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# RAA2900024H12HPD

R07DS1341EJ0100

Rev.1.00

## INTELLIGENT POWER DEVICE

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April 18, 2016

### 1. Overview

#### 1.1 Description

RAA290002 is designed for 2 Wheeler 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
- AEC Qualified
- RoHS compliant

#### 1.3 Application

- 2 Wheeler Flasher bulb switching

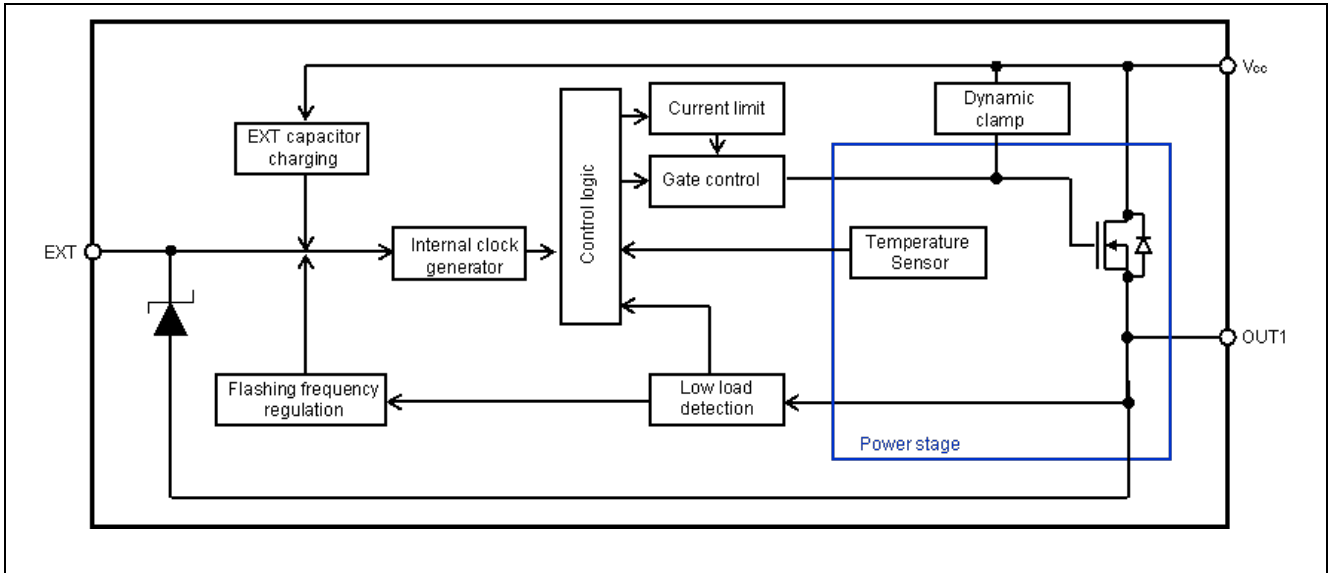
**Note:** The information contained in this document is the one that was obtained when the document was issued, and may be subject to change.

**2. Ordering Information**

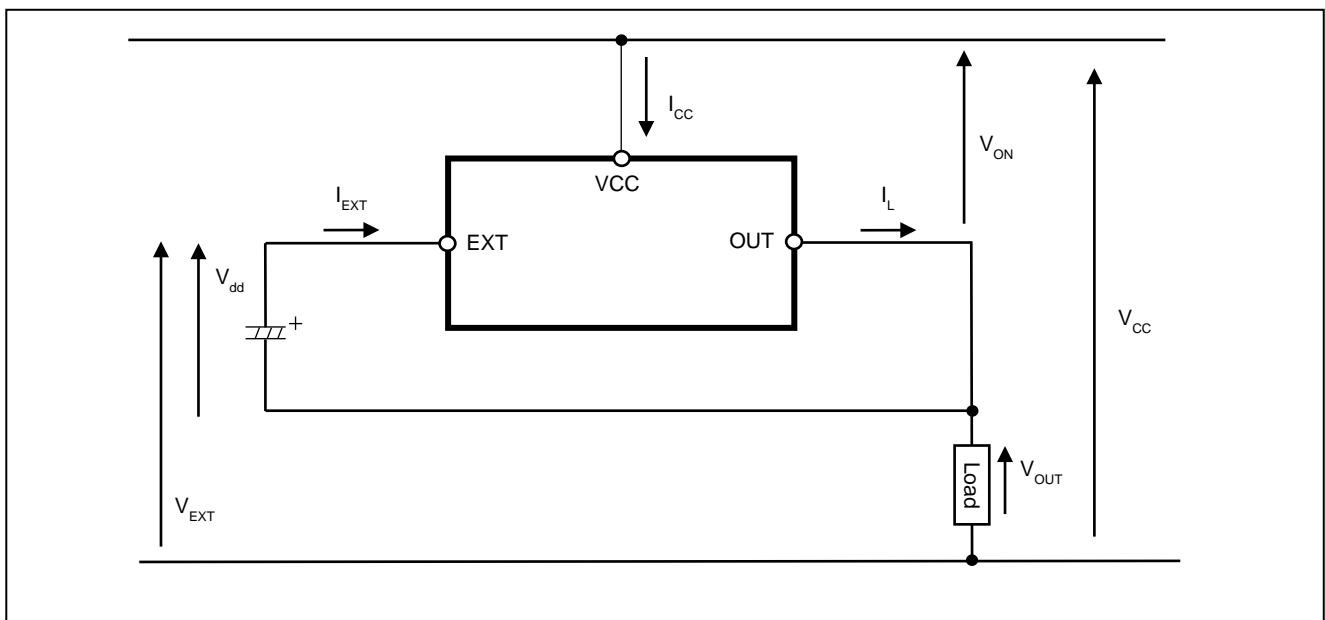
Part No.	Lead plating	Packing	Package
RAA2900024H12HPD	Pure Sn	Tape 2500pcs /reel	TO252 (MP-3ZP)

