

### GENERAL DESCRIPTION

The SGM42507 is an integrated driver IC for driving motors and coils in industrial applications. The PH and EN/FAULT pins allow simple interfacing to controller circuits.

Internal protection functions are provided for under-voltage lockout (UVLO), over-current protection (OCP) and over-temperature protection (OTP). Fault conditions are indicated by the EN/FAULT pin.

The SGM42507A is available in a Green TSOT-23-6 package. The SGM42507B/C are available in Green SC70-6 and TSOT-23-6 packages. They operate over an ambient temperature range of -40°C to +125°C.

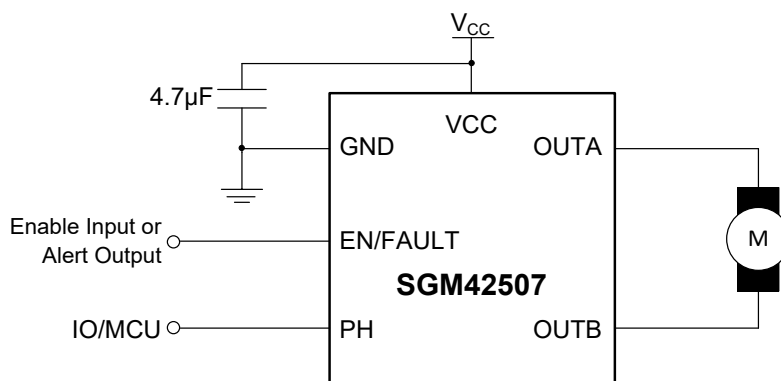
### APPLICATIONS

- Robot
- Utility Meter
- Solenoid

### FEATURES

- **Internal OC/UV/OT Protections**
  - ♦ **Over-Current Threshold Options:**  
**0.45A/0.9A/1.5A**
  - ♦ **Under-Voltage Threshold Options:**  
**1.75V/2.8V/3.6V**
  - ♦ **Over-Temperature Protection**
- **Up to 7.5V Supply Range for Applications Powered by:**
  - ♦ **1 Li+/Poly Cell**
  - ♦ **2/3/4 Dry Cells**
  - ♦ **1/2 LiSOCl<sub>2</sub> Cell(s)**
- **Selectable Slow or Fast Decay Modes**
- **-40°C to +125°C Operating Temperature Range**
- **SGM42507A is Available in a Green TSOT-23-6 Package**  
**SGM42507B/C are Available in Green SC70-6 and TSOT-23-6 Packages**

### TYPICAL APPLICATION



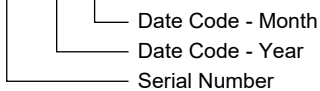
**PACKAGE/ORDERING INFORMATION**

| MODEL          | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER        | PACKAGE MARKING | PACKING OPTION      |
|----------------|---------------------|-----------------------------|------------------------|-----------------|---------------------|
| SGM42507A-1.75 | TSOT-23-6           | -40°C to +125°C             | SGM42507A-1.75XTN6G/TR | GM5XX           | Tape and Reel, 3000 |
| SGM42507A-2.8  | TSOT-23-6           | -40°C to +125°C             | SGM42507A-2.8XTN6G/TR  | GS0XX           | Tape and Reel, 3000 |
| SGM42507A-3.6  | TSOT-23-6           | -40°C to +125°C             | SGM42507A-3.6XTN6G/TR  | GS1XX           | Tape and Reel, 3000 |
| SGM42507B-1.75 | SC70-6              | -40°C to +125°C             | SGM42507B-1.75XC6G/TR  | GPBXX           | Tape and Reel, 3000 |
|                | TSOT-23-6           | -40°C to +125°C             | SGM42507B-1.75XTN6G/TR | M09XX           | Tape and Reel, 3000 |
| SGM42507B-2.8  | SC70-6              | -40°C to +125°C             | SGM42507B-2.8XC6G/TR   | GW8XX           | Tape and Reel, 3000 |
|                | TSOT-23-6           | -40°C to +125°C             | SGM42507B-2.8XTN6G/TR  | M0AXX           | Tape and Reel, 3000 |
| SGM42507B-3.6  | SC70-6              | -40°C to +125°C             | SGM42507B-3.6XC6G/TR   | GW9XX           | Tape and Reel, 3000 |
|                | TSOT-23-6           | -40°C to +125°C             | SGM42507B-3.6XTN6G/TR  | M0BXX           | Tape and Reel, 3000 |
| SGM42507C-1.75 | SC70-6              | -40°C to +125°C             | SGM42507C-1.75XC6G/TR  | GWAXX           | Tape and Reel, 3000 |
|                | TSOT-23-6           | -40°C to +125°C             | SGM42507C-1.75XTN6G/TR | M0CXX           | Tape and Reel, 3000 |
| SGM42507C-2.8  | SC70-6              | -40°C to +125°C             | SGM42507C-2.8XC6G/TR   | GWBXX           | Tape and Reel, 3000 |
|                | TSOT-23-6           | -40°C to +125°C             | SGM42507C-2.8XTN6G/TR  | M0DXX           | Tape and Reel, 3000 |
| SGM42507C-3.6  | SC70-6              | -40°C to +125°C             | SGM42507C-3.6XC6G/TR   | GCWXX           | Tape and Reel, 3000 |
|                | TSOT-23-6           | -40°C to +125°C             | SGM42507C-3.6XTN6G/TR  | M0EXX           | Tape and Reel, 3000 |

