



# SILEGO

# SLG59M1440V

## Ultra-small 40 mΩ 1.0 A GreenFET 3 Load Switch with Discharge

### General Description

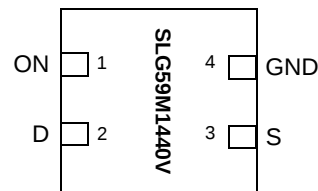
The SLG59M1440V is designed for load switching applications. The part comes with one 40 mΩ 1.0 A rated MOSFET controlled by a single ON control pin. The MOSFET's ramp rate is adjustable depending on the input current level of the ON pin.

The product is packaged in an ultra-small 1.0 x 1.0 mm package.

### Features

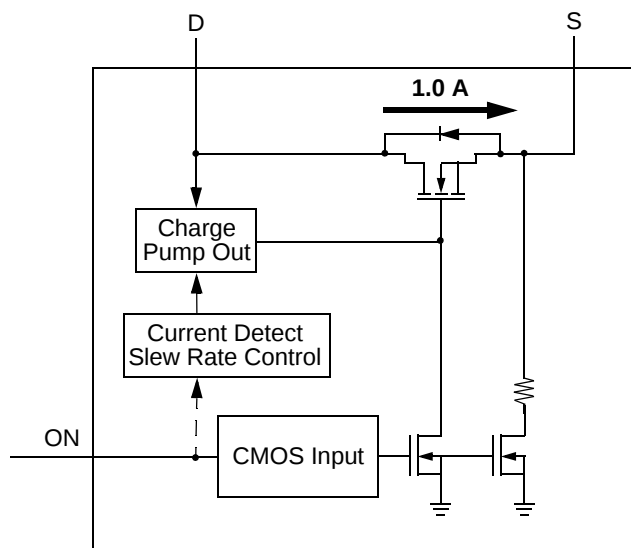
- One 40 mΩ 1.0 A MOSFET
- One integrated VGS Charge Pump
- User selectable ramp rate with external resistor
- Integrated Discharge Resistor
- Over Temperature Protection
- Pb-Free / Halogen-Free / RoHS compliant
- STDFN 4L, 1.0 x 1.0 x 0.55 mm

### Pin Configuration



**4-pin STDFN**  
(Top View)

### Block Diagram





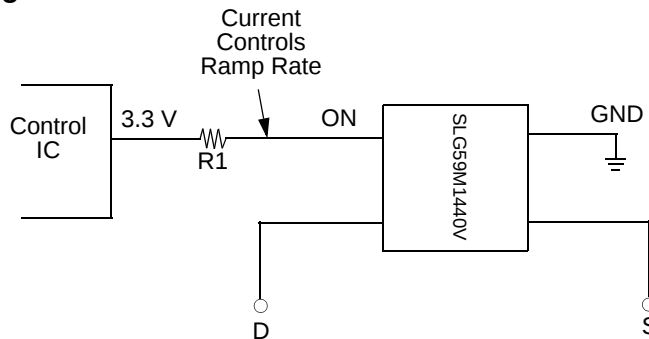
### Pin Description

| Pin # | Pin Name | Type   | Pin Description                                                             |
|-------|----------|--------|-----------------------------------------------------------------------------|
| 1     | ON       | Input  | Turns on MOSFET. Configurable slew rate control depending on input current. |
| 2     | D        | MOSFET | Drain of Power MOSFET                                                       |
| 3     | S        | MOSFET | Source of Power MOSFET                                                      |
| 4     | GND      | GND    | Ground                                                                      |

### Ordering Information

| Part Number   | Type                     | Production Flow             |
|---------------|--------------------------|-----------------------------|
| SLG59M1440V   | STDFN 4L                 | Industrial, -40 °C to 85 °C |
| SLG59M1440VTR | STDFN 4L (Tape and Reel) | Industrial, -40 °C to 85 °C |

### Application Diagram



### Adjustable Ramp Rate vs. ON Pin Current (5.5 V, 25 °C)

| I <sub>ON</sub> | T <sub>SLEW</sub> (typ) |
|-----------------|-------------------------|
| 20 µA           | 0.56 V/ms               |
| 50 µA           | 1.34 V/ms               |
| 100 µA          | 2.53 V/ms               |
| 150 µA          | 3.71 V/ms               |
| 200 µA          | 4.68 V/ms               |
| 250 µA          | 5.63 V/ms               |

