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# RAA2900034H12HPD

R07DS1342EJ0102

Rev.1.02

## INTELLIGENT POWER DEVICE

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Feb. 28, 2020

### 1. Overview

#### 1.1 Description

RAA290003 is designed for 2Wheeler Flasher driver with double frequency flashing in low load current condition.

#### 1.2 Features

- High side driver
- Low on-state resistance
- Small package; TO252-3
- Short circuit protection
  - Over temperature protection with current limitation control
- Built-in auto flashing operation with only one external capacitor
- Built-in double frequency flashing in low load condition
- Active clamp operation at inductive load switch off
- RoHS compliant

#### 1.3 Application

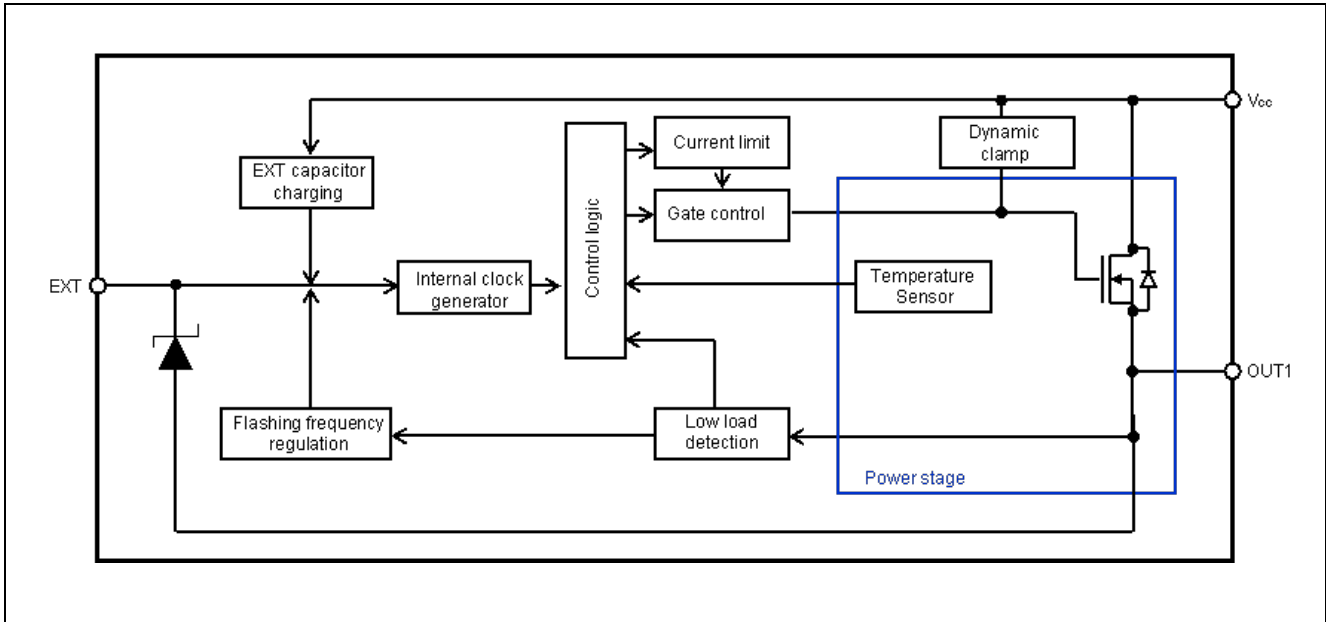
- 2Wheeler Flasher bulb switching

**2. Ordering Information**

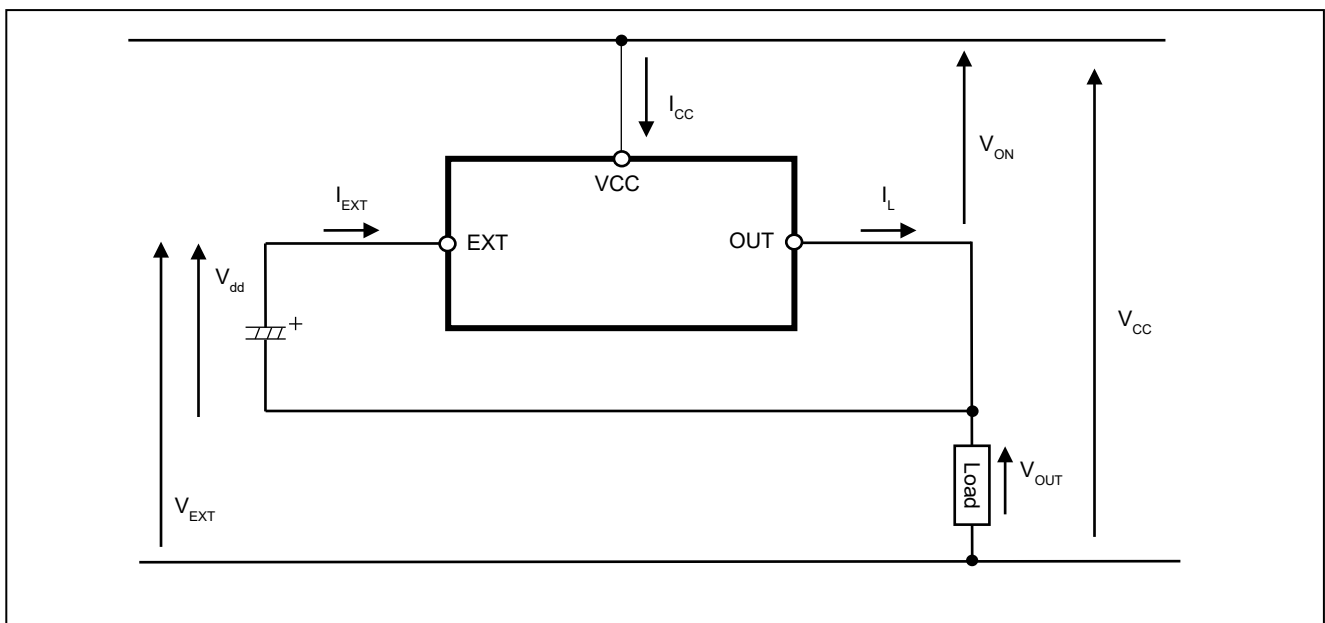
| <b>Part No.</b>  | <b>Lead plating</b> | <b>Packing</b>     | <b>Package</b> |
|------------------|---------------------|--------------------|----------------|
| RAA2900034H12HPD | Pure Sn             | Tape 2500pcs /reel | TO252 (MP-3ZP) |

### 3. Specification

#### 3.1 Block Diagram



#### 3.2 Current and Voltage definition



### 3.3 Pin Configuration

| Pin No. | Terminal Name |
|---------|---------------|
| 1       | EXT           |
| 2/4     | VCC           |
| 3       | OUT           |