**MARKING INFORMATION**

NOTE: XX = Date Code.

**YYY X X**



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**SELECTABLE MODEL**

| MODEL          | OVER-CURRENT PROTECTION THRESHOLD (A) | UNDER-VOLTAGE PROTECTION THRESHOLD (V) |
|----------------|---------------------------------------|--|
| SGM42507A-1.75 | 1.5                                   | 1.75                                   |
| SGM42507A-2.8  | 1.5                                   | 2.8                                    |
| SGM42507A-3.6  | 1.5                                   | 3.6                                    |
| SGM42507B-1.75 | 0.9                                   | 1.75                                   |
| SGM42507B-2.8  | 0.9                                   | 2.8                                    |
| SGM42507B-3.6  | 0.9                                   | 3.6                                    |
| SGM42507C-1.75 | 0.45                                  | 1.75                                   |
| SGM42507C-2.8  | 0.45                                  | 2.8                                    |
| SGM42507C-3.6  | 0.45                                  | 3.6                                    |

**ABSOLUTE MAXIMUM RATINGS**

|  |                            |
|--|----------------------------|
| V <sub>CC</sub> .....                  | -0.3V to 9V <sup>(1)</sup> |
| Digital Input Pin Voltage Range .....  | -0.3V to 6V                |
| Package Thermal Resistance             |                            |
| SC70-6, θ <sub>JA</sub> .....          | 245.8°C/W                  |
| TSOT-23-6, θ <sub>JA</sub> .....       | 217.8°C/W                  |
| Junction Temperature.....              | +150°C                     |
| Storage Temperature Range .....        | -65°C to +150°C            |
| Lead Temperature (Soldering, 10s)..... | +260°C                     |
| ESD Susceptibility                     |                            |
| HBM.....                               | 5000V                      |
| MM.....                                | 300V                       |
| CDM .....                              | 1000V                      |

NOTE 1: Guaranteed SGM42507 work at 7.5V DC and surge to 9V.

**RECOMMENDED OPERATING CONDITIONS**

|                                       |                 |
|---------------------------------------|-----------------|
| V <sub>CC</sub> .....                 | 1.9V to 7.5V    |
| Digital Input Pin Voltage Range ..... | 0V to 5.5V      |
| Ambient Temperature Range.....        | -40°C to +125°C |

**OVERSTRESS CAUTION**

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

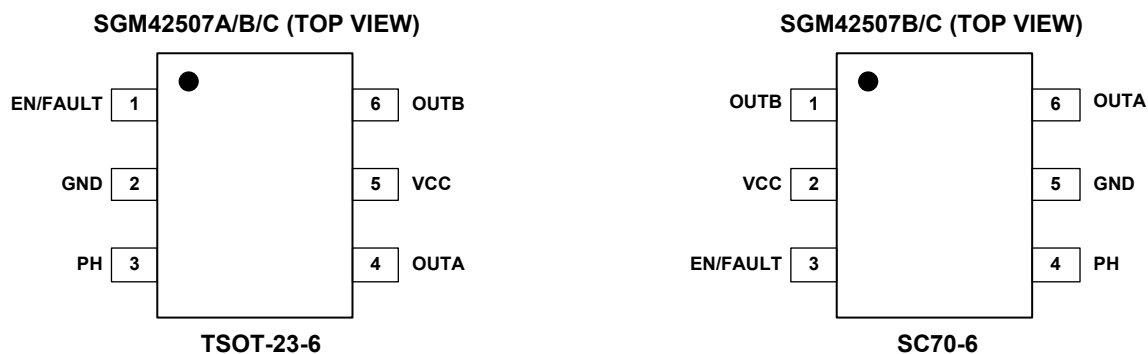
**ESD SENSITIVITY CAUTION**

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

## PIN CONFIGURATIONS



## PIN DESCRIPTION

| NAME     | TYPE | FUNCTION  |
|----------|------|---|
| EN/FAULT | I/O  | Enable Input or Alert Output (OTP, OCP, UVLO) Pin. Logic high to enable normal operation, logic low to enter low power dissipation sleep mode and reset all internal logic. Internal pull-down. This output is not valid when the device into minimum power dissipation sleep mode. |
| GND      | G    | Ground.   |
| PH       | I    | Direction Input Pin ( $V_{PH} \leq V_{CC}$ ). Logic high for sourcing from OUTA and sinking into OUTB, logic low for reverse driving. Internal pull-down.   |
| OUTA     | O    | H-Bridge Output A.  |
| VCC      | P    | Power Input Pin. A 4.7 $\mu$ F (MIN) ceramic bypass capacitor to GND is recommended.  |
| OUTB     | O    | H-Bridge Output B.  |

