



## PD55003L

### RF POWER TRANSISTORS *The LdmoST Plastic FAMILY*

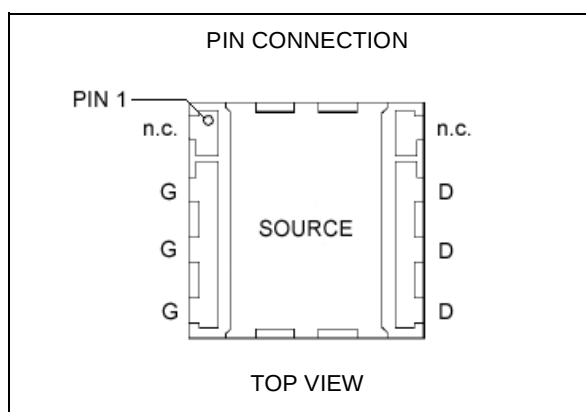
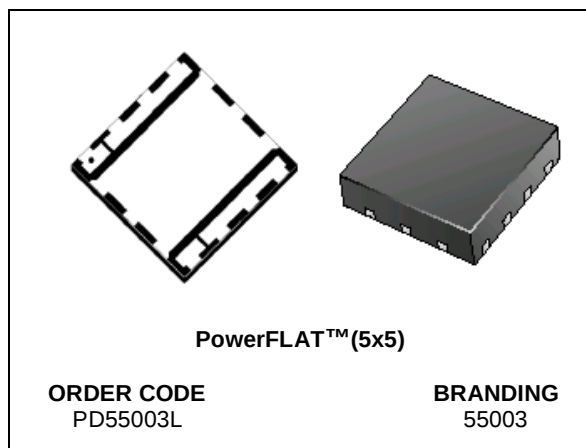
#### N-CHANNEL ENHANCEMENT-MODE LATERAL MOSFETs

- EXCELLENT THERMAL STABILITY
- COMMON SOURCE CONFIGURATION
- $P_{OUT} = 3\text{ W}$  with 17 dB gain @ 500 MHz / 12.5 V
- NEW LEADLESS PLASTIC PACKAGE
- ESD PROTECTION
- SUPPLIED IN TAPE & REEL OF 3K UNITS

#### DESCRIPTION

The PD55003L is a common source N-Channel, enhancement-mode lateral Field-Effect RF power transistor. It is designed for high gain, broadband commercial and industrial applications. It operates at 12 V in common source mode at frequencies of up to 1 GHz. PD55003L boasts the excellent gain, linearity and reliability of STH1LV latest LDMOS technology mounted in the innovative leadless SMD plastic package, PowerFLAT™.

PD55003L's superior linearity performance makes it an ideal solution for car mobile radio.



#### ABSOLUTE MAXIMUM RATINGS ( $T_{CASE} = 25\text{ }^{\circ}\text{C}$ )

| Symbol        | Parameter                                         | Value       | Unit               |
|---------------|---------------------------------------------------|-------------|--------------------|
| $V_{(BR)DSS}$ | Drain-Source Voltage                              | 40          | V                  |
| $V_{GS}$      | Gate-Source Voltage                               | -0.5 to +15 | V                  |
| $I_D$         | Drain Current                                     | 2.5         | A                  |
| $P_{DISS}$    | Power Dissipation (@ $T_c = 70^{\circ}\text{C}$ ) | 14          | W                  |
| $T_j$         | Max. Operating Junction Temperature               | 150         | $^{\circ}\text{C}$ |
| $T_{STG}$     | Storage Temperature                               | -65 to +150 | $^{\circ}\text{C}$ |

#### THERMAL DATA

|               |                                   |     |                      |
|---------------|-----------------------------------|-----|----------------------|
| $R_{th(j-c)}$ | Junction -Case Thermal Resistance | 5.7 | $^{\circ}\text{C/W}$ |
|---------------|-----------------------------------|-----|----------------------|

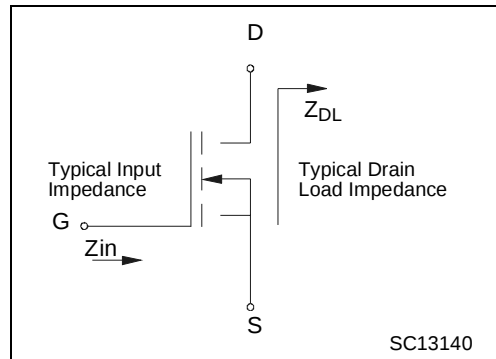
ELECTRICAL SPECIFICATION ( $T_{CASE} = 25^{\circ}C$ )