### 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, 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. R=1.5kohm, C=100pF	All pin
		4000			IEC61000-4-2 std. R=330ohm, C=150pF, 100nF at VCC and OUT	VCC, OUT
		200	V	MM	AEC-Q100-003 std. 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, RL=Nomimal load, Refer 3.8.4
		7.0		9.0	V	Auto flashing operation RL=Nomimal load, Refer 3.8.4
On-state resistance	Ron		16		mohm	Tch=25°C 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, RL=Nominal load, , Refer 3.8.4, Refer 3.8.5
Nominal operation frequency	fnom	1.25	1.4	1.58	Hz	Vcc=13.5V Tch=25°C, RL=Nominal load, Refer 3.8.4
		0.66				Vcc=7.0 to 9V Tch=-20 to 85°C, RL=Nominal load, 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	Vexth		6.10		V	VCC=13.5V
Internal clock low level between EXT and OUT	Vextl		4.95		V	VCC=13.5V
EXT clamp voltage	Vdd,clamp		7		V	IEXT=2mA, Von=0V
EXT reverse clamp voltage	Vdd,rev		-0.7		V	IEXT=-2mA, Von=0V
Supply current via EXT pin	IEXT		708		μA	Von=0V, Vext=5.5V, Tch=25°C
Double frequency flashing threshold	ldff	0.85	0.96	1.06	A	VCC=9V, Tch=-20 to 85°C
		1.07	1.20	1.33		VCC=13.5V, Tch=-20 to 85°C
		1.20	1.34	1.47		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	IL(LIM)		42		A	VCC=13.5V
Absolute thermal shutdown temperature	aTth	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  $I_{dfl}$  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

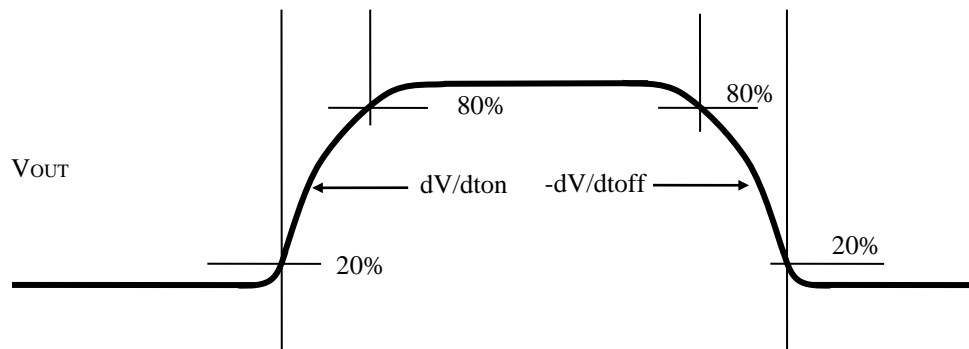
Current limitation control with IL(LIM) when auto restart from absolute  $T_{ch}$  protection.