NOTE: I: input, O: output, I/O: input or output, G: ground, P: power for the circuit.

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = +25°C, V<sub>CC</sub> = 5V, EN/FAULT pin connected to 5V through 500Ω resistor, Full = -40°C to +125°C, unless otherwise noted.)

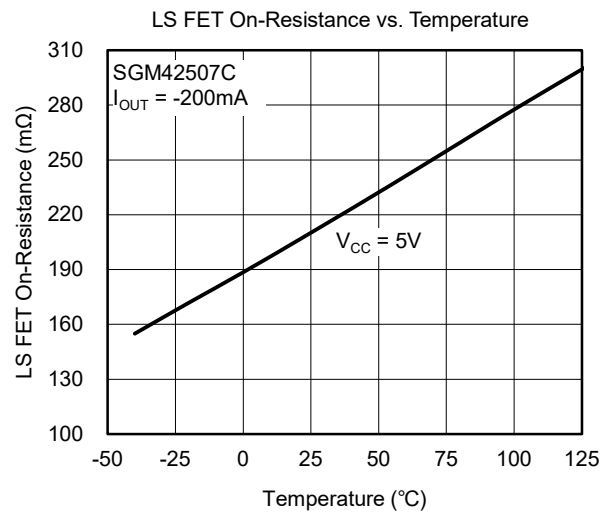
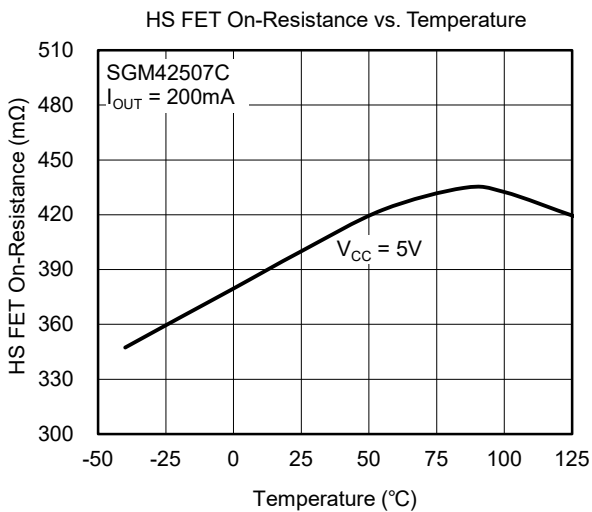
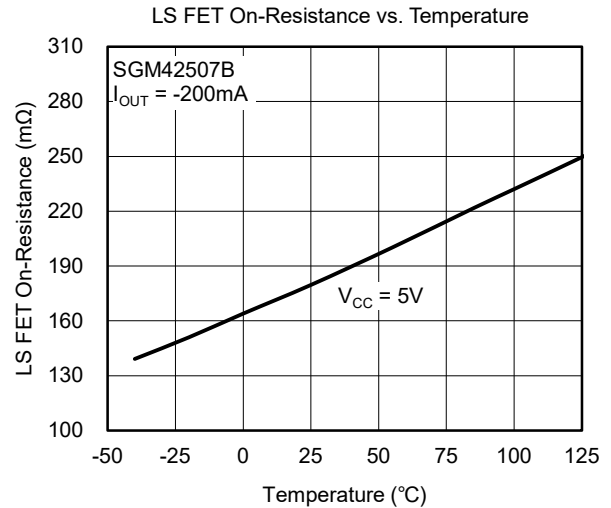
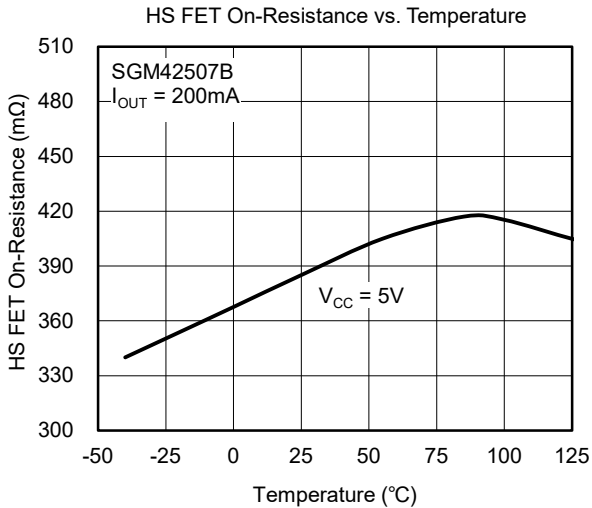
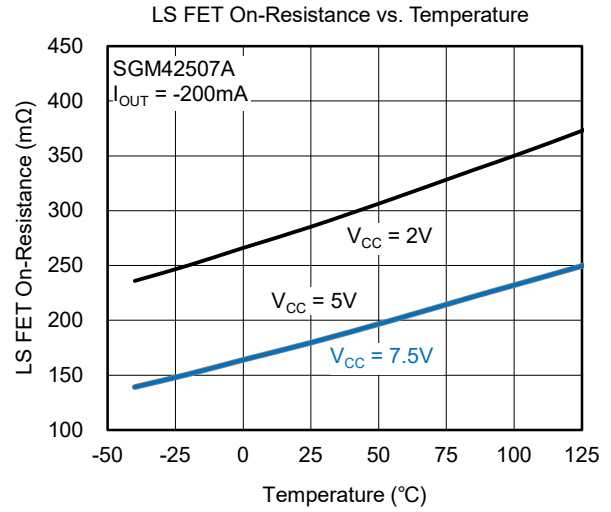
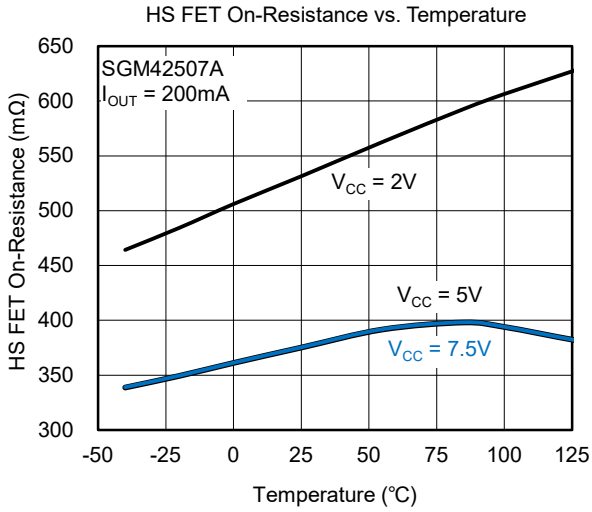
| PARAMETER                                       | SYMBOL                 | CONDITIONS                                      | TEMP  | MIN  | TYP  | MAX  | UNITS |
|---|------------------------|---|-------|------|------|------|-------|
| <b>Power Supplies</b>                           |                        |   |       |      |      |      |       |
| Power Supply Voltage                            | V <sub>CC</sub>        |   | +25°C | 1.9  |      | 7.5  | V     |
| Digital Input Voltage Range (EN/FAULT, PH)      | V <sub>IN</sub>        |   | +25°C | 0    |      | 5.5  | V     |
| Power Supply Current                            | I <sub>VCC</sub>       | No PWM  | +25°C |      | 45   | 74   | μA    |
| Sleep Mode Supply Current                       | I <sub>VCCQ</sub>      | EN/FAULT = GND                                  | +25°C |      | 1.3  | 2    | μA    |
| VCC Under-Voltage Lockout Voltage               | V <sub>UVLO</sub>      | SGM42507A/B/C-1.75                              | +25°C |      | 1.7  | 1.9  | V     |
|   |                        | SGM42507A/B/C-2.8                               | +25°C |      | 1.95 | 2.15 |       |