## STATIC

| Symbol       | Test Conditions        |                          | Min. | Typ. | Max. | Unit          |
|--------------|------------------------|--------------------------|------|------|------|---------------|
| $I_{DSS}$    | $V_{GS} = 0\text{ V}$  | $V_{DS} = 28\text{ V}$   |      |      | 1    | $\mu\text{A}$ |
| $I_{GSS}$    | $V_{GS} = 20\text{ V}$ | $V_{DS} = 0\text{ V}$    |      |      | 1    | $\mu\text{A}$ |
| $V_{GS(Q)}$  | $V_{DS} = 10\text{ V}$ | $I_D = 50\text{ mA}$     | 2.0  |      | 5.0  | V             |
| $V_{DS(ON)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 0.5\text{ A}$     |      |      | 0.36 | V             |
| $G_{FS}$     | $V_{DS} = 10\text{ V}$ | $I_D = 1\text{ A}$       |      | 1.0  |      | mho           |
| $C_{ISS}$    | $V_{GS} = 0\text{ V}$  | $V_{DS} = 12.5\text{ V}$ |      | 34   |      | pF            |
| $C_{OSS}$    | $V_{GS} = 0\text{ V}$  | $V_{DS} = 12.5\text{ V}$ |      | 23   |      | pF            |
| $C_{RSS}$    | $V_{GS} = 0\text{ V}$  | $V_{DS} = 12.5\text{ V}$ |      | 1.8  |      | pF            |

## DYNAMIC

| Symbol        | Test Conditions          |                                                                                         | Min. | Typ. | Max. | Unit |
|---------------|--------------------------|-----------------------------------------------------------------------------------------|------|------|------|------|
| $P_{1dB}$     | $V_{DD} = 12.5\text{ V}$ | $I_{DQ} = 50\text{ mA}$ $f = 500\text{ MHz}$                                            | 3    |      |      | W    |
| $G_P$         | $V_{DD} = 12.5\text{ V}$ | $I_{DQ} = 50\text{ mA}$ $P_{OUT} = 3\text{ W}$ $f = 500\text{ MHz}$                     | 17   | 19   |      | dB   |
| $\eta_D$      | $V_{DD} = 12.5\text{ V}$ | $I_{DQ} = 50\text{ mA}$ $P_{OUT} = 3\text{ W}$ $f = 500\text{ MHz}$                     | 50   | 52   |      | %    |
| Load mismatch | $V_{DD} = 15.5\text{ V}$ | $I_{DQ} = 50\text{ mA}$ $P_{OUT} = 3\text{ W}$ $f = 500\text{ MHz}$<br>ALL PHASE ANGLES | 20:1 |      |      | VSWR |



## IMPEDANCE DATA

| FREQ. MHz | $Z_{IN} (\Omega)$ | $Z_{DL} (\Omega)$ |
|-----------|-------------------|-------------------|
| 480       | $1.79 - j\ 4.96$  | $10.68 + j\ 7.45$ |
| 500       | $1.88 - j\ 5.93$  | $10.28 + j\ 8.92$ |
| 520       | $2.10 - j\ 7.03$  | $9.86 + j\ 10.18$ |

## ESD PROTECTION CHARACTERISTICS

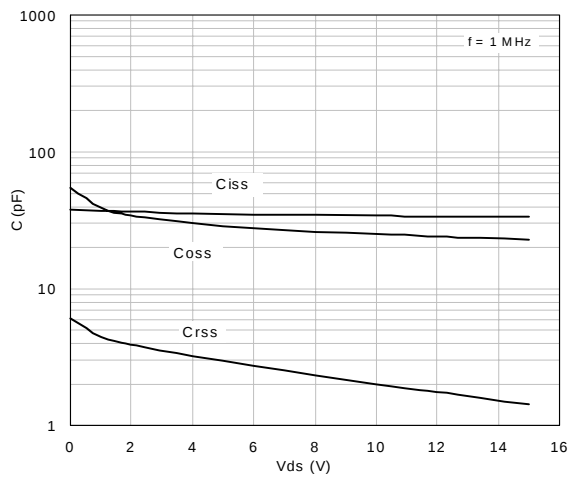
| Test Conditions  | Class |
|------------------|-------|
| Human Body Model | 2     |
| Machine Model    | M3    |

## MOISTURE SENSITIVITY LEVEL

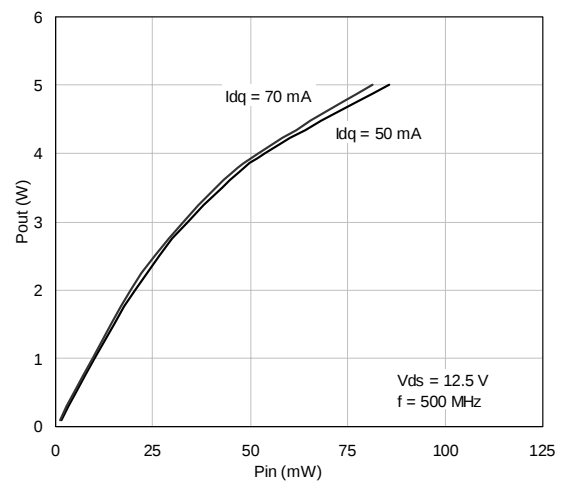
| Test Methodology | Rating |
|------------------|--------|
| J-STD-020B       | MSL 3  |