### 3.8.4 Nominal load

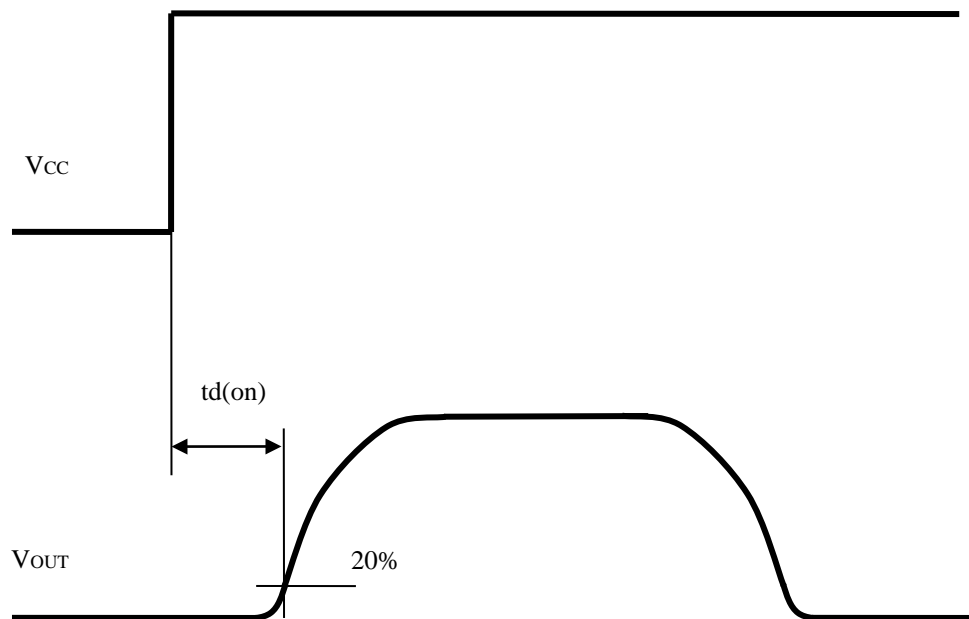
Product	Nominal load
RAA290002	3.4ohm

### 3.8.5 Measurement condition

#### Switching waveform of OUT terminal



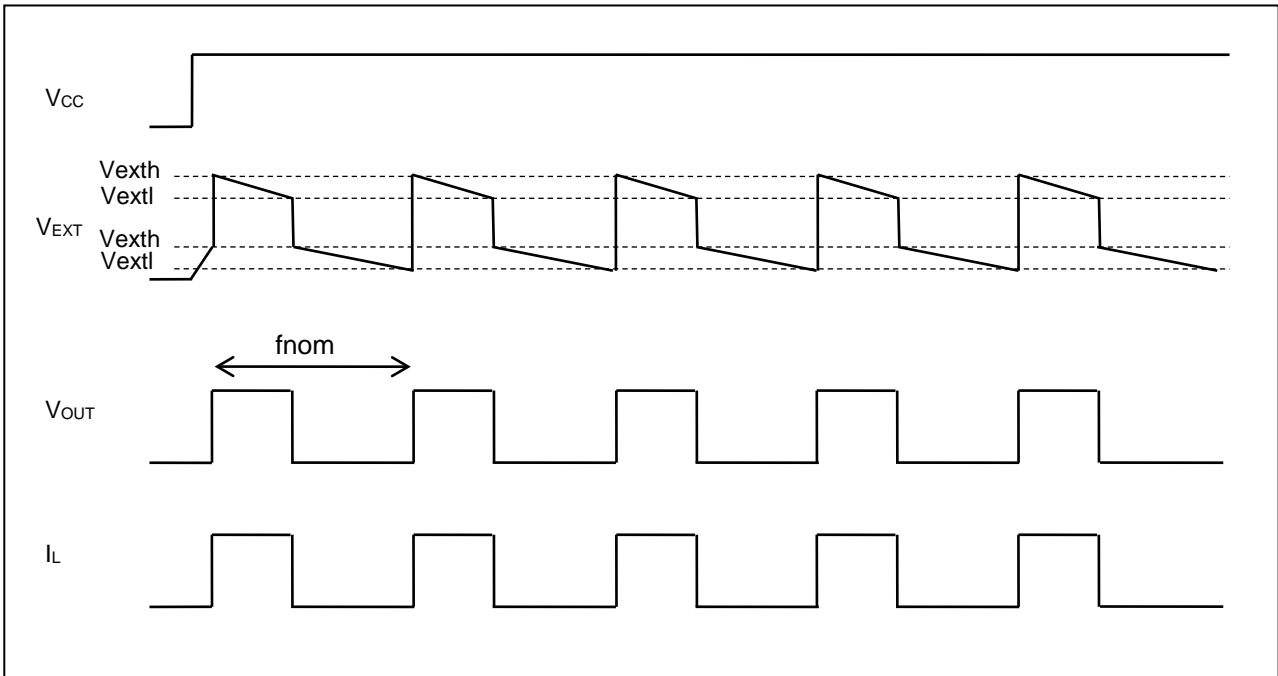
#### Turn on delay time after Power Supply on



