RAA2900024H12HPD

INTELLIGENT POWER DEVICE

R07DS1341EJ0101
Rev.1.01
Feb. 28, 2020

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
- RoHS compliant

1.3 Application

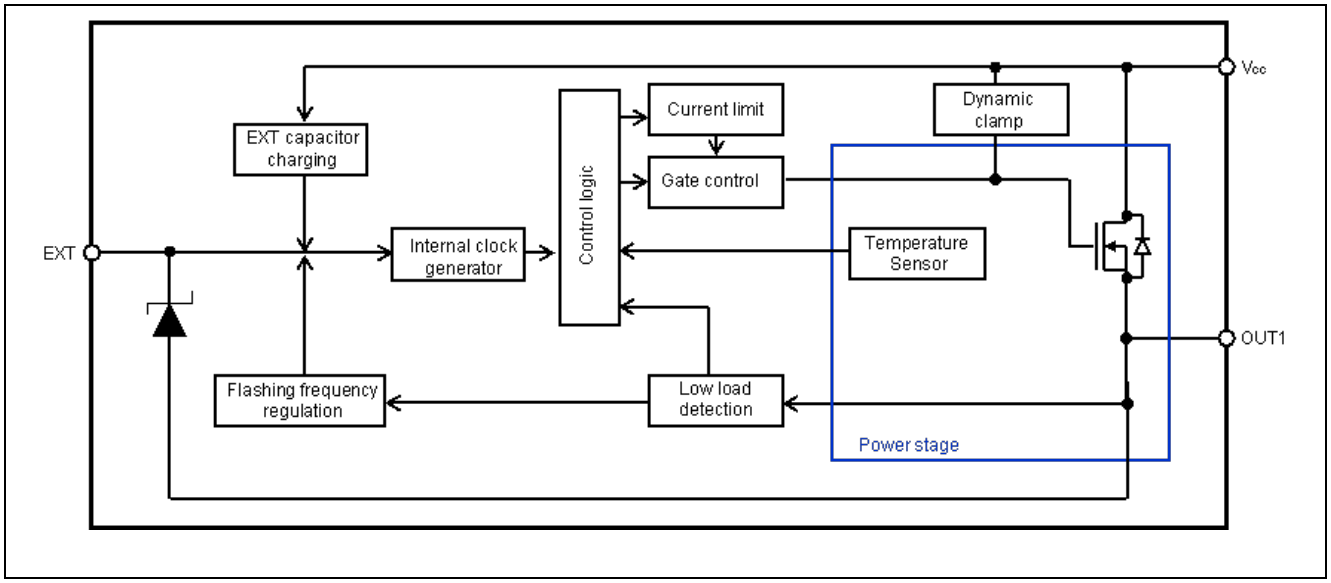
- 2 Wheeler Flasher bulb switching

2. Ordering Information

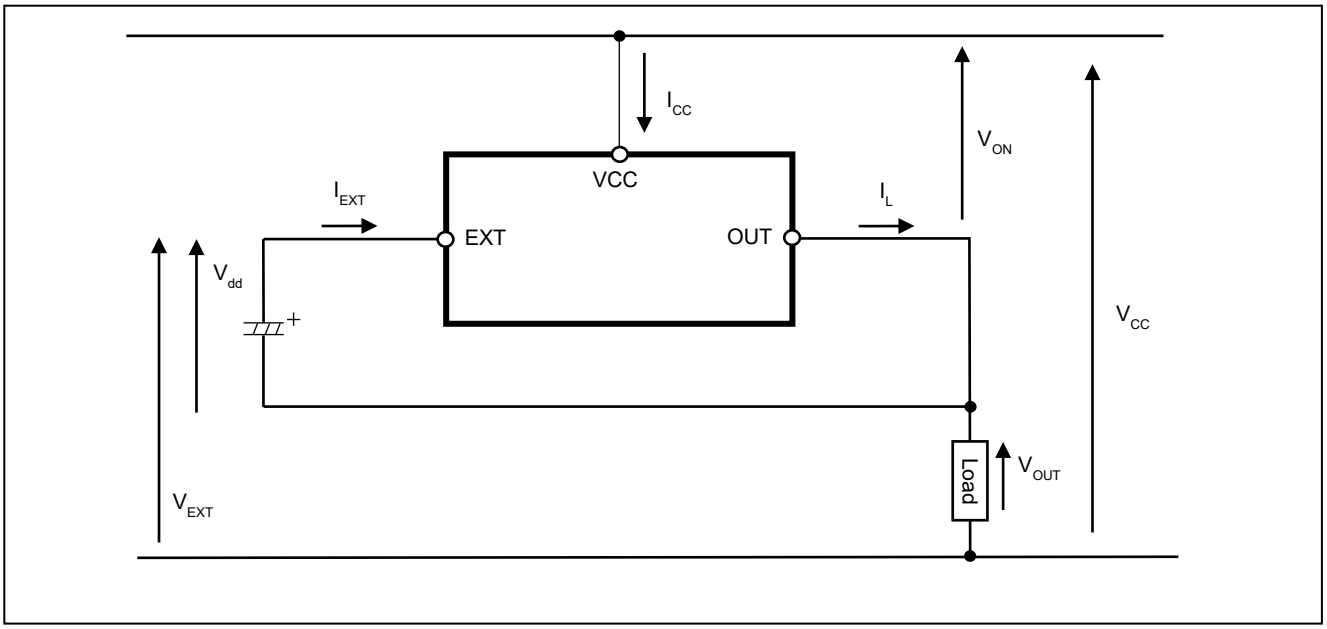
Part No.	Lead plating	Packing	Package
RAA2900024H12HPD	Pure Sn	Tape 2500pcs /reel	TO252 (MP-3ZP)

