Integrated Silicon Pressure Sensor On-Chip Signal Conditioned, Temperature Compensated and Calibrated

MPXV7025G SERIES

INTEGRATED PRESSURE SENSOR -25 to 25 kPa (-3.6 to 3.6 psi) 0.2 to 4.7 V OUTPUT

The MPXV7025G series piezoresistive transducer is a state-of-the-art monolithic silicon pressure sensor designed for a wide range of applications, but particularly those employing a microcontroller or microprocessor with A/D inputs. This patented, single element transducer combines advanced micromachining techniques, thin-film metallization, and bipolar processing to provide an accurate, high level analog output signal that is proportional to the applied pressure.

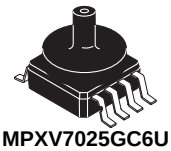
Features

- 5.0% Maximum Error Over 0° to 85°C
- Ideally Suited for Microprocessor or Microcontroller-Based Systems
- Temperature Compensated Over –40° to +125°C
- Thermoplastic (PPS) Surface Mount Package
- Patented Silicon Shear Stress Strain Gauge
- Available in Differential and Gauge Configurations

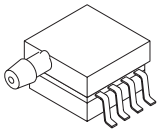
Typical Applications

- Respiratory Systems
- Process Control
- Patient Monitoring
- Remote Monitoring Devices

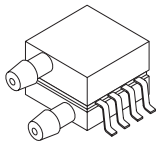
SMALL OUTLINE PACKAGE



MPXV7025GC6U
CASE 482A-01



MPXV7025GP
CASE 1369-01



MPXV7025DP
CASE 1351-01

ORDERING INFORMATION					
Device Type	**Options**	**Case No.**	**MPX Series Order No.**	**Packing Options**	**Device Marking**
SMALL OUTLINE PACKAGE (MPXV7025G SERIES)					
Ported Elements	Gauge, Axial Port, SMT	482A	MPXV7025GC6U	Rails	MPXV7025G
		482A	MPXV7025GC6T1	Tape & Reel	MPXV7025G
	Gauge, Side Port, SMT	1369	MPXV7025GP	Trays	MPXV7025G
		1369	MPXV7025GPT1	Tape & Reel	MPXV7025G
	Gauge, Dual Port, SMT	1351	MPXV7025DP	Trays	MPXV7025D
		1351	MPXV7025DPT1	Tape & Reel	MPXV7025D

SMALL OUTLINE PACKAGE PIN NUMBERS[1]			
1	N/C	5	N/C
2	V_S	6	N/C
3	Gnd	7	N/C
4	V_{out}	8	N/C

1. Pins 1, 5, 6, 7, and 8 are internal device connections. Do not connect to external circuitry or ground. Pin 1 is noted by the notch in the lead.

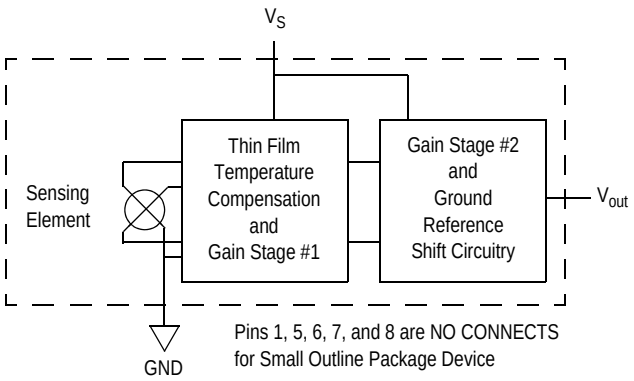


Figure 1. Fully Integrated Pressure Sensor Schematic

Table 1. Maximum Ratings[1]

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{max}	200	kPa
Storage Temperature	T_{stg}	–40° to +125°	°C
Operating Temperature	T_A	–40° to +125°	°C

1. Exposure beyond the specified limits may cause permanent damage or degradation to the device.

Table 2. Operating Characteristics (V_S = 5.0 Vdc, T_A = 25°C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 3 required to meet electrical specifications.)

