

# ASM3P2762A

## Low Power Peak EMI Reducing Solution

### Description

The ASM3P2762A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2762A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2762A allows significant system cost savings by reducing the number of circuit board layers, ferrite beads and shielding that are traditionally required to pass EMI regulations.

The ASM3P2762A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2762A modulates the output of a single PLL in order to “spread” the bandwidth of a synthesized clock, and more importantly, decreases the peak amplitudes of its harmonics. This results in significantly lower system EMI compared to the typical narrow band signal produced by oscillators and most frequency generators. Lowering EMI by increasing a signal’s bandwidth is called ‘spread spectrum clock generation.’

### Applications

The ASM3P2762A is targeted towards all portable devices with very low power requirements like MP3 players and digital still cameras.

### Features

- Generates an EMI Optimized Clock Signal at the Output
- Integrated Loop Filter Components
- Operates with a 3.3 V / 2.5 V Supply
- Operating Current less than 6 mA
- Low Power CMOS Design
- Input Frequency Range:
  - 6 MHz to 12 MHz for 2.5 V
  - 6 MHz to 13 MHz for 3.3 V
- Generates a 1X Low EMI Spread Spectrum Clock of the Input Frequency
- Frequency Deviation: -1.25% (Typ) @ 10 MHz Input Frequency
- Available in 6-pin TSOT-23, 8-pin SOIC and 8-pin TSSOP Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



**ON Semiconductor®**

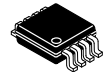
<http://onsemi.com>



**TSOT-6  
O SUFFIX  
CASE 419AF**

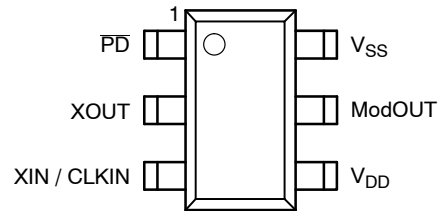


**TSSOP-8  
T SUFFIX  
CASE 948AL**

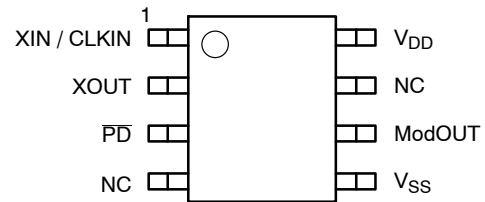


**SOIC-8  
S SUFFIX  
CASE 751BD**

### PIN CONFIGURATIONS



6-Pin TSOT-23 Package  
(Top View)



8-Pin SOIC and TSSOP Packages  
(Top View)

### KEY SPECIFICATIONS

| Description              | Specification                            |
|--------------------------|--|
| Supply Voltages          | $V_{DD} = 3.3 \text{ V} / 2.5 \text{ V}$ |
| Cycle-to-Cycle Jitter    | 200 pS (Max)                             |
| Output Duty Cycle        | 45/55%                                   |
| Modulation Rate Equation | $F_{IN}/256$                             |
| Frequency Deviation      | -1.25% (Typ)<br>@ 10 MHz                 |