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_{CC}	28	V			
Vcc Voltage at reverse battery condition	$-V_{CC}$	-16	V	RL=Nomimal load, Refer 3.8.4, t<2min		
Output Drain to Source Voltage	V_{DSS}	42	V	RL=Nomimal load, Refer 3.8.4, t = 200 ms		
Load Current	I_L	Self limited	A			
OUT Reverse Current at reverse battery condition	$-I_L$	-5	A	t<2min		
Total power dissipation for whole device (DC)	P_D	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_{dd}	6.5	V			
Channel Temperature	Tch	-40 to +150	degreeC			
Storage Temperature	Tstg	-55 to +150	degreeC			
ESD susceptibility	V_{ESD}	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_{CC}	9		16	V	

3.6 Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Thermal characteristics	Rth(ch-a)		38		degree C/W	According to JEDEC JESD51-2, -5, -7 on FR4 2s2p board
	Rth(ch-c)		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_{CC}	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℃	RL=Nominal load, Refer 3.8.4
				48		Tch=150℃	
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℃, 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℃, RL=Nominal load, Refer 3.8.4
		0.66				Vcc=7.0 to 9V	Tch=-20 to 85℃, 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℃, 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℃	
Double frequency flashing threshold	Idff	0.85	0.96	1.06	A	VCC=9V, Tch=-20 to 85℃	
		1.07	1.20	1.33		VCC=13.5V, Tch=-20 to 85℃	
		1.20	1.34	1.47		VCC=16V, Tch=-20 to 85℃	

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 Vexth quickly, and then discharging EXT capacitor down to Vextl slowly with constant current IEXT.

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

$$fnom = \frac{IEXT}{2 \times CEXT \times (Vexth - Vextl)}$$

3.8.2 Double flashing operation at low load current condition

If load current is lower than Idff 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 Tch > aTth is detected.

Absolute thermal toggling

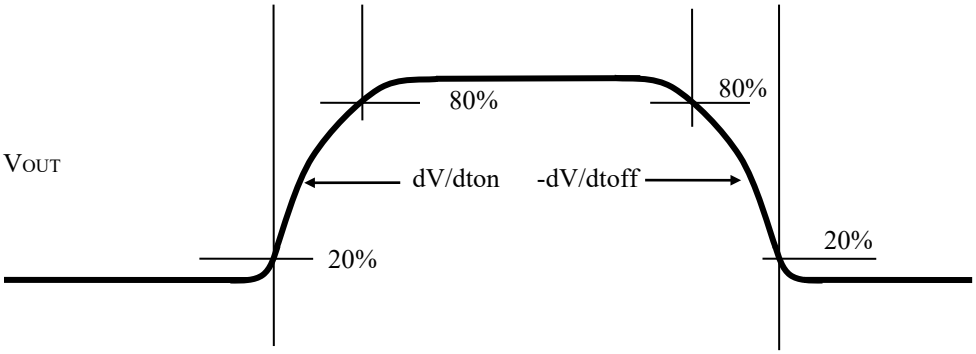
Current limitation control with IL(LIM) when auto restart from absolute Tch protection.