Characteristic		Symbol	Min	Typ	Max	Unit
Pressure Range[1]		P_{OP}	-25	—	25	kPa
Supply Voltage[2]		V_S	4.75	5.0	5.25	Vdc
Supply Current		I_o	—	7.0	10	mAdc
Minimum Pressure Offset[3] @ V_S = 5.0 Volts	(0 to 85°C)	V_{off}	0.116	0.25	0.384	Vdc
Full Scale Output[4] @ V_S = 5.0 Volts	(0 to 85°C)	V_{FSO}	4.610	4.75	4.890	Vdc
Full Scale Span[5] @ V_S = 5.0 Volts	(0 to 85°C)	V_{FSS}	—	4.5	—	Vdc
Accuracy[6]	(0 to 85°C)	—	—	—	±5.0	$\%V_{FSS}$
Sensitivity		V/P	—	90	—-	mV/kPa
Response Time[7]		t_R	—	1.0	—-	ms
Output Source Current at Full Scale Output		I_{o+}	—	0.1	—-	mAdc
Warm-Up Time[8]		—	—	20	—-	ms
Offset Stability[9]		—	—	±0.5	—-	$\%V_{FSS}$

1. 1.0 kPa (kiloPascal) equals 0.145 psi.
2. Device is ratiometric within this specified excitation range.
3. Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
4. Full Scale Output (V_{FSO}) is defined as the output voltage at the maximum or full rated pressure.
5. Full Scale Span (V_{FSS}) is defined as the algebraic difference between the output voltage at full rated pressure and the output voltage at the minimum rated pressure.
6. Accuracy (error budget) consists of the following:
   - Linearity: Output deviation from a straight line relationship with pressure over the specified pressure range.
   - Temperature Hysteresis: Output deviation at any temperature within the operating temperature range, after the temperature is cycled to and from the minimum or maximum operating temperature points, with zero differential pressure applied.
   - Pressure Hysteresis: Output deviation at any pressure within the specified range, when this pressure is cycled to and from the minimum or maximum rated pressure at 25°C.
   - TcSpan: Output deviation over the temperature range of 0° to 85°C, relative to 25°C.
   - TcOffset: Output deviation with minimum pressure applied, over the temperature range of 0° to 85°C, relative to 25°C.
   - Variation from Nominal: The variation from nominal values, for Offset or Full Scale Span, as a percent of V_{FSS} at 25°C.
7. Response Time is defined as the time for the incremental change in the output to go from 10% to 90% of its final value when subjected to a specified step change in pressure.
8. Warm-up Time is defined as the time required for the product to meet the specified output voltage after the Pressure has been stabilized.
9. Offset Stability is the product's output deviation when subjected to 1000 hours of Pulsed Pressure, Temperature Cycling with Bias Test.

The MPXV7025G series pressure sensor operating characteristics, and internal reliability and qualification tests are based on use of dry air as the pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Contact the factory for information regarding media compatibility in your application.

Figure 2 shows the sensor output signal relative to pressure input. Typical, minimum, and maximum output curves are shown for operation over a temperature range of 0° to 85°C using the decoupling circuit shown in Figure 3. The output will saturate outside of the specified pressure range.

Figure 3 shows the recommended decoupling circuit for interfacing the output of the integrated sensor to the A/D input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

