

### Features

- 2.5 to 5.5V supply voltage operating range.
- Low current consumption: 1mA in operation,
- 50 kHz or 100kHz operation frequency .
- Built-in maximum duty control.
- push-pull output.
- Built-in soft start circuit.
- Built-in auto-discharge function.

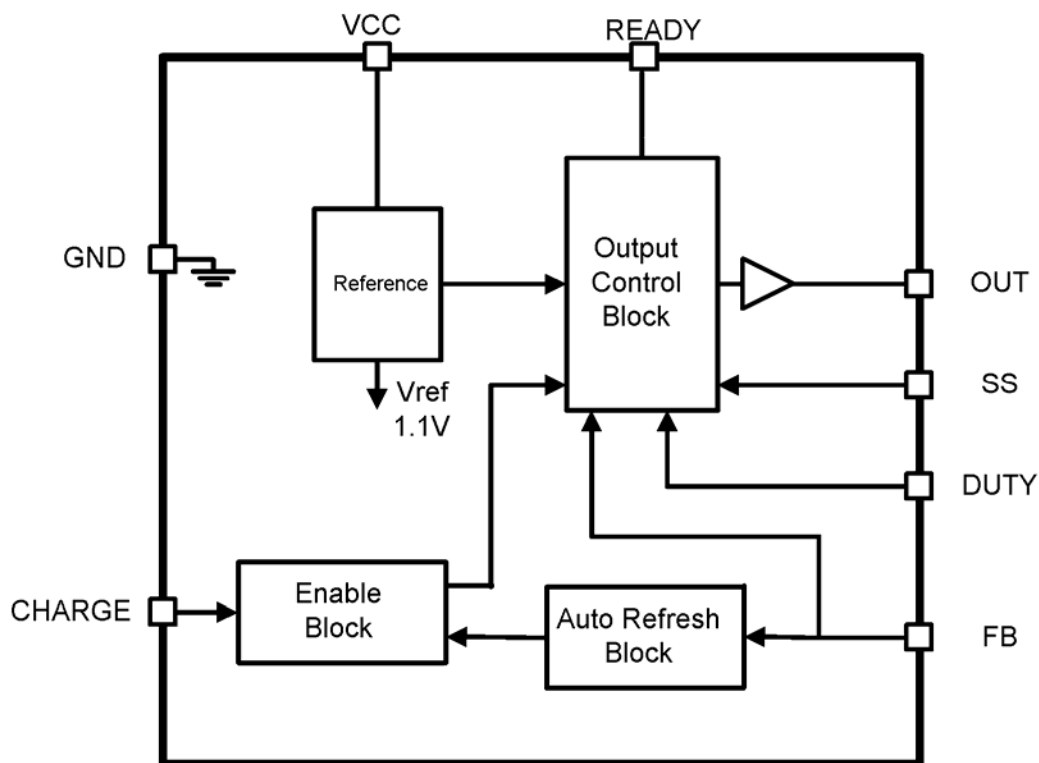
### General Description

The AT1452 is a charger control IC for Photoflash capacitor with soft start function, adjustable maximum duty cycle, auto refresh and auto-discharge circuit. Adjustable soft start is programmed with an external capacitor on SS pin. It is ideal for DSC flash unit.

### Applications

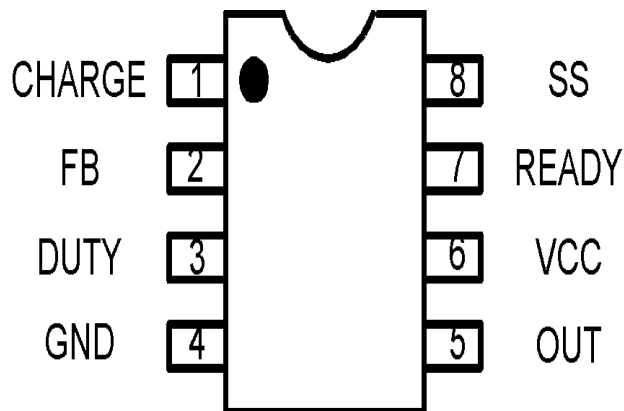
- Digital Still Cameras flash unit

### Block Diagram



Aimtron reserves the right without notice to change this circuitry and specifications.

## Pin Configuration



## Ordering Information

| Part number | Package             | Remarks  |
|-------------|---------------------|----------|
| AT1452A     | 8-pin Plastic SOP   | AT1452AS |
|             | 8-pin Plastic TSSOP | AT1452AP |
| AT1452B     | 8-pin Plastic SOP   | AT1452BS |
|             | 8-pin Plastic TSSOP | AT1452BP |

A:50kHz B:100kHz

## Pin Description

| Pin No. | Symbol | I/O | Description                    |
|---------|--------|-----|--------------------------------|
| 1       | CHARGE | I   | Charge enable input            |
| 2       | FB     | I   | Error amplifier input          |
| 3       | DUTY   | I   | Duty control input             |
| 4       | GND    | -   | Ground                         |
| 5       | OUT    | O   | Push-pull output               |
| 6       | VCC    | -   | Power supply                   |
| 7       | READY  | O   | Charge ready open drain output |
| 8       | SS     | I   | Soft-start setting             |

### Absolute Maximum Ratings

| Parameter                        | Condition                      | Rated Value |      | Unit |
|----------------------------------|--------------------------------|-------------|------|------|
|                                  |                                | Min.        | Max. |      |
| Power Supply Voltage             | —                              | -           | +7   | V    |
| Source Average Current of OUT    | —                              | -           | -50  | mA   |
| Sink Average Current of OUT      | —                              | -           | 50   | mA   |
| Input Voltage to Error Amplifier | —                              | -           | 6.5  | V    |
| Continuous power dissipation     | TSSOP8 (T <sub>a</sub> =+25°C) | -           | 450  | mW   |
|                                  | SOP8 (T <sub>a</sub> =+25°C)   | -           | 500  | mW   |
| Operating temperature            | —                              | -30         | +85  | °C   |
| Junction temperature             | —                              | -           | +125 | °C   |
| Storage temperature              | —                              | -40         | +150 | °C   |
| Lead temperature                 | —                              | -           | +300 | °C   |