#### Pin function

| Terminal Name | Pin function  | Recommended connection                    |
|---------------|---|---|
| EXT           | An external capacitor is connected between EXT pin and OUT pin. This capacitor stores power supply to the device during on-state and sets the flashing frequency. | Connected to OUT pin with 220uF capacitor |
| VCC           | Positive power supply for logic supply as well as output power supply   |   |
| OUT           | Protected high-side power output channel  |   |

### 3.4 Absolute Maximum Ratings

Ta=25degreeC, unless other specified

| Parameter  | Symbol           | Rating       | Unit    | Test Condition   |   |          |
|--|------------------|--------------|---------|--|---|----------|
| Vcc Voltage                                      | V <sub>CC</sub>  | 28           | V       |  |   |          |
| Vcc Voltage at reverse battery condition         | -V <sub>CC</sub> | -16          | V       | RL=Nomimal load, Refer 3.8.4, t<2min   |   |          |
| Output Drain to Source Voltage                   | V <sub>DSS</sub> | 42           | V       | RL=Nomimal load, Refer 3.8.4, t = 200 ms   |   |          |
| Load Current                                     | I <sub>L</sub>   | Self limited | A       |  |   |          |
| OUT Reverse Current at reverse battery condition | -I <sub>L</sub>  | -5           | A       | t<2min   |   |          |
| Total power dissipation for whole device (DC)    | P <sub>D</sub>   | 1.7          | W       | Ta=85degreeC,<br>Device on 50mmx50mmx1.5mm epoxy PCB FR4 with 6 cm2 of 70 um copper area |   |          |
| Voltage between EXT and OUT                      | V <sub>dd</sub>  | 6.5          | V       |  |   |          |
| Channel Temperature                              | T <sub>ch</sub>  | -40 to +150  | degreeC |  |   |          |
| Storage Temperature                              | T <sub>stg</sub> | -55 to +150  | degreeC |  |   |          |
| ESD susceptibility                               | V <sub>ESD</sub> | 2000         | V       | HBM  | AEC-Q100-002 std.<br>R=1.5kohm, C=100pF                         | All pin  |
|  |                  | 4000         |         |  | IEC61000-4-2 std.<br>R=330ohm, C=150pF,<br>100nF at VCC and OUT | VCC, OUT |
|  |                  | 200          | V       | MM   | AEC-Q100-003 std.<br>R=0ohm, C=200pF                            |          |

### 3.5 Recommended Operation Condition

| Parameter            | Symbol          | Min | Typ | Max | Unit    | Test Condition |
|----------------------|-----------------|-----|-----|-----|---------|----------------|
| Ambient temperature  | Ta              | -20 |     | 85  | degreeC |                |
| Power supply voltage | V <sub>CC</sub> | 9   |     | 16  | V       |                |

### 3.6 Thermal Characteristics

| Parameter               | Symbol                | Min | Typ | Max | Unit       | Test Condition  |
|-------------------------|-----------------------|-----|-----|-----|------------|---|
| Thermal characteristics | R <sub>th(ch-a)</sub> |     | 38  |     | degree C/W | According to JEDEC JESD51-2, -5, -7 on FR4 2s2p board |
|                         | R <sub>th(ch-c)</sub> |     | 5   |     | degree C/W |   |

### 3.7 Electrical Characteristics

#### Operation function

Tch=-40 to 150degreeC, Vcc=9 to 16V, 220uF between EXT and OUT, unless otherwise specified

| Parameter                                     | Symbol                | Min  | Typ  | Max  | Unit | Test Condition   |
|---|-----------------------|------|------|------|------|--|
| Operating Voltage                             | V <sub>CC</sub>       | 9    |      | 28   | V    | Von<0.4V,<br>RL=Nomimal load, Refer 3.8.4                                  |
|   |                       | 7.0  |      | 9.0  | V    | Auto flashing operation<br>RL=Nomimal load, Refer 3.8.4                    |
| On-state resistance                           | Ron                   |      | 16   |      | mohm | Tch=25°C<br>RL=Nominal load, Refer 3.8.4                                   |
|   |                       |      |      | 48   |      | Tch=150°C  |
| Slew rate on                                  | dV/dton               | 0.04 |      | 1.0  | V/μs | VCC=13.5V, RL=Nominal load, Refer 3.8.4, Refer 3.8.5                       |
| Slew rate off                                 | -dV/dtoff             | 0.04 |      | 1.0  | V/μs |  |
| Turn on delay time after power supply on 1)   | td(on)                |      |      | 100  | ms   | VCC=13.5V, Tch=-20 to 85°C,<br>RL=Nominal load, , Refer 3.8.4, Refer 3.8.5 |
| Nominal operation frequency                   | f <sub>nom</sub>      | 1.25 | 1.4  | 1.58 | Hz   | Vcc=13.5V<br>Tch=25°C,<br>RL=Nominal load,<br>Refer 3.8.4                  |
|   |                       | 0.66 |      |      |      | Vcc=7.0 to 9V<br>Tch=-20 to 85°C,<br>RL=Nominal load,<br>Refer 3.8.4       |
|   |                       | 1.12 | 1.4  | 1.68 |      | Vcc=9 to 16V   |
| On duty rate                                  | don                   | 35   |      | 60   | %    | Tch=-20 to 85°C, RL=Nominal load, Refer 3.8.4                              |
| Internal clock high level between EXT and OUT | V <sub>exth</sub>     |      | 6.10 |      | V    | VCC=13.5V  |
| Internal clock low level between EXT and OUT  | V <sub>extl</sub>     |      | 4.95 |      | V    | VCC=13.5V  |
| EXT clamp voltage                             | V <sub>dd,clamp</sub> |      | 7    |      | V    | I <sub>EXT</sub> =2mA, Von=0V  |
| EXT reverse clamp voltage                     | V <sub>dd,rev</sub>   |      | -0.7 |      | V    | I <sub>EXT</sub> =-2mA, Von=0V   |
| Supply current via EXT pin                    | I <sub>EXT</sub>      |      | 708  |      | μA   | Von=0V, V <sub>ext</sub> =5.5V, Tch=25°C                                   |
| Double frequency flashing threshold           | I <sub>dff</sub>      | 1.75 | 2.06 | 2.40 | A    | VCC=9V, Tch=-20 to 85°C  |
|   |                       | 2.21 | 2.60 | 3.03 |      | VCC=13.5V, Tch=-20 to 85°C   |
|   |                       | 2.45 | 2.88 | 3.36 |      | VCC=16V, Tch=-20 to 85°C   |

1) not subjected production test, guaranteed by design

#### Protection function

Tch=-40 to 150degreeC, Vcc=9 to 16V, unless other wise specified

| Parameter                             | Symbol               | Min | Typ | Max | Unit    | Test Condition |
|---------------------------------------|----------------------|-----|-----|-----|---------|----------------|
| Current limitation                    | I <sub>L</sub> (LIM) |     | 42  |     | A       | VCC=13.5V      |
| Absolute thermal shutdown temperature | aT <sub>th</sub>     | 150 |     |     | degreeC |                |

## 3.8 Feature Description

### 3.8.1 Normal operation

When a nominal load such as defined 3.8.4 is connected to OUT pin, device operate with auto flashing mode by charging EXT capacitor up to the  $V_{extH}$  quickly, and then discharging EXT capacitor down to  $V_{extL}$  slowly with constant current IEXT.