## TYPICAL PERFORMANCE

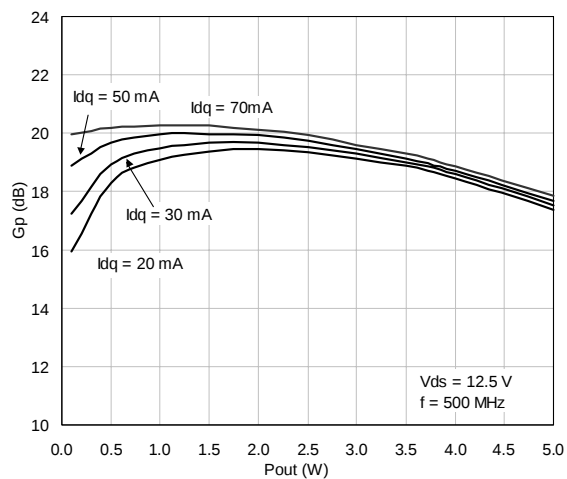
## Capacitance Vs Supply Voltage



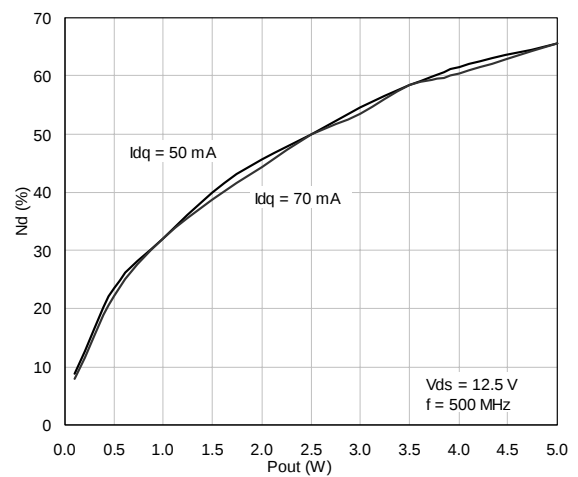
## Output Power Vs Input Power



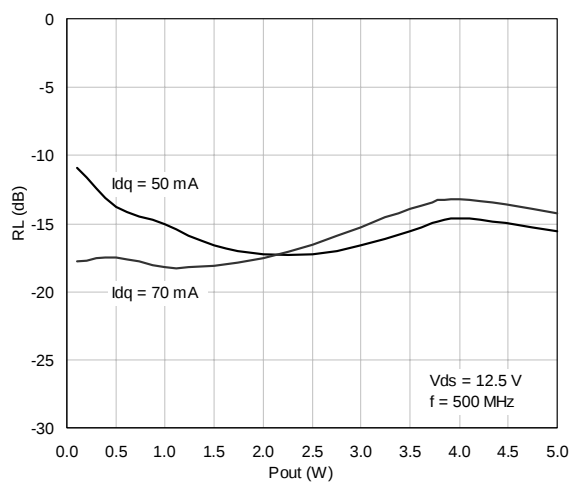
## Power Gain Vs Output Power



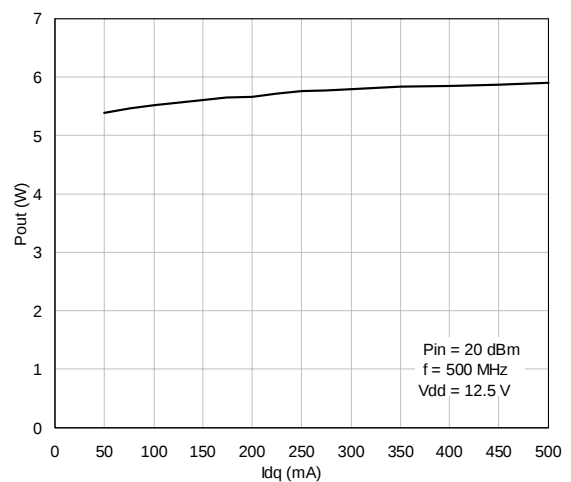
## Efficiency Vs Output Power



## Input Return Loss Vs Output Power

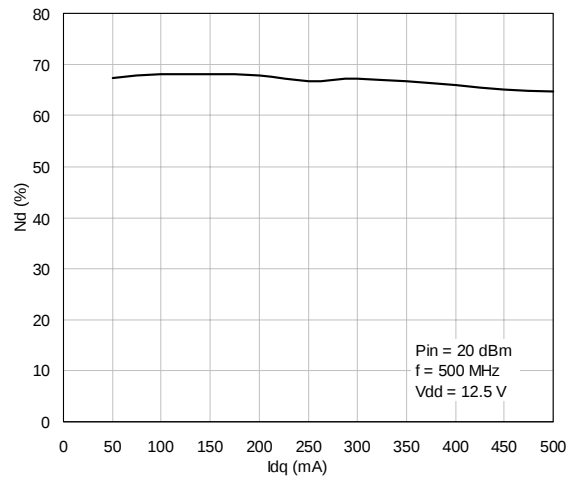


## Output Power Vs Bias Current

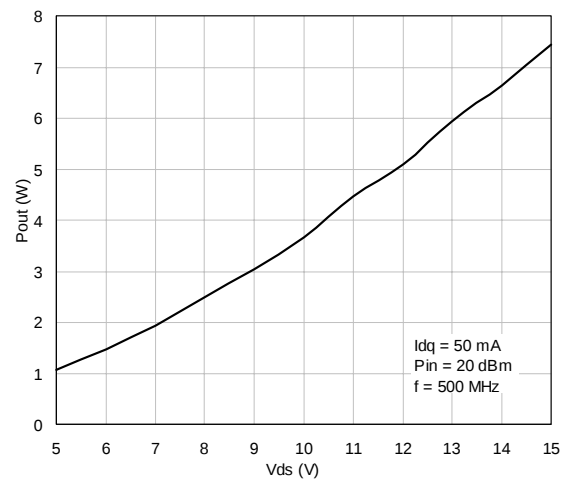


TYPICAL PERFORMANCE

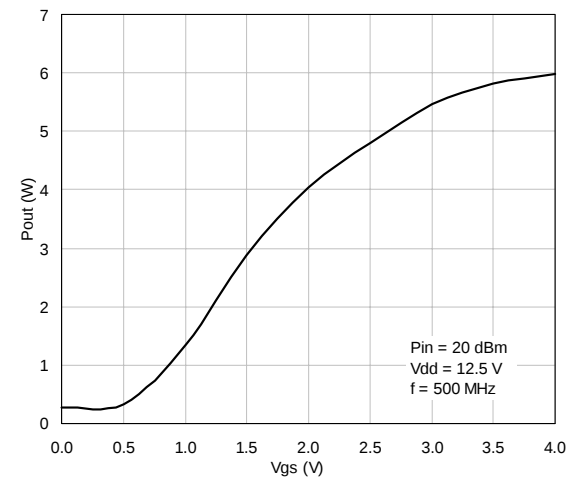
Efficiency Vs Bias Current



Output Power Vs Supply Voltage

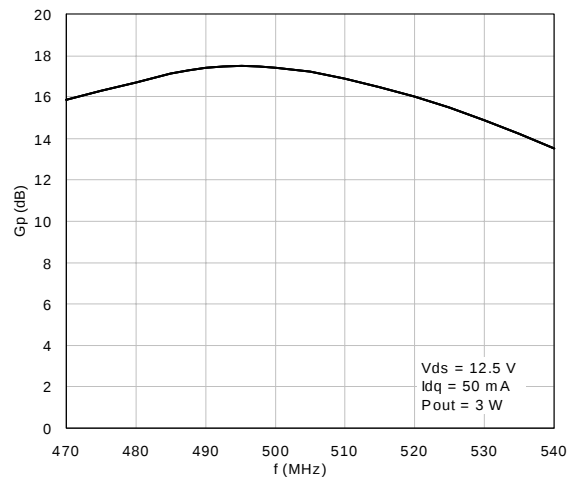


Output Power Vs Gate-Source Voltage

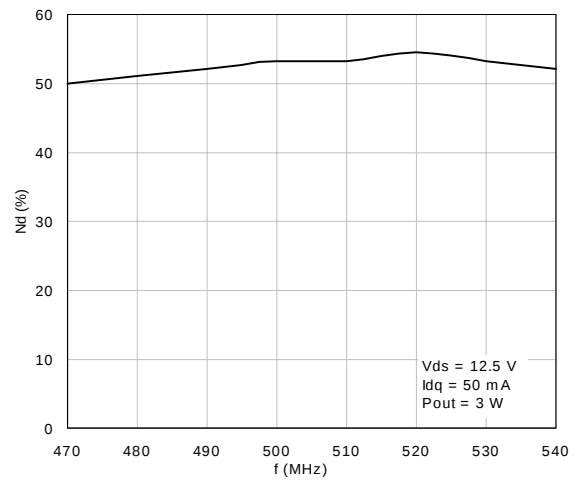


## TYPICAL PERFORMANCE (BROADBAND)

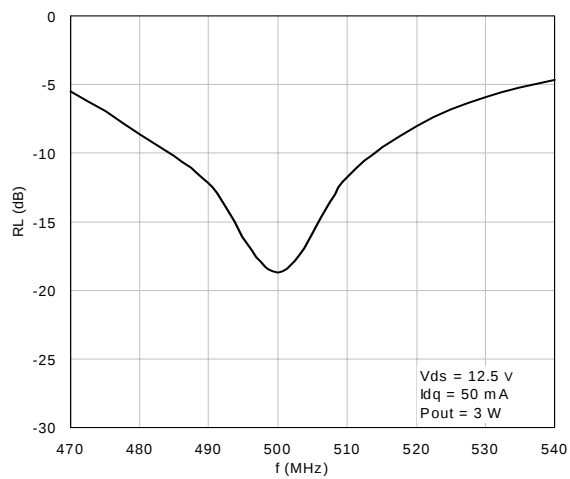
Power Gain Vs Frequency



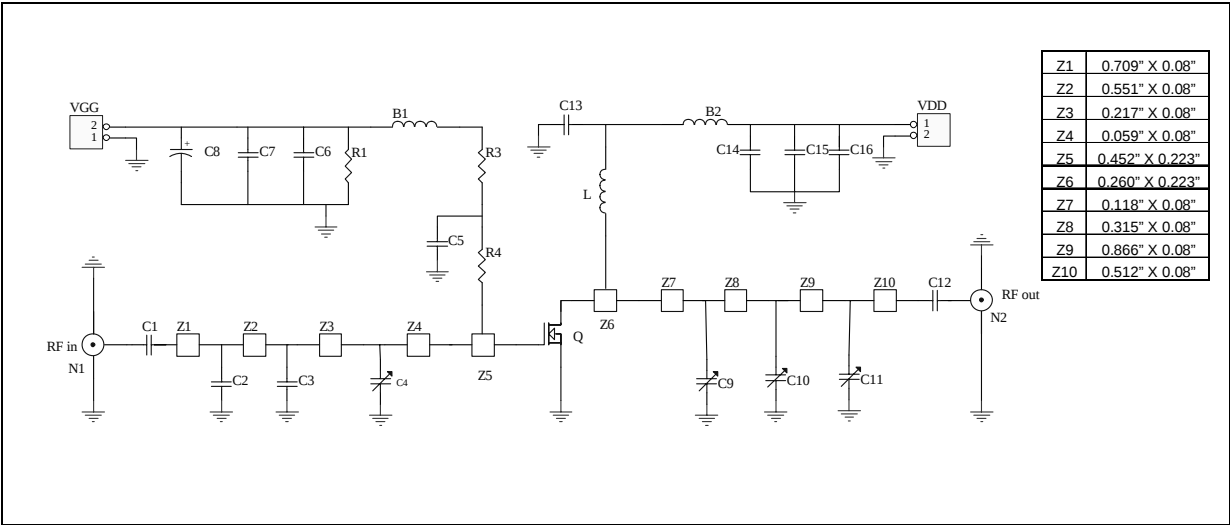
Efficiency Vs Frequency



Return Loss Vs Frequency



TEST CIRCUIT SCHEMATIC



TEST CIRCUIT COMPONENT PART LIST

| COMPONENT | DESCRIPTION                                                    |
|-----------|----------------------------------------------------------------|
| B1,B2     | FERRITE BEAD                                                   |
| C1,C12,   | 300pF, 100B ATC CHIP CAPACITOR                                 |
| C2,C3     | 15pF 100B ATC CHIP CAPACITOR                                   |
| C4, C9    | 0 -:- 20 pF VARIABLE CAPACITOR JOHANSON                        |
| C5, C13   | 120pF 100B ATC CHIP CAPACITOR                                  |
| C6, C14   | 0.1 mF 100B ATC CHIP CAPACITOR                                 |
| C7, C15   | 1200pF 100B ATC CHIP CAPACITOR                                 |
| C8, C16   | 10uF, 35V, SMD ELECTROLYTIC CAPACITOR                          |
| C10       | 0.5 -:- 5 pF VARIABLE CAPACITOR JOHANSON                       |
| C11       | 0.8 -:- 10 pF VARIABLE CAPACITOR JOHANSON                      |
| R1        | 33 Kohm CHIP RESITOR 1W                                        |
| R2, R3    | 15 ohm MELF RESITOR 1W                                         |
| R4        | 1 Kohm CHIP RESITOR 1W                                         |
| N1, N2    | TYPE N FLANGE MOUNT                                            |
| BOARD     | ROGER ULTRA LAM 2000 THK 0.030" εr = 2.55 2OZ ED Cu BOTH SIDES |



**PD55003L****S-PARAMETER (PD55003L)**(V<sub>DS</sub> = 12.5V I<sub>DS</sub> = 0.15A)

| FREQ<br>(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> ° | S <sub>21</sub> | ∠S <sub>21</sub> ° | S <sub>12</sub> | ∠S <sub>12</sub> ° | S <sub>22</sub> | ∠S <sub>22</sub> ° |