3.8.4 Nominal load

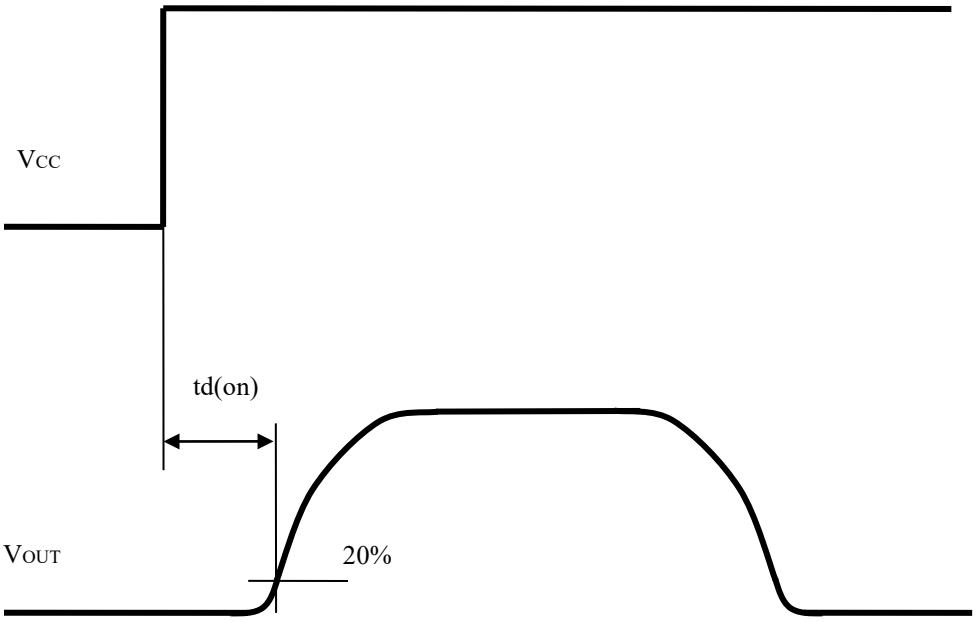
Product	Nominal load
RAA290002	3.4ohm

3.8.5 Measurement condition

Switching waveform of OUT terminal

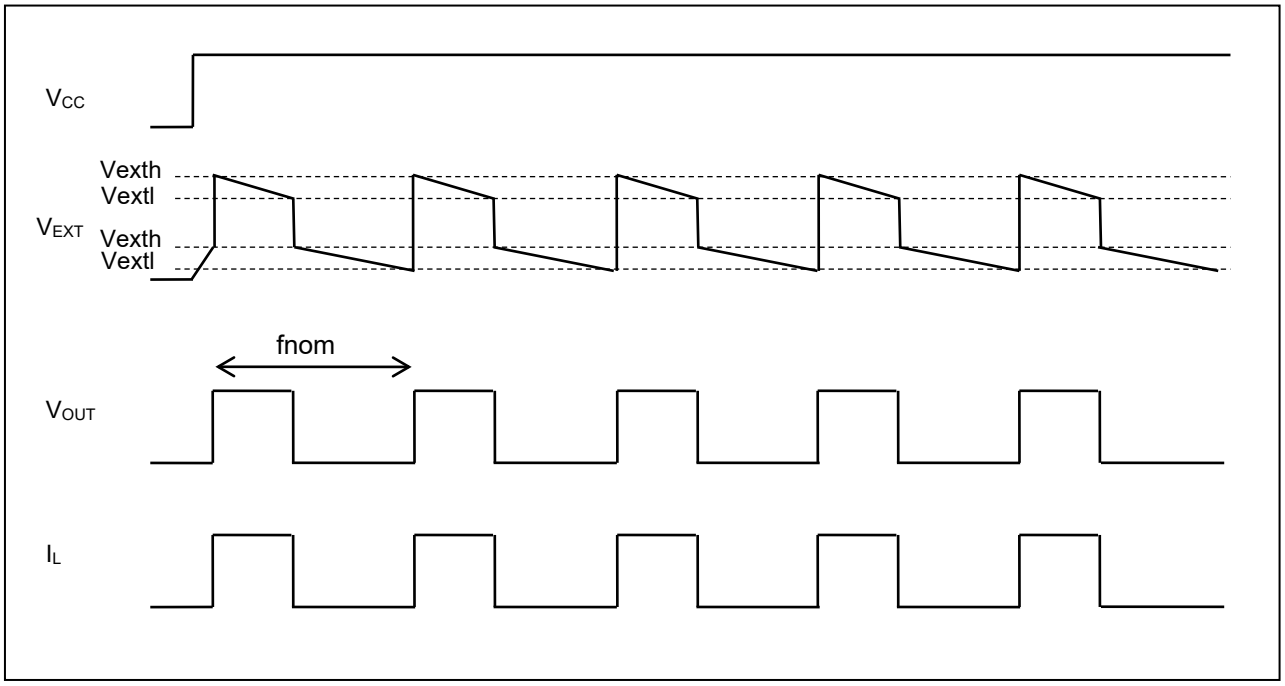


Turn on delay time after Power Supply on

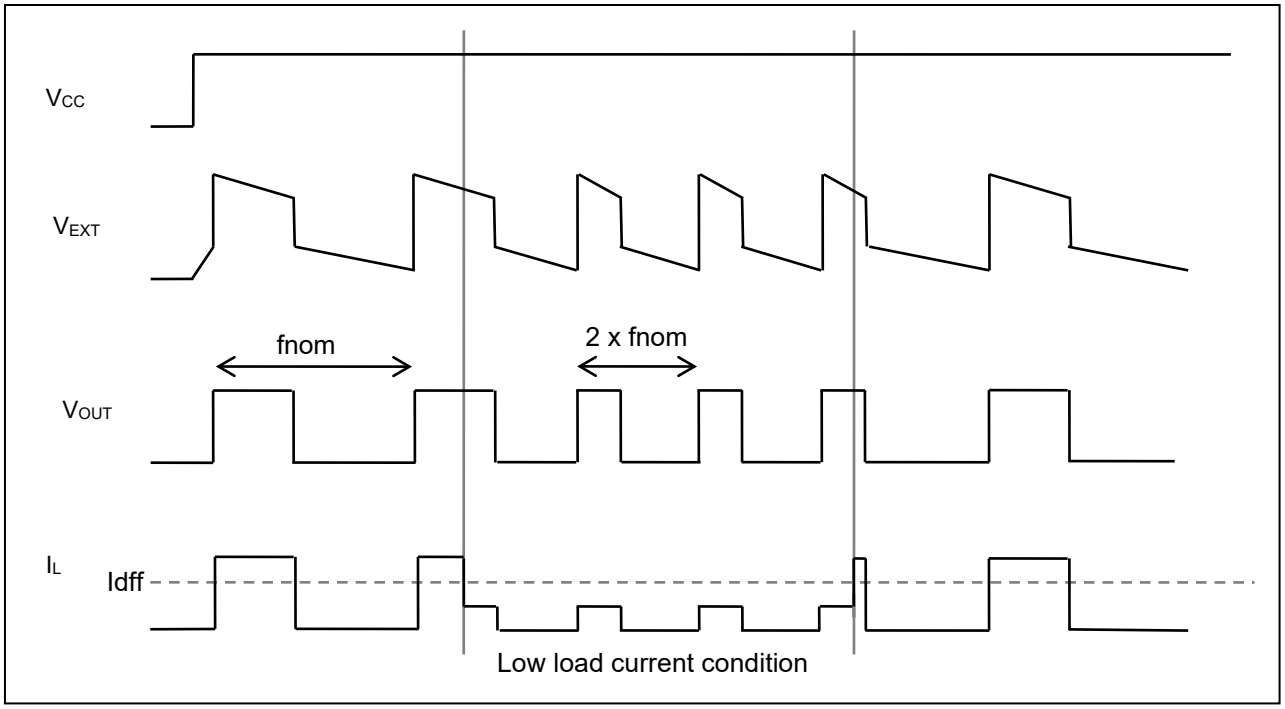


3.8.6 Timing chart

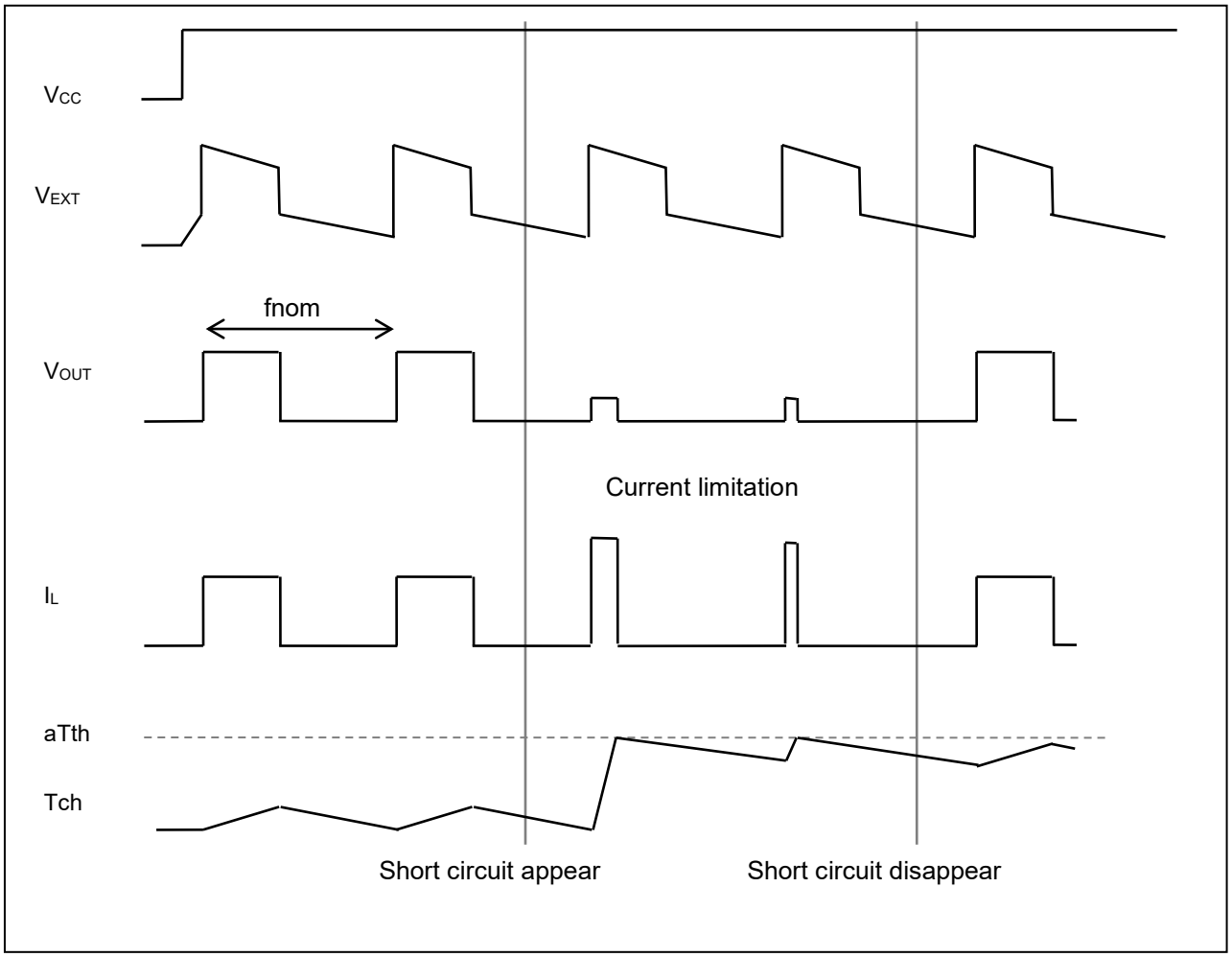
Nominal Operation