### Adjustable Slew Rate (ON Pin 2)

SLG59M1440V has a built in configurable slew control feature. The configurable slew control uses current detection method on Pin 2. When ON voltage rise above ON\_VIH\_INI (1.2 V typical), the slew control circuit will measure the current flowing into Pin 2. Based on the current flowing into pin 2, different slew rates will be selected by the internal control circuit. See I<sub>ON</sub> vs. T<sub>slew</sub> table on page 2. The slew rate is configurable by selecting a different R1 resistor value as shown on application diagram on page 2. Calculating the R1 value depends on both the desired slew rate, and the V<sub>OH</sub> level of the device driving the ON Pin 2.

$$ON\_Current = (GPIO\_VOH - ON\_VREF (1.05 V typical)) / R1$$



## Absolute Maximum Ratings

| Parameter         | Description                       | Conditions                               | Min. | Typ. | Max. | Unit |
|-------------------|-----------------------------------|------------------------------------------|------|------|------|------|
| $V_D$             | Power Supply                      |                                          | --   | --   | 6    | V    |
| $T_S$             | Storage Temperature               |                                          | -65  | --   | 150  | °C   |
| $ESD_{HBM}$       | ESD Protection                    | Human Body Model                         | 2000 | --   | --   | V    |
| $W_{DIS}$         | Package Power Dissipation         |                                          | --   | --   | 0.5  | W    |
| MOSFET $IDS_{PK}$ | Peak Current from Drain to Source | For no more than 1 ms with 1% duty cycle | --   | --   | 1.5  | A    |

Note: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Electrical Characteristics

$T_A = -40\text{ °C to }85\text{ °C}$  (unless otherwise stated)

