

# ASM1233D, ASM1233D-L, ASM1233M

## Low Power, 5 V/3.3 V, $\mu$ P Reset, Active LOW, Open-Drain Output

### Description

The ASM1233D-L/1233D/1233M are voltage supervisors with low-power, 5/3.3 V  $\mu$ P Reset, with an active LOW, open-drain output. Maximum supply current over temperature is 15  $\mu$ A for 3.3 V devices and 20  $\mu$ A for 5 V devices.

The ASM1233D-L/1233D/1233M generates an active LOW reset signal whenever the monitored supply is out of tolerance. A precision reference and comparator circuit monitors power supply ( $V_{CC}$ ) level. The tolerances are 5%, 10% and 15%. When an out-of-tolerance condition is detected, an internal power-fail signal is generated which forces an active LOW reset signal. After  $V_{CC}$  returns to an in-tolerance condition, the reset signal remains active for 350 ms to allow the power supply and system microprocessor to stabilize.

The ASM1233D-L/1233D/1233M is designed with an open drain output stage and operates over the extended industrial temperature range. These devices are available in compact SOT-223, SO-8 and TO-92 packages.

Other low power products in this family include ASM1810/11/12/15/16/17.

### Features

- Low Supply Current
- 15  $\mu$ A Maximum ( $\leq 3.6$  V), 20  $\mu$ A Maximum (5.5 V)
- Automatically Restarts a Microprocessor after Power Failure
- 350 ms Reset Delay after  $V_{CC}$  Returns to an In-tolerance Condition
- Active LOW Power-up Reset, 5 k $\Omega$  Internal Pull-up
- Precision Temperature-compensated Voltage Reference and Comparator
- Eliminates External Components
- Low-cost SOT-223/SO-8/TO-92 Packages
- Operating Temperature: -40°C to +85°C

### Applications

- Set-top Boxes
- Cellular Phones
- PDAs
- Energy Management Systems
- Embedded Control Systems
- Printers
- Single Board Computers



ON Semiconductor®

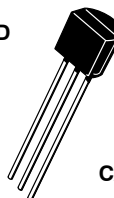
<http://onsemi.com>



SOIC-8  
8 LEAD  
CASE 751BD

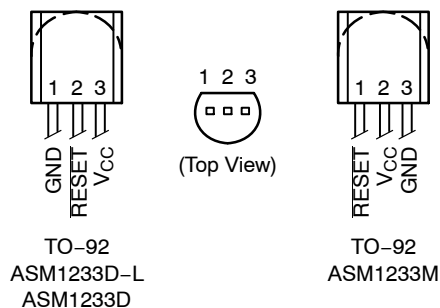
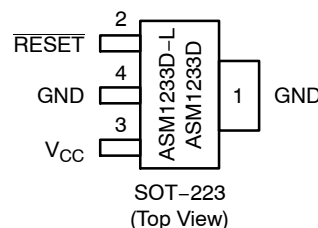
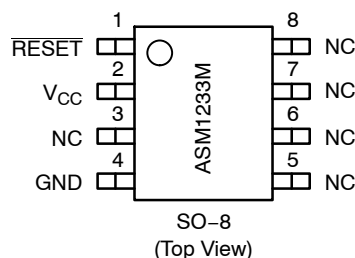