Double flashing operation at low load current condition



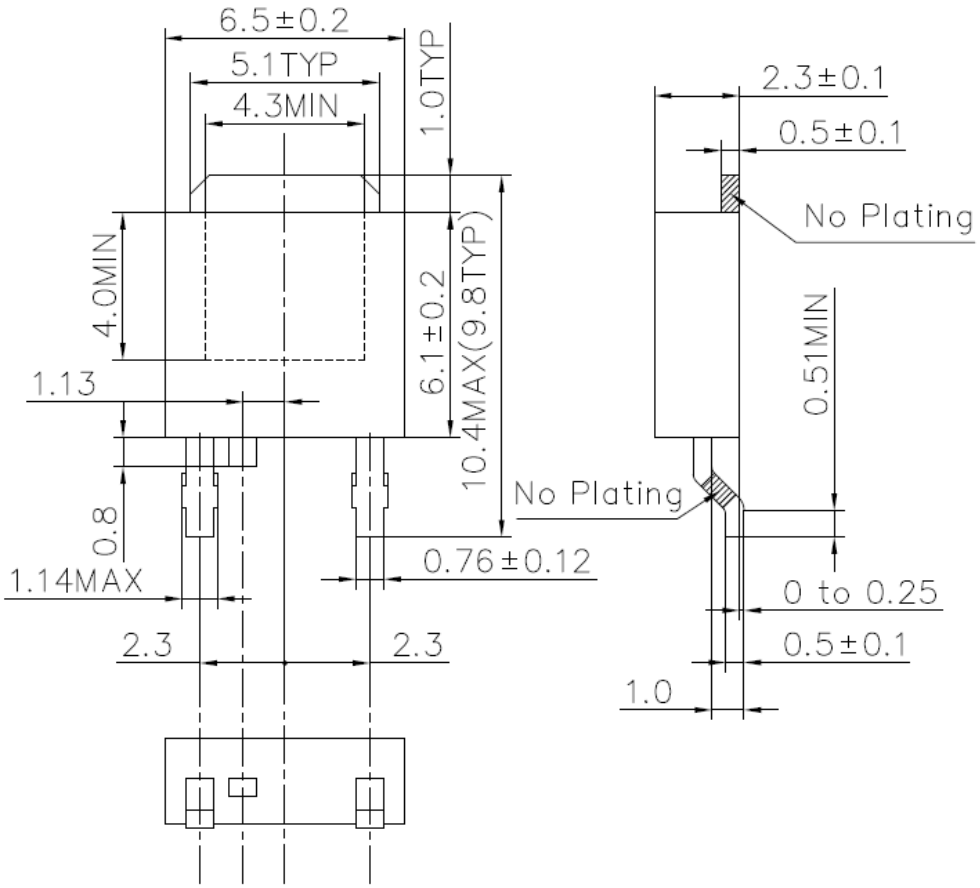
Short circuit protection



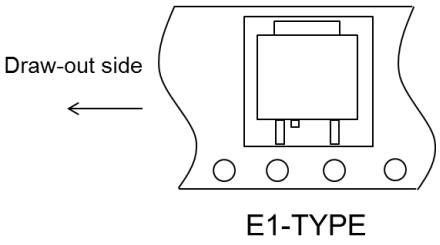
3.9 Package drawing

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

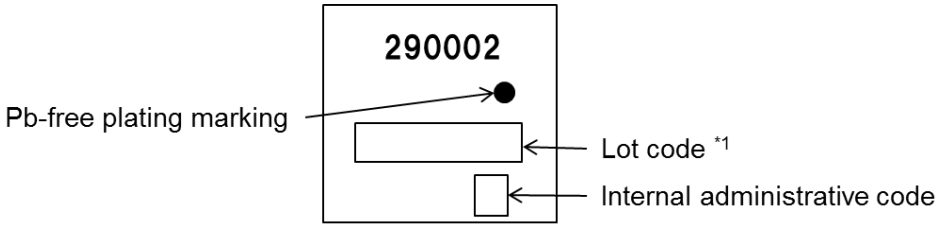
Unit : mm



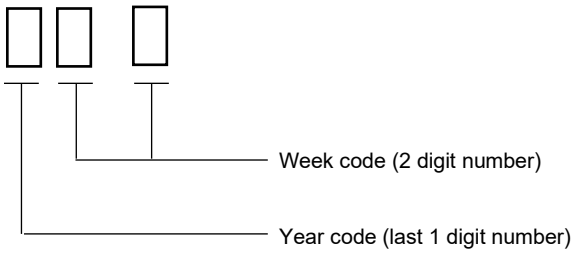
3.10 Taping information