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### Recommended Operating Conditions

(T<sub>a</sub>=+25°C)

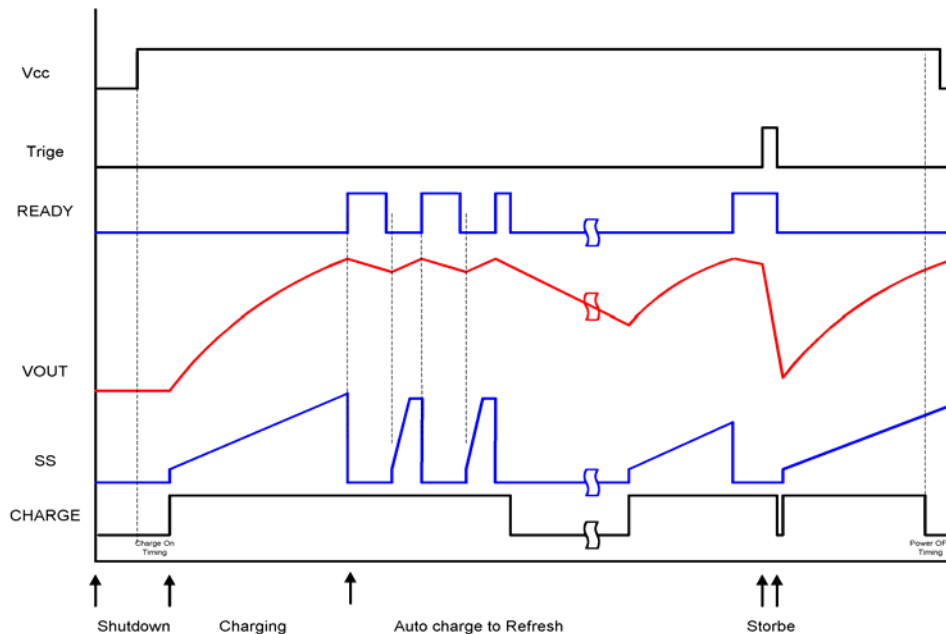
| Parameter             | Symbol          | Values |      |      | Unit |
|-----------------------|-----------------|--------|------|------|------|
|                       |                 | Min.   | Typ. | Max. |      |
| Power supply voltage  | V <sub>CC</sub> | 2.5    | --   | 5.5  | V    |
| Operating temperature | T <sub>OP</sub> | -30    | +25  | +85  | °C   |

## Electrical Characteristics

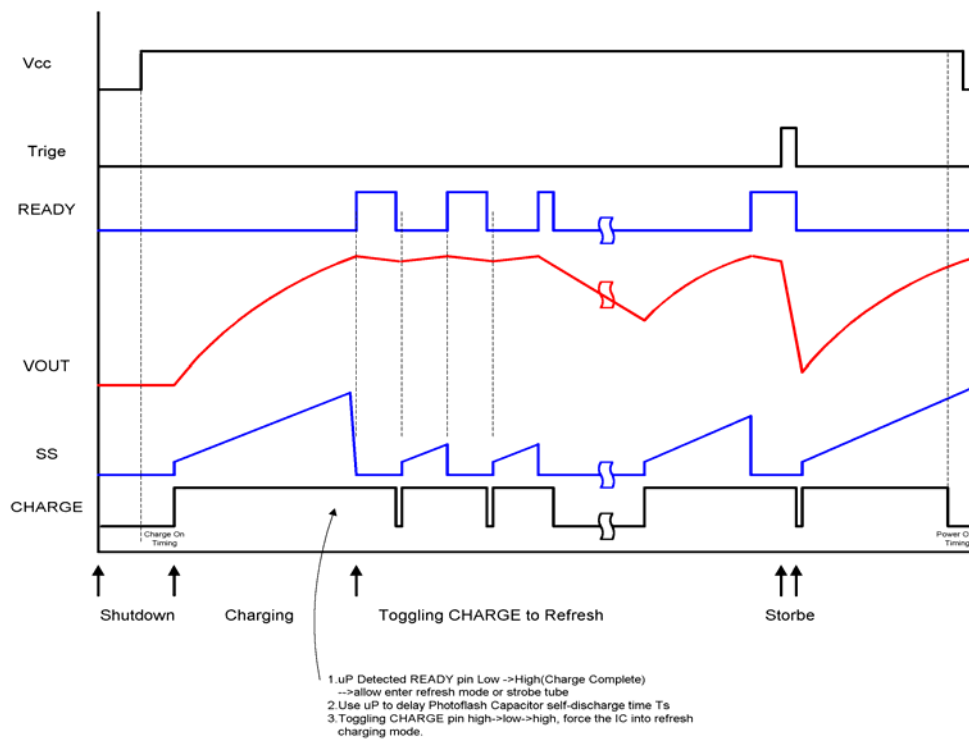
(VCC = 3.3V, T<sub>a</sub> = +25°C, unless otherwise noted.)