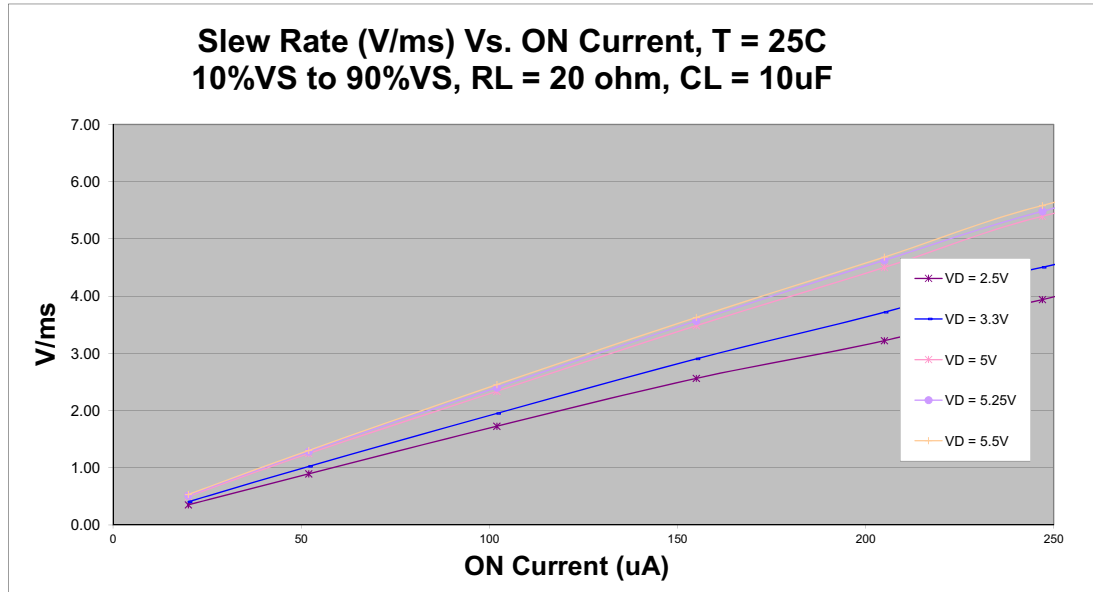
| Parameter         | Description                           | Conditions                                                                                                                | Min.                      | Typ. | Max.     | Unit |
|-------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------|------|----------|------|
| $V_D$             | Power Supply Voltage                  | -40 °C to 85 °C                                                                                                           | 2.5                       | --   | 5.5      | V    |
| $I_{DD}$          | Power Supply Current (PIN 2)          | when OFF                                                                                                                  | --                        | 0.1  | 1        | μA   |
|                   |                                       | when ON, No load                                                                                                          | --                        | 18   | 30       | μA   |
| $R_{DS_{ON}}$     | Static Drain to Source ON Resistance  | $T_A$ 25°C MOSFET                                                                                                         | --                        | 40   | 50       | mΩ   |
|                   |                                       | $T_A$ 70°C MOSFET                                                                                                         | --                        | 50   | 55       | mΩ   |
|                   |                                       | $T_A$ 85°C MOSFET                                                                                                         | --                        | 55   | 65       | mΩ   |
| $IDS$             | Operating Current                     | $V_D = 2.5\text{ V to }5.5\text{ V}$                                                                                      | --                        | --   | 1.0      | A    |
| $T_{ON\_Delay}$   | ON pin Delay Time                     | 50% ON to Ramp Begin<br>Input Current (PIN 1) = 20 μA,<br>$V_D = 5\text{ V}$ , Source_Cap = 10 μF,<br>$R_L = 20\text{ Ω}$ | 0                         | 2.4  | 4.0      | ms   |
| $T_{Total\_ON}$   | Total Turn On Time                    | 50% ON to 90% $V_S$                                                                                                       | Configurable <sup>1</sup> |      |          | ms   |
|                   |                                       | Example: Input Current (PIN 1) = 20 μA, $V_D = 5\text{ V}$ , Source_Cap = 10 μF, $R_L = 20\text{ Ω}$                      | --                        | 11.7 | --       | ms   |
| $T_{SLEWRATE}$    | Slew Rate                             | 10% $V_S$ to 90% $V_S$                                                                                                    | Configurable <sup>1</sup> |      |          | V/ms |
|                   |                                       | Example: Input Current (PIN 1) = 20 μA, $V_D = 5\text{ V}$ , Source_Cap = 10 μF, $R_L = 20\text{ Ω}$                      | --                        | 0.56 | --       | V/ms |
| $R_{DIS}$         | Discharge Resistance                  |                                                                                                                           | 100                       | 150  | 300      | Ω    |
| $ON\_V_{REF}$     | ON Pin Reference Voltage <sup>2</sup> |                                                                                                                           | 0.99                      | 1.05 | 1.10     | V    |
| $ON\_V_{IH\_INI}$ | Initial Turn On Voltage               | Internal Charge Pump ON                                                                                                   | 1.2                       | --   | $V_{DD}$ | V    |
| $ON\_V_{IL}$      | Low Input Voltage on ON pin           | Internal Charge Pump OFF                                                                                                  | -0.3                      | 0    | 0.3      | V    |
| $ON\_R$           | Input Impedance on ON pin             |                                                                                                                           | 100                       | --   | --       | MΩ   |
| $THERM_{ON}$      | Thermal shutoff turn-on temperature   |                                                                                                                           | --                        | 120  | --       | °C   |
| $THERM_{OFF}$     | Thermal shutoff turn-off temperature  |                                                                                                                           | --                        | 100  | --       | °C   |
| $THERM_{TIME}$    | Thermal shutoff time                  |                                                                                                                           | --                        | --   | 1        | ms   |
| $T_{Delay\_OFF}$  | OFF Delay Time                        | 50% ON to $V_S$ Fall, $V_D = 5\text{ V}$ ,<br>$R_L = 20\text{ Ω}$                                                         | --                        | 6.5  | 20       | μs   |
| $T_{FALL}$        | $V_S$ Fall Time                       | 90% $V_S$ to 10% $V_S$ , $V_D = 5\text{ V}$ ,<br>$R_L = 20\text{ Ω}$                                                      | --                        | 1.2  | 2        | μs   |

Notes:

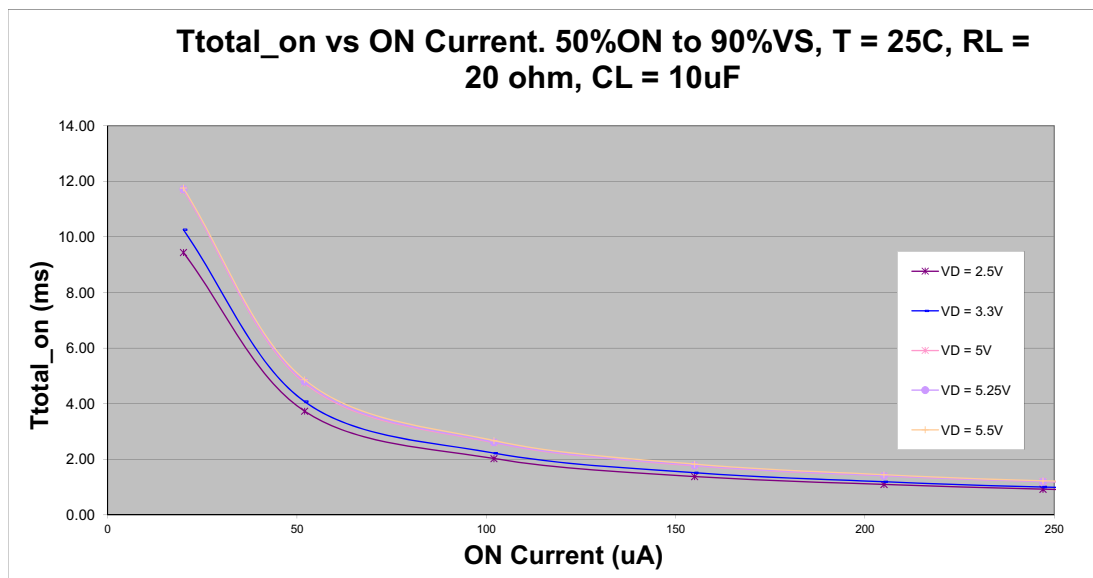
1. Refer to table for configuration details.
2. Voltage before ON pin resistor needs to be higher than 1.2 V to generate required  $I_{ON}$