3.11 Marking information

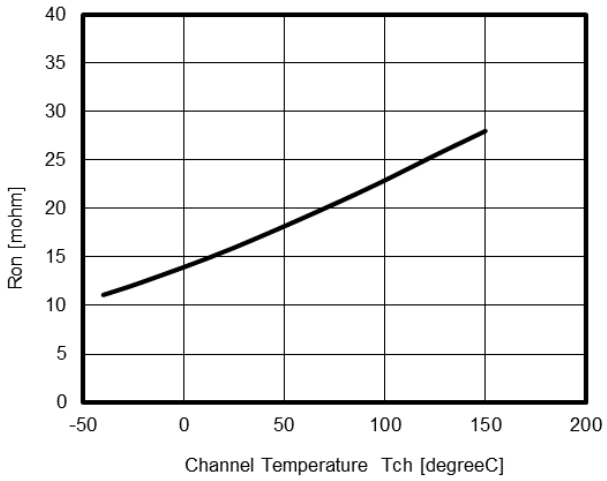


Note: *1. Composition of the lot code

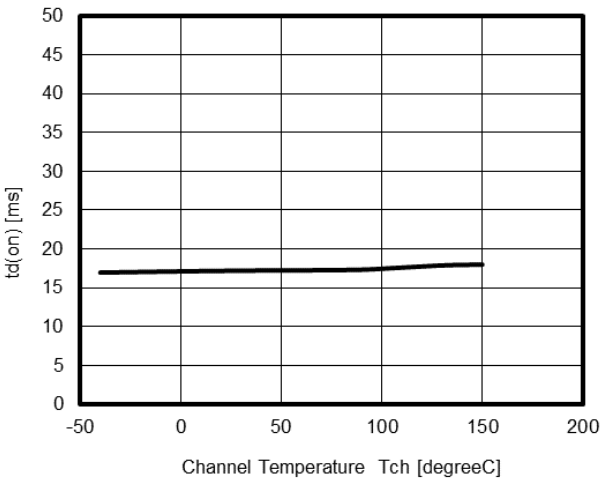


4. Typical characteristics

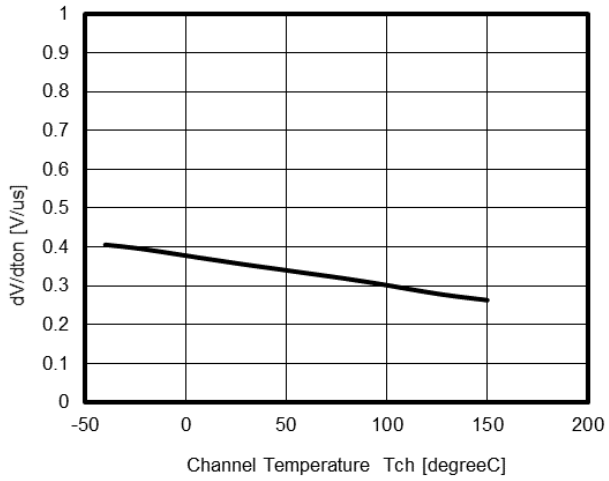
On-state resistance per channel
VS. Channel TEMPERATURE



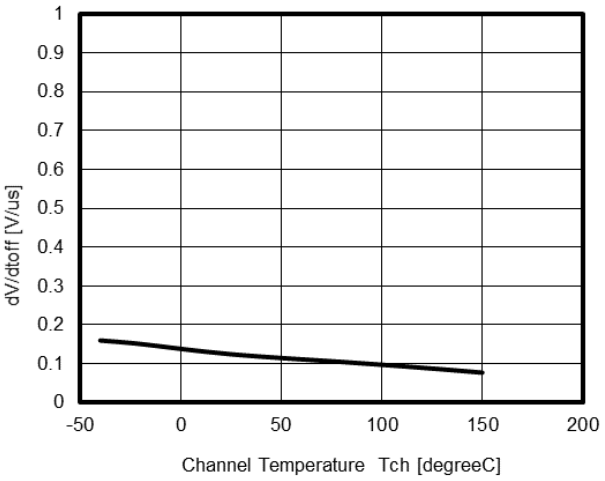
Turn on delay time
VS. Channel TEMPERATURE