| Parameter                   |                                     | Symbol               | Condition                          | Values |      |       | Unit |
|-----------------------------|-------------------------------------|----------------------|------------------------------------|--------|------|-------|------|
|                             |                                     |                      |                                    | Min.   | Typ. | Max.  |      |
| Entire device               | Input Supply Range                  | V <sub>CC</sub>      |                                    | 2.5    | --   | 5.5   | V    |
|                             | Feedback Voltage                    | V <sub>FB</sub>      |                                    | 1.089  | 1.1  | 1.111 | V    |
|                             | Auto-Refresh Level                  | V <sub>FB1</sub>     | V <sub>FB1</sub> / V <sub>FB</sub> | -      | 90   | -     | %    |
|                             | Feedback Voltage line-regulation    | V <sub>FB-Line</sub> | VCC=2.5V to 5.5V                   | -      | 1    | 5     | mV   |
|                             | Feedback Variation with Temperature |                      | T <sub>a</sub> = -30°C to +85°C    | -      | 0.5  | 5     | %    |
|                             | Standby current                     | I <sub>CCS</sub>     | CHARGE=GND                         | -      | -    | 400   | μA   |
|                             | Operating Current                   | I <sub>CC</sub>      | Duty=50%,<br>fOSC=50KHz            | -      | 1.0  | -     | mA   |
| Oscillator                  | Frequency                           | fosc                 | A                                  | 40     | 50   | 60    | KHz  |
|                             |                                     |                      | B                                  | 90     | 100  | 110   | KHz  |
| Soft-Start and Duty Section | Threshold voltage of SS             | V <sub>SS_0</sub>    | Duty Cycle=0%                      | -      | 0.3  | -     | V    |
|                             | Threshold voltage of SS             | V <sub>SS_100</sub>  | Duty Cycle=100%                    | -      | 1.1  | -     | V    |
|                             | Charging current                    | I <sub>SS</sub>      | V <sub>SS</sub> =0V                | -      | 1.0  | -     | μA   |
|                             | Maximum duty cycle                  | T <sub>DUTY</sub>    |                                    | --     | --   | 90    | %    |
| Output Section              | Output source current               | I <sub>SOURCE</sub>  | Duty ≥ 95%, OUT=0V                 | -      | -130 | -80   | mA   |
|                             | Output sink current                 | I <sub>SINK</sub>    | Duty ≤ 5%, OUT=5V                  | 65     | 100  | -     | mA   |
|                             | Output ON resistor                  | R <sub>OH</sub>      | OUT = -15mA                        | -      | 18   | 30    | Ω    |
|                             | Output OFF resistor                 | R <sub>OL</sub>      | OUT = 15mA                         | -      | 16   | 25    | Ω    |
| Charge ON/OFF Section       | Active mode Threshold               | V <sub>ONH</sub>     |                                    | 2.0    |      |       | V    |
|                             | Disable mode Threshold              | V <sub>ONL</sub>     |                                    |        |      | 0.8   | V    |