SOT-223  
4 LEAD  
CASE 318E



TO-92  
3 LEAD  
CASE 29-11

### PIN CONFIGURATIONS



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

## ASM1233D, ASM1233D-L, ASM1233M

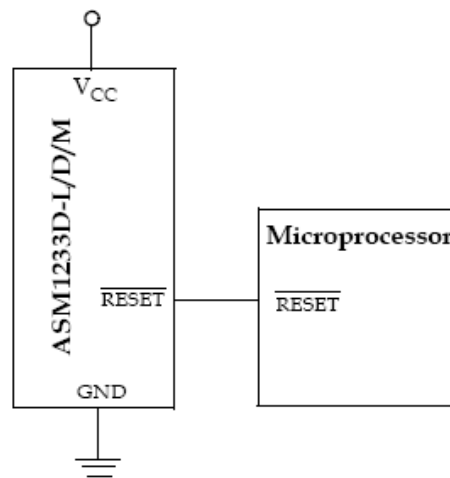


Figure 1. Typical Operating Circuit

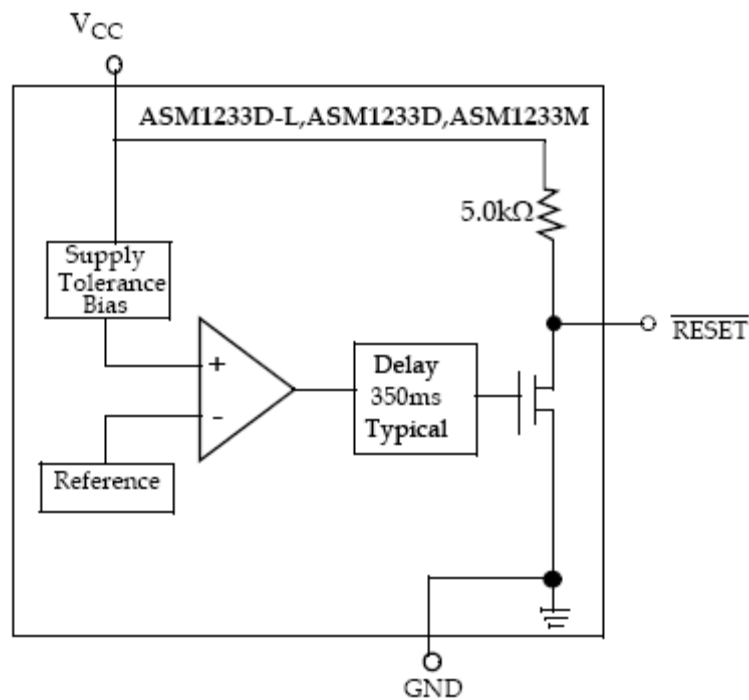


Figure 2. Block Diagram

# ASM1233D, ASM1233D-L, ASM1233M

**Table 1. PIN DESCRIPTION**

| Pin #                           |                   |                |         | Pin Name        | Description              |
|---------------------------------|-------------------|----------------|---------|-----------------|--------------------------|
| TO-92<br>ASM1233D-L<br>ASM1233D | TO-92<br>ASM1233M | SO-8           | SOT-223 |                 |                          |
| 1                               | 3                 | 4              | 1,4     | GND             | Ground.                  |
| 2                               | 1                 | 1              | 2       | RESET           | Active LOW reset output. |
| 3                               | 2                 | 2              | 3       | V <sub>CC</sub> | Power supply input.      |
|                                 |                   | 3, 5, 6, 7 & 8 |         | NC              | No connection.           |

**Table 2. ABSOLUTE MAXIMUM RATINGS**

| Parameter                           |     | Min  | Max                   | Unit |
|-------------------------------------|-----|------|-----------------------|------|
| Voltage on V <sub>CC</sub> (Note 1) |     | -0.5 | 7                     | V    |
| Voltage on RESET (Note 1)           |     | -0.5 | V <sub>CC</sub> + 0.5 | V    |
| Operating Temperature Range         |     | -40  | +85                   | °C   |
| Soldering Temperature (for 10 sec)  |     |      | +260                  | °C   |
| Storage Temperature                 |     | -55  | +125                  | °C   |
| ESD rating                          | HBM |      | 2                     | KV   |
|                                     | MM  |      | 200                   | V    |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Voltages are measured with respect to ground.

# ASM1233D, ASM1233D-L, ASM1233M

**Table 3. DC ELECTRICAL CHARACTERISTICS** (Unless otherwise noted,  $V_{CC} = 5\text{ V} \pm 10\%$  and specifications are over the operating temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . All voltages are referenced to ground.) (Note 2)