### ORDERING INFORMATION

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

# ASM3P2762A

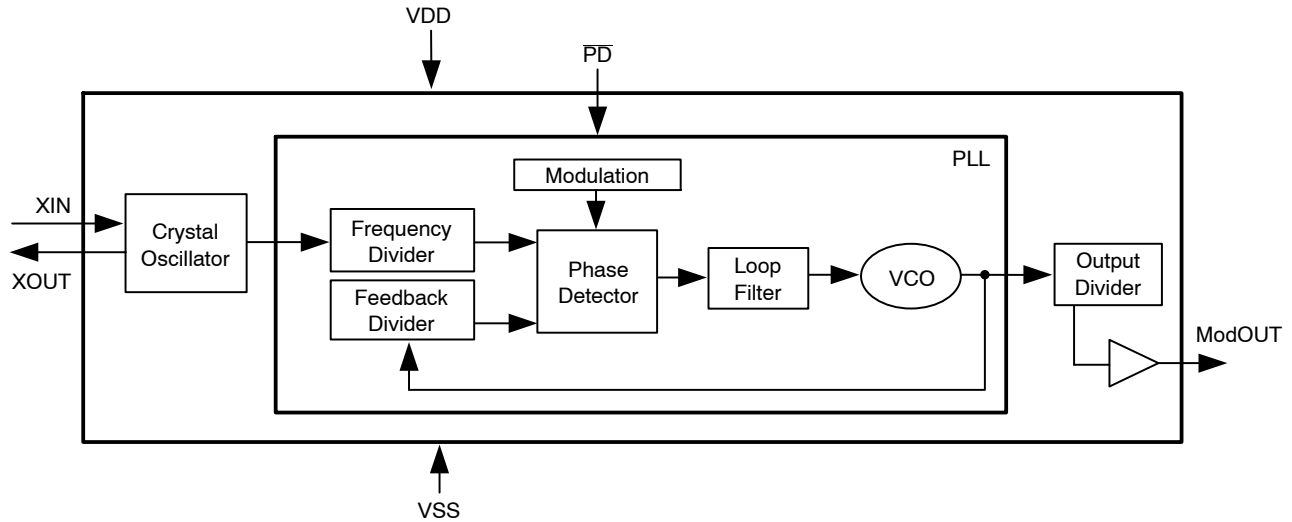


Figure 1. Block Diagram

Table 1. PIN DESCRIPTION (6-Pin TSOT-23 Package)

| Pin# | Pin Name        | Type | Description  |
|------|-----------------|------|--|
| 1    | $\overline{PD}$ | I    | Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used.  |
| 2    | XOUT            | O    | Crystal connection. If using an external reference, this pin must be left unconnected.   |
| 3    | XIN / CLKIN     | I    | Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock. |
| 4    | V <sub>DD</sub> | P    | Power supply for the entire chip.  |
| 5    | ModOUT          | O    | Spread spectrum clock output.  |
| 6    | V <sub>SS</sub> | P    | Ground connection.   |

Table 2. PIN DESCRIPTION (8-Pin SOIC and TSSOP Packages)

| Pin# | Pin Name        | Type | Description  |
|------|-----------------|------|--|
| 1    | XIN / CLKIN     | I    | Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock. |
| 2    | XOUT            | O    | Crystal connection. If using an external reference, this pin must be left unconnected.   |
| 3    | $\overline{PD}$ | I    | Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used.  |
| 4    | NC              | -    | No connect.  |
| 5    | V <sub>SS</sub> | P    | Ground connection.   |
| 6    | ModOUT          | O    | Spread spectrum clock output.  |
| 7    | NC              | -    | No connect.  |
| 8    | V <sub>DD</sub> | P    | Power supply for the entire chip.  |

# ASM3P2762A

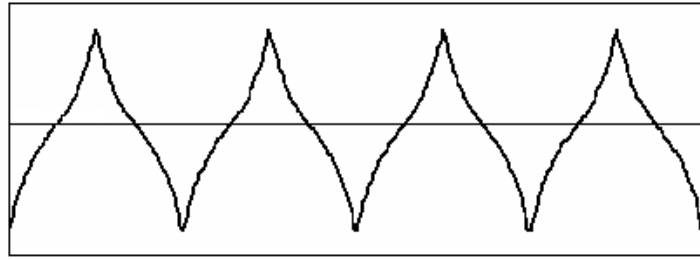


Figure 2. Modulation Profile

Table 3. SPECIFICATIONS

| Description         |                  | Specification          |
|---------------------|------------------|------------------------|
| Frequency Range     | For 2.5 V Supply | 6 MHz < CLKIN < 12 MHz |
|                     | For 3.3 V Supply | 6 MHz < CLKIN < 13 MHz |
| Modulation Equation |                  | $F_{IN}/256$           |
| Frequency Deviation |                  | -1.25% (Typ) @ 10 MHz  |

Table 4. ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter   | Rating       | Unit |
|------------------|---|--------------|------|
| $V_{DD}, V_{IN}$ | Voltage on any pin with respect to Ground             | -0.5 to +4.6 | V    |
| $T_{STG}$        | Storage temperature                                   | -65 to +125  | °C   |
| $T_A$            | Operating temperature                                 | -40 to +85   | °C   |
| $T_s$            | Max. Soldering Temperature (10 sec)                   | 260          | °C   |
| $T_J$            | Junction Temperature                                  | 150          | °C   |
| $T_{DV}$         | Static Discharge Voltage (As per JEDEC STD22- A114-B) | 2            | KV   |

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.