|---------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|
| 50            | 0.808           | -110               | 20.14           | 112                | 0.039           | 22                 | 0.672           | -109               |
| 100           | 0.772           | -141               | 11.77           | 93                 | 0.042           | 5                  | 0.633           | -138               |
| 150           | 0.771           | -152               | 7.86            | 82                 | 0.041           | -5                 | 0.642           | -147               |
| 200           | 0.779           | -157               | 5.80            | 73                 | 0.040           | -11                | 0.665           | -151               |
| 250           | 0.794           | -161               | 4.50            | 66                 | 0.038           | -17                | 0.694           | -154               |
| 300           | 0.809           | -163               | 3.62            | 60                 | 0.035           | -22                | 0.721           | -155               |
| 350           | 0.824           | -165               | 2.98            | 54                 | 0.033           | -26                | 0.750           | -157               |
| 400           | 0.839           | -166               | 2.50            | 49                 | 0.031           | -30                | 0.774           | -159               |
| 450           | 0.853           | -168               | 2.13            | 44                 | 0.028           | -32                | 0.796           | -160               |
| 500           | 0.865           | -169               | 1.83            | 40                 | 0.025           | -34                | 0.818           | -161               |
| 550           | 0.874           | -171               | 1.59            | 36                 | 0.023           | -36                | 0.837           | -163               |
| 600           | 0.885           | -172               | 1.39            | 33                 | 0.021           | -36                | 0.852           | -164               |
| 650           | 0.894           | -173               | 1.23            | 29                 | 0.018           | -37                | 0.867           | -165               |
| 700           | 0.901           | -174               | 1.10            | 26                 | 0.016           | -37                | 0.880           | -166               |
| 750           | 0.906           | -175               | 0.97            | 23                 | 0.015           | -36                | 0.890           | -167               |