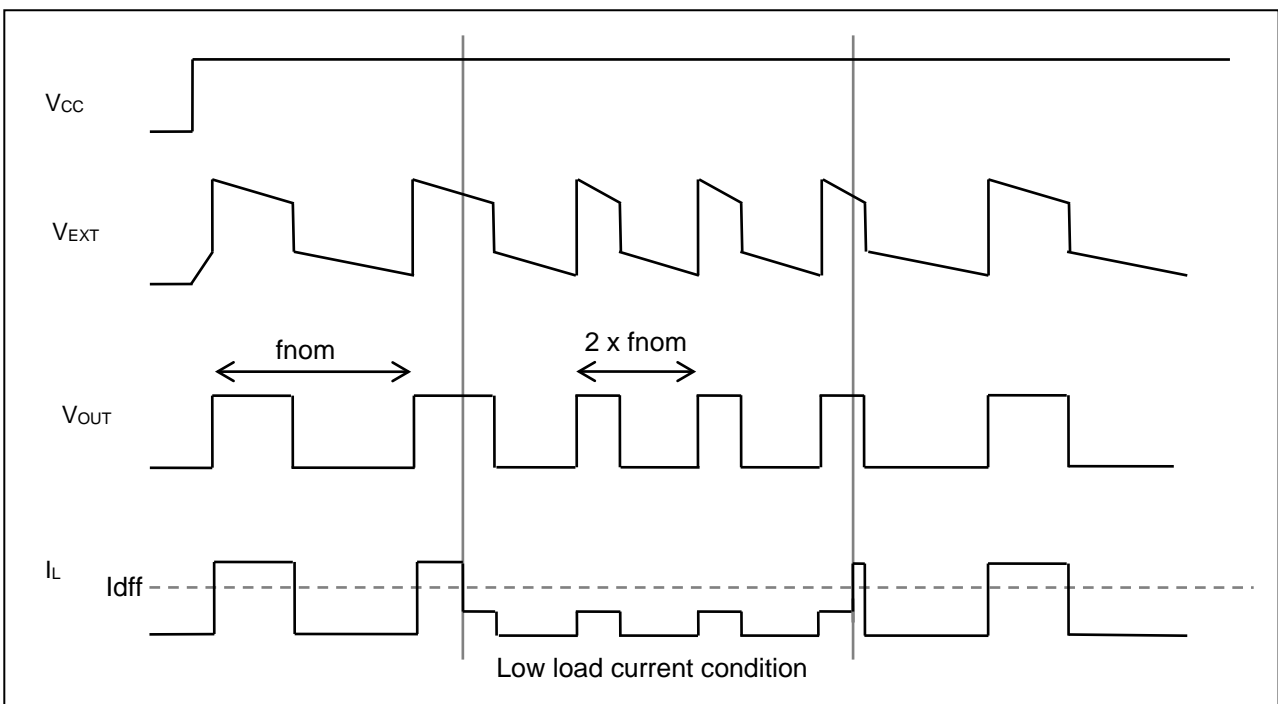


### 3.8.6 Timing chart

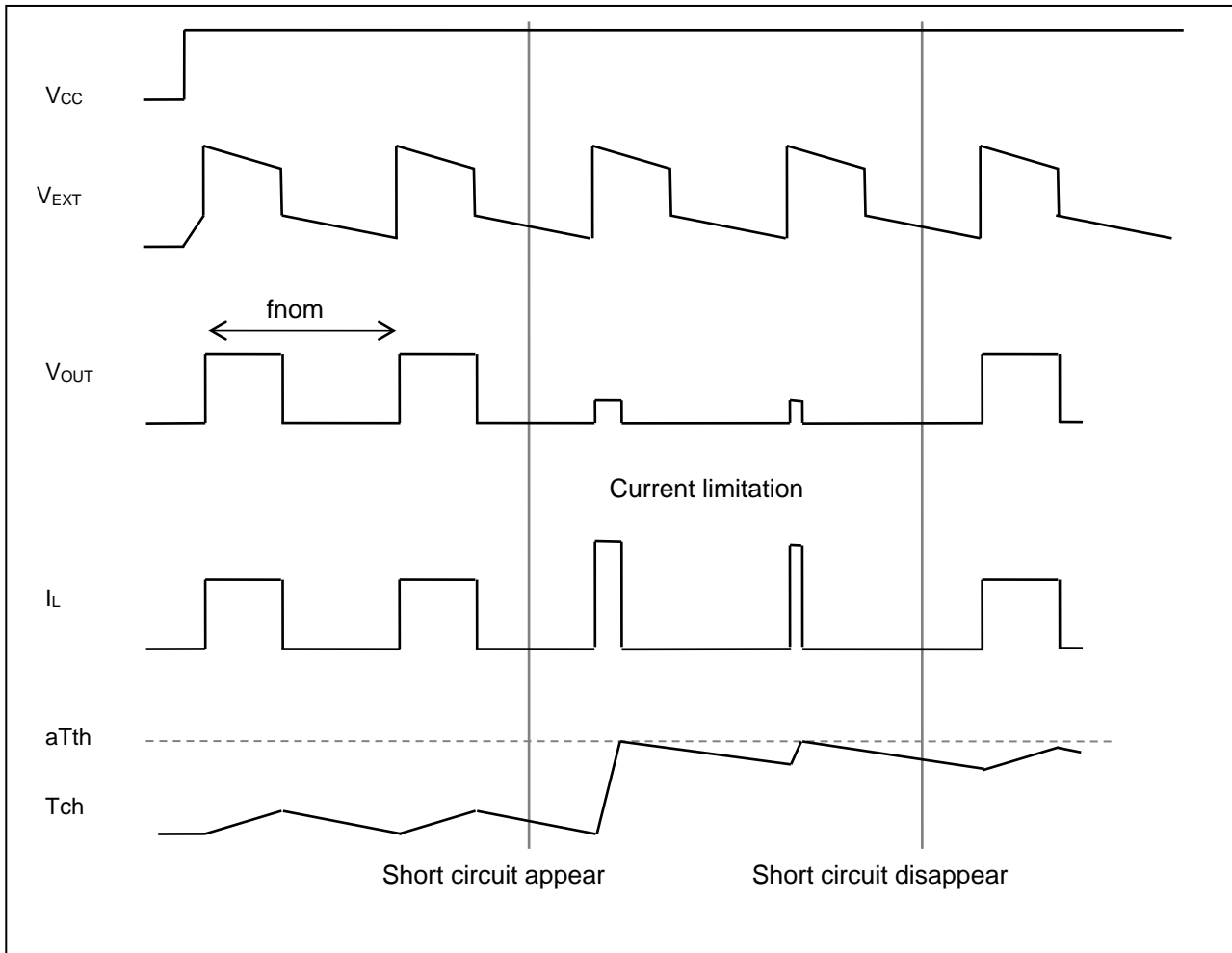
#### Nominal Operation



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



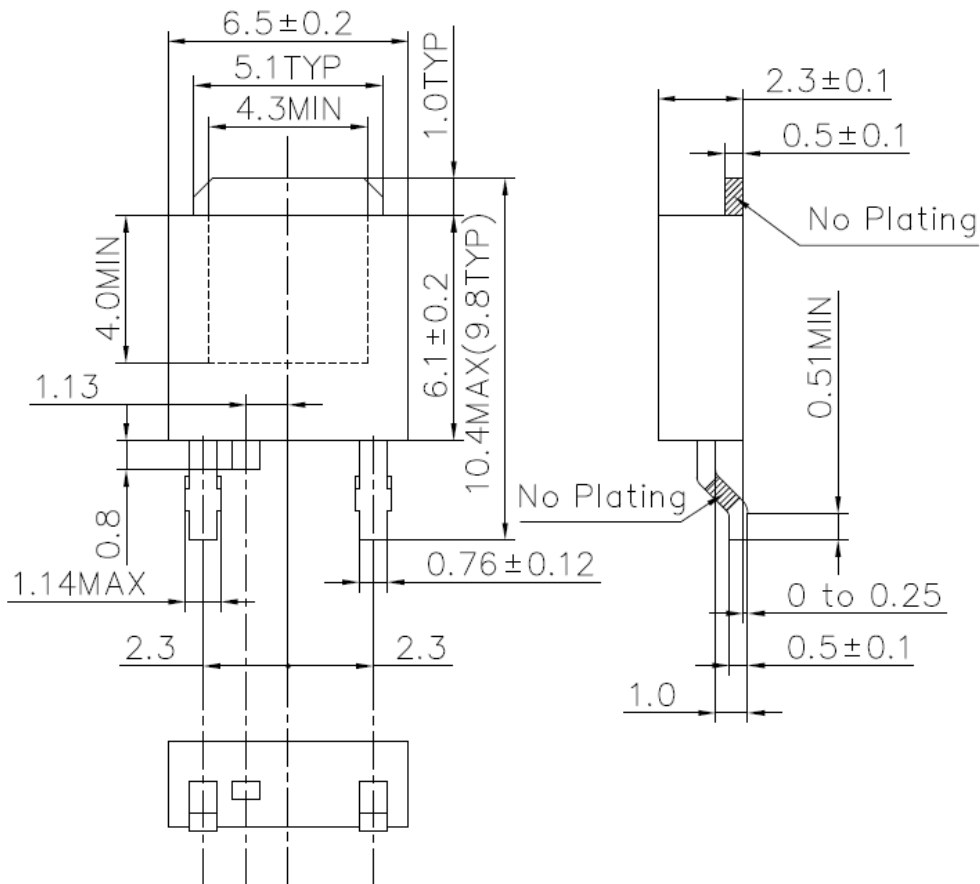
Short circuit protection



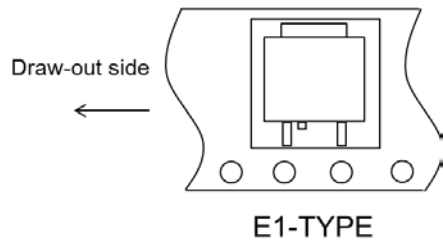
3.9 Package drawing

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

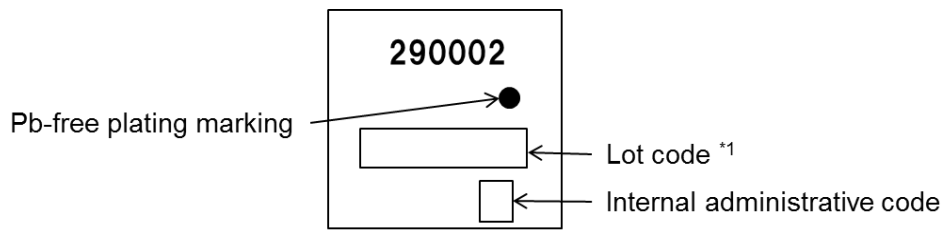
Unit : mm