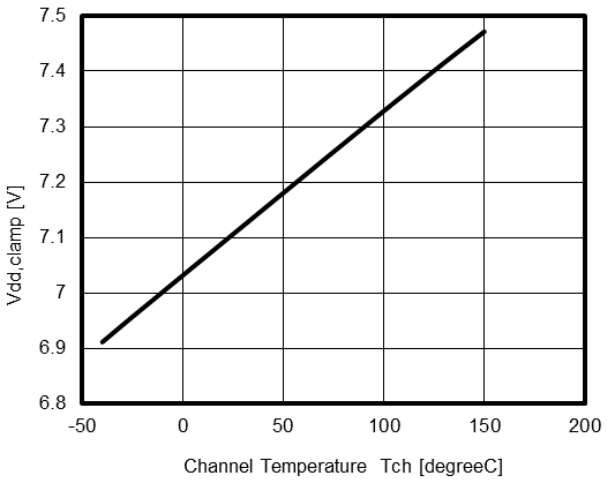
Slew rate on
VS. Channel TEMPERATURE



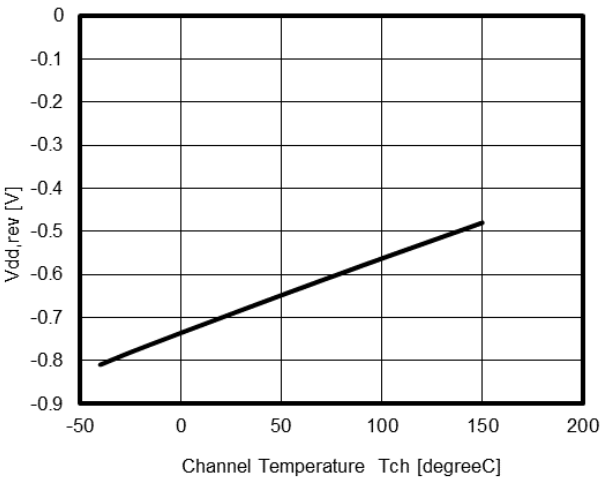
Slew rate off
VS. Channel TEMPERATURE



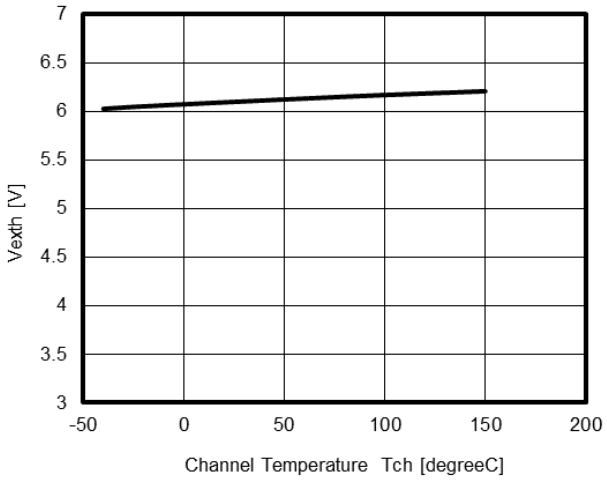
EXT clamp voltage
VS. Channel TEMPERATURE



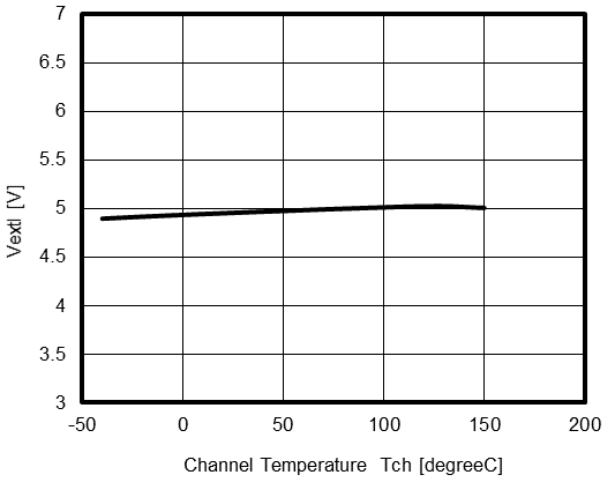
EXT reverse clamp voltage
VS. Channel TEMPERATURE



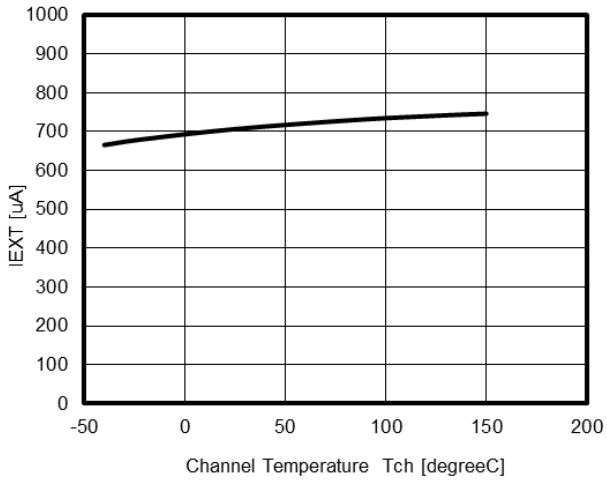
Internal clock high level between EXT and OUT
VS. Channel TEMPERATURE



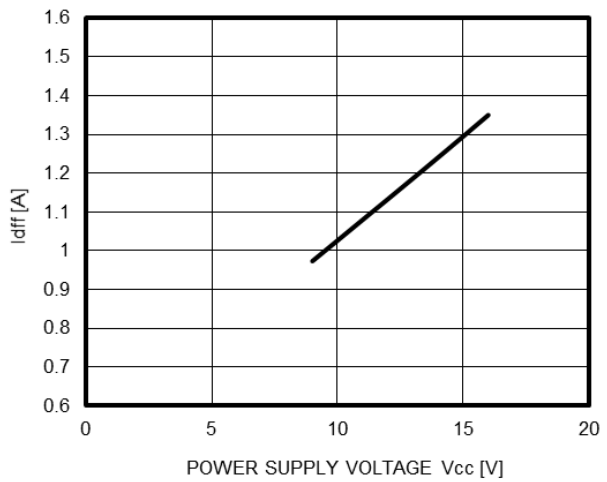
Internal clock low level between EXT and OUT
VS. Channel TEMPERATURE