Auto flashing operation frequency is determined following formula. Duty cycle is approx. 50%.

$$f_{nom} = \frac{I_{EXT}}{2 \times C_{EXT} \times (V_{extH} - V_{extL})}$$

### 3.8.2 Double flashing operation at low load current condition

If load current is lower than  $I_{dff}$  during on-state, device detects low load condition, and start double flashing operation automatically.

### 3.8.3 Short circuit protection

The device shuts down automatically when  $T_{ch} > aT_{th}$  is detected.

### Absolute thermal toggling

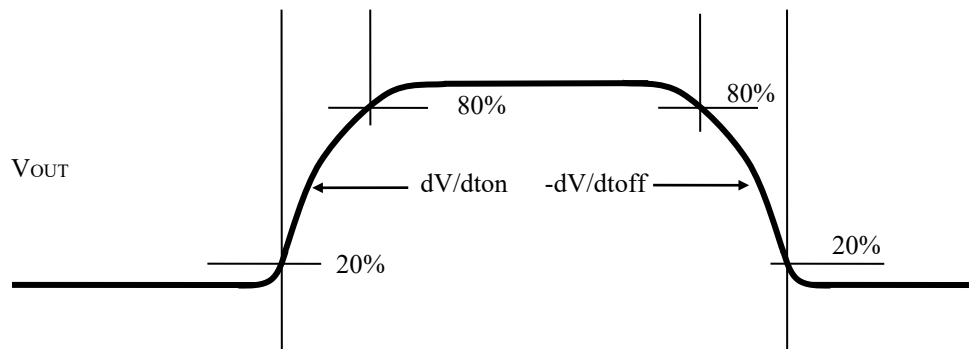
Current limitation control with IL(LIM) when auto restart from absolute  $T_{ch}$  protection.

### 3.8.4 Nominal load

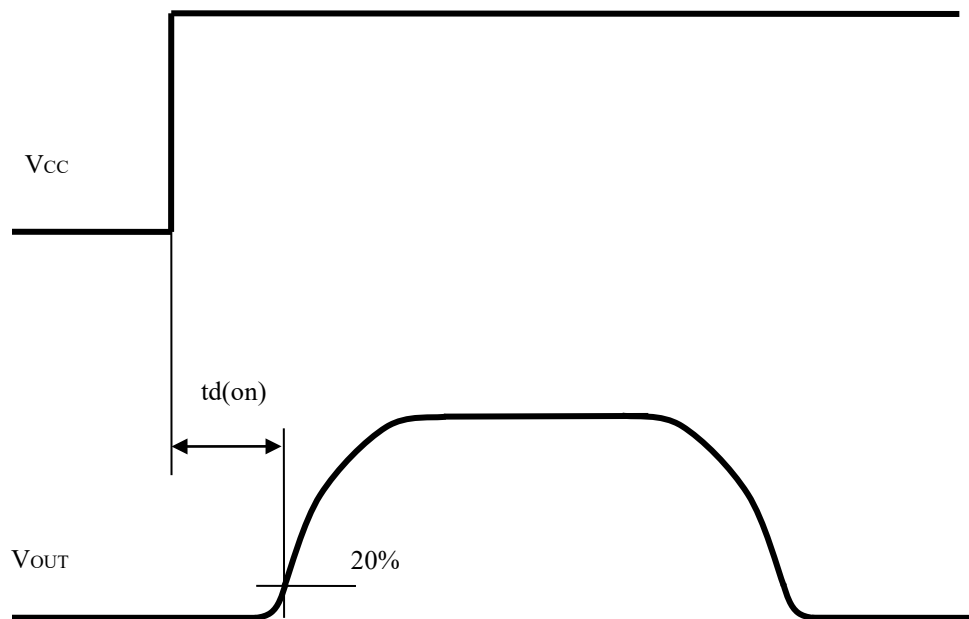
| Product   | Nominal load |
|-----------|--------------|
| RAA290003 | 3.4ohm       |

### 3.8.5 Measurement condition

#### Switching waveform of OUT terminal



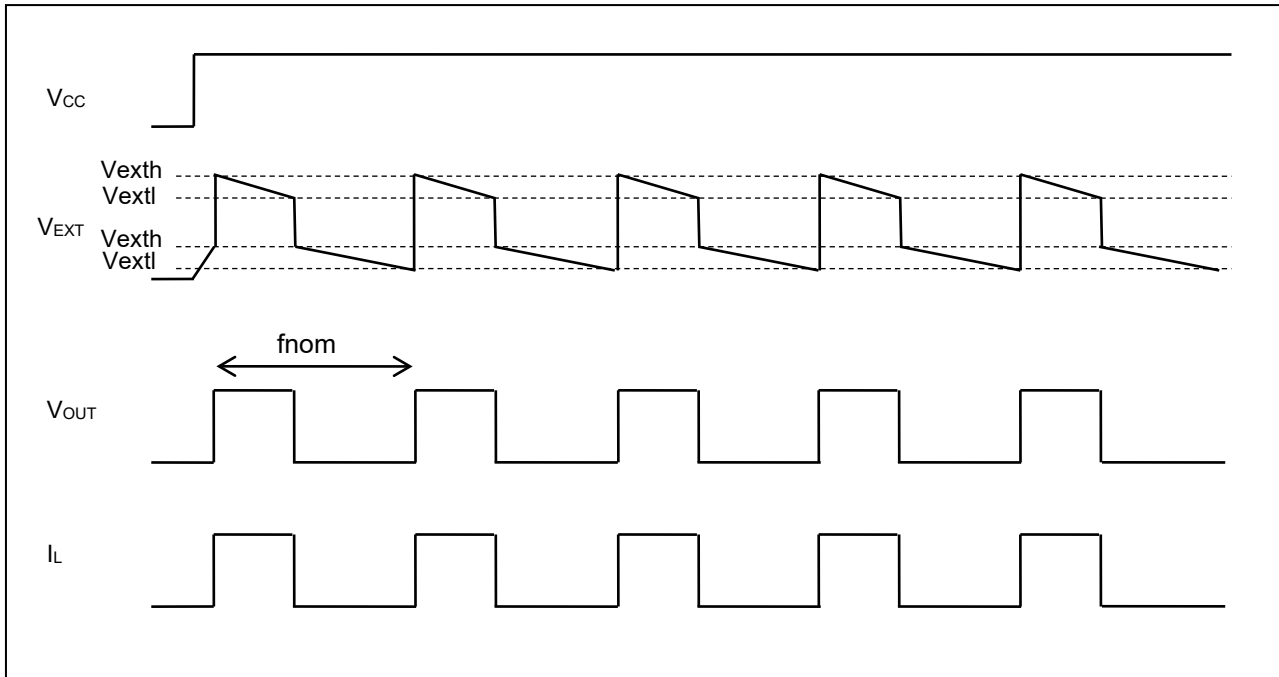
#### Turn on delay time after Power Supply on