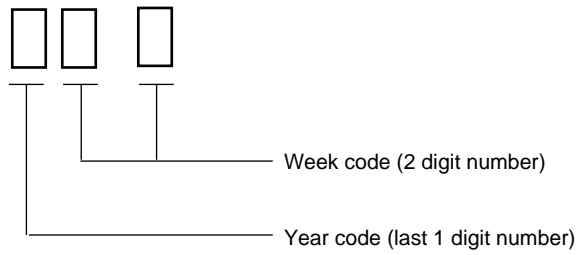
### 3.10 Taping information



### 3.11 Marking information

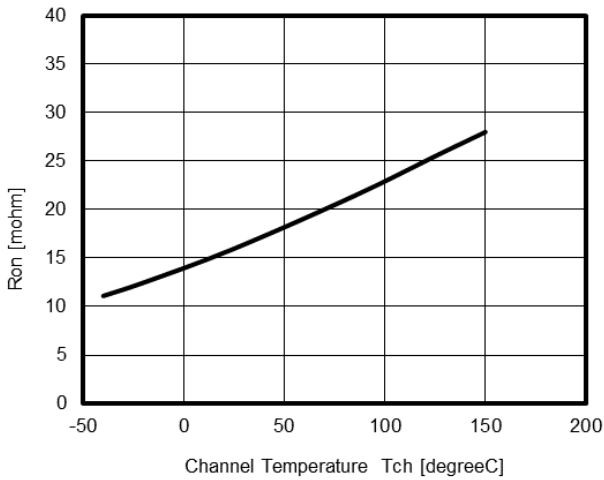


Note: \*1. Composition of the lot code

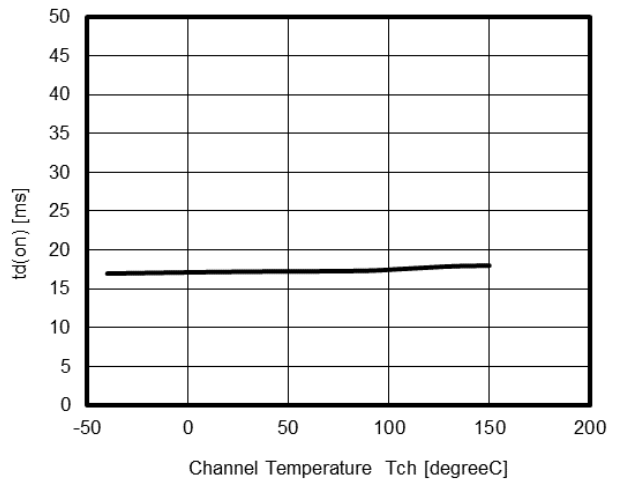


4. Typical characteristics

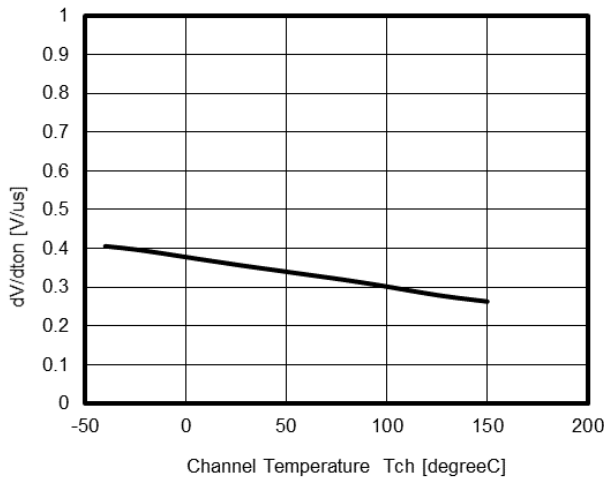
On-state resistance per channel  
VS. Channel TEMPERATURE



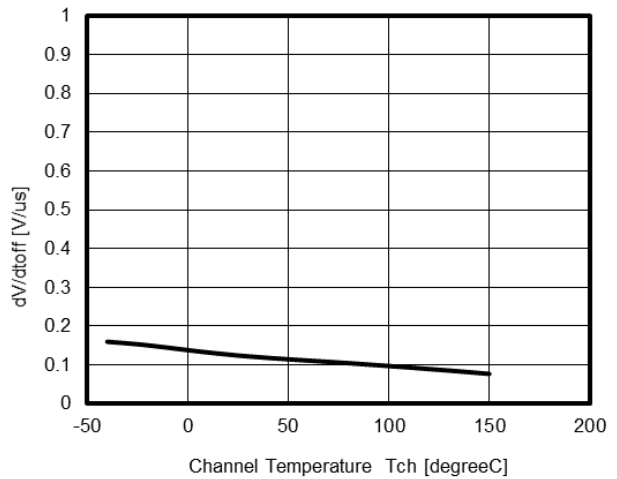
Turn on delay time  
VS. Channel TEMPERATURE