| 800           | 0.911           | -176               | 0.88            | 20                 | 0.012           | -32                | 0.902           | -169               |
| 850           | 0.916           | -177               | 0.79            | 18                 | 0.011           | -28                | 0.909           | -169               |
| 900           | 0.918           | -178               | 0.72            | 15                 | 0.010           | -22                | 0.918           | -171               |
| 950           | 0.922           | -179               | 0.65            | 13                 | 0.008           | -13                | 0.922           | -171               |
| 1000          | 0.925           | 180                | 0.59            | 11                 | 0.007           | -7                 | 0.928           | -172               |
| 1050          | 0.925           | 179                | 0.54            | 9                  | 0.007           | 8                  | 0.934           | -173               |
| 1100          | 0.928           | 178                | 0.50            | 7                  | 0.006           | 21                 | 0.938           | -174               |
| 1150          | 0.927           | 177                | 0.46            | 5                  | 0.007           | 38                 | 0.941           | -175               |
| 1200          | 0.928           | 176                | 0.43            | 4                  | 0.008           | 51                 | 0.944           | -176               |
| 1250          | 0.929           | 175                | 0.40            | 2                  | 0.010           | 56                 | 0.947           | -176               |
| 1300          | 0.927           | 175                | 0.37            | 1                  | 0.011           | 61                 | 0.953           | -177               |
| 1350          | 0.927           | 174                | 0.34            | -1                 | 0.011           | 65                 | 0.951           | -178               |
| 1400          | 0.925           | 173                | 0.32            | -2                 | 0.012           | 68                 | 0.952           | -178               |
| 1450          | 0.922           | 172                | 0.30            | -4                 | 0.014           | 72                 | 0.954           | -179               |
| 1500          | 0.922           | 172                | 0.28            | -5                 | 0.016           | 73                 | 0.957           | -180               |