Table 5. DC ELECTRICAL CHARACTERISTICS FOR 2.5 V SUPPLY

(Test condition: All parameters are measured at room temperature (+25°C) unless otherwise stated.)

| Symbol    | Parameter  | Min          | Typ | Max          | Unit |
|-----------|--|--------------|-----|--------------|------|
| $V_{IL}$  | Input low voltage  | $V_{SS}-0.3$ | -   | 0.8          | V    |
| $V_{IH}$  | Input high voltage   | 2.0          | -   | $V_{DD}+0.3$ | V    |
| $I_{IL}$  | Input low current  | -            | -   | -35          | μA   |
| $I_{IH}$  | Input high current   | -            | -   | 35           | μA   |
| $I_{XOL}$ | XOUT output low current (@ 0.5 V, $V_{DD} = 2.5$ V)        | -            | 3   | -            | mA   |
| $I_{XOH}$ | XOUT output high current (@ 1.8 V, $V_{DD} = 2.5$ V)       | -            | 3   | -            | mA   |
| $V_{OL}$  | Output low voltage ( $V_{DD} = 2.5$ V, $I_{OL} = 8$ mA)    | -            | -   | 0.6          | V    |
| $V_{OH}$  | Output high voltage ( $V_{DD} = 2.5$ V, $I_{OH} = 8$ mA)   | 1.8          | -   | -            | V    |
| $I_{DD}$  | Static supply current (Note 1)                             | -            | -   | 10           | μA   |
| $I_{CC}$  | Dynamic supply current (2.5 V, 10 MHz and no load)         | -            | 2   | -            | mA   |
| $V_{DD}$  | Operating Voltage  | 2.375        | 2.5 | 2.625        | V    |
| $t_{ON}$  | Power-up time (first locked cycle after power-up) (Note 2) | -            | -   | 5            | mS   |
| $Z_{OUT}$ | Output impedance   | -            | 50  | -            | Ω    |

1.  $\overline{PD}$  pin is pulled low.
2.  $V_{DD}$  and XIN / CLKIN input are stable,  $\overline{PD}$  pin is made high from low.

# ASM3P2762A

**Table 6. AC ELECTRICAL CHARACTERISTICS FOR 2.5 V SUPPLY**

| Symbol            | Parameter                                       | Min                      | Typ | Max   | Unit |   |
|-------------------|---|--------------------------|-----|-------|------|---|
| CLKIN             | Input frequency                                 | 6                        | –   | 12    | MHz  |   |
| ModOUT            | Output frequency                                | 6                        | –   | 12    | MHz  |   |
| $f_d$             | Frequency Deviation                             | Input Frequency = 6 MHz  | –   | –1.75 | –    | % |
|                   |   | Input Frequency = 12 MHz | –   | –0.95 | –    |   |
| $t_{LH}$ (Note 3) | Output rise time (measured from 0.7 V to 1.7 V) | 0.7                      | 1.1 | 1.4   | nS   |   |
| $t_{HL}$ (Note 3) | Output fall time (measured from 1.7 V to 0.7 V) | 0.5                      | 0.8 | 1.0   | nS   |   |
| $t_{JC}$          | Jitter (cycle-to-cycle)                         | –                        | –   | 200   | pS   |   |
| $t_D$             | Output duty cycle                               | 45                       | 50  | 55    | %    |   |

3.  $t_{LH}$  and  $t_{HL}$  are measured into a capacitive load of 15 pF.

**Table 7. DC ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY**

(Test condition: All parameters are measured at room temperature (+25°C) unless otherwise stated.)

| Symbol    | Parameter  | Min          | Typ | Max          | Unit     |
|-----------|--|--------------|-----|--------------|----------|
| $V_{IL}$  | Input low voltage  | $V_{SS}-0.3$ | –   | 0.8          | V        |
| $V_{IH}$  | Input high voltage   | 2.0          | –   | $V_{DD}+0.3$ | V        |
| $I_{IL}$  | Input low current  | –            | –   | –35          | $\mu$ A  |
| $I_{IH}$  | Input high current   | –            | –   | 35           | $\mu$ A  |
| $I_{XOL}$ | XOUT output low current (@ 0.4 V, $V_{DD} = 3.3$ V)        | –            | 3   | –            | mA       |
| $I_{XOH}$ | XOUT output high current (@ 2.5 V, $V_{DD} = 3.3$ V)       | –            | 3   | –            | mA       |
| $V_{OL}$  | Output low voltage ( $V_{DD} = 3.3$ V, $I_{OL} = 8$ mA)    | –            | –   | 0.4          | V        |
| $V_{OH}$  | Output high voltage ( $V_{DD} = 3.3$ V, $I_{OH} = 8$ mA)   | 2.5          | –   | –            | V        |
| $I_{DD}$  | Static supply current (Note 4)                             | –            | –   | 10           | $\mu$ A  |
| $I_{CC}$  | Dynamic supply current (3.3 V, 10 MHz and no load)         | –            | 3   | –            | mA       |
| $V_{DD}$  | Operating voltage  | 2.7          | 3.3 | 3.6          | V        |
| $t_{ON}$  | Power-up time (first locked cycle after power-up) (Note 5) | –            | –   | 5            | mS       |
| $Z_{OUT}$ | Output impedance   | –            | 45  | –            | $\Omega$ |