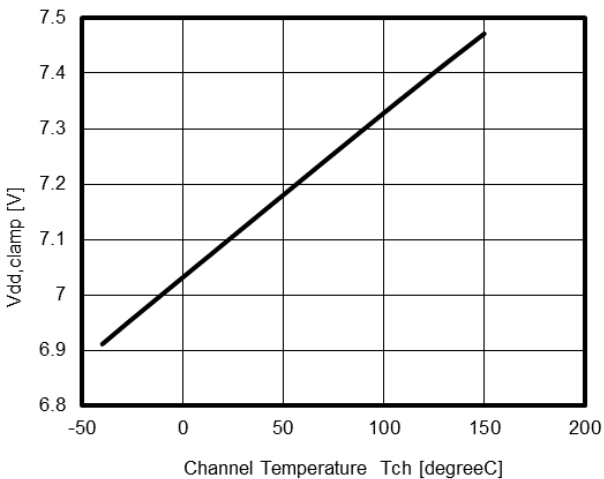
Slew rate on  
VS. Channel TEMPERATURE



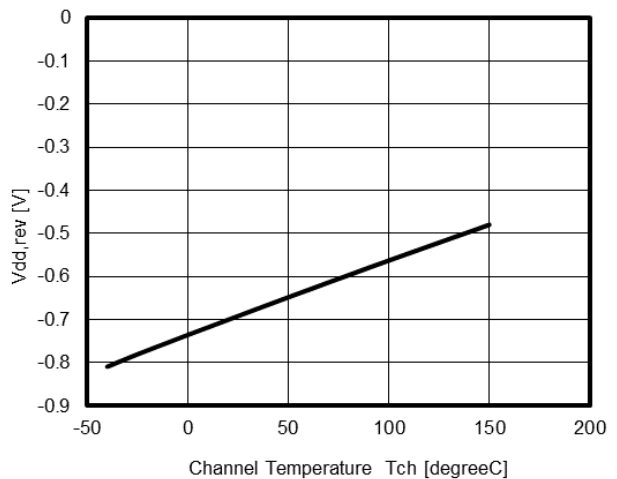
Slew rate off  
VS. Channel TEMPERATURE

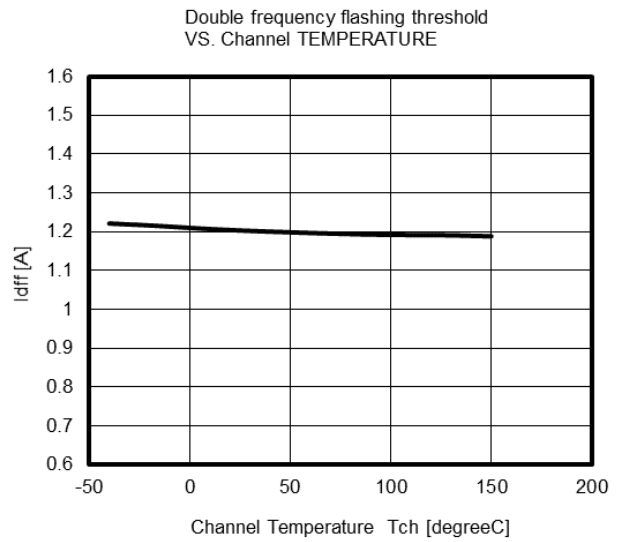
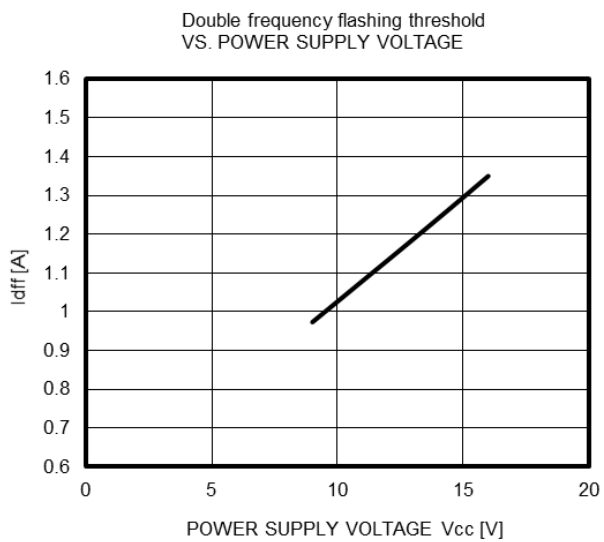
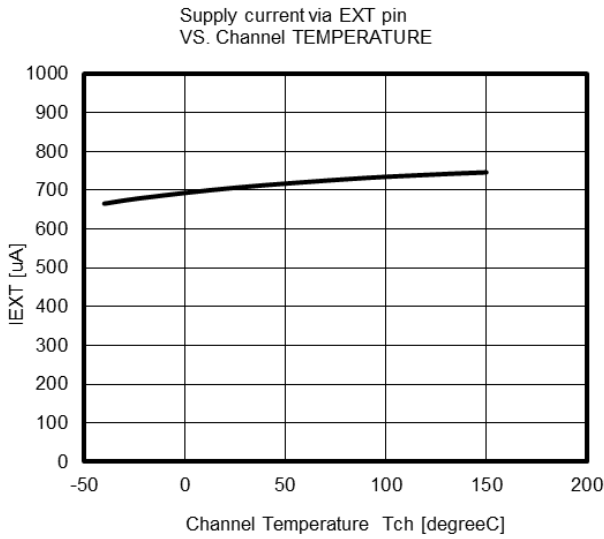
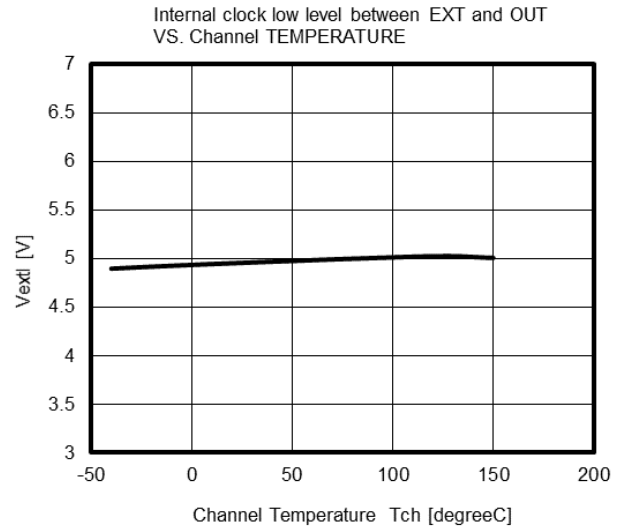
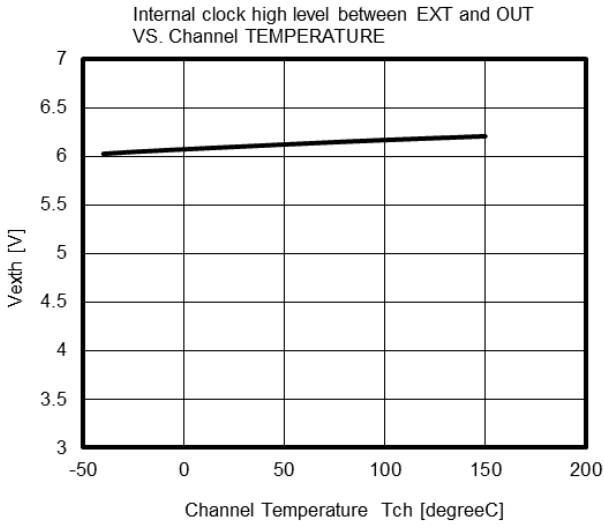