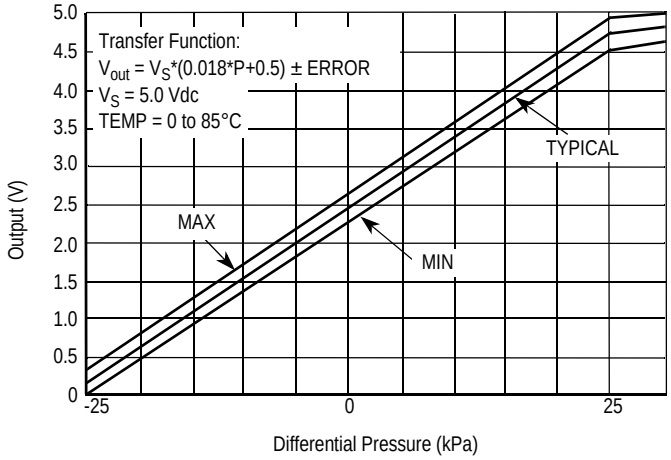


Figure 2. Output versus Pressure Differential

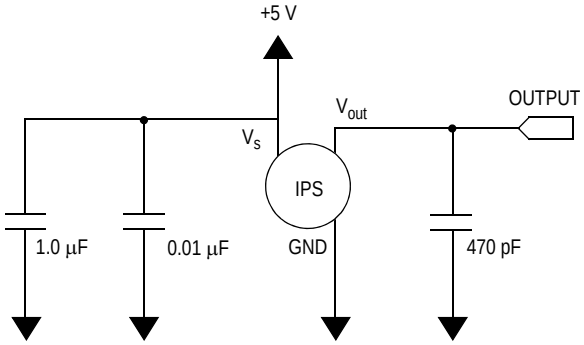


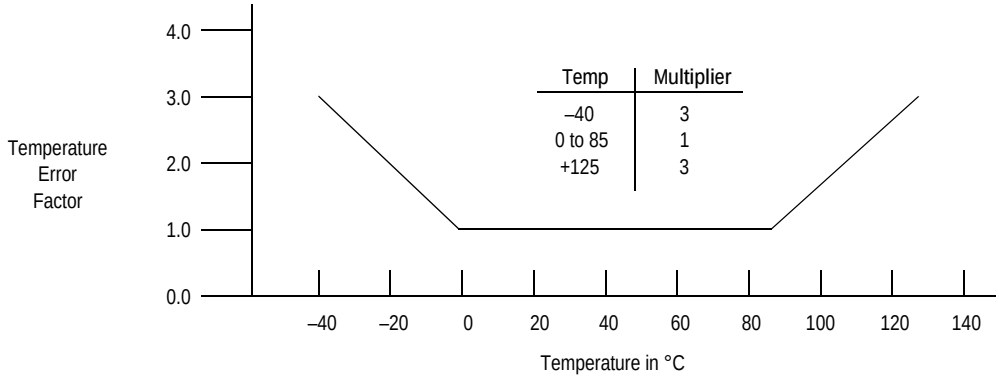
Figure 3. Recommended Power Supply Decoupling and Output Filtering
(For additional output filtering, please refer to Application Note AN1646.)

Transfer Function

Nominal Transfer Value: $V_{out} = V_S (P \times 0.018 + 0.5)$
$\pm$ (Pressure Error x Temp. Factor x 0.018 x V_S)
$V_S = 5.0\ V \pm 0.25\ Vdc$

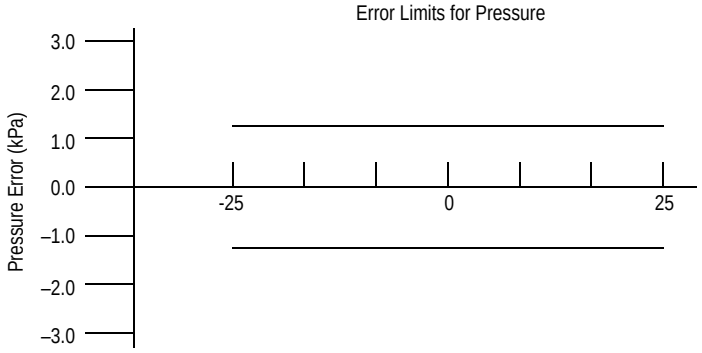
Temperature Error Band

MPXV7025G SERIES



NOTE: The Temperature Multiplier is a linear response from 0° to –40°C and from 85° to 125°C.

Pressure Error Band



Pressure	Error (Max)
-25 to 25 (kPa)	±1.25 (kPa)

PRESSURE (P1)/VACUUM (P2) SIDE IDENTIFICATION TABLE

Freescale designates the two sides of the pressure sensor as the Pressure (P1) side and the Vacuum (P2) side. The Pressure (P1) side is the side containing fluorosilicone gel which protects the die from harsh media. The MPX pressure sensor is designed to operate with positive differential pressure applied, P1 > P2.