4.  $\overline{PD}$  pin is pulled low.

5.  $V_{DD}$  and XIN / CLKIN input are stable;  $\overline{PD}$  pin is made high from low.

**Table 8. AC ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY**

| Symbol            | Parameter                                     | Min                      | Typ | Max   | Unit |   |
|-------------------|---|--------------------------|-----|-------|------|---|
| CLKIN             | Input frequency                               | 6                        | –   | 13    | MHz  |   |
| ModOUT            | Output frequency                              | 6                        | –   | 13    | MHz  |   |
| $f_d$             | Frequency Deviation                           | Input Frequency = 6 MHz  | –   | –1.75 | –    | % |
|                   |   | Input Frequency = 13 MHz | –   | –0.9  | –    |   |
| $t_{LH}$ (Note 6) | Output rise time (measured from 0.8 to 2.0 V) | 0.5                      | 1.0 | 1.4   | nS   |   |
| $t_{HL}$ (Note 6) | Output fall time (measured at 2.0 V to 0.8 V) | 0.4                      | 0.9 | 1.2   | nS   |   |
| $t_{JC}$          | Jitter (cycle-to-cycle)                       | –                        | –   | 200   | pS   |   |
| $t_D$             | Output duty cycle                             | 45                       | 50  | 55    | %    |   |

6.  $t_{LH}$  and  $t_{HL}$  are measured into a capacitive load of 15 pF.

## ASM3P2762A

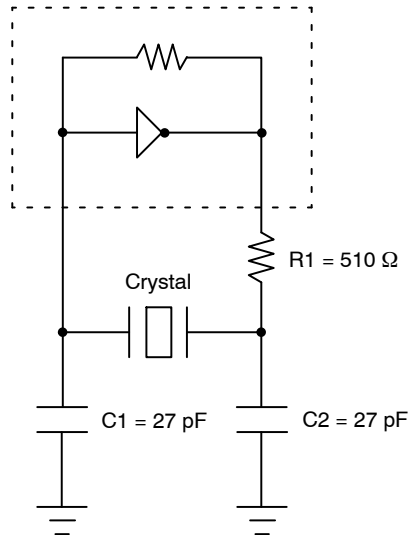


Figure 3. Typical Crystal Oscillator Circuit

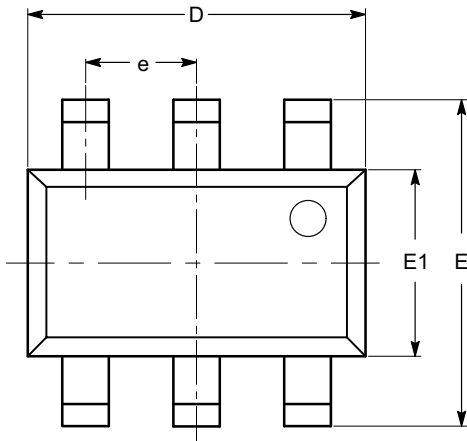
Table 9. TYPICAL CRYSTAL SPECIFICATIONS

| Fundamental AT Cut Parallel Resonant Crystal |                           |
|--|---------------------------|
| Nominal frequency                            | 8.000 MHz                 |
| Frequency tolerance                          | ±50 ppm or better at 25°C |
| Operating temperature range                  | -25°C to +85°C            |
| Storage temperature                          | -40°C to +85°C            |
| Load capacitance                             | 18 pF                     |
| Shunt capacitance                            | 7 pF maximum              |
| ESR  | 25 Ω                      |