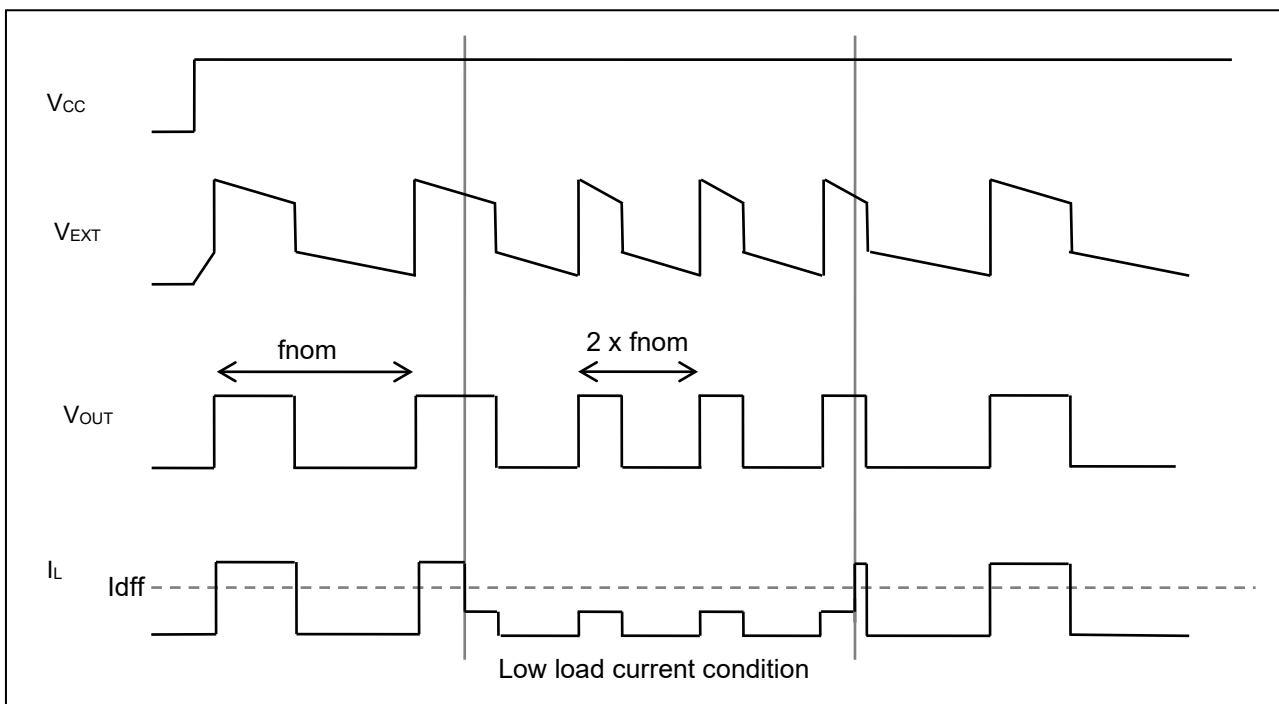


### 3.8.6 Timing chart

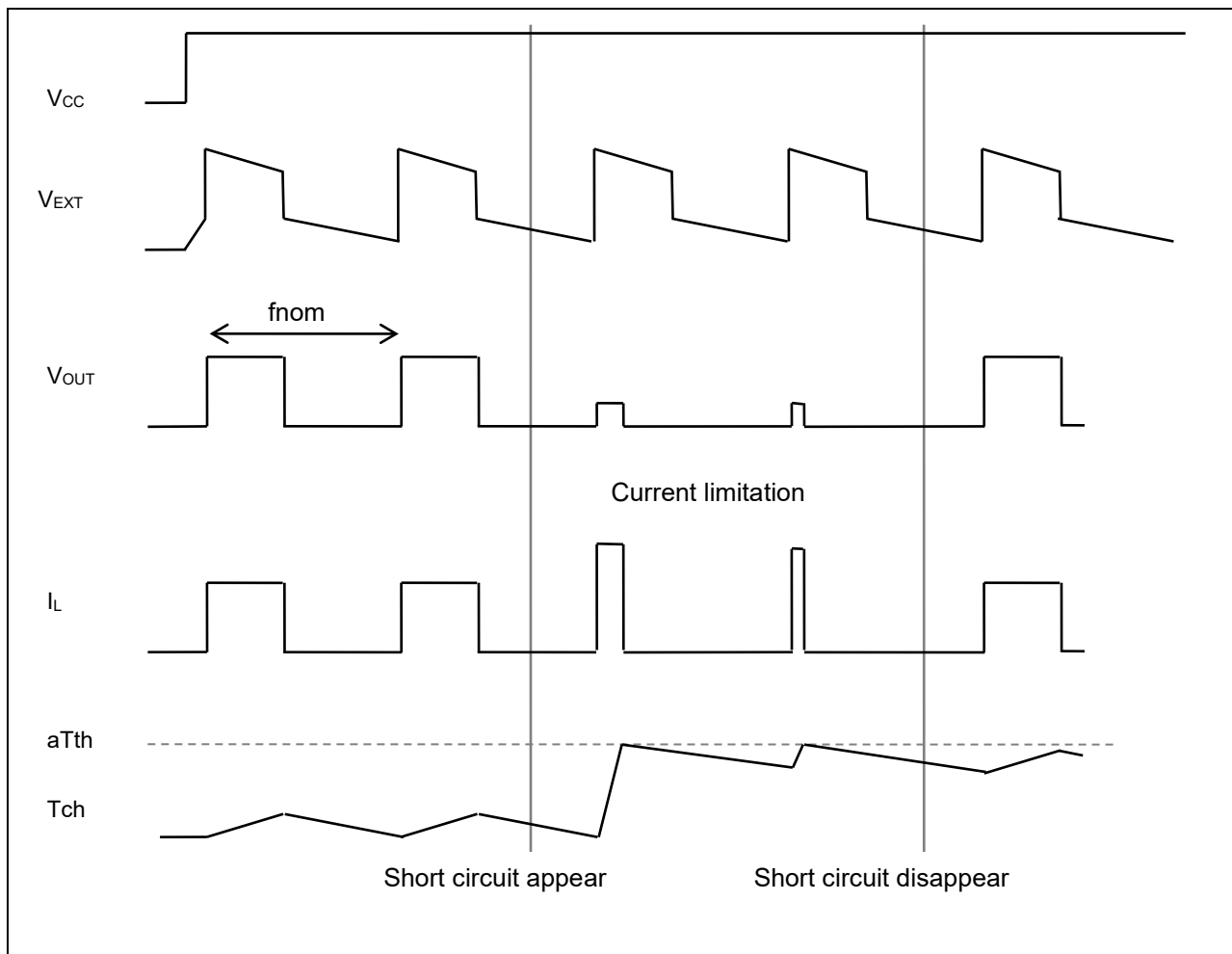
#### Nominal Operation



#### Double flashing operation at low load current condition



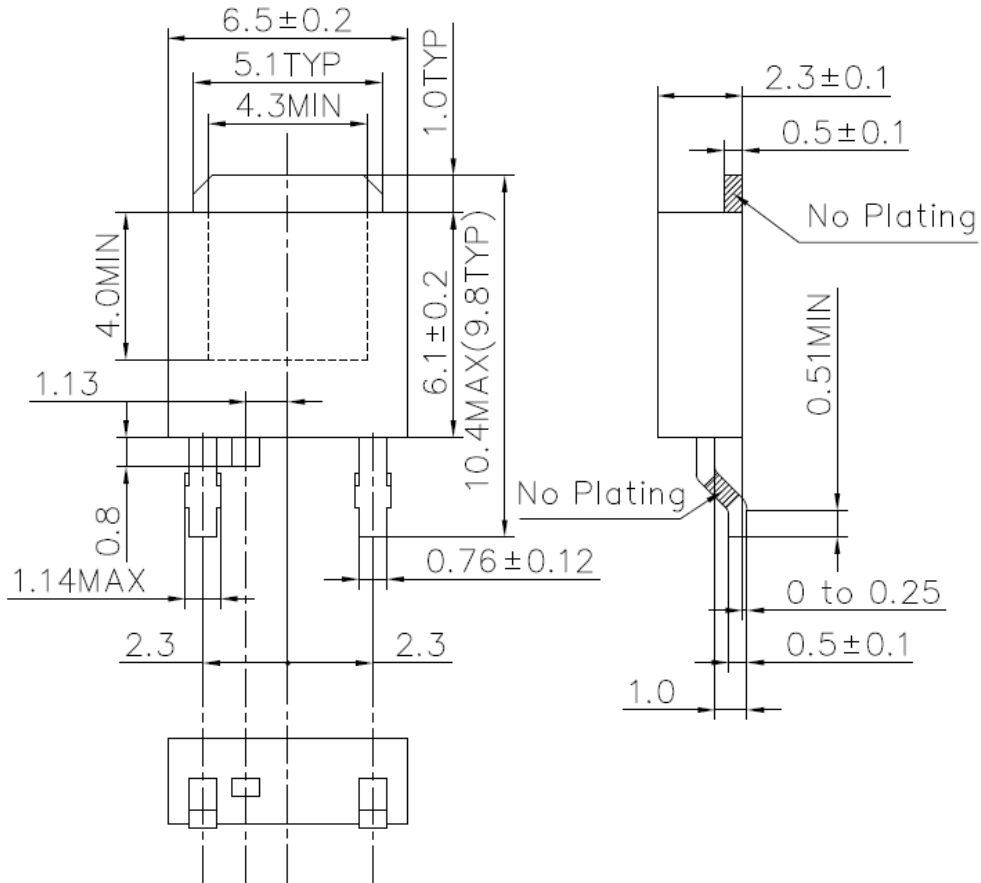
Short circuit protection



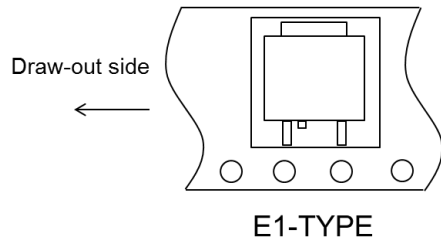
3.9 Package drawing

| JEITA Package Code | Renesas Code | Previous Code | Mass(TYP.)[g] |
|--------------------|--------------|---------------|---------------|
| -                  | PRSS0004ZP-A | P3J5-230-512  | 0.3           |