## Timing Chart

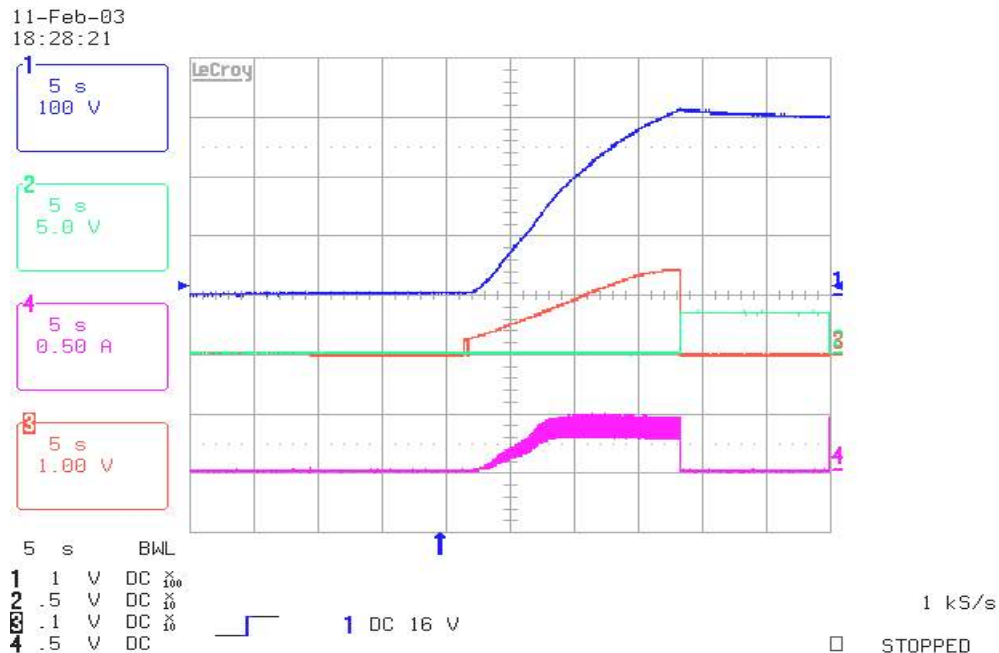


## AT1452 Auto Refresh Mode

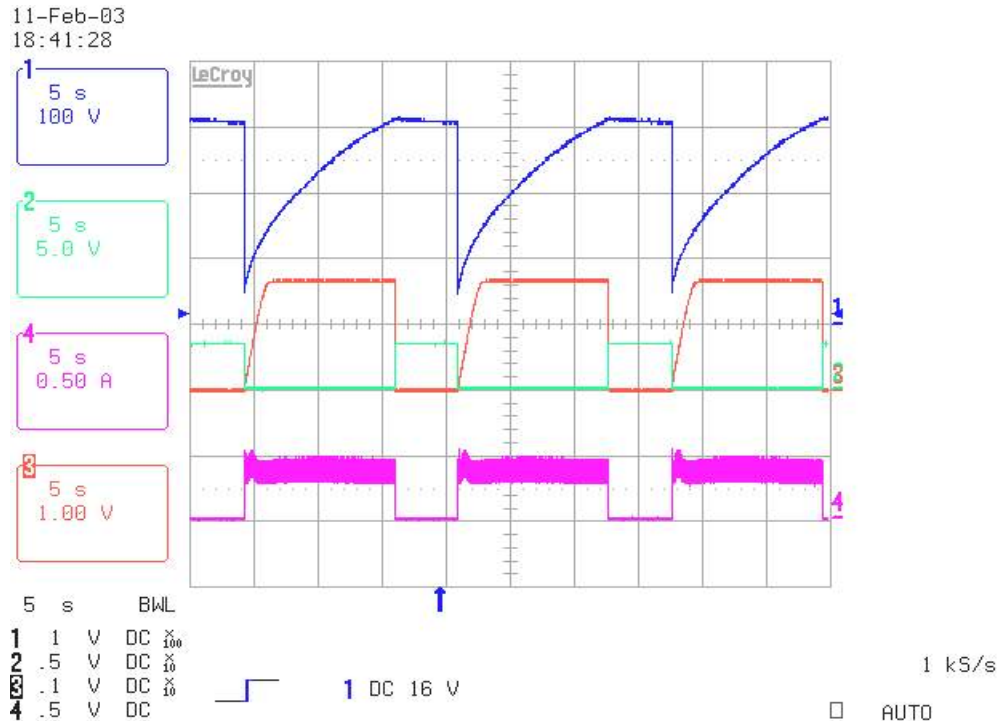


## AT1452 Charge Toggling Refresh Mode

CH1:Vout(310V) CH2:READY CH3:SS CH4:IBAT



**Fig 1. Charge ON Soft-Start (VCC=3.3V VBAT=1.8V CSS=10uF)**



**Fig 2. Auto-Refresh (VCC=3.3V VBAT=1.8V CSS=10uF)**

## DUTY Setting

The DUTY resistor selection depends on Duty Cycle , choose the component using the following equation:

$$V_{DUTY}(V) = 0.3 + \frac{DUTY}{1.15}$$
$$R_{DUTY}(K\Omega) = \frac{15}{\left(\frac{1.1}{V_{DUTY}}\right) - 1.073}$$

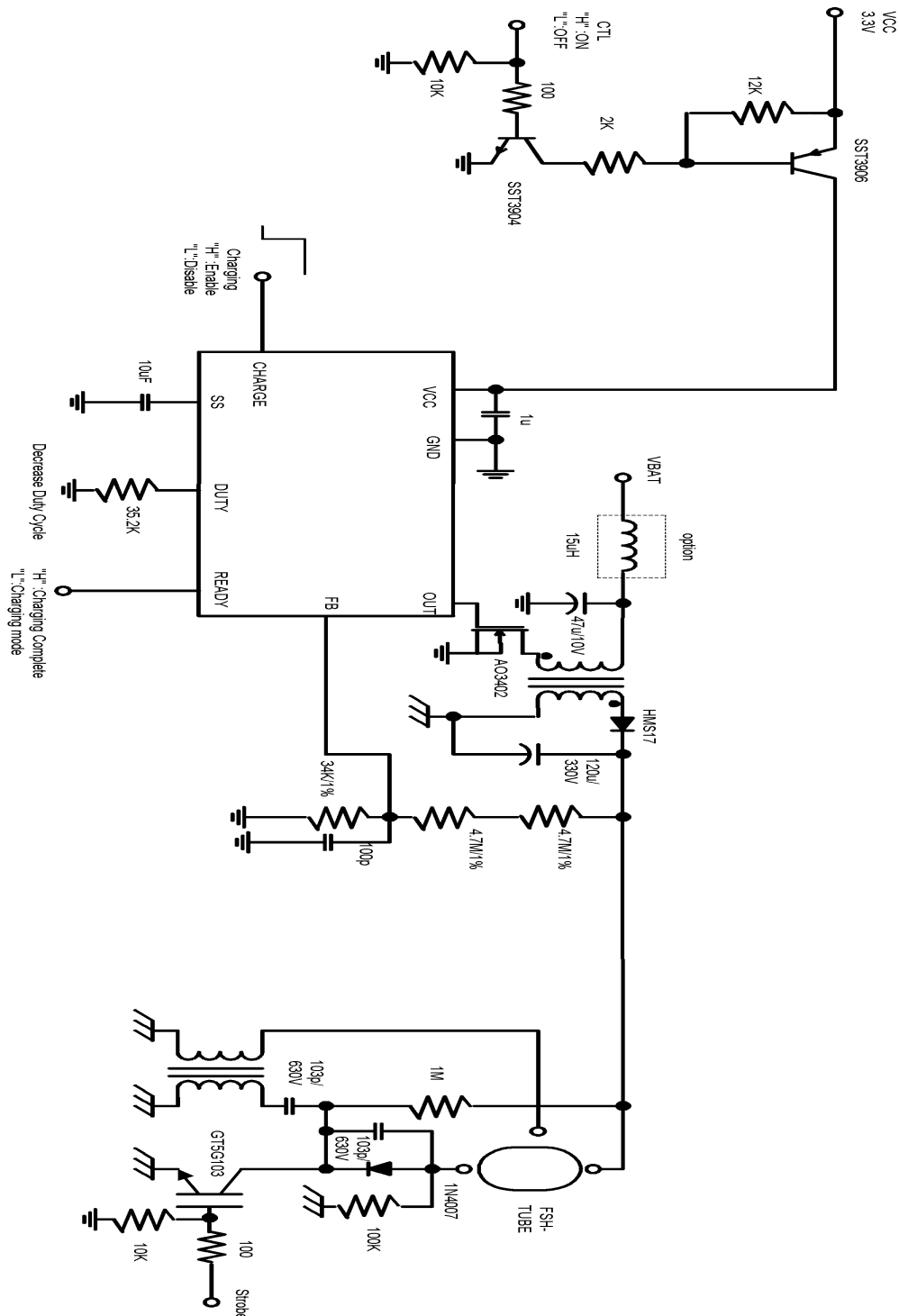
example:

Set duty cycle is 50%

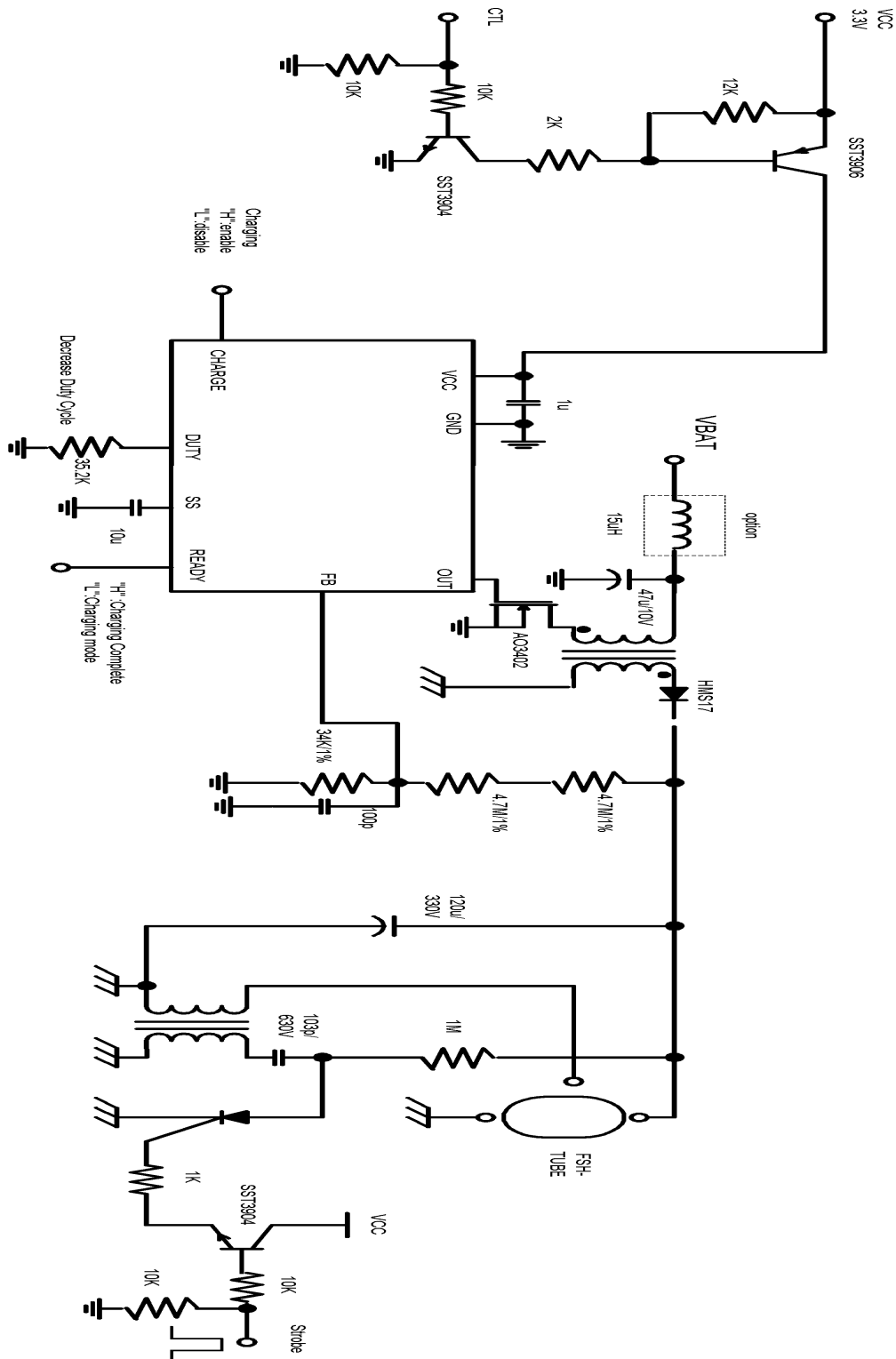
$$V_{DUTY} = 0.3 + \frac{0.5}{1.15} = 0.734$$
$$R_{DUTY} = \frac{15}{\left(\frac{1.1}{0.734}\right) - 1.073} \approx 35.2K\Omega$$

