Panasonic

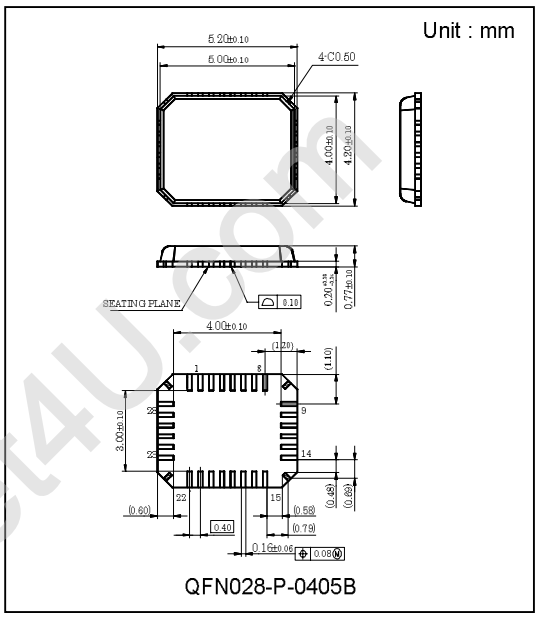
Product News

*Facilitating more compact and lightweight equipment designs.*

# Power Control IC for ASSPs AN30213A

## ■ Overview

The AN30213A IC has three channels of PWM-based DC-DC converter control outputs.
Able to operate on a minimum operating voltage as low as 1.7V, the IC can be powered from two batteries. A time-sharing system does not require a transformer in the CCD power supply circuit. A built-in switched capacitor type phase compensation filter and error amp controlled soft-start system allow fewer externally connected components, minimizing the mounting area.



QFN028-P-0405B

## ■ Feature

- Can be powered from two "AA" batteries (1.7V to 3.2V) or one lithium battery cell (2.6V to 5.5V)
- 3-channel power outputs
  3.3V power supply for synchronous rectifier voltage rise/fall control
  16V/-8V power supply for time-sharing control
- Independent control for all channels
- Built-in low-input voltage malfunction prevention function (2 "AA" batteries: 1.51V, 1 lithium cell: 2.52V)
- Built-in timer latch type protection against short-circuits
- External setting for soft start
- Built-in phase compensation filter
- Time-sharing proportion: voltage rise 1/inversion 3 or voltage rise 1/inversion 7; selectable with setting terminal
- Ultra-small, slim package

## ■ Applications

CCD cameras (digital still cameras, cellular phone cameras, etc.)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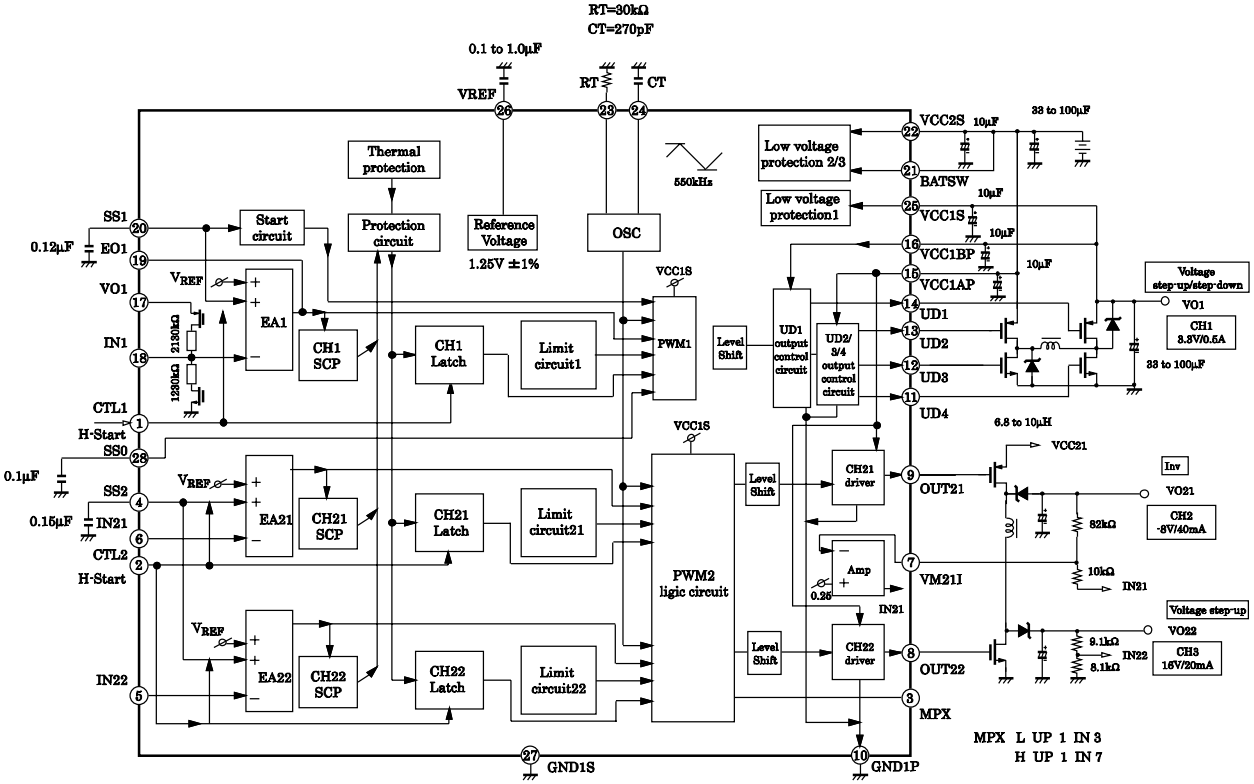
## ■ Block diagram