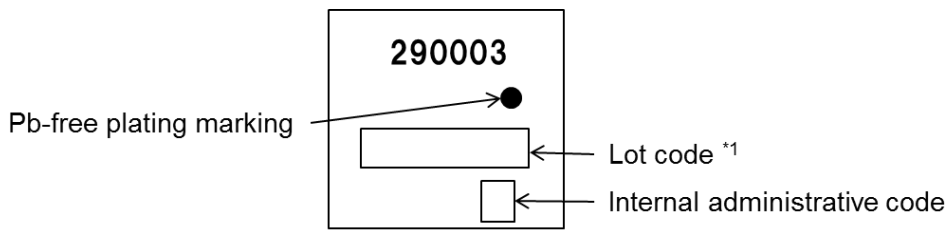
Unit : mm



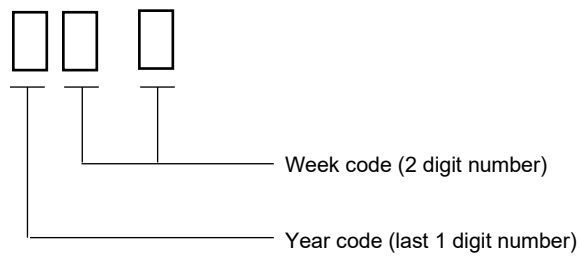
### 3.10 Taping information



### 3.11 Marking information

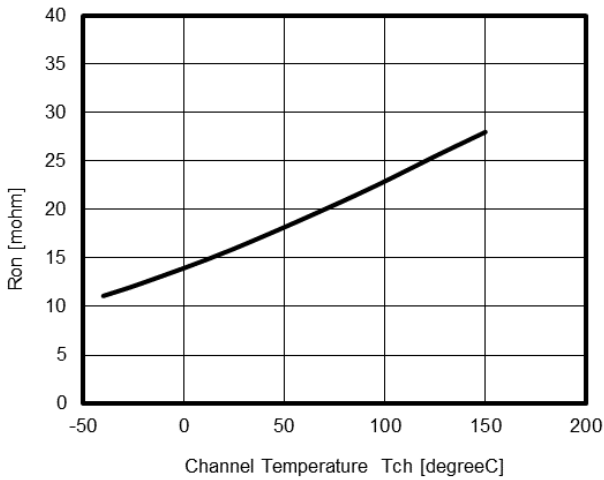


Note: \*1. Composition of the lot code

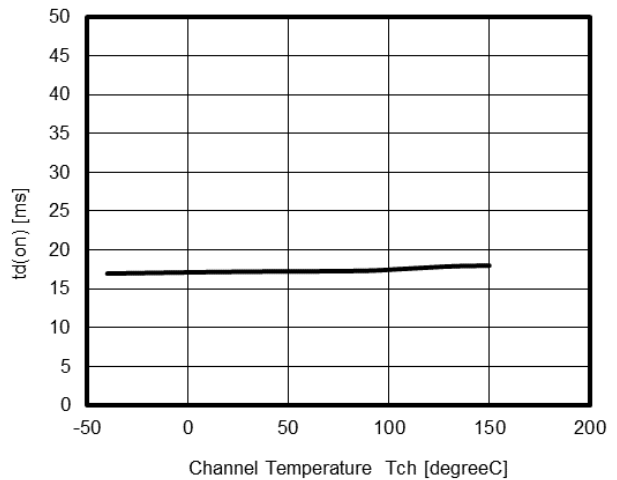


4. Typical characteristics

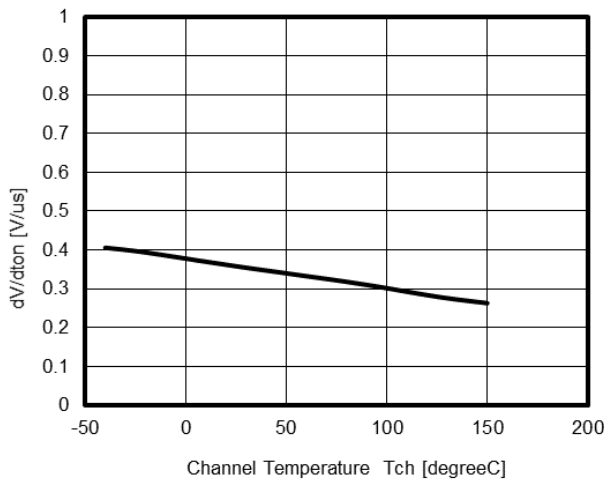
On-state resistance per channel  
VS. Channel TEMPERATURE



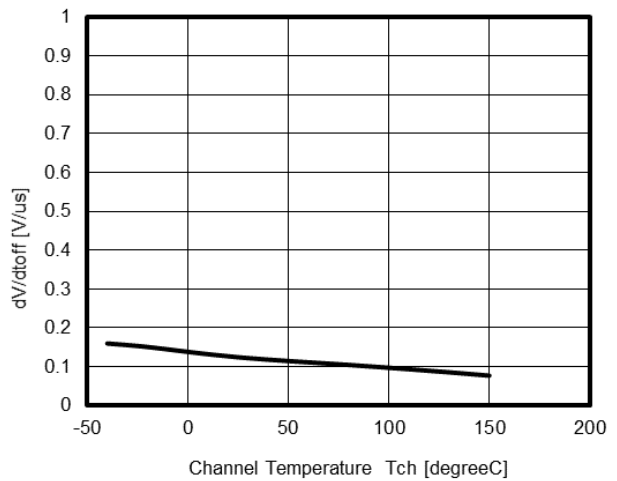
Turn on delay time  
VS. Channel TEMPERATURE