**S-PARAMETER (PD55003L)**(V<sub>DS</sub> = 12.5V I<sub>DS</sub> = 0.8A)

| FREQ<br>(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> ° | S <sub>21</sub> | ∠S <sub>21</sub> ° | S <sub>12</sub> | ∠S <sub>12</sub> ° | S <sub>22</sub> | ∠S <sub>22</sub> ° |
|---------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|
| 50            | 0.841           | -124               | 22.20           | 107                | 0.029           | 21                 | 0.651           | -130               |
| 100           | 0.800           | -150               | 12.84           | 92                 | 0.031           | 6                  | 0.654           | -153               |
| 150           | 0.800           | -159               | 8.59            | 83                 | 0.031           | -2                 | 0.666           | -159               |
| 200           | 0.803           | -163               | 6.38            | 76                 | 0.030           | -8                 | 0.684           | -161               |
| 250           | 0.812           | -166               | 5.00            | 70                 | 0.028           | -11                | 0.702           | -163               |
| 300           | 0.822           | -168               | 4.07            | 64                 | 0.027           | -15                | 0.721           | -163               |
| 350           | 0.830           | -169               | 3.39            | 59                 | 0.025           | -17                | 0.740           | -164               |
| 400           | 0.837           | -170               | 2.87            | 55                 | 0.024           | -20                | 0.760           | -165               |
| 450           | 0.848           | -172               | 2.47            | 50                 | 0.022           | -23                | 0.777           | -166               |
| 500           | 0.857           | -172               | 2.15            | 46                 | 0.020           | -23                | 0.795           | -166               |
| 550           | 0.866           | -174               | 1.89            | 42                 | 0.018           | -25                | 0.813           | -167               |
| 600           | 0.874           | -174               | 1.67            | 39                 | 0.017           | -23                | 0.825           | -168               |
| 650           | 0.882           | -175               | 1.49            | 35                 | 0.015           | -24                | 0.839           | -168               |
| 700           | 0.887           | -176               | 1.33            | 32                 | 0.013           | -22                | 0.853           | -169               |
| 750           | 0.893           | -177               | 1.19            | 29                 | 0.012           | -16                | 0.863           | -170               |
| 800           | 0.898           | -178               | 1.08            | 26                 | 0.011           | -15                | 0.875           | -171               |
| 850           | 0.903           | -179               | 0.98            | 23                 | 0.010           | -11                | 0.885           | -172               |
| 900           | 0.904           | -180               | 0.89            | 21                 | 0.009           | -1                 | 0.893           | -173               |
| 950           | 0.909           | 179                | 0.82            | 19                 | 0.008           | 7                  | 0.901           | -173               |
| 1000          | 0.911           | 179                | 0.75            | 16                 | 0.008           | 16                 | 0.904           | -174               |
| 1050          | 0.914           | 178                | 0.69            | 14                 | 0.008           | 27                 | 0.911           | -175               |
| 1100          | 0.916           | 177                | 0.64            | 12                 | 0.008           | 35                 | 0.916           | -175               |
| 1150          | 0.917           | 176                | 0.59            | 10                 | 0.009           | 43                 | 0.919           | -176               |
| 1200          | 0.917           | 176                | 0.55            | 8                  | 0.010           | 48                 | 0.923           | -177               |
| 1250          | 0.918           | 175                | 0.51            | 6                  | 0.010           | 57                 | 0.929           | -177               |
| 1300          | 0.917           | 174                | 0.47            | 5                  | 0.012           | 62                 | 0.929           | -178               |
| 1350          | 0.917           | 173                | 0.44            | 3                  | 0.013           | 63                 | 0.934           | -179               |
| 1400          | 0.914           | 173                | 0.42            | 1                  | 0.013           | 67                 | 0.936           | -179               |
| 1450          | 0.912           | 172                | 0.39            | 0                  | 0.015           | 71                 | 0.938           | -180               |
| 1500          | 0.911           | 171                | 0.36            | -2                 | 0.016           | 72                 | 0.941           | 179                |