| Parameter                                         | Symbol     | Conditions                                     | Min                     | Typ                     | Max  | Unit          |
|---------------------------------------------------|------------|------------------------------------------------|-------------------------|-------------------------|------|---------------|
| Supply Voltage                                    | $V_{CC}$   |                                                | 1.2                     |                         | 5.5  | V             |
| Output Voltage                                    | $V_{OL}$   | RESET asserted                                 |                         |                         | 0.4  | V             |
|                                                   | $V_{OH}$   | $I_{OUT} < 500\text{ }\mu\text{A}$             | $V_{CC} - 0.5\text{ V}$ | $V_{CC} - 0.1\text{ V}$ |      |               |
| Output Current                                    | $I_{OL}$   | Output = 0.4 V                                 | 8                       |                         |      | mA            |
| Operating Current                                 | $I_{CC}$   | $V_{CC} < 5.5\text{ V}$ , RESET output open    |                         | 8                       | 20   | $\mu\text{A}$ |
|                                                   |            | $V_{CC} \leq 3.6\text{ V}$ , RESET output open |                         | 6                       | 15   |               |
| V <sub>CC</sub> Trip Point                        | $V_{CCTP}$ | ASM1233D-LZ-5                                  | 2.98                    | 3.06                    | 3.15 | V             |
|                                                   |            | ASM1233D-LZ-10                                 | 2.8                     | 2.88                    | 2.97 |               |
|                                                   |            | ASM1233D-LZ-15                                 | 2.64                    | 2.72                    | 2.8  |               |
|                                                   |            | ASM1233DZ-5                                    | 4.5                     | 4.625                   | 4.74 |               |
|                                                   |            | ASM1233DZ-10                                   | 4.25                    | 4.375                   | 4.49 |               |
|                                                   |            | ASM1233DZ-15                                   | 4.0                     | 4.125                   | 4.24 |               |
|                                                   |            | ASM1233M-5                                     | 4.25                    | 4.375                   | 4.49 |               |
|                                                   |            | ASM1233M-55                                    | 4.5                     | 4.625                   | 4.75 |               |
|                                                   |            | ASM1233M-3                                     | 2.64                    | 2.72                    | 2.8  |               |
| Voltage High Trip Level                           | $V_{HTL}$  | ASM1233D, ASM1233MS-5, ASM1233MS-55            |                         |                         | 4.75 | V             |
|                                                   |            | ASM1233MS-3                                    |                         |                         | 3.14 |               |
|                                                   |            | ASM1233D-L                                     |                         |                         | 3.06 |               |
| Voltage Low Trip Level                            | $V_{LTL}$  | ASM1233D, ASM1233MS-5, ASM1233MS-55            |                         |                         | 4.00 | V             |
|                                                   |            | ASM1233MS-3                                    |                         |                         | 2.48 |               |
|                                                   |            | ASM1233D-L                                     |                         |                         | 2.3  |               |
| Internal Pull-up Resistor                         | $R_P$      |                                                | 3.5                     | 5.0                     | 7.5  | k $\Omega$    |
| Output Capacitance                                | $C_{OUT}$  |                                                |                         |                         | 10   | pF            |
| V <sub>CC</sub> Detect to RESET Low               | $t_{RPD}$  |                                                |                         | 2                       | 10   | $\mu\text{s}$ |
| V <sub>CC</sub> Detect to RESET High              | $t_{RPU}$  | ASM1233D-L, ASM1233M                           | 200                     | 350                     | 500  | ms            |
|                                                   |            | ASM1233D                                       | 250                     | 350                     | 450  |               |
| V <sub>CC</sub> Slew Rate ( $V_{HTL} - V_{LTL}$ ) | $t_F$      |                                                | 300                     |                         |      | $\mu\text{s}$ |
| V <sub>CC</sub> Slew Rate ( $V_{LTL} - V_{HTL}$ ) | $t_R$      |                                                | 0                       |                         |      | ns            |

2. A 1 k $\Omega$  resistor may be required in some applications for proper operation of the microprocessor reset control circuit.

# ASM1233D, ASM1233D-L, ASM1233M

**Table 4. FAMILY SELECTION GUIDE**

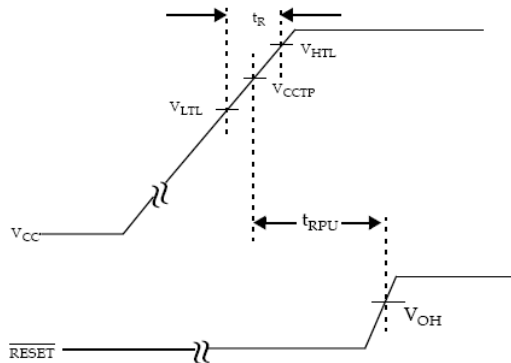
| Part #     | RESET Voltage (V)   | RESET Time (ms) | Output Stage | RESET Polarity |
|------------|---------------------|-----------------|--------------|----------------|
| ASM1810    | 4.620, 4.370, 4.120 | 150             | Push-Pull    | LOW            |
| ASM1811    | 4.620, 4.350, 4.130 | 150             | Open-Drain   | LOW            |
| ASM1812    | 4.620, 4.350, 4.130 | 150             | Push-Pull    | HIGH           |
| ASM1815    | 3.060, 2.880, 2.550 | 150             | Push-Pull    | LOW            |
| ASM1816    | 3.060, 2.880, 2.550 | 150             | Open-Drain   | LOW            |
| ASM1817    | 3.060, 2.880, 2.550 | 150             | Push-Pull    | HIGH           |
| ASM1233D   | 4.625, 4.375, 4.125 | 350             | Open-Drain   | LOW            |
| ASM1233M   | 4.625, 4.375, 2.720 | 350             | Open-Drain   | LOW            |
| ASM1233D-L | 3.060, 2.880, 2.720 | 350             | Open-Drain   | LOW            |