### Slew Rate vs. ON Current

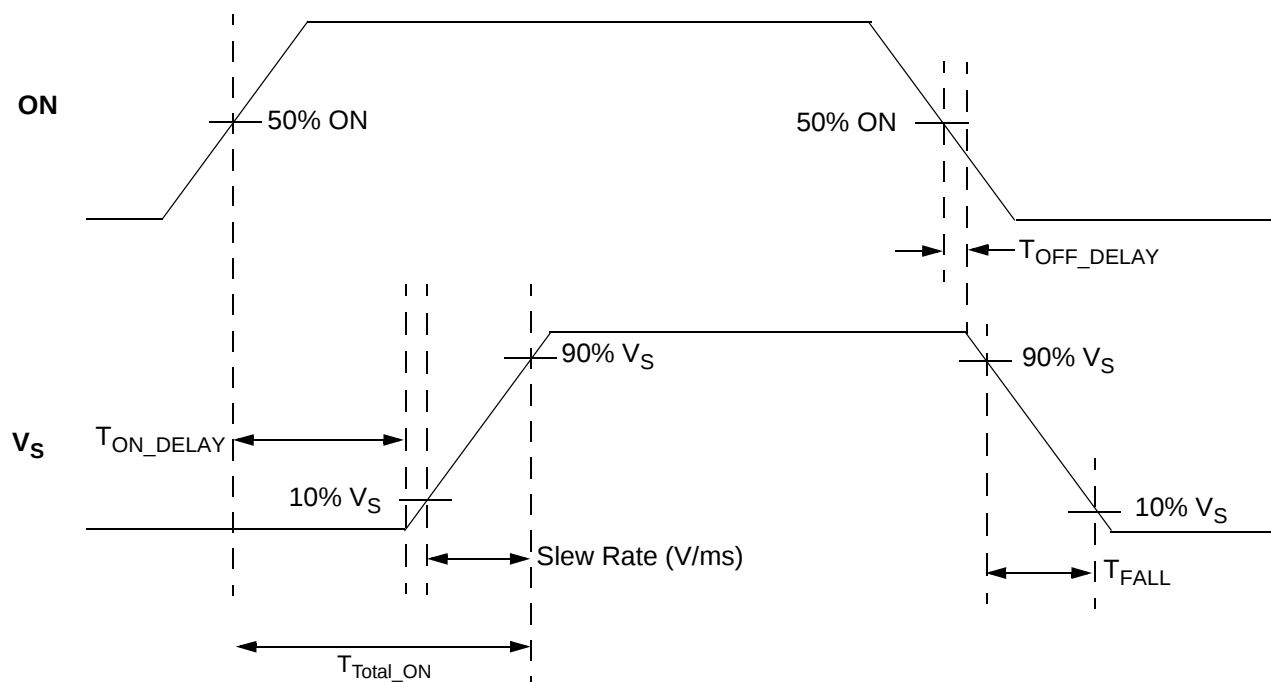


### T<sub>Total\_ON</sub> vs. On Current

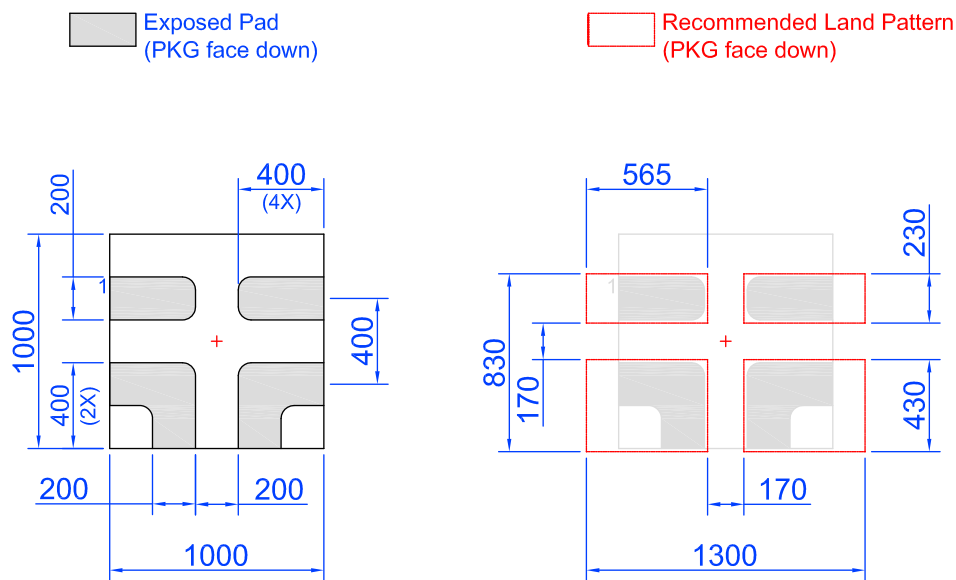




### $T_{Total\_ON}$ , $T_{ON\_Delay}$ and Slew Rate Measurement



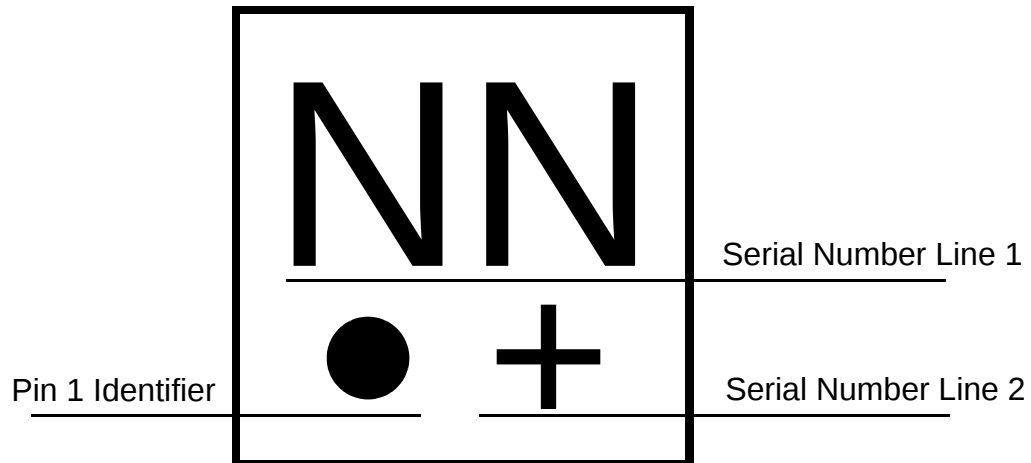
### SLG59M1440V Layout Suggestion



Note: All dimensions shown in micrometers ( $\mu m$ )