The Pressure (P1) side may be identified by using the table below:

Part Number	Case Type	Pressure (P1) Side Identifier
MPX7025GC6U/C6T1	482A	Gauge, Axial Port, SMT
MPXV7025GP/GPT1	1369	Side with Port Attached
MPXV7025DP/DPT1	1351	Side with Part Marking

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the surface mount packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct footprint, the packages will self align when subjected to a solder reflow process. It is always recommended to design boards with a solder mask layer to avoid bridging and shorting between solder pads.

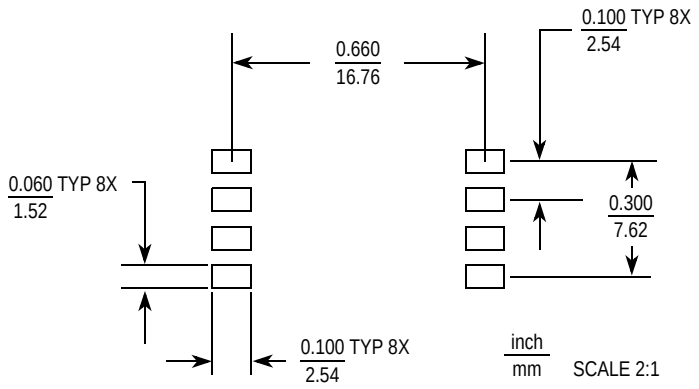
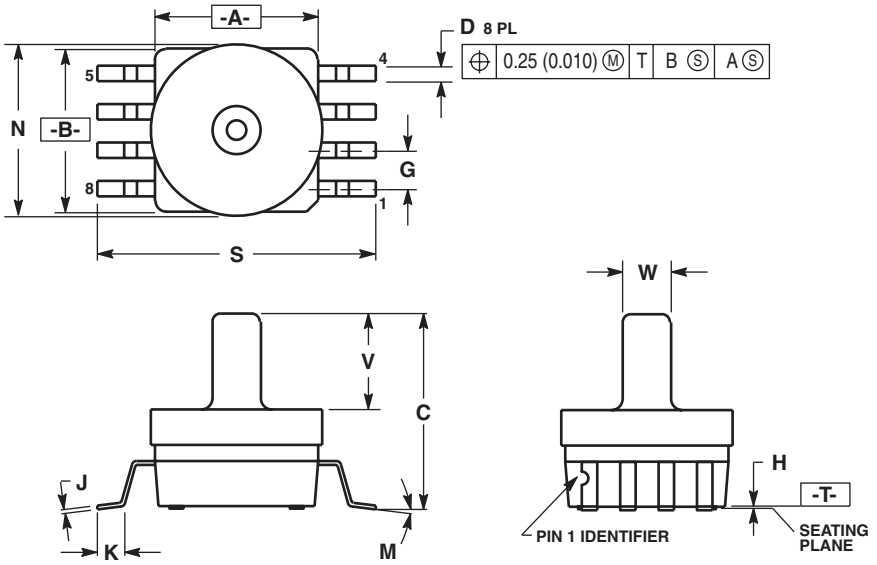