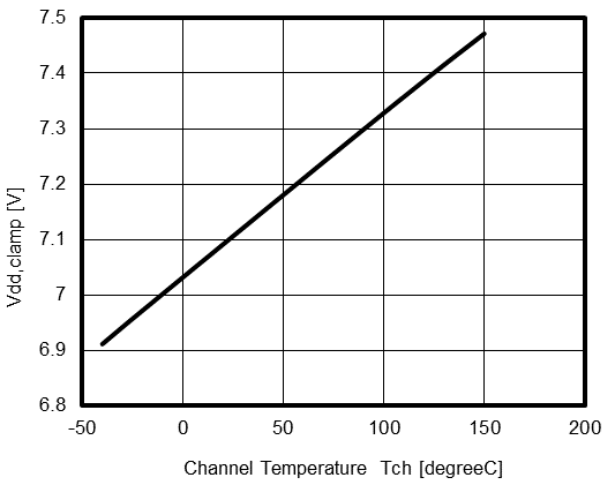
Slew rate on  
VS. Channel TEMPERATURE



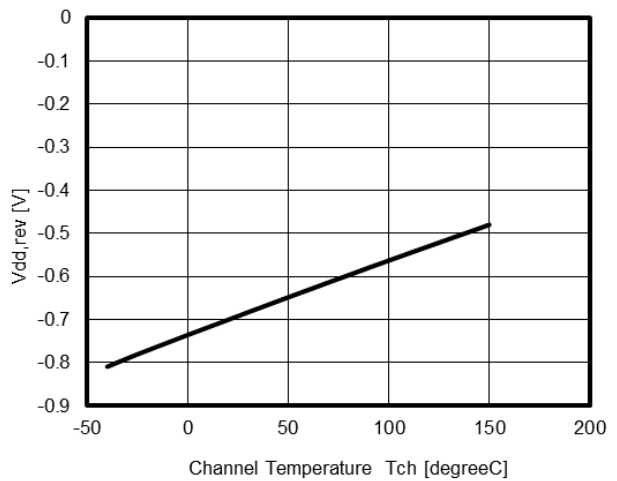
Slew rate off  
VS. Channel TEMPERATURE

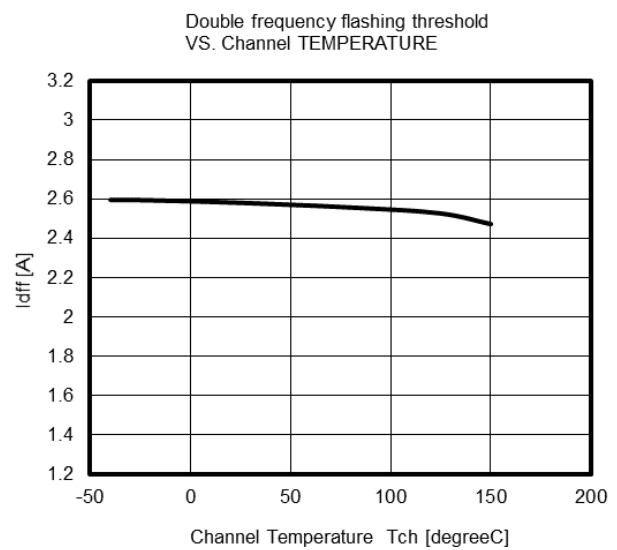
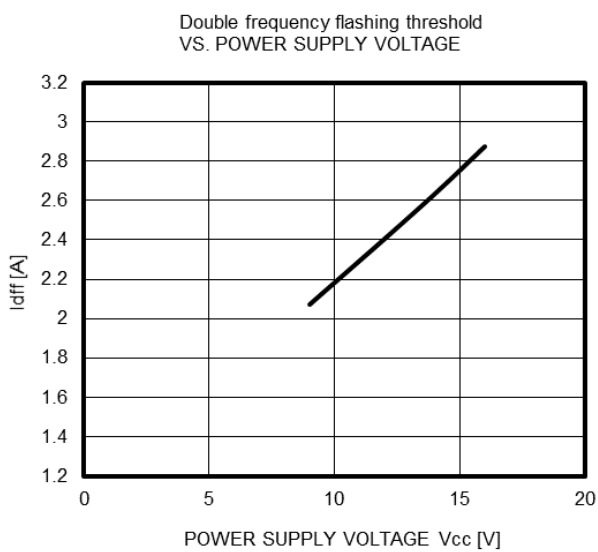
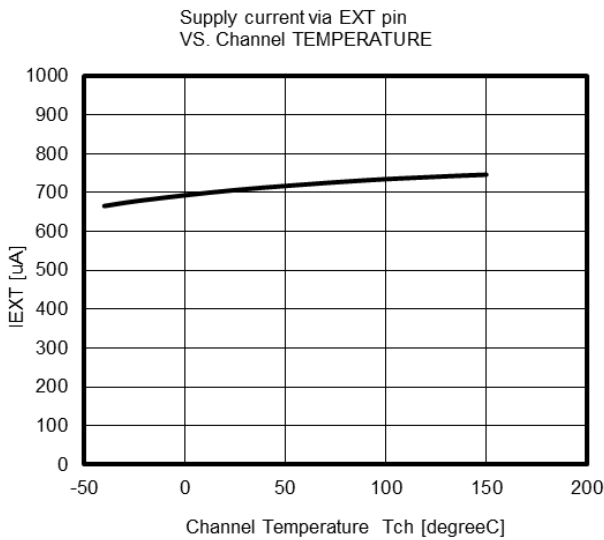
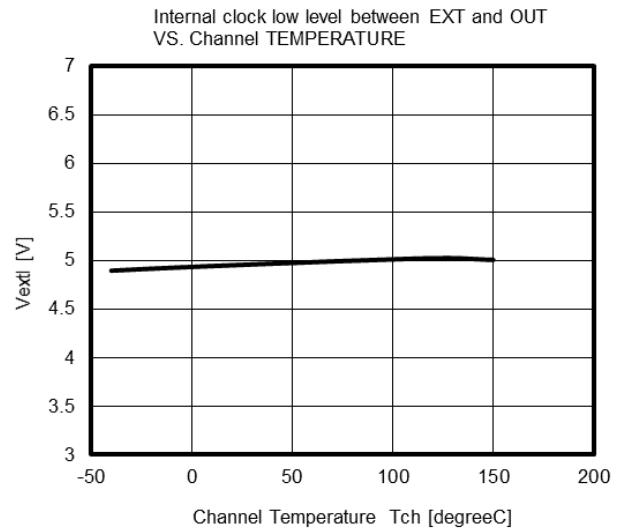