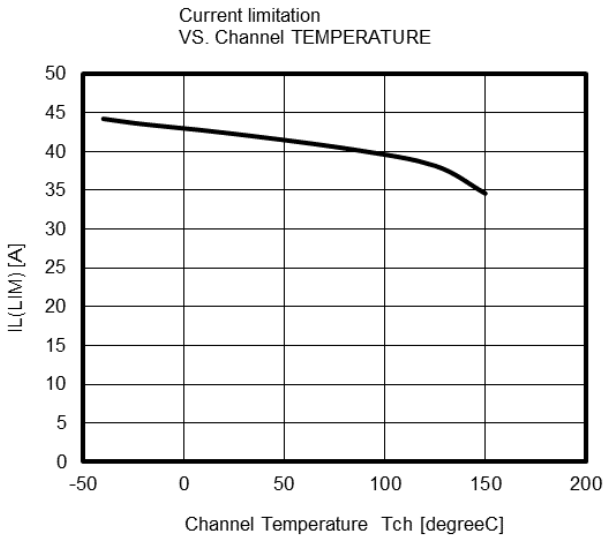
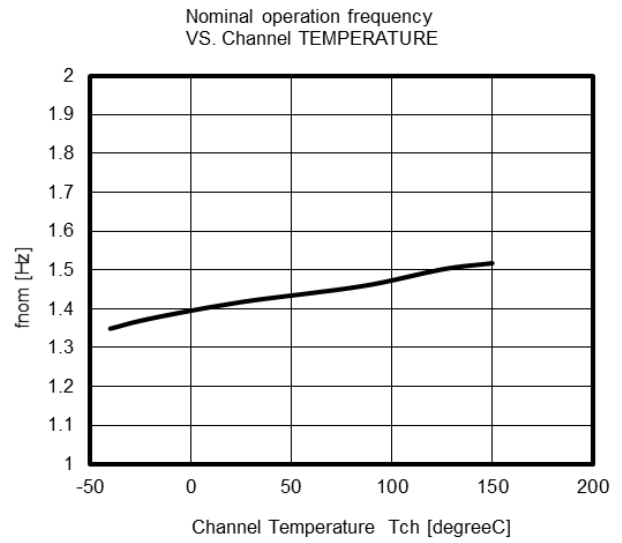
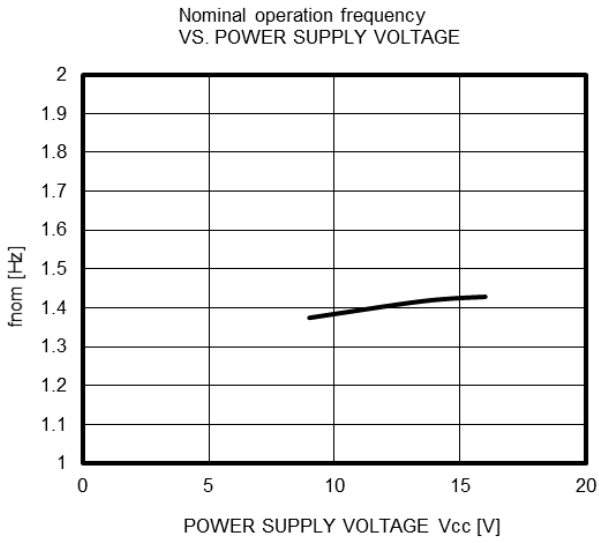
EXT clamp voltage  
VS. Channel TEMPERATURE