|   |                        | SGM42507A/B/C-3.6                               | +25°C |      | 1.7  | 1.85 |       |
| VCC Under-Voltage Lockout Voltage Hysteresis    | V <sub>HYS</sub>       |   | +25°C |      | 100  |      | mV    |
| VCC Under-Voltage Protection Voltage            | V <sub>UVP</sub>       | SGM42507A/B/C-1.75                              | +25°C |      | 1.75 | 1.9  | V     |
|   |                        | SGM42507A/B/C-2.8                               | +25°C |      | 2.8  | 3.05 |       |
|   |                        | SGM42507A/B/C-3.6                               | +25°C |      | 3.6  | 3.75 |       |
| VCC Under-Voltage Protection Voltage Hysteresis | V <sub>HYS</sub>       |   | +25°C |      | 100  |      | mV    |
| <b>Logic Level Inputs</b>                       |                        |   |       |      |      |      |       |
| Input Low Voltage                               | V <sub>IL</sub>        |   | Full  |      |      | 0.6  | V     |
| Input High Voltage                              | V <sub>IH</sub>        |   | Full  | 1.6  |      |      | V     |
| Input Low Current                               | I <sub>IL</sub>        | V <sub>IN</sub> = 0V                            | +25°C | -500 |      | 500  | nA    |
| Input High Weak Pull-Down Current               | I <sub>IH_weak</sub>   | V <sub>IN</sub> = 5.5V                          | +25°C |      | 60   | 85   | μA    |
| Input High Strong Pull-Down Current             | I <sub>IH_strong</sub> | V <sub>IN</sub> = 1.1V                          | +25°C |      | 300  | 380  | μA    |
| Input Deglitch Time                             | t <sub>DEG</sub>       |   | +25°C |      | 300  |      | ns    |