Figure 4. Small Outline Package Footprint

PACKAGE DIMENSIONS

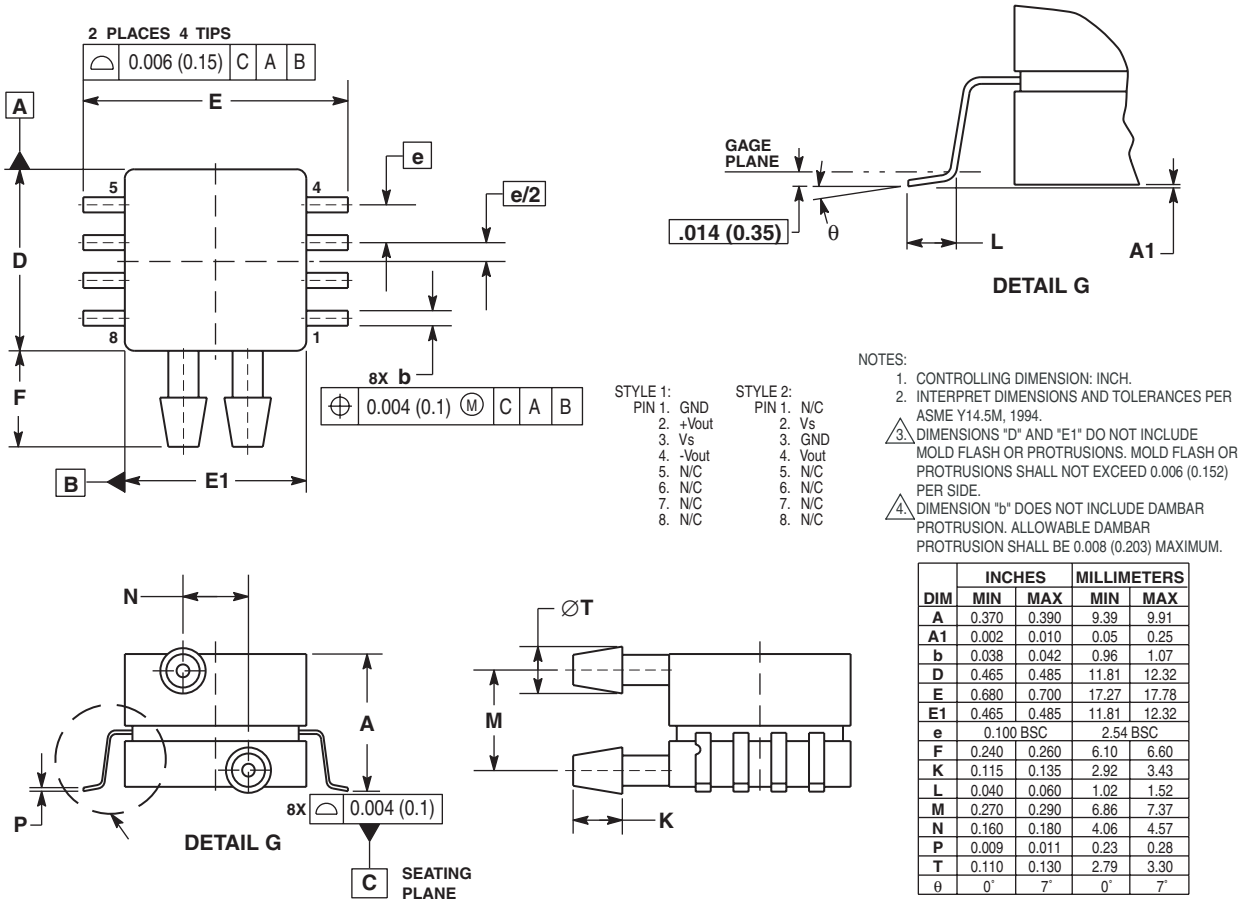


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006).
5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.415	0.425	10.54	10.79
B	0.415	0.425	10.54	10.79
C	0.500	0.520	12.70	13.21
D	0.038	0.042	0.96	1.07
G	0.100 BSC		2.54 BSC	
H	0.002	0.010	0.05	0.25
J	0.009	0.011	0.23	0.28
K	0.061	0.071	1.55	1.80
M	0°	7°	0°	7°
N	0.444	0.448	11.28	11.38
S	0.709	0.725	18.01	18.41
V	0.245	0.255	6.22	6.48
W	0.115	0.125	2.92	3.17