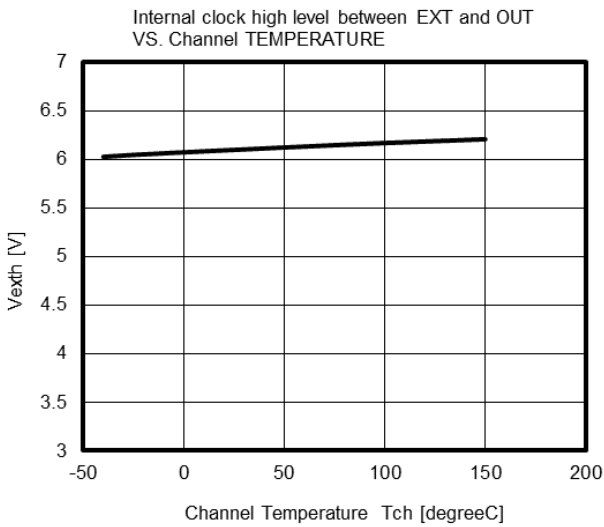


EXT clamp voltage  
VS. Channel TEMPERATURE

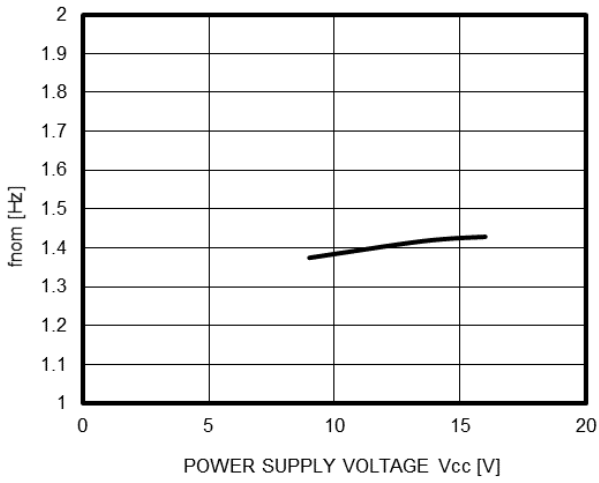


EXT reverse clamp voltage  
VS. Channel TEMPERATURE

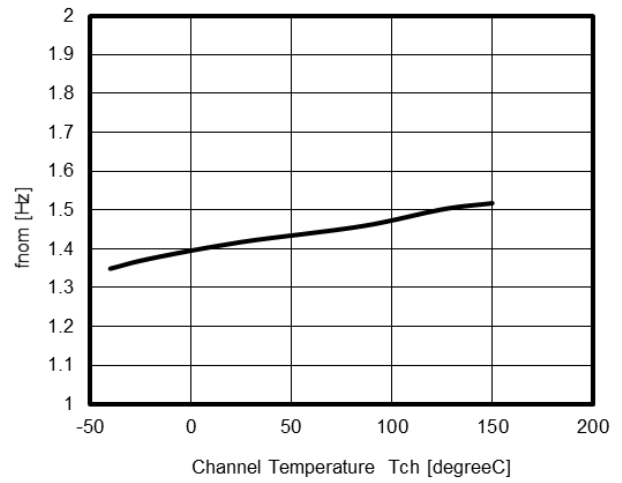




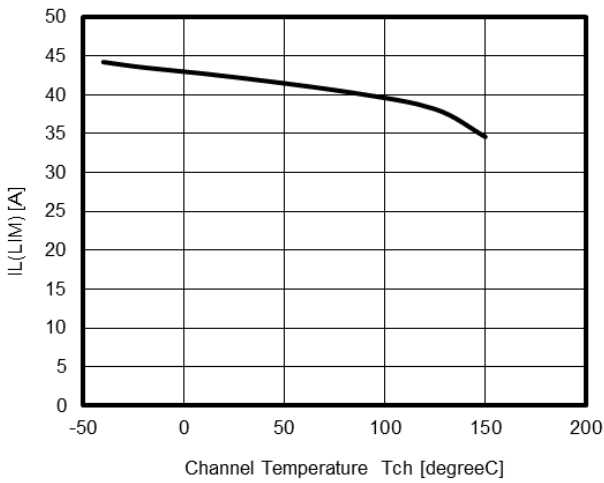
Nominal operation frequency  
VS. POWER SUPPLY VOLTAGE



