036           | -39.90 | 0.613           | 136.45 |
| 3.85     | 0.888           | 110.59 | 1.252           | -20.85 | 0.036           | -40.73 | 0.613           | 135.74 |
| 3.90     | 0.887           | 109.45 | 1.240           | -22.36 | 0.036           | -41.33 | 0.612           | 134.56 |
| 3.95     | 0.888           | 108.32 | 1.230           | -24.01 | 0.036           | -41.73 | 0.613           | 133.64 |
| 4.00     | 0.887           | 107.24 | 1.222           | -25.35 | 0.036           | -42.00 | 0.612           | 133.05 |
| 4.05     | 0.886           | 106.10 | 1.216           | -26.93 | 0.037           | -42.60 | 0.611           | 131.91 |
| 4.10     | 0.887           | 105.02 | 1.205           | -28.43 | 0.037           | -43.13 | 0.611           | 130.81 |
| 4.15     | 0.886           | 104.22 | 1.198           | -29.78 | 0.037           | -43.70 | 0.609           | 130.15 |
| 4.20     | 0.884           | 103.08 | 1.195           | -31.44 | 0.038           | -44.59 | 0.607           | 128.89 |
| 4.25     | 0.885           | 102.00 | 1.189           | -33.00 | 0.038           | -45.54 | 0.608           | 127.57 |
| 4.30     | 0.885           | 101.08 | 1.184           | -34.46 | 0.038           | -46.22 | 0.608           | 126.81 |
| 4.35     | 0.884           | 100.08 | 1.183           | -35.96 | 0.039           | -46.93 | 0.605           | 125.63 |
| 4.40     | 0.883           | 98.90  | 1.176           | -37.67 | 0.039           | -48.09 | 0.606           | 124.16 |
| 4.45     | 0.882           | 97.99  | 1.172           | -39.19 | 0.039           | -49.06 | 0.607           | 123.26 |
| 4.50     | 0.881           | 96.91  | 1.176           | -40.74 | 0.040           | -49.87 | 0.604           | 122.03 |
| 4.55     | 0.880           | 95.41  | 1.172           | -42.48 | 0.040           | -50.58 | 0.603           | 120.40 |
| 4.60     | 0.879           | 94.29  | 1.172           | -44.02 | 0.040           | -51.24 | 0.601           | 119.45 |
| 4.65     | 0.878           | 92.80  | 1.177           | -45.83 | 0.041           | -52.21 | 0.597           | 118.22 |
| 4.70     | 0.877           | 91.10  | 1.175           | -47.87 | 0.042           | -53.61 | 0.594           | 116.51 |
| 4.75     | 0.876           | 89.66  | 1.176           | -49.70 | 0.042           | -55.11 | 0.594           | 115.24 |
| 4.80     | 0.874           | 87.90  | 1.178           | -51.58 | 0.042           | -56.51 | 0.590           | 113.89 |
| 4.85     | 0.874           | 86.08  | 1.177           | -53.56 | 0.042           | -57.66 | 0.589           | 112.15 |
| 4.90     | 0.870           | 84.39  | 1.175           | -55.56 | 0.042           | -58.60 | 0.588           | 110.76 |
| 4.95     | 0.867           | 82.48  | 1.177           | -57.53 | 0.043           | -59.41 | 0.585           | 109.40 |
| 5.00     | 0.866           | 80.32  | 1.179           | -59.75 | 0.043           | -60.39 | 0.583           | 107.71 |

# PACKAGE DIMENSIONS



**CASE 466-03  
ISSUE D  
PLD-1.5  
PLASTIC**



# REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date      | Description                                                                                                           |
|----------|-----------|-----------------------------------------------------------------------------------------------------------------------|
| 5        | Jan. 2008 | <ul style="list-style-type: none"> <li>Listed replacement part, p. 1</li> <li>Added Revision History, p. 9</li> </ul> |

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