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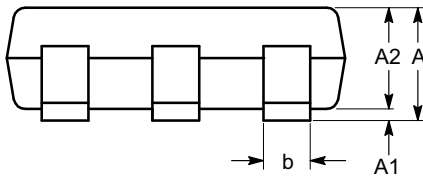
## PACKAGE DIMENSIONS

TSOT-23, 6 LEAD  
CASE 419AF-01  
ISSUE O

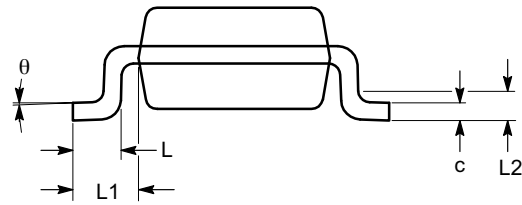


TOP VIEW

| SYMBOL   | MIN      | NOM  | MAX  |
|----------|----------|------|------|
| A        |          |      | 1.00 |
| A1       | 0.01     | 0.05 | 0.10 |
| A2       | 0.80     | 0.87 | 0.90 |
| b        | 0.30     |      | 0.45 |
| c        | 0.12     | 0.15 | 0.20 |
| D        | 2.90 BSC |      |      |
| E        | 2.80 BSC |      |      |
| E1       | 1.60 BSC |      |      |
| e        | 0.95 TYP |      |      |
| L        | 0.30     | 0.40 | 0.50 |
| L1       | 0.60 REF |      |      |
| L2       | 0.25 BSC |      |      |
| $\theta$ | 0°       |      | 8°   |



SIDE VIEW



END VIEW

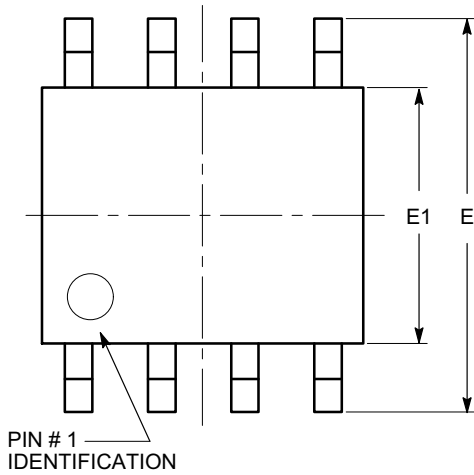
### Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-193.