## Typical Application Schematic

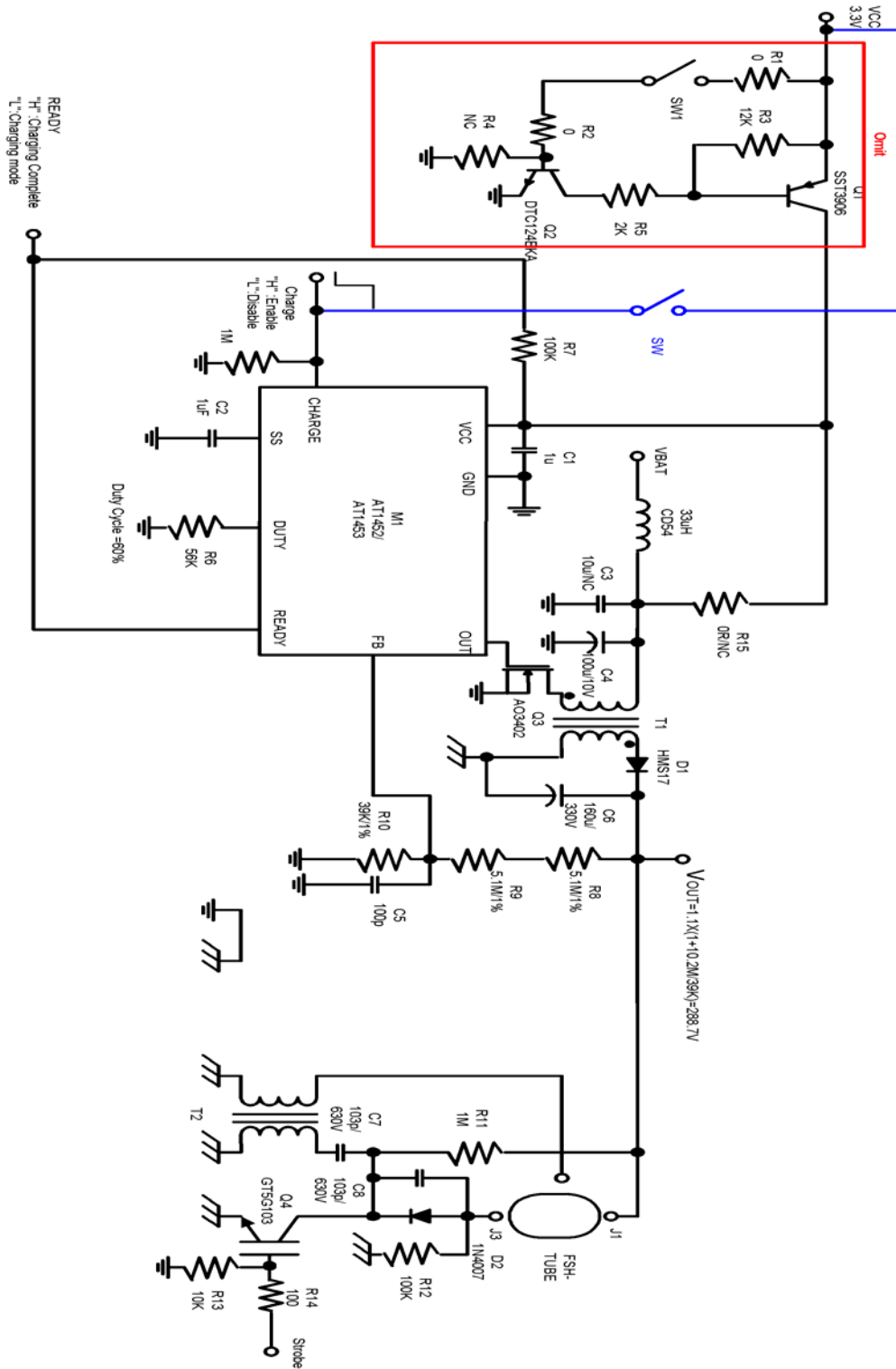
### (A) IGBT Trigger



**(B) SCR Trigger**



(C)



CH1:READY CH2: CHARGE CH3:IBAT CH4:VOUT(290V)