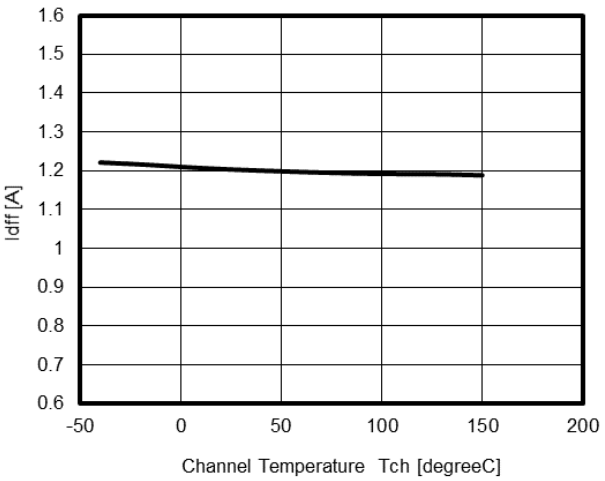
Supply current via EXT pin
VS. Channel TEMPERATURE



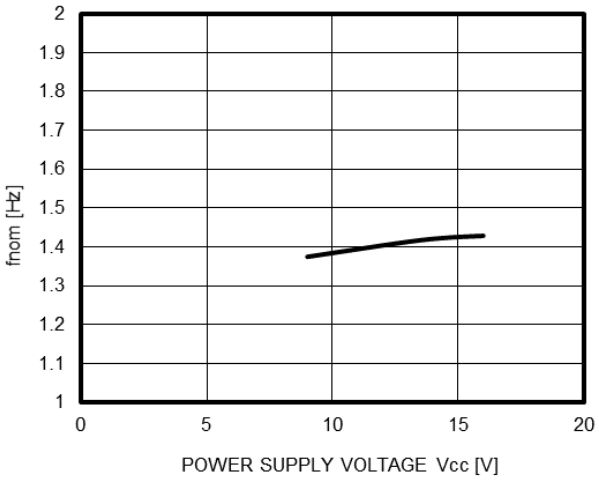
Double frequency flashing threshold
VS. POWER SUPPLY VOLTAGE



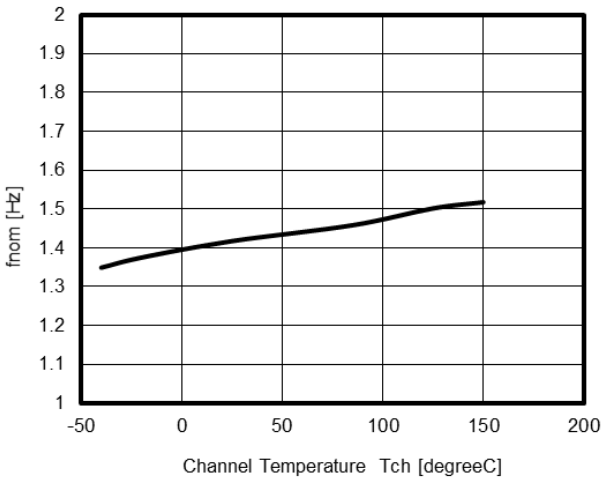
Double frequency flashing threshold
VS. Channel TEMPERATURE



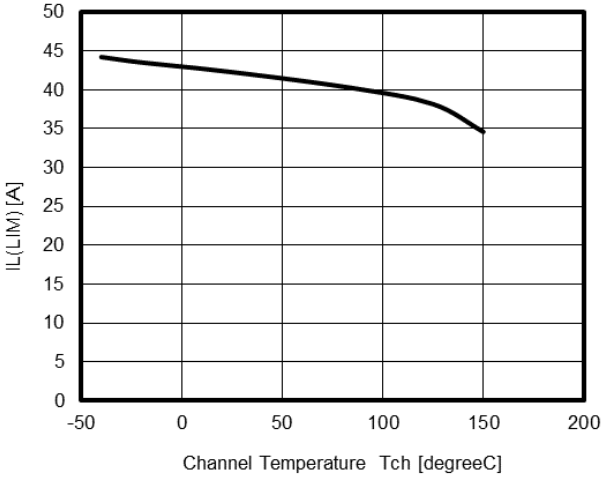
Nominal operation frequency
VS. POWER SUPPLY VOLTAGE