**PD55003L****S-PARAMETER (PD55003L)**(V<sub>DS</sub> = 12.5V I<sub>DS</sub> = 1.5A)

| FREQ<br>(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> ° | S <sub>21</sub> | ∠S <sub>21</sub> ° | S <sub>12</sub> | ∠S <sub>12</sub> ° | S <sub>22</sub> | ∠S <sub>22</sub> ° |
|---------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|
| 50            | 0.837           | -114               | 18.43           | 111                | 0.030           | 24                 | 0.588           | -132               |
| 100           | 0.799           | -143               | 10.49           | 93                 | 0.033           | 6                  | 0.632           | -152               |
| 150           | 0.801           | -154               | 6.99            | 82                 | 0.032           | -3                 | 0.656           | -158               |
| 200           | 0.809           | -159               | 5.15            | 74                 | 0.031           | -9                 | 0.680           | -160               |
| 250           | 0.823           | -163               | 4.00            | 67                 | 0.029           | -14                | 0.701           | -162               |
| 300           | 0.835           | -165               | 3.22            | 61                 | 0.028           | -18                | 0.726           | -163               |
| 350           | 0.845           | -167               | 2.66            | 56                 | 0.025           | -20                | 0.750           | -164               |
| 400           | 0.855           | -169               | 2.23            | 52                 | 0.024           | -24                | 0.768           | -165               |
| 450           | 0.866           | -170               | 1.91            | 47                 | 0.022           | -26                | 0.789           | -166               |
| 500           | 0.876           | -171               | 1.65            | 43                 | 0.020           | -24                | 0.812           | -167               |
| 550           | 0.882           | -173               | 1.44            | 39                 | 0.018           | -25                | 0.828           | -167               |
| 600           | 0.892           | -174               | 1.26            | 36                 | 0.016           | -25                | 0.836           | -168               |
| 650           | 0.898           | -175               | 1.12            | 33                 | 0.015           | -25                | 0.844           | -169               |
| 700           | 0.903           | -176               | 1.00            | 29                 | 0.013           | -20                | 0.857           | -170               |
| 750           | 0.907           | -177               | 0.90            | 27                 | 0.011           | -17                | 0.868           | -171               |
| 800           | 0.909           | -178               | 0.81            | 24                 | 0.010           | -10                | 0.883           | -171               |
| 850           | 0.912           | -179               | 0.73            | 21                 | 0.009           | -6                 | 0.889           | -172               |
| 900           | 0.915           | -180               | 0.67            | 19                 | 0.009           | 1                  | 0.894           | -173               |
| 950           | 0.917           | 179                | 0.61            | 17                 | 0.008           | 17                 | 0.905           | -174               |
| 1000          | 0.917           | 178                | 0.56            | 15                 | 0.008           | 24                 | 0.907           | -174               |
| 1050          | 0.918           | 178                | 0.51            | 13                 | 0.008           | 32                 | 0.908           | -175               |
| 1100          | 0.920           | 177                | 0.47            | 11                 | 0.009           | 40                 | 0.912           | -176               |
| 1150          | 0.920           | 176                | 0.44            | 9                  | 0.010           | 48                 | 0.919           | -177               |
| 1200          | 0.920           | 175                | 0.41            | 7                  | 0.010           | 57                 | 0.922           | -177               |
| 1250          | 0.919           | 174                | 0.38            | 6                  | 0.012           | 59                 | 0.926           | -178               |
| 1300          | 0.919           | 174                | 0.35            | 4                  | 0.013           | 61                 | 0.931           | -179               |
| 1350          | 0.918           | 173                | 0.33            | 3                  | 0.014           | 63                 | 0.928           | -179               |
| 1400          | 0.917           | 172                | 0.31            | 1                  | 0.015           | 68                 | 0.929           | -180               |
| 1450          | 0.914           | 172                | 0.29            | 0                  | 0.016           | 70                 | 0.933           | 180                |
| 1500          | 0.912           | 171                | 0.27            | -1                 | 0.018           | 71                 | 0.935           | 179                |

## PowerFLAT™ TAPE &amp; REEL DIMENSIONS

|    | mm   |      |      |
|----|------|------|------|
|    | MIN. | TYP. | MAX  |
| Ao | 5.15 | 5.25 | 5.35 |
| Bo | 5.15 | 5.25 | 5.35 |
| Ko | 1.0  | 1.1  | 1.2  |