| <b>EN/FAULT Output (Open-Drain Output)</b>      |                        |   |       |      |      |      |       |
| Output Low Voltage                              | V <sub>OL</sub>        | V <sub>CC</sub> = 1.8V, I <sub>OUT</sub> = -5mA | +25°C |      |      | 170  | mV    |
| Output High Leakage Current                     | I <sub>OH</sub>        |   | +25°C |      |      | 95   | μA    |
| <b>H-Bridge FETs</b>                            |                        |   |       |      |      |      |       |
| HS FET On-Resistance                            | R <sub>DS(ON)</sub>    | SGM42507A-X, I <sub>OUT</sub> = 200mA           | +25°C |      | 375  |      | mΩ    |
|   |                        |   | Full  |      |      | 550  |       |
|   |                        | SGM42507B-X, I <sub>OUT</sub> = 200mA           | +25°C |      | 385  |      |       |
|   |                        |   | Full  |      |      | 570  |       |
| LS FET On-Resistance                            | R <sub>DS(ON)</sub>    | SGM42507A-X, I <sub>OUT</sub> = -200mA          | +25°C |      | 180  |      | mΩ    |
|   |                        |   | Full  |      |      | 335  |       |
|   |                        | SGM42507B-X, I <sub>OUT</sub> = -200mA          | +25°C |      | 185  |      |       |
|   |                        |   | Full  |      |      | 360  |       |
| SGM42507C-X, I <sub>OUT</sub> = -200mA          | +25°C                  |   | 210   |      |      |      |       |
|   | Full                   |   |       | 395  |      |      |       |
| Off-State Leakage Current                       | I <sub>OFF</sub>       | V <sub>OUT</sub> = 0V or 7.5V                   | +25°C | -800 |      | 800  | nA    |