### Package Top Marking System Definition

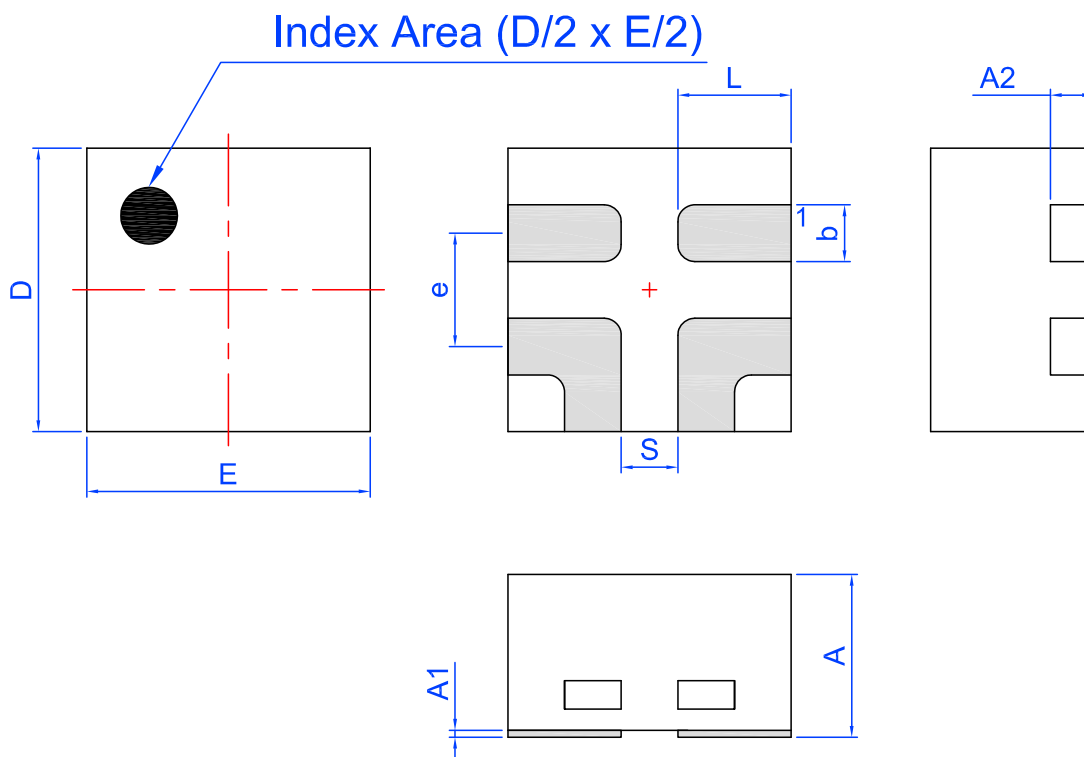


NN - Part Serial Number Field Line 1  
where each "N" character can be A-Z and 0-9  
+ - Part Serial Number Field Line 2  
where "+" character can be +, -, =, or blank



### Package Drawing and Dimensions

4 Lead STDFN Package 1.0 x 1.0 mm



Unit: mm

| Symbol | Min      | Nom. | Max   | Symbol | Min     | Nom. | Max  |
|--------|----------|------|-------|--------|---------|------|------|
| A      | 0.50     | 0.55 | 0.60  | D      | 0.95    | 1.00 | 1.05 |
| A1     | 0.005    | -    | 0.060 | E      | 0.95    | 1.00 | 1.05 |
| A2     | 0.10     | 0.15 | 0.20  | L      | 0.35    | 0.40 | 0.45 |
| b      | 0.15     | 0.20 | 0.25  | S      | 0.2 REF |      |      |
| e      | 0.40 BSC |      |       |        |         |      |      |