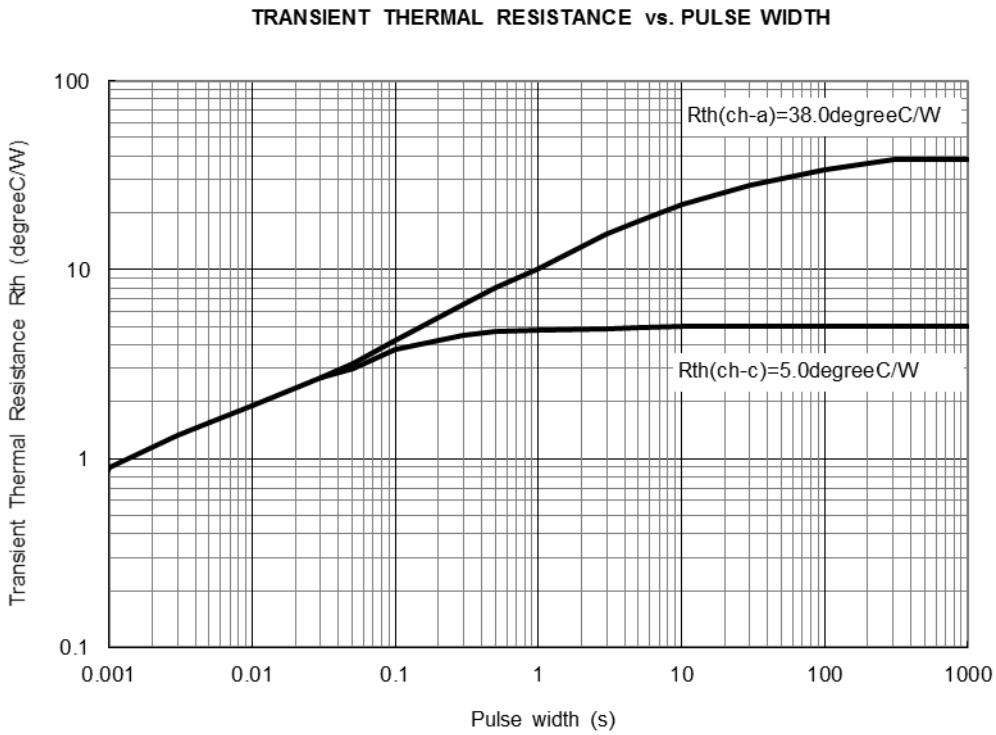
Nominal operation frequency
VS. Channel TEMPERATURE



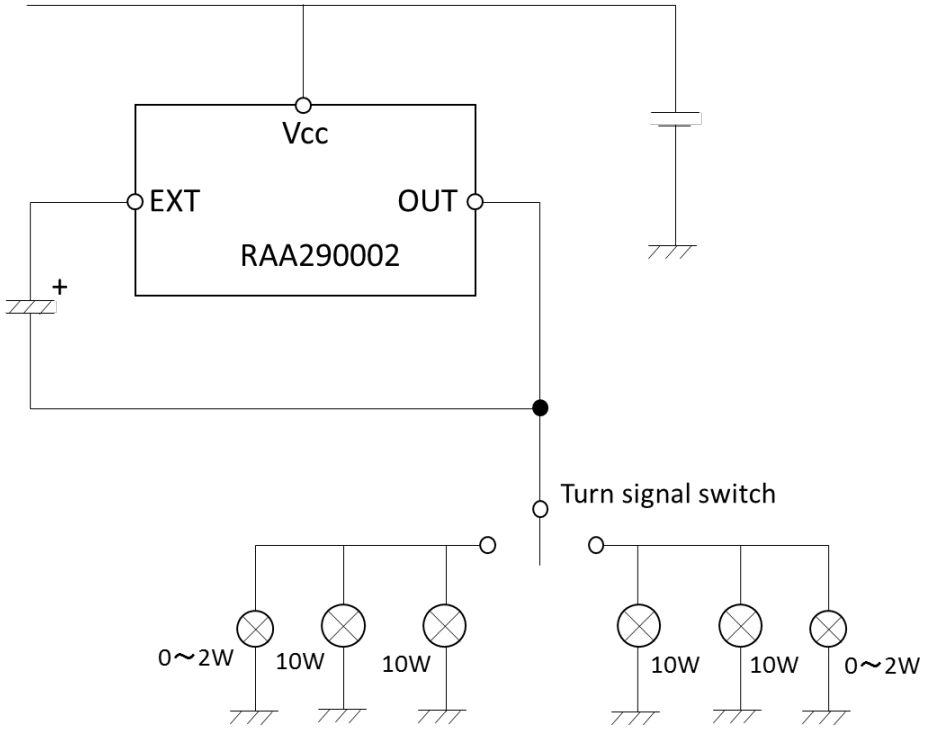
Current limitation
VS. Channel TEMPERATURE



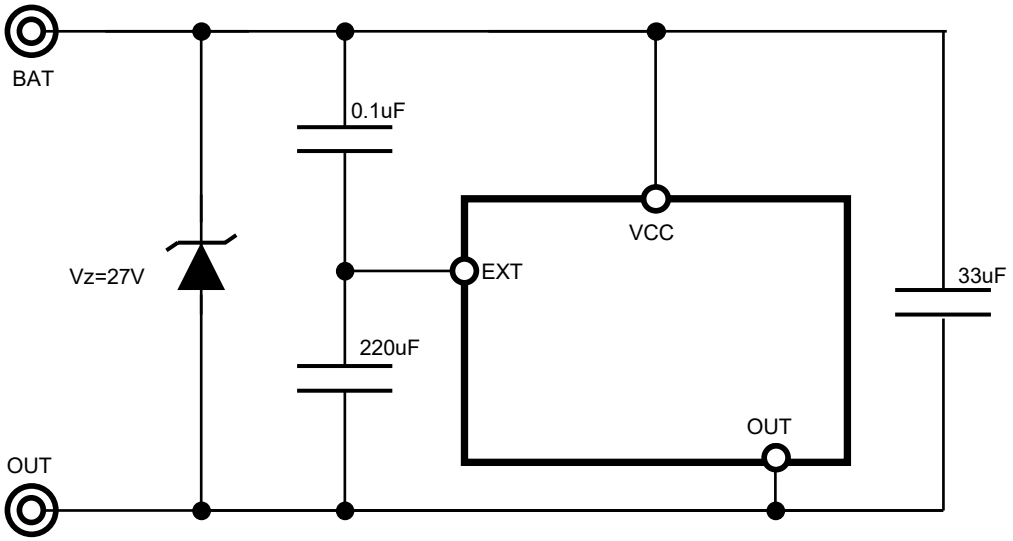
5. Thermal characteristics



6. Application example in principle



Recommended circuit for dump surge



Revision History	RAA2900024H12HPD Datasheet

Rev.	Date	Description	
		Page	Summary
1.00	April. 18, 2016	1-17	1st issue
1.01	Feb. 28, 2020	1	Deleted description of “AEC-Q100 qualified” 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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