## ■ Pin Description

| Pin No. | Symbol | Description | Pin No. | Symbol | Description |
|---|---|---|---|---|---|
| 1 | CTL1 | Ch.1 ON-OFF start-up input pin | 15 | VCC1AP | Ch.1(UD2/3/4) and Ch.21/22 driver Vcc |
| 2 | CTL2 | Ch.21/22 ON-OFF start-up input pin | 16 | VCC1BP | Ch.1,UD1 driver Vcc |
| 3 | MPX | Time-sharing setting pin | 17 | VO1 | Ch.1 detection resistance pin |
| 4 | SS2 | Ch.21/22 soft-start setting pin | 18 | IN1 | Ch.1 error amp inverting input pin |
| 5 | IN22 | Ch.22 error amp inverting input pin | 19 | EO1 | Ch.1 error amp inverting input pin |
| 6 | IN21 | Ch.21 error amp inverting input pin | 20 | SS1 | Ch.1 soft-start setting pin |
| 7 | VM21 | Ch.2 error amp inverting input pin | 21 | BATSW | Low voltage protection switching pin for battery |
| 8 | OUT22 | Ch.22 driver output pin | 22 | VCC2S | Battery voltage application pin |
| 9 | OUT21 | Ch.21 driver output pin | 23 | RT | Oscillator frequency setup resistor connection pin |
| 10 | GND1P | Ground pin for Ch.1/21/22 driver | 24 | CT | Oscillator frequency setup capacitor connection pin |
| 11 | UD4 | Ch.1 step-up/down output gate pin 4 | 25 | VCC1S | Signal Vcc |
| 12 | UD3 | Ch.1 step-up/down output gate pin 3 | 26 | VREF | Reference voltage output |
| 13 | UD2 | Ch.1 step-up/down output gate pin 2 | 27 | GND1S | Signal GND |
| 14 | UD1 | Ch.1 step-up/down output gate pin 1 | 28 | SS0 | Ch.1 PWM soft-start setting pin |

## ■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit | Note |
|---|---|---|---|---|
| Power supply voltage | $V_{CC1S}$ | 6.9 | V | 1 |
| | $V_{CC2S}$ | 6.9 | V | |
| Supply current | $I_{CC}$ | – | A | |
| Power dissipation | Pd | 112 | mW | 2 |
| Operating ambient temperature | Topr | –20 to85 | °C | 3 |
| Storage temperature | Tstg | –55 to 125 | °C | 3 |
| $V_{CC1AP}$ /$V_{CC1BP}$ terminal | $V_{CC1AP}$ /$V_{CC1BP}$ | 6.9 | V | 4 |
| CTL1/2 terminal | VCTL1/2 | -0.2 to ($V_{CC2S}$+0.1) | V | 4 |
| MPX terminal | VMPX | -0.2 to ($V_{CC2S}$+0.1) | V | |
| IN1/21/22 terminal | VIN1/2 | -0.2 to ($V_{CC1S}$+0.1) | V | 4 |

Note 1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.
Note 2: The power dissipation shown is the value at Ta=85℃ for the independent (unmounted)IC package without a heat sink.
Note 3: Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for Ta=25℃.
Note 4: Do not put any current or electric pressure to pins not specified.