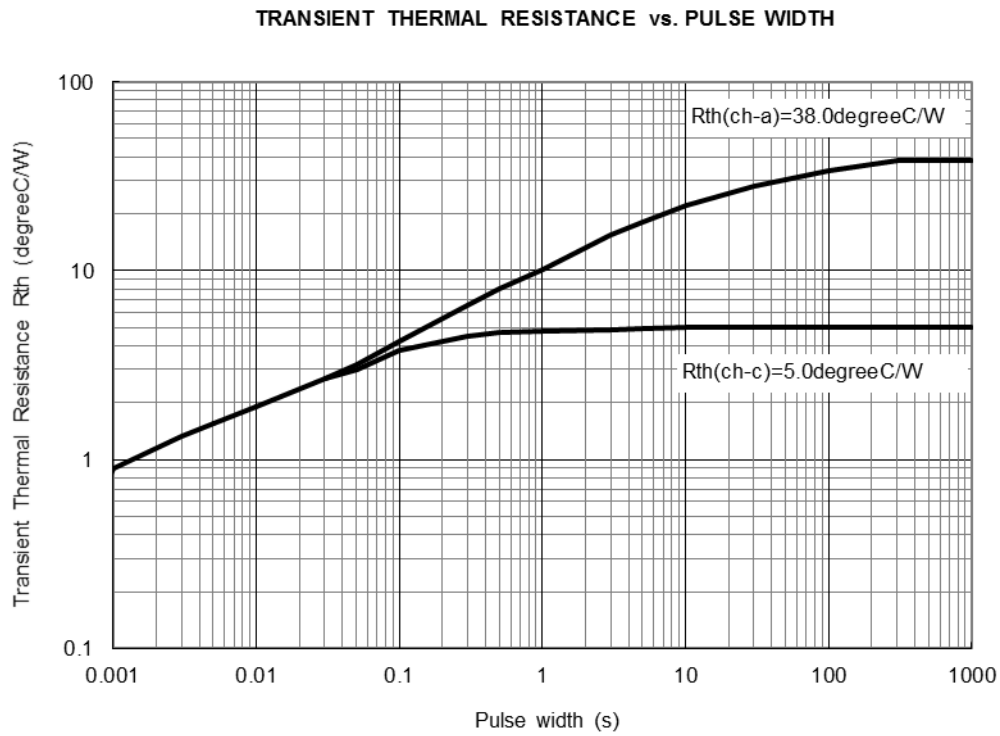
Nominal operation frequency  
VS. Channel TEMPERATURE



Current limitation  
VS. Channel TEMPERATURE

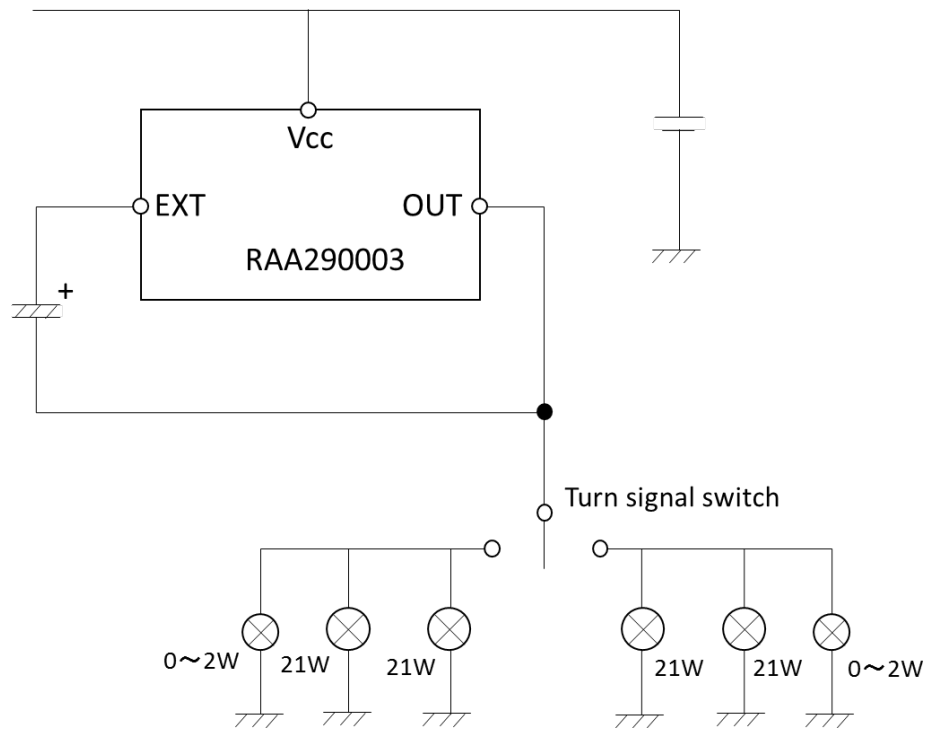


5. Thermal characteristics

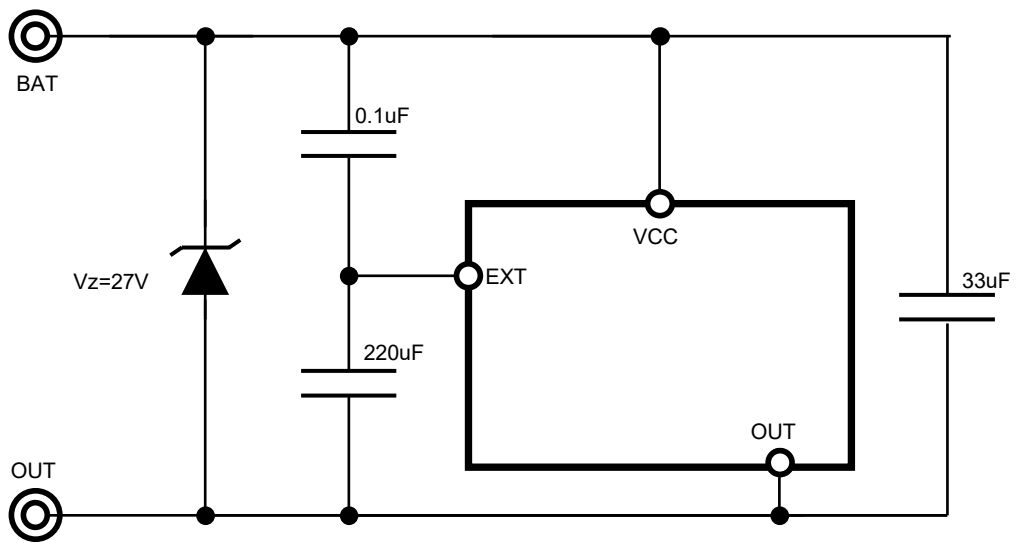




6. Application example in principle



Recommended circuit for dump surge



|                         |                                   |
|-------------------------|-----------------------------------|
| <b>Revision History</b> | <b>RAA2900034H12HPD Datasheet</b> |
|-------------------------|-----------------------------------|

| Rev. | Date           | Description |   |
|------|----------------|-------------|---|
|      |                | Page        | Summary   |
| 1.00 | April 18, 2016 | 1-17        | 1st issue   |
| 1.01 | Sep. 20, 2017  | 1-17        | ldff (Double frequency flashing threshold) has been changed.  |
| 1.02 | Feb. 28, 2020  | 1           | Deleted description of "AEC-Q100 qualified"<br>Deleted description of "Note: The information contained in this document is the one that was obtained when the document was issued, and may be subject to change." |

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