**ELECTRICAL CHARACTERISTICS (continued)**(T<sub>A</sub> = +25°C, V<sub>CC</sub> = 5V, EN/FAULT pin connected to 5V through 500Ω resistor, Full = -40°C to +125°C, unless otherwise noted.)

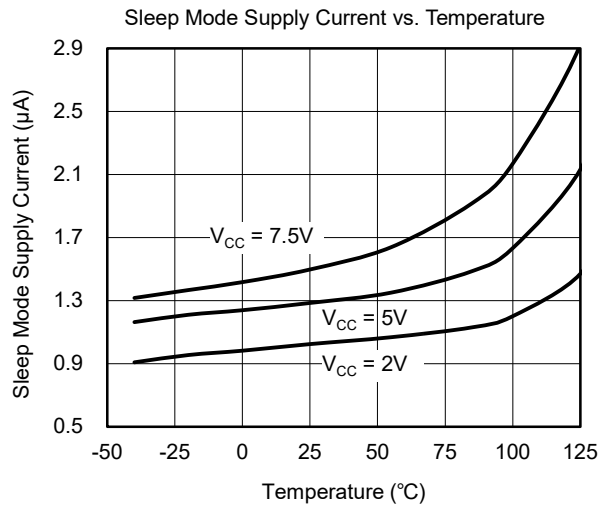
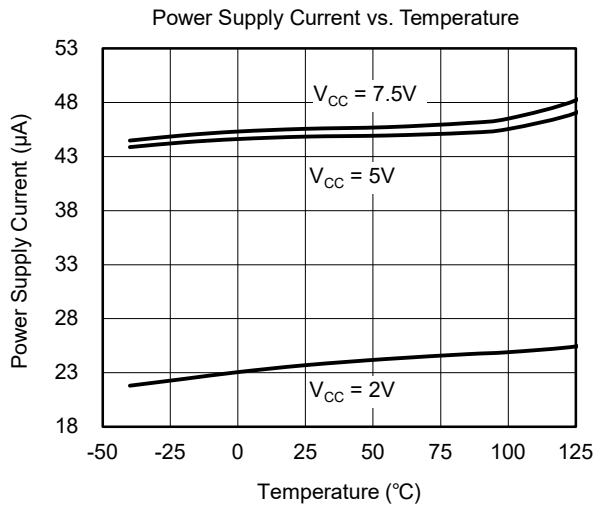
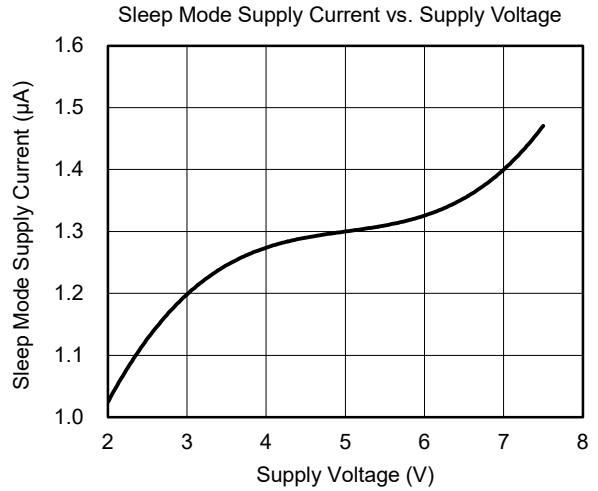
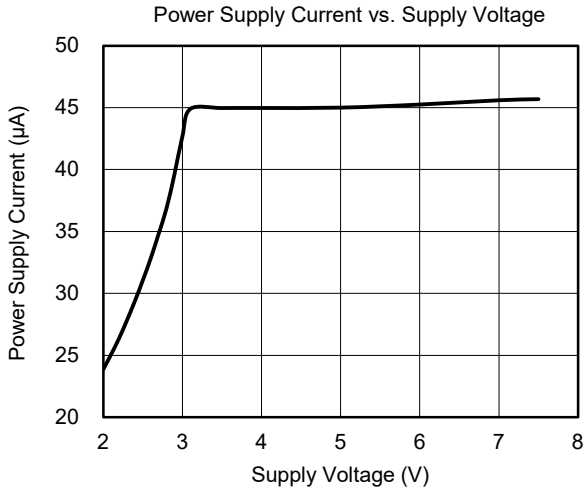
| PARAMETER                               | SYMBOL             | CONDITIONS  | TEMP  | MIN | TYP  | MAX | UNITS |
|---|--------------------|---|-------|-----|------|-----|-------|
| <b>Motor Driver</b>                     |                    |   |       |     |      |     |       |
| Rise Time                               | t <sub>R</sub>     | R <sub>L</sub> = 16Ω to GND,<br>10% to 90% V <sub>CC</sub>              | +25°C |     | 125  |     | ns    |
| Fall Time                               | t <sub>F</sub>     | R <sub>L</sub> = 16Ω to V <sub>CC</sub> ,<br>90% to 10% V <sub>CC</sub> | +25°C |     | 155  |     | ns    |
| Propagation Delay INx to OUTx           | t <sub>PROP</sub>  |   | +25°C |     | 1    |     | μs    |
| Dead Time <sup>(1)</sup>                | t <sub>DEAD</sub>  |   | +25°C |     | 255  |     | ns    |
| <b>Protection Circuits</b>              |                    |   |       |     |      |     |       |
| Over-Current Protection Trip Level      | I <sub>OC</sub> P  | SGM42507A-X   | +25°C |     | 1.5  |     | A     |
|   |                    | SGM42507B-X   | +25°C |     | 0.9  |     |       |
|   |                    | SGM42507C-X   | +25°C |     | 0.45 |     |       |
| <b>Thermal Shutdown</b>                 |                    |   |       |     |      |     |       |
| Thermal Shutdown Temperature            | T <sub>TSD</sub>   |   |       |     | 165  |     | °C    |
| Thermal Shutdown Temperature Hysteresis | T <sub>HYS</sub>   |   |       |     | 30   |     | °C    |
| <b>nSLEEP Mode</b>                      |                    |   |       |     |      |     |       |
| Time to Enter Sleep Mode                | t <sub>SLEEP</sub> |   | +25°C | 60  |      | 105 | ms    |
| Wake Time                               | t <sub>WAKE</sub>  | EN/FAULT inactive high to<br>H-bridge on                                | +25°C |     |      | 4.5 | ms    |

NOTE: 1. Internal dead time. External implementation is not necessary.

TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS (continued)





**REVISION HISTORY**

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

**Changes from Original (NOVEMBER 2018) to REV.A**

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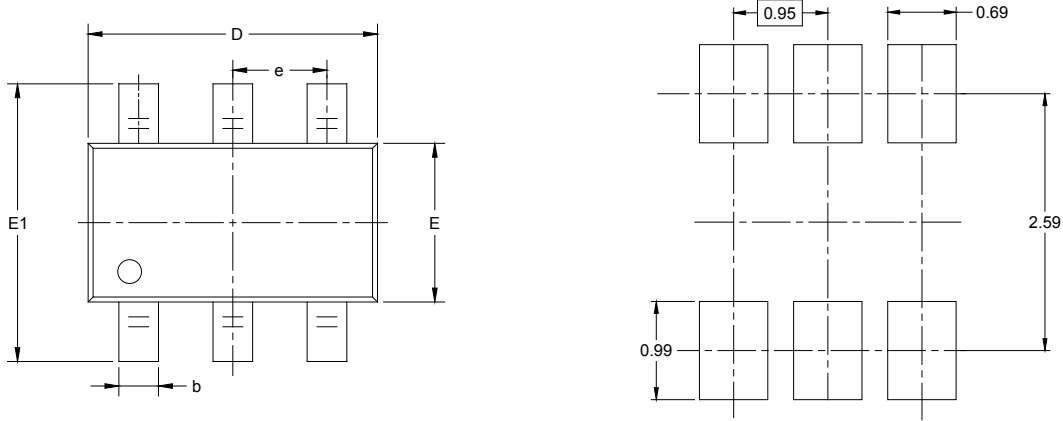
Changed from product preview to production data.....All

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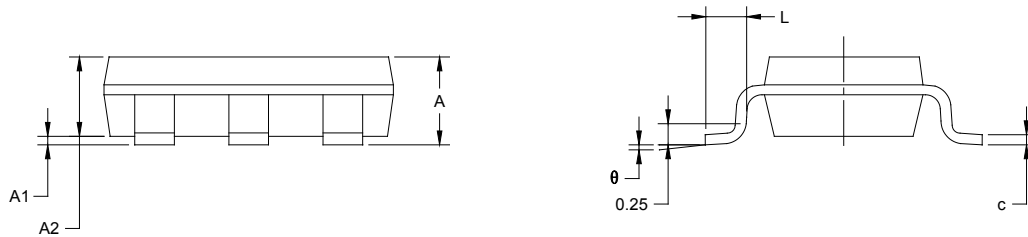
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### TSOT-23-6



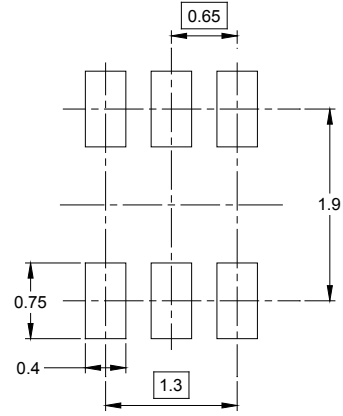
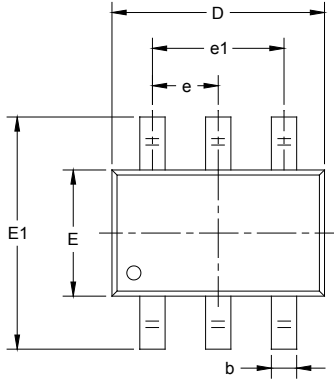
RECOMMENDED LAND PATTERN (Unit: mm)



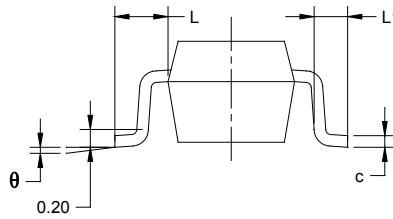
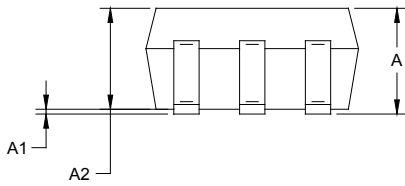
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        |                              | 1.000 |                         | 0.043 |
| A1       | 0.000                        | 0.100 | 0.000                   | 0.004 |
| A2       | 0.700                        | 0.900 | 0.028                   | 0.039 |
| b        | 0.300                        | 0.500 | 0.012                   | 0.020 |
| c        | 0.080                        | 0.200 | 0.003                   | 0.008 |
| D        | 2.850                        | 2.950 | 0.112                   | 0.116 |
| E        | 1.550                        | 1.650 | 0.061                   | 0.065 |
| E1       | 2.650                        | 2.950 | 0.104                   | 0.116 |
| e        | 0.950 BSC                    |       | 0.037 BSC               |       |
| L        | 0.300                        | 0.600 | 0.012                   | 0.024 |
| $\theta$ | 0°                           | 8°    | 0°                      | 8°    |