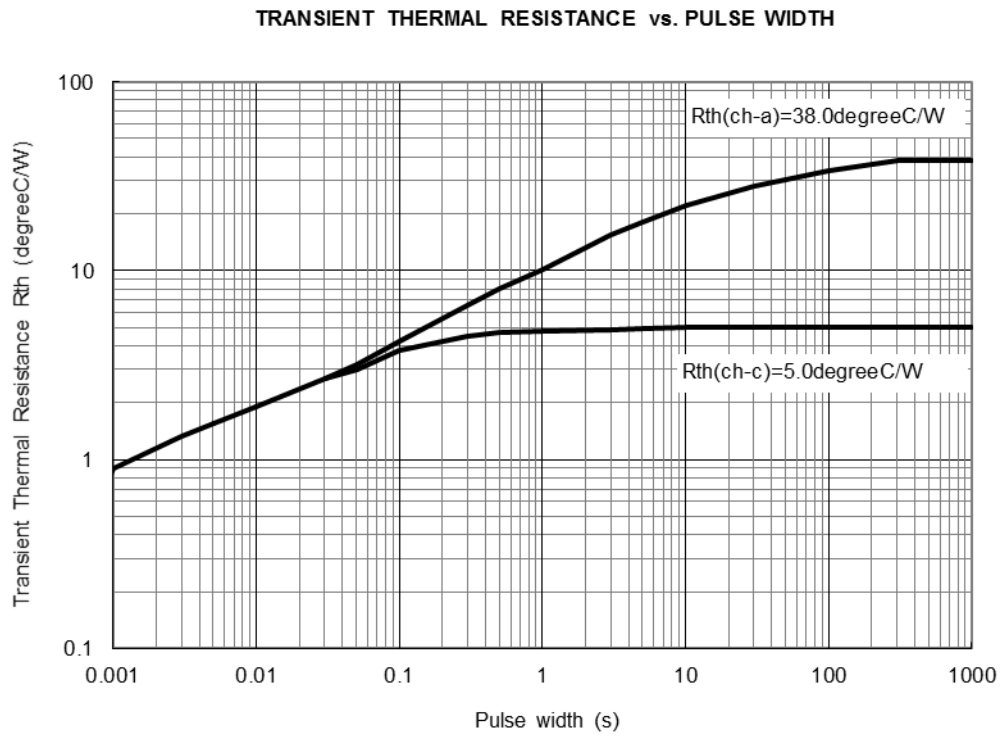
EXT reverse clamp voltage  
VS. Channel TEMPERATURE





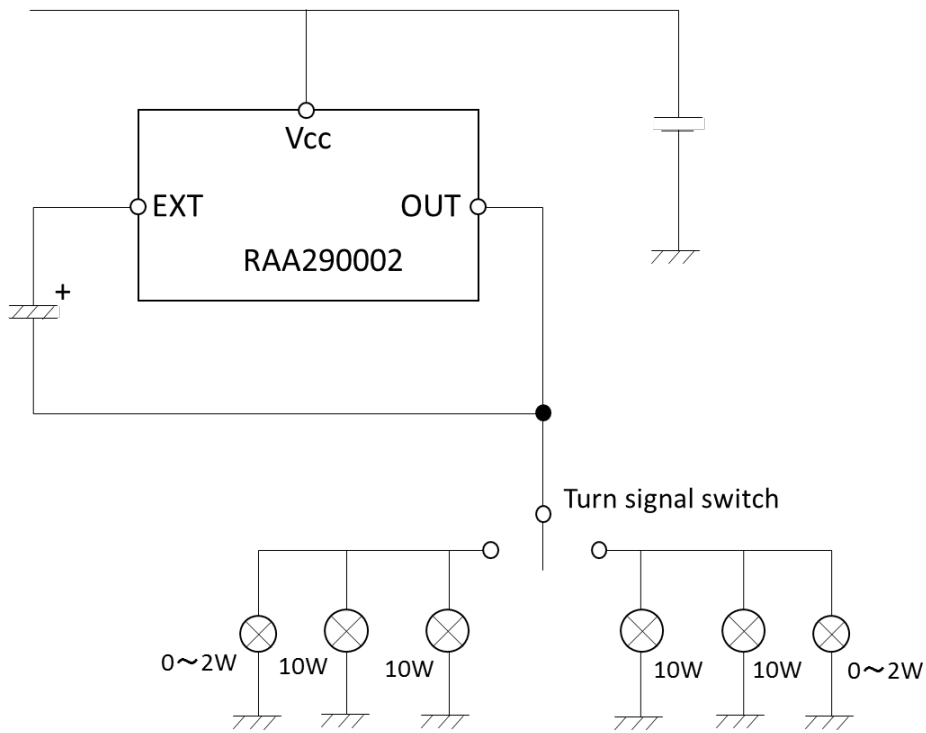


5. Thermal characteristics

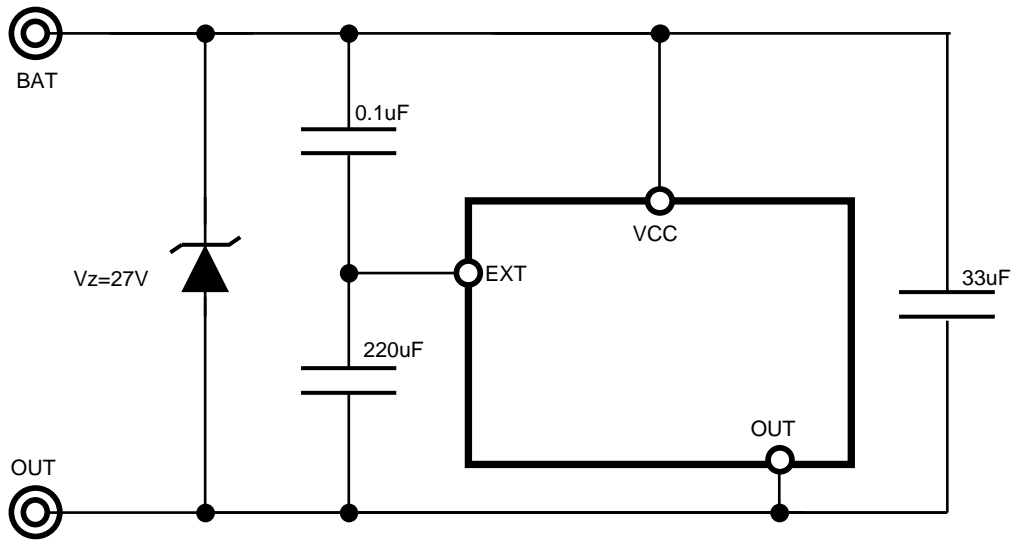




6. Application example in principle



Recommended circuit for dump surge



<b>Revision History</b>	<b>RAA2900024H12HPD Datasheet</b>
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Rev.	Date	Description	
		Page	Summary
1.00	April 18, 2016	1-17	1st issue

All documents should contain the following section break and paragraph as the last item. The footers of this document refer to the paragraph in order to reference the last page of the document.

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