## Application Information

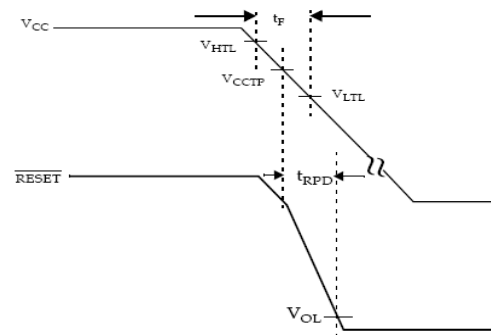
### Operation – Power Monitor

The ASM1233D-L/1233D/1233M detects out-of-tolerance Power supply conditions. It resets a processor during powerup, Power-down and generates a reset to the system Processor when the monitored power supply voltage is below the reset threshold. When an out-of-tolerance  $V_{CC}$

voltage is detected, the  $\overline{\text{RESET}}$  signal is asserted. On power-up,  $\overline{\text{RESET}}$  is kept active (LOW) for approximately 350 ms after the power supply voltage has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before  $\overline{\text{RESET}}$  is released.



**Figure 3. Timing Diagram: Power-Up**



**Figure 4. Timing Diagram: Power-Down**

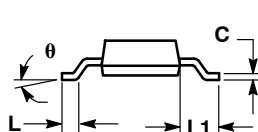
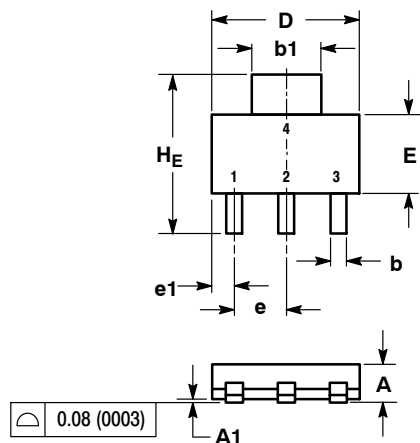
# ASM1233D, ASM1233D-L, ASM1233M

## PACKAGE DIMENSIONS

SOT-223 (TO-261)

CASE 318E-04

ISSUE N

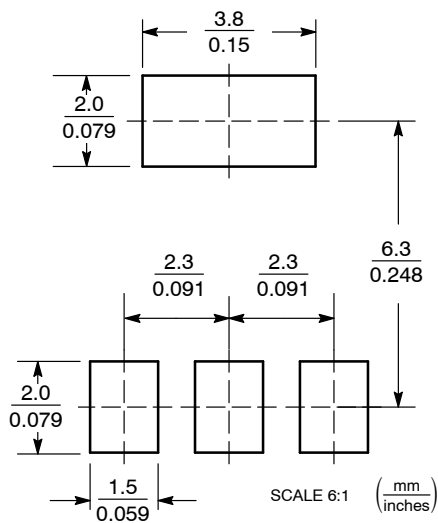


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 1.50        | 1.63 | 1.75 | 0.060  | 0.064 | 0.068 |
| A1  | 0.02        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.60        | 0.75 | 0.89 | 0.024  | 0.030 | 0.035 |
| b1  | 2.90        | 3.06 | 3.20 | 0.115  | 0.121 | 0.126 |
| c   | 0.24        | 0.29 | 0.35 | 0.009  | 0.012 | 0.014 |
| D   | 6.30        | 6.50 | 6.70 | 0.249  | 0.256 | 0.263 |
| E   | 3.30        | 3.50 | 3.70 | 0.130  | 0.138 | 0.145 |
| e   | 2.20        | 2.30 | 2.40 | 0.087  | 0.091 | 0.094 |
| e1  | 0.85        | 0.94 | 1.05 | 0.033  | 0.037 | 0.041 |
| L   | 0.20        | ---  | ---  | 0.008  | ---   | ---   |
| L1  | 1.50        | 1.75 | 2.00 | 0.060  | 0.069 | 0.078 |
| H_E | 6.70        | 7.00 | 7.30 | 0.264  | 0.276 | 0.287 |
| θ   | 0°          | —    | 10°  | 0°     | —     | 10°   |