PACKAGE OUTLINE DIMENSIONS

SC70-6



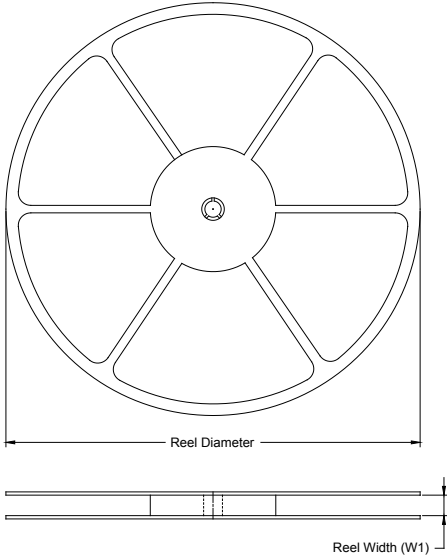
RECOMMENDED LAND PATTERN (Unit: mm)



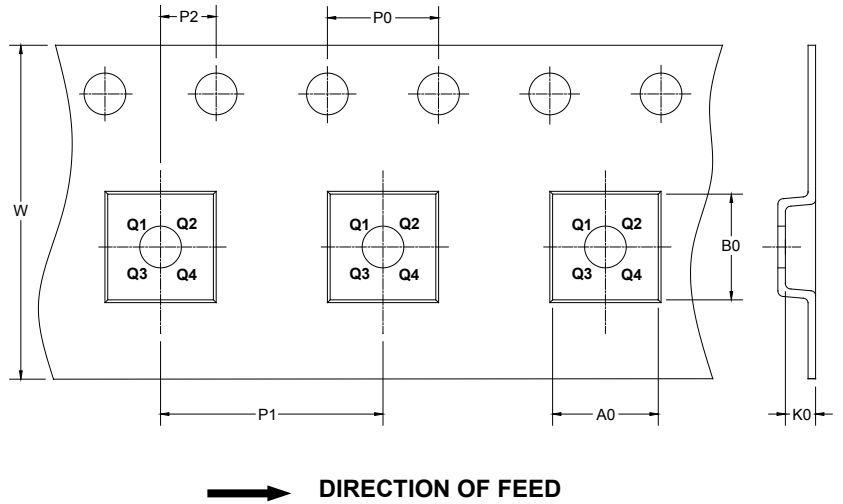
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        | 0.900                        | 1.100 | 0.035                   | 0.043 |
| A1       | 0.000                        | 0.100 | 0.000                   | 0.004 |
| A2       | 0.900                        | 1.000 | 0.035                   | 0.039 |
| b        | 0.150                        | 0.350 | 0.006                   | 0.014 |
| c        | 0.080                        | 0.150 | 0.003                   | 0.006 |
| D        | 2.000                        | 2.200 | 0.079                   | 0.087 |
| E        | 1.150                        | 1.350 | 0.045                   | 0.053 |
| E1       | 2.150                        | 2.450 | 0.085                   | 0.096 |
| e        | 0.65 TYP                     |       | 0.026 TYP               |       |
| e1       | 1.300 BSC                    |       | 0.051 BSC               |       |
| L        | 0.525 REF                    |       | 0.021 REF               |       |
| L1       | 0.260                        | 0.460 | 0.010                   | 0.018 |
| $\theta$ | 0°                           | 8°    | 0°                      | 8°    |

**TAPE AND REEL INFORMATION**

**REEL DIMENSIONS**



**TAPE DIMENSIONS**



NOTE: The picture is only for reference. Please make the object as the standard.

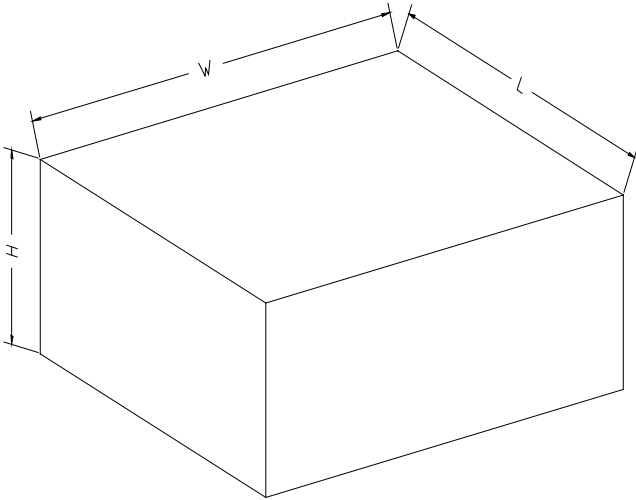
**KEY PARAMETER LIST OF TAPE AND REEL**

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SC70-6       | 7"            | 9.5                | 2.40    | 2.50    | 1.20    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |
| TSOT-23-6    | 7"            | 9.5                | 3.20    | 3.10    | 1.10    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |

DD0001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

| Reel Type   | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-------------|-------------|------------|-------------|--------------|
| 7" (Option) | 368         | 227        | 224         | 8            |
| 7"          | 442         | 410        | 224         | 18           |

DD0002