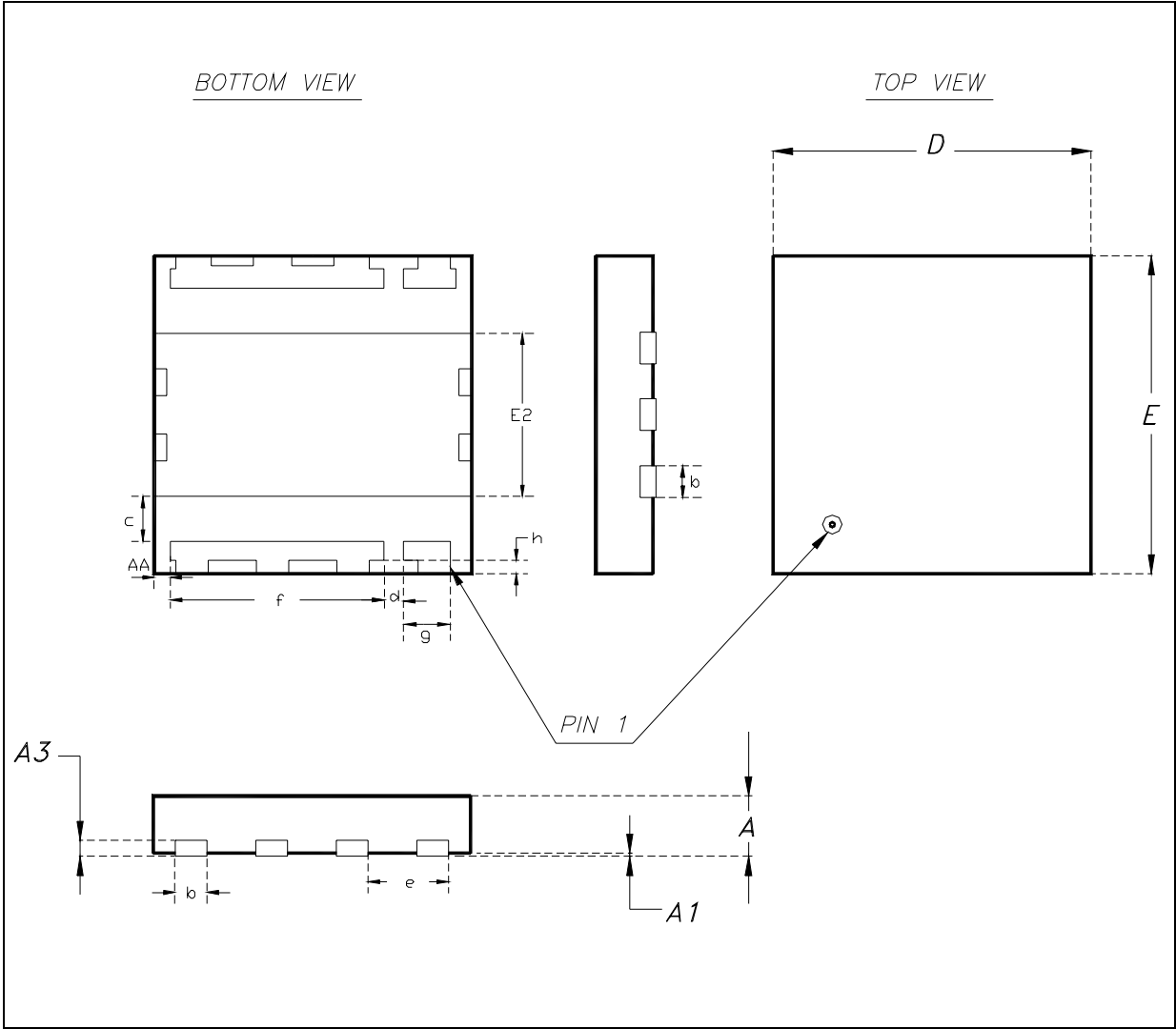
  

NOTES:

1. 10° SPROCKET HOLE PITCH CUMULATIVE TOLERANCE  $\pm 0.2$
2. CAMBER IN COMPLIANCE WITH ETA 481
3. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

PowerFLAT™ MECHANICAL DATA

| DIM. | mm   |      |      | Inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX  | MIN.  | TYP.  | MAX   |
| A    |      | 0.90 | 1.00 |       | 0.035 | 0.039 |
| A1   |      | 0.02 | 0.05 |       | 0.001 | 0.002 |
| A3   |      | 0.24 |      |       | 0.009 |       |
| AA   | 0.15 | 0.25 | 0.35 | 0.006 | 0.01  | 0.014 |
| b    | 0.43 | 0.51 | 0.58 | 0.017 | 0.020 | 0.023 |
| c    | 0.64 | 0.71 | 0.79 | 0.025 | 0.028 | 0.031 |
| D    |      | 5.00 |      |       | 0.197 |       |
| d    |      | 0.30 |      |       | 0.011 |       |
| E    |      | 5.00 |      |       | 0.197 |       |
| E2   | 2.49 | 2.57 | 2.64 | 0.098 | 0.101 | 0.104 |
| e    |      | 1.27 |      |       | 0.050 |       |
| f    |      | 3.37 |      |       | 0.132 |       |
| g    |      | 0.74 |      |       | 0.03  |       |
| h    |      | 0.21 |      |       | 0.008 |       |



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