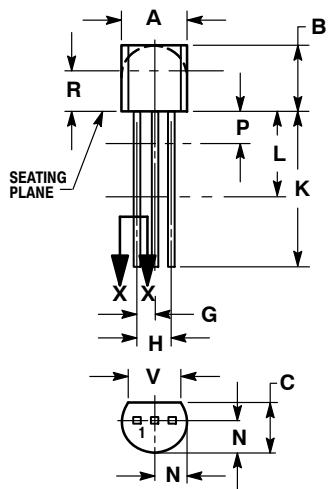
## SOLDERING FOOTPRINT



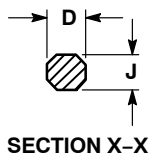
# ASM1233D, ASM1233D-L, ASM1233M

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-11  
ISSUE AM



STRAIGHT LEAD  
BULK PACK



### NOTES:

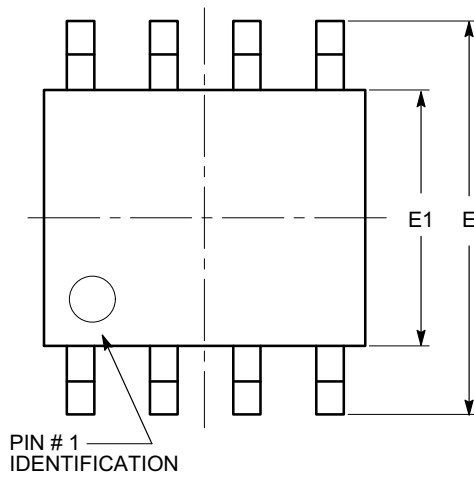
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.175  | 0.205 | 4.45        | 5.20  |
| B   | 0.170  | 0.210 | 4.32        | 5.33  |
| C   | 0.125  | 0.165 | 3.18        | 4.19  |
| D   | 0.016  | 0.021 | 0.407       | 0.533 |
| G   | 0.045  | 0.055 | 1.15        | 1.39  |
| H   | 0.095  | 0.105 | 2.42        | 2.66  |
| J   | 0.015  | 0.020 | 0.39        | 0.50  |
| K   | 0.500  | ---   | 12.70       | ---   |
| L   | 0.250  | ---   | 6.35        | ---   |
| N   | 0.080  | 0.105 | 2.04        | 2.66  |
| P   | ---    | 0.100 | ---         | 2.54  |
| R   | 0.115  | ---   | 2.93        | ---   |
| V   | 0.135  | ---   | 3.43        | ---   |

# ASM1233D, ASM1233D-L, ASM1233M

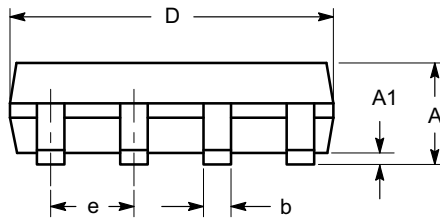
## PACKAGE DIMENSIONS

SOIC 8, 150 mils  
CASE 751BD-01  
ISSUE O

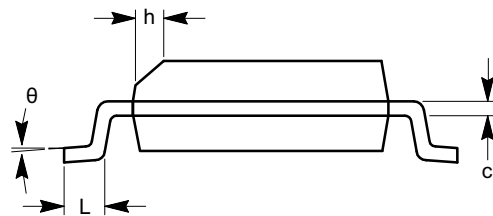


TOP VIEW

| SYMBOL   | MIN      | NOM | MAX  |
|----------|----------|-----|------|
| A        | 1.35     |     | 1.75 |
| A1       | 0.10     |     | 0.25 |
| b        | 0.33     |     | 0.51 |
| c        | 0.19     |     | 0.25 |
| D        | 4.80     |     | 5.00 |
| E        | 5.80     |     | 6.20 |
| E1       | 3.80     |     | 4.00 |
| e        | 1.27 BSC |     |      |
| h        | 0.25     |     | 0.50 |
| L        | 0.40     |     | 1.27 |
| $\theta$ | 0°       |     | 8°   |



SIDE VIEW



END VIEW

### Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MS-012.