CASE 482A-01
ISSUE A
SMALL OUTLINE PACKAGE

PACKAGE DIMENSIONS



STYLE 1:
PIN 1. GND
2. +Vout
3. Vs
4. -Vout
5. N/C
6. N/C
7. N/C
8. N/C

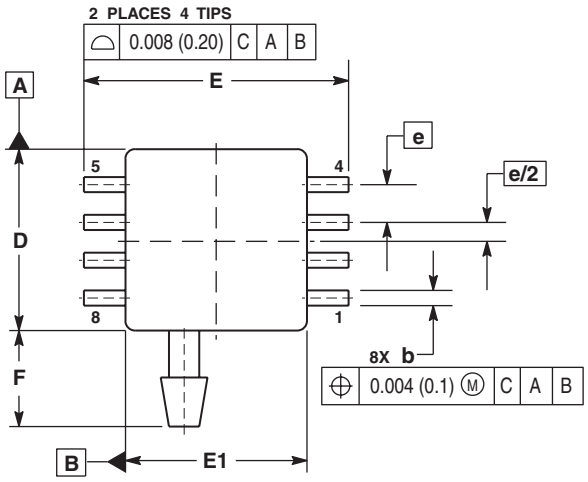
STYLE 2:
PIN 1. N/C
2. Vs
3. GND
4. Vout
5. N/C
6. N/C
7. N/C
8. N/C

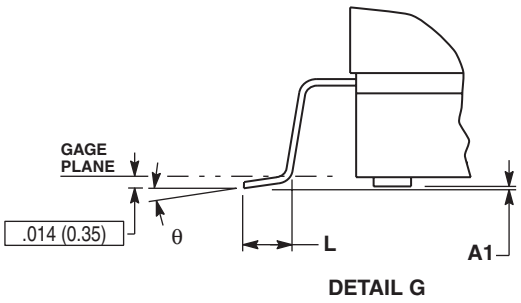
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.006 (0.152) PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.008 (0.203) MAXIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.370	0.390	9.39	9.91
A1	0.002	0.010	0.05	0.25
b	0.038	0.042	0.96	1.07
D	0.465	0.485	11.81	12.32
E	0.680	0.700	17.27	17.78
E1	0.465	0.485	11.81	12.32
e	0.100 BSC		2.54 BSC	
F	0.240	0.260	6.10	6.60
K	0.115	0.135	2.92	3.43
L	0.040	0.060	1.02	1.52
M	0.270	0.290	6.86	7.37
N	0.160	0.180	4.06	4.57
P	0.009	0.011	0.23	0.28
T	0.110	0.130	2.79	3.30
θ	0°	7°	0°	7°

CASE 1351-01
ISSUE O
SMALL OUTLINE PACKAGE

PACKAGE DIMENSIONS





DETAIL G

NOTES:
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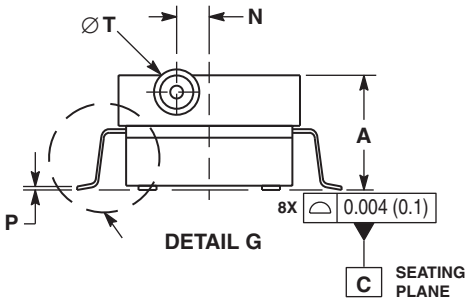

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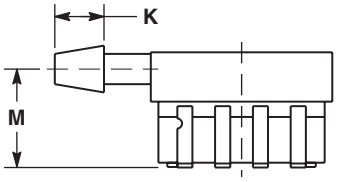

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.300	0.330	7.11	7.62
A1	0.002	0.010	0.05	0.25
b	0.038	0.042	0.96	1.07
D	0.465	0.485	11.81	12.32
E	0.717 BSC		18.21 BSC	
E1	0.465	0.485	11.81	12.32
e	0.100 BSC		2.54 BSC	
F	0.245	0.255	6.22	6.47
K	0.120	0.130	3.05	3.30
L	0.061	0.071	1.55	1.80
M	0.270	0.290	6.86	7.36
N	0.080	0.090	2.03	2.28
P	0.009	0.011	0.23	0.28
T	0.115	0.125	2.92	3.17
θ	0°	7°	0°	7°

CASE 1369-01
ISSUE O
SMALL OUTLINE PACKAGE

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MPXV7025G
Rev 2
08/2007