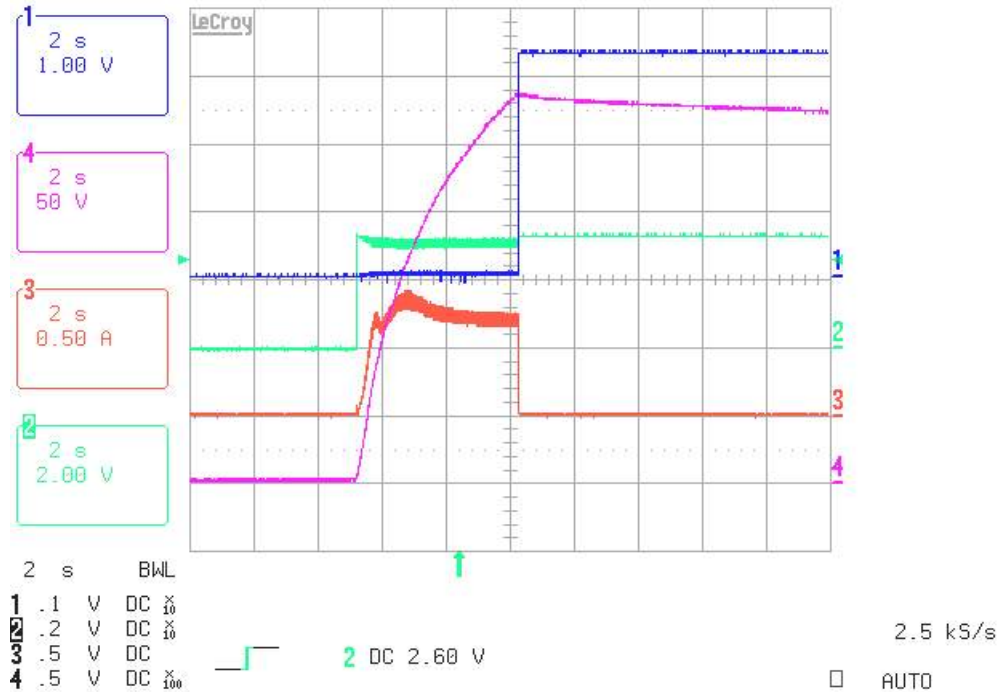


Fig3. VCC=3.0V VBAT=3.0V

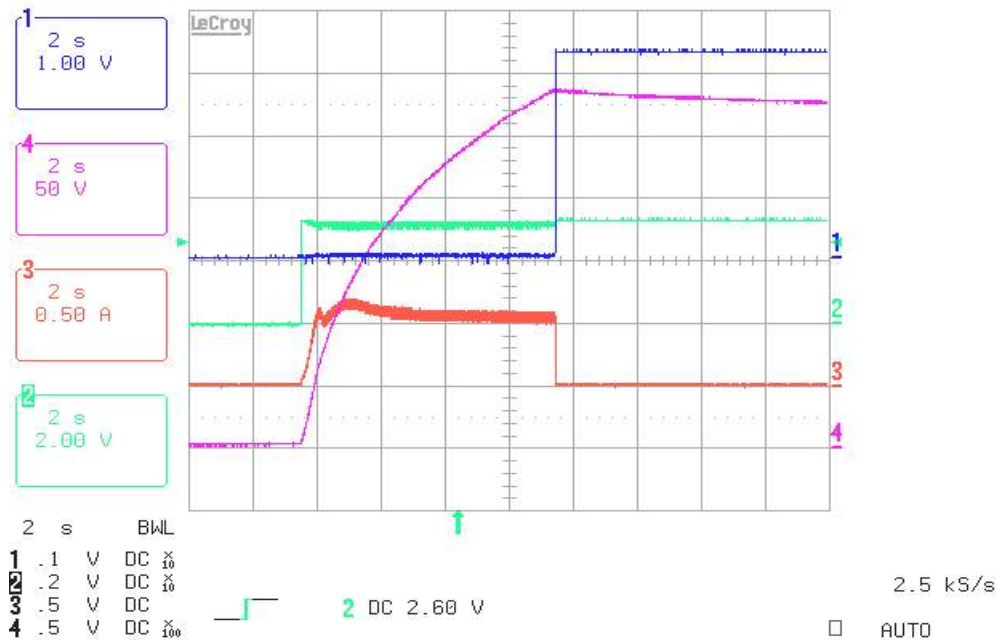
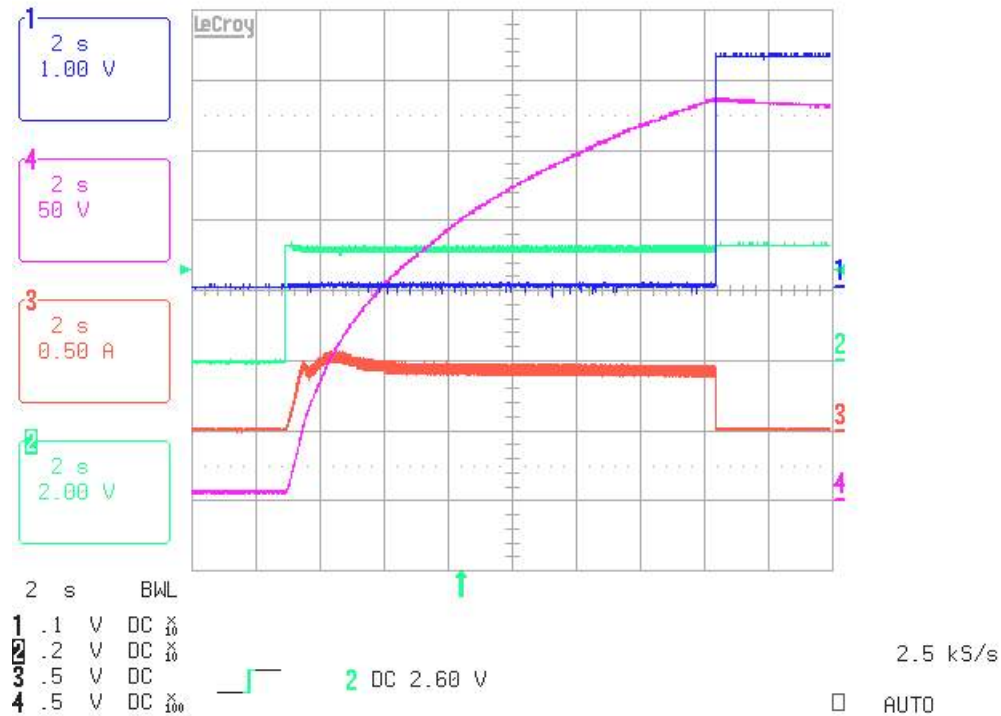


Fig4. VCC=3.0V VBAT=2.5V



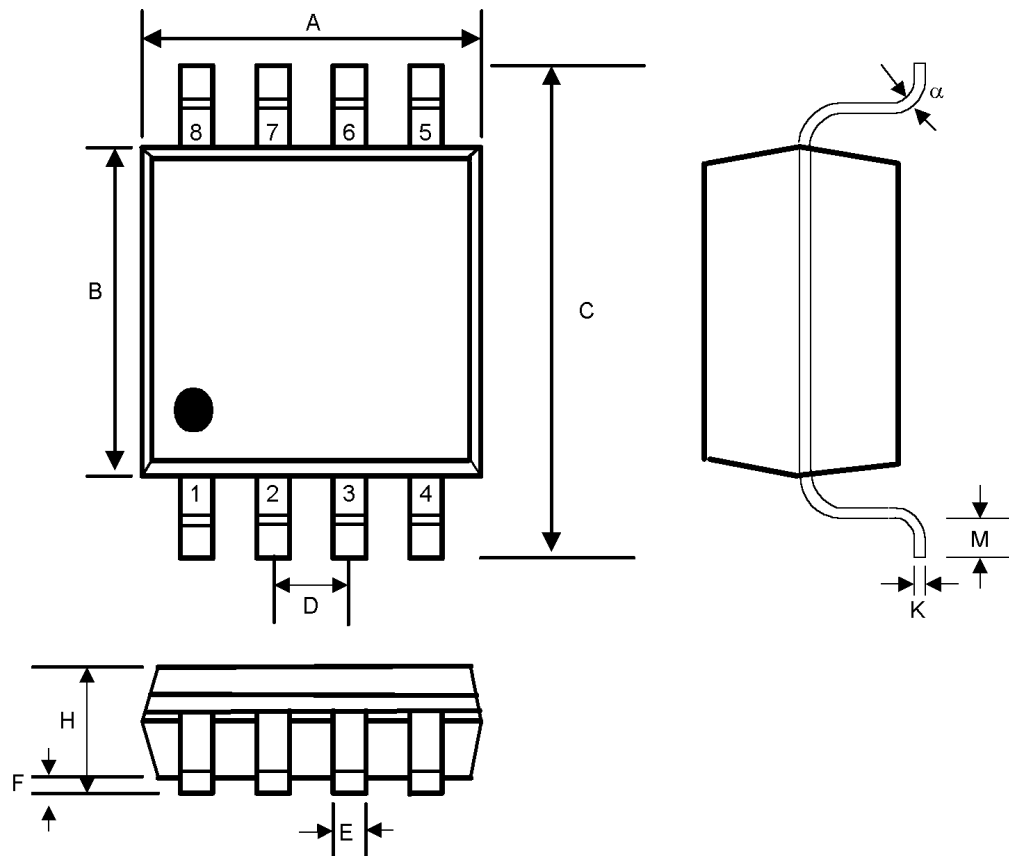
**Fig5. VCC=3.0V VBAT=2.0V**

Technical drawing of a rectangular box with dimensions and features:

- Top View:** Shows a rectangle with dimensions  $A$  (width) and  $B$  (height). Four small rectangular features are located along the top edge, labeled 8, 7, 6, and 5 from left to right. A large black circle is located in the bottom-left corner of the main rectangle.
- Front View:** Shows a rectangle with dimensions  $C$  (height) and  $D$  (width). Four small rectangular features are located along the bottom edge, labeled 1, 2, 3, and 4 from left to right.
- Side View:** Shows a rectangle with dimensions  $H$  (height) and  $L$  (length). Four small rectangular features are located along the bottom edge, labeled 1, 2, 3, and 4 from left to right. A dimension  $E$  is shown between the first and second features.
- Detail View:** A close-up of the top edge of the box, showing a curved profile with a radius  $R$ . The profile is defined by a curve  $\alpha$  and a straight line segment  $e1$ . The distance from the center of the curve to the bottom edge is  $J$ . The distance from the center of the curve to the right edge is  $K$ . The distance from the center of the curve to the left edge is  $M$ .

| SYMBOL   | INCHES |       | MILLIMETERS |      | NOTES |
|----------|--------|-------|-------------|------|-------|
|          | MIN    | MAX   | MIN         | MAX  |       |
| A        | 0.188  | 0.197 | 4.80        | 5.00 | -     |
| B        | 0.149  | 0.158 | 3.80        | 4.00 | -     |
| C        | 0.228  | 0.244 | 5.80        | 6.20 | -     |
| D        | 0.050  | BSC   | 1.27        | BSC  | -     |
| E        | 0.013  | 0.020 | 0.33        | 0.51 | -     |
| F        | 0.004  | 0.010 | 0.10        | 0.25 | -     |
| H        | 0.053  | 0.069 | 1.35        | 1.75 | -     |
| J        | 0.011  | 0.019 | 0.28        | 0.48 | -     |
| K        | 0.007  | 0.010 | 0.19        | 0.25 | -     |
| M        | 0.016  | 0.050 | 0.40        | 1.27 | -     |
| L        | 0.150  | REF   | 3.81        | REF  | -     |
| e1       | 45°    |       | 45°         |      | -     |
| $\alpha$ | 0°     | 8°    | 0°          | 8°   | -     |

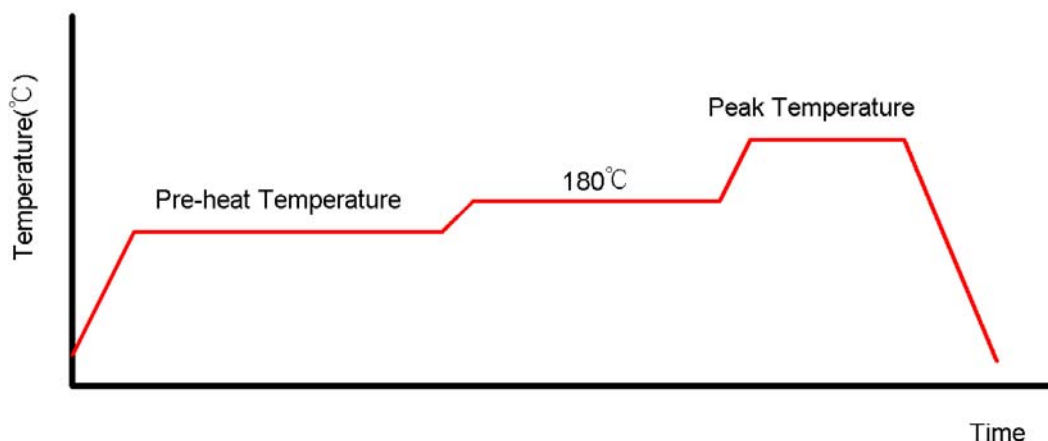
**Small Outline 8-pin TSSOP**



| SYMBOL   | INCHES    |       | MILLIMETERS |      | NOTES |
|----------|-----------|-------|-------------|------|-------|
|          | MIN       | MAX   | MIN         | MAX  |       |
| A        | 0.114     | 0.122 | 2.90        | 3.10 | -     |
| B        | 0.169     | 0.177 | 4.30        | 4.50 | -     |
| C        | 0.244     | 0.260 | 6.20        | 6.60 | -     |
| D        | 0.026 BSC |       | 0.65 BSC    |      | -     |
| E        | 0.010     | 0.012 | 0.25        | 0.30 | -     |
| F        | 0.002     | 0.006 | 0.05        | 0.15 | -     |
| H        | 0.041     | 0.047 | 1.05        | 1.20 | -     |
| K        | 0.005 BSC |       | 0.127 BSC   |      | -     |
| M        | 0.020     | 0.028 | 0.50        | 0.70 | -     |
| $\alpha$ | 0°        | 8°    | 0°          | 8°   | -     |

## Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A



## Classification Reflow Profiles

|                                            | Convection or<br>IR/Convction | VPR                       |
|--------------------------------------------|-------------------------------|---------------------------|
| Average Heating Rate(180°C to peak)        | 5°C/second max.               | 10°C/second max.          |
| Preheat Temperature(125±20°C)              | 120 seconds max.              |                           |
| Temperature maintained above 180°C         | 10~150 seconds                |                           |
| Time within 5°C of actual Peak Temperature | 10~20 seconds                 | 60 seconds                |
| Peak Temperature Range(Note 1)             | 219~225°C or<br>235~240°C     | 219~225°C or<br>235~240°C |
| Cooling Rate                               | 6°C /second max.              | 10°C/second max.          |
| Time 25°C to Peak Temperature              | 6 minutes max.                |                           |

\*1 The maximum peak temperatures for IR and VP reflow are depending on package dimensions.

## Package Reflow Conditions

| Pkg. Thickness ≥2.5mm<br>and all bags | Pkg. Thickness <2.5mm<br>and<br>Pkg. Volume ≥350 mm <sup>3</sup> | Pkg. Thickness <2.5mm<br>and<br>Pkg. Volume <350 mm <sup>3</sup> |
|---------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|
| Convection 219~225°C                  |                                                                  | Convection 235~240°C                                             |
| VPR 219~225°C                         |                                                                  | VPR 235~240°C                                                    |
| IR/Convection 219~225°C               |                                                                  | IR/Convection 235~240°C                                          |