# ASM3P2762A

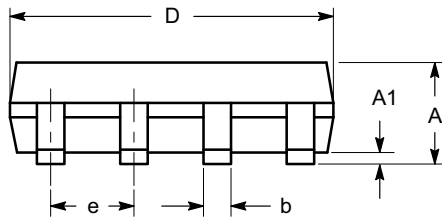
## PACKAGE DIMENSIONS

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

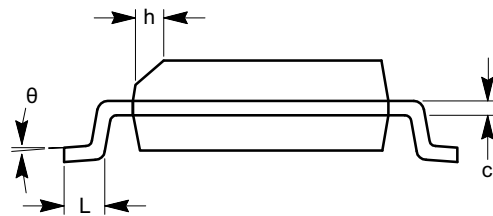


TOP VIEW

| 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

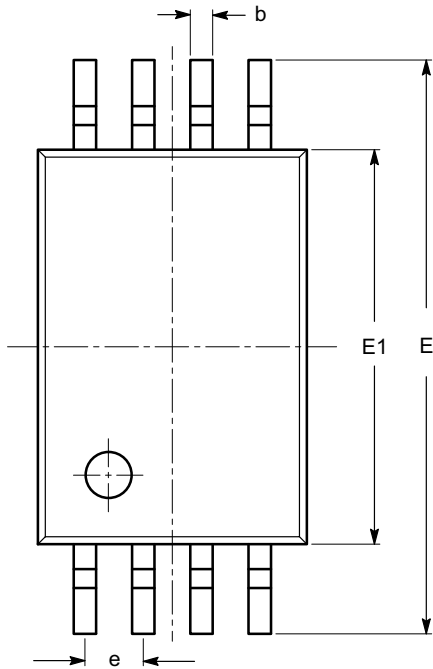
**Notes:**

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

# ASM3P2762A

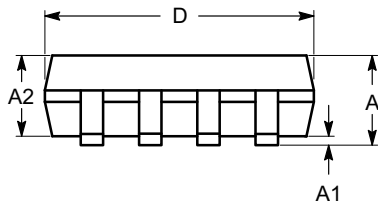
## PACKAGE DIMENSIONS

TSSOP8, 4.4x3  
CASE 948AL-01  
ISSUE O

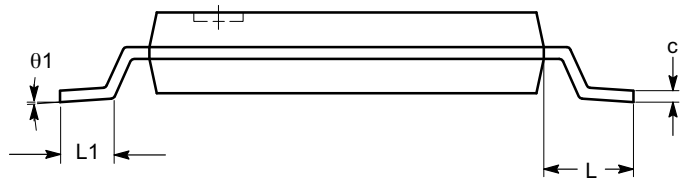


| SYMBOL   | MIN      | NOM  | MAX  |
|----------|----------|------|------|
| A        |          |      | 1.20 |
| A1       | 0.05     |      | 0.15 |
| A2       | 0.80     | 0.90 | 1.05 |
| b        | 0.19     |      | 0.30 |
| c        | 0.09     |      | 0.20 |
| D        | 2.90     | 3.00 | 3.10 |
| E        | 6.30     | 6.40 | 6.50 |
| E1       | 4.30     | 4.40 | 4.50 |
| e        | 0.65 BSC |      |      |
| L        | 1.00 REF |      |      |
| L1       | 0.50     | 0.60 | 0.75 |
| $\theta$ | 0°       |      | 8°   |

TOP VIEW



SIDE VIEW



END VIEW

### Notes:


- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.



# ASM3P2762A

**Table 10. ORDERING INFORMATION**

| Part Number      | Marking  | Package Type                        | Temperature |
|------------------|----------|-------------------------------------|-------------|
| ASM3P2762AF-06OR | I4LL     | 6-Pin TSOT-23, TAPE & REEL, Pb Free | Commercial  |
| ASM3P2762AF-08TT | 3P2762AF | 8-Pin TSSOP, TUBE, Pb Free          | Commercial  |
| ASM3P2762AF-08TR | 3P2762AF | 8-Pin TSSOP, TAPE & REEL, Pb Free   | Commercial  |
| ASM3P2762AF-08ST | 3P2762AF | 8-Pin SOIC, TUBE, Pb Free           | Commercial  |
| ASM3P2762AF-08SR | 3P2762AF | 8-Pin SOIC, TAPE & REEL, Pb Free    | Commercial  |
| ASM3P2762AG-06OR | I3LL     | 6-Pin TSOT-23, TAPE & REEL, Green   | Commercial  |
| ASM3P2762AG-08TT | 3P2762AG | 8-Pin TSSOP, TUBE, Green            | Commercial  |
| ASM3P2762AG-08TR | 3P2762AG | 8-Pin TSSOP, TAPE & REEL, Green     | Commercial  |
| ASM3P2762AG-08ST | 3P2762AG | 8-Pin SOIC, TUBE, Green             | Commercial  |
| ASM3P2762AG-08SR | 3P2762AG | 8-Pin SOIC, TAPE & REEL, Green      | Commercial  |
| ASM3I2762AF-06OR | I5LL     | 6-Pin TSOT-23, TAPE & REEL, Pb Free | Industrial  |
| ASM3I2762AF-08TT | 3I2762AF | 8-Pin TSSOP, TUBE, Pb Free          | Industrial  |
| ASM3I2762AF-08TR | 3I2762AF | 8-Pin TSSOP, TAPE & REEL, Pb Free   | Industrial  |
| ASM3I2762AF-08ST | 3I2762AF | 8-Pin SOIC, TUBE, Pb Free           | Industrial  |
| ASM3I2762AF-08SR | 3I2762AF | 8-Pin SOIC, TAPE & REEL, Pb Free    | Industrial  |
| ASM3I2762AG-06OR | I6LL     | 6-Pin TSOT-23, TAPE & REEL, Green   | Industrial  |
| ASM3I2762AG-08TT | 3I2762AG | 8-Pin TSSOP, TUBE, Green            | Industrial  |
| ASM3I2762AG-08TR | 3I2762AG | 8-Pin TSSOP, TAPE & REEL, Green     | Industrial  |
| ASM3I2762AG-08ST | 3I2762AG | 8-Pin SOIC, TUBE, Green             | Industrial  |
| ASM3I2762AG-08SR | 3I2762AG | 8-Pin SOIC, TAPE & REEL, Green      | Industrial  |

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