# ASM1233D, ASM1233D-L, ASM1233M

**Table 5. ORDERING INFORMATION**

| Part Number                      | RESET Output Voltage | RESET Tolerance | RESET Time | Open Drain Output | RESET Polarity | Package    | Package Marking |
|----------------------------------|----------------------|-----------------|------------|-------------------|----------------|------------|-----------------|
| <b>TIN - LEAD DEVICES</b>        |                      |                 |            |                   |                |            |                 |
| ASM1233D-L-5<br>(ASM1233A-5)     | 3.06                 | 5%              | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-L-5    |
| ASM1233D-L-10<br>(ASM1233A-10)   | 2.88                 | 10%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-L-10   |
| ASM1233D-L-15<br>(ASM1233A-15)   | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-L-15   |
| ASM1233D-LZ-5<br>(ASM1233AZ-5)   | 3.06                 | 5%              | 350 ms     | ◆                 | LOW            | 4L SOT-223 | RVLL            |
| ASM1233D-LZ-10<br>(ASM1233AZ-10) | 2.88                 | 10%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | RWLL            |
| ASM1233D-LZ-15<br>(ASM1233AZ-15) | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | RXLL            |
| ASM1233D-5                       | 4.625                | 5%              | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-5      |
| ASM1233D-10                      | 4.375                | 10%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-10     |
| ASM1233D-15                      | 4.125                | 15%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-15     |
| ASM1233DZ-5                      | 4.625                | 5%              | 350 ms     | ◆                 | LOW            | 4L SOT-223 | RSLL            |
| ASM1233DZ-10                     | 4.375                | 10%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | RTLL            |
| ASM1233DZ-15                     | 4.125                | 15%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | RULL            |
| ASM1233M-55                      | 4.625                | 5%              | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233M-55     |
| ASM1233M-5                       | 4.375                | 10%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233M-5      |
| ASM1233M-3                       | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233M-3      |
| ASM1233MS-55                     | 4.625                | 5%              | 350 ms     | ◆                 | LOW            | 8L SOIC    | ASM1233MS-55    |
| ASM1233MS-5                      | 4.38                 | 10%             | 350 ms     | ◆                 | LOW            | 8L SOIC    | ASM1233MS-5     |
| ASM1233MS-3                      | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 8L SOIC    | ASM1233MS-3     |
| <b>LEAD FREE DEVICES</b>         |                      |                 |            |                   |                |            |                 |
| ASM1233D-L-5F                    | 3.06                 | 5%              | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-L-5F   |
| ASM1233D-L-10F                   | 2.88                 | 10%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-L-10F  |
| ASM1233D-L-15F                   | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-L-15F  |
| ASM1233D-LZ-5F                   | 3.06                 | 5%              | 350 ms     | ◆                 | LOW            | 4L SOT-223 | KVLL            |
| ASM1233D-LZ-10F                  | 2.88                 | 10%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | KWLL            |
| ASM1233D-LZ-15F                  | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | KXLL            |
| ASM1233D-5F                      | 4.625                | 5%              | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-5F     |
| ASM1233D-10F                     | 4.375                | 10%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-10F    |
| ASM1233D-15F                     | 4.125                | 15%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233D-15F    |
| ASM1233DZ-5F                     | 4.625                | 5%              | 350 ms     | ◆                 | LOW            | 4L SOT-223 | KSLL            |
| ASM1233DZ-10F                    | 4.375                | 10%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | KTLL            |
| ASM1233DZ-15F                    | 4.125                | 15%             | 350 ms     | ◆                 | LOW            | 4L SOT-223 | KULL            |
| ASM1233M-5F                      | 4.375                | 5%              | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233M-5F     |
| ASM1233M-55F                     | 4.625                | 10%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233M-55F    |
| ASM1233M-3F                      | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 3L TO-92   | ASM1233M-3F     |
| ASM1233MS-5F                     | 4.38                 | 5%              | 350 ms     | ◆                 | LOW            | 8L SOIC    | ASM1233MS-5F    |
| ASM1233MS-55F                    | 4.625                | 10%             | 350 ms     | ◆                 | LOW            | 8L SOIC    | ASM1233MS-55F   |
| ASM1233MS-3F                     | 2.72                 | 15%             | 350 ms     | ◆                 | LOW            | 8L SOIC    | ASM1233MS-3F    |

# ASM1233D, ASM1233D-L, ASM1233M

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