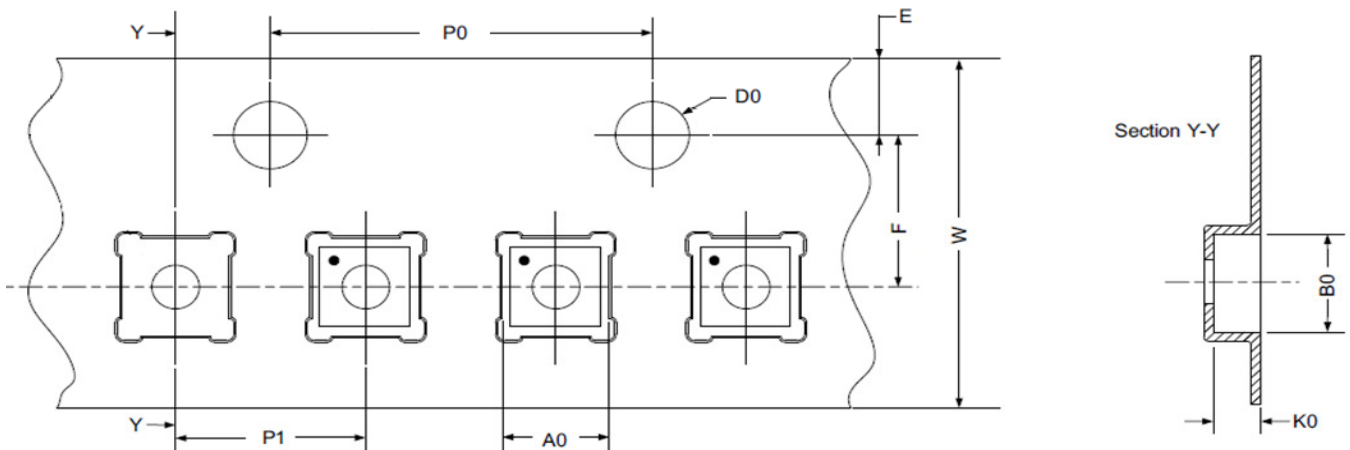


### Tape and Reel Specifications

| Package Type   | # of Pins | Nominal Package Size [mm] | Max Units |         | Reel & Hub Size [mm] | Leader (min) |             | Trailer (min) |             | Tape Width [mm] | Part Pitch [mm] |
|----------------|-----------|---------------------------|-----------|---------|----------------------|--------------|-------------|---------------|-------------|-----------------|-----------------|
|                |           |                           | per Reel  | per Box |                      | Pockets      | Length [mm] | Pockets       | Length [mm] |                 |                 |
| STDFN 4L Green | 4         | 1.0 x 1.0 x 0.55          | 8000      | 8000    | 178 / 60             | 200          | 400         | 200           | 400         | 8               | 2               |

### Carrier Tape Drawing and Dimensions

| Package Type   | Pocket BTM Length | Pocket BTM Width | Pocket Depth | Index Hole Pitch | Pocket Pitch | Index Hole Diameter | Index Hole to Tape Edge | Index Hole to Pocket Center | Tape Width |
|----------------|-------------------|------------------|--------------|------------------|--------------|---------------------|-------------------------|-----------------------------|------------|
|                | A0                | B0               | K0           | P0               | P1           | D0                  | E                       | F                           | W          |
| STDFN 4L Green | 1.16              | 1.16             | 0.63         | 4                | 2            | 1.5                 | 1.75                    | 3.5                         | 8          |



Refer to EIA-481 specification

### Recommended Reflow Soldering Profile

Please see IPC/JEDEC J-STD-020: latest revision for reflow profile based on package volume of 0.55 mm<sup>3</sup> (nominal). More information can be found at [www.jedec.org](http://www.jedec.org).



### Revision History

| Date       | Version | Change                                                                            |
|------------|---------|-----------------------------------------------------------------------------------|
| 11/20/2017 | 1.12    | Updated Package Marking Definition<br>Updated Layout Suggestion                   |
| 12/11/2013 | 1.11    | changed temp range to -40 to 85C                                                  |
| 5/21/2013  | 1.01    | renamed TDELAY_ON to TON_DELAY in Electrical Characteristics Table to match graph |