## ■ Operating supply voltage range

| | | | |
|---|---|---|---|
| Operating supply voltage range | $V_{CC1S}$ | 3.0V to 3.6V | |
| | $V_{CC2S}$ | 1.7V to5.5V | * |

* The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

■ Electrical Characteristics (unless otherwise specified, ambient temperature is 25°C±2°C, $V_{CC1S}=V_{CC1AP}=V_{CC1BP}=3.3V$, $V_{CC2S}=3V$)

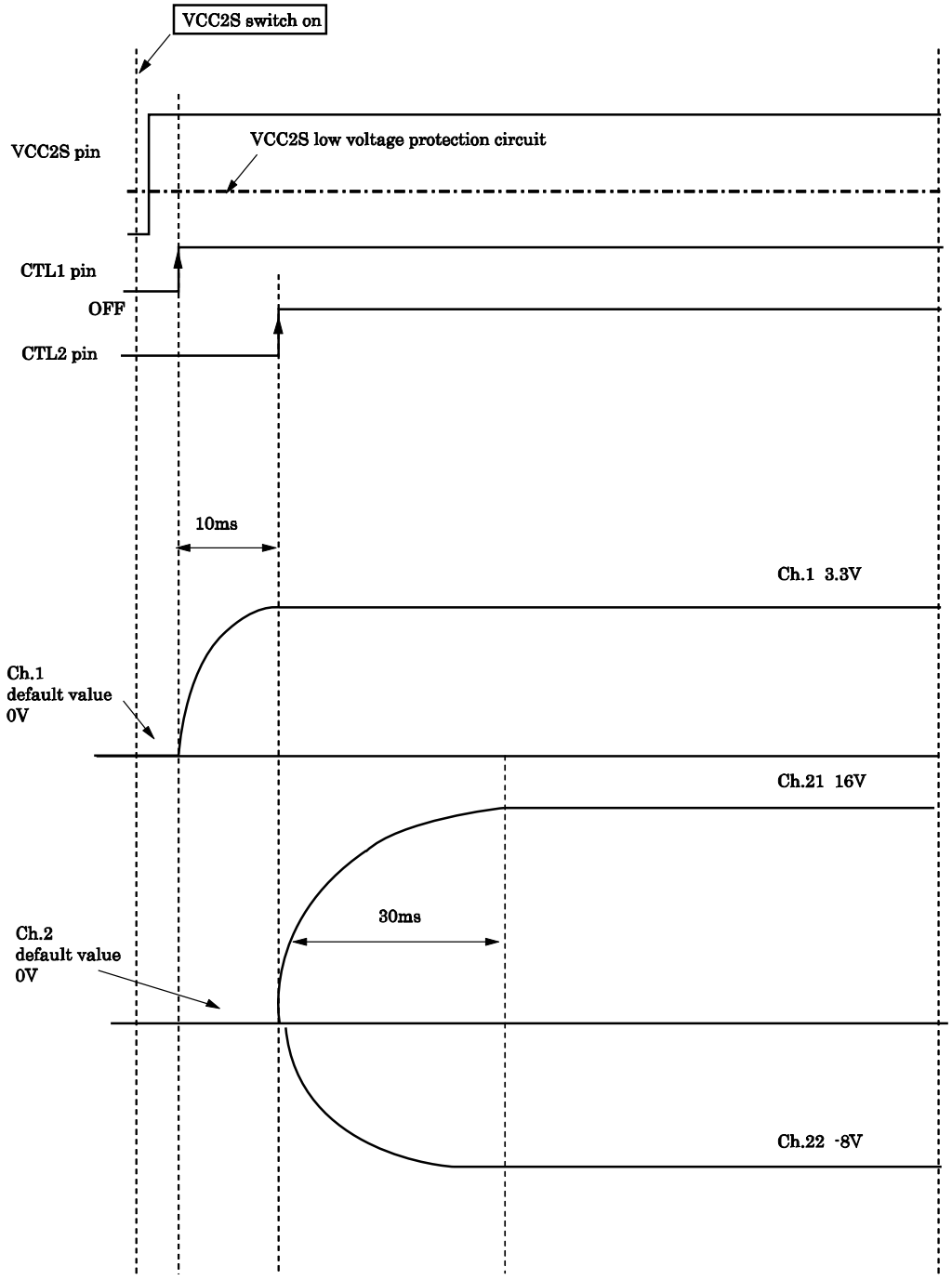
| Parameter | Symbol | Condition | Min | typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Reference voltage** | | | | | | |
| Reference voltage | $V_{REF}$ | $I_{REF}$=-0.1mA | 1.237 | 1.25 | 1.263 | V |
| Line regulation | Line | $V_{CC1S}$=3.1 to 3.6V | - | 3 | 15 | mA |
| Load regulation | Load | $I_{REF}$=0 to -1.0mA | -24 | -12 | - | mV |
| $V_{CC2S}$ U.V.L.O | | | | | | |
| U.V.L.O start voltage | $V_{CC1SON}$ | | 2.8 | 2.95 | 3.1 | V |
| U.V.L.O stop voltage | $V_{CC1OFF}$ | | 2.55 | 2.7 | 2.85 | V |
| $V_{CC2S}$ U.V.L.O | | | | | | |
| U.V.L.O start voltage | $V_{CC2SON}$ | BATSW=$V_{CC2S}$ | 2.05 | 2.28 | 2.51 | V |
| U.V.L.O stop voltage | $V_{CC2OFF}$ | BATSW=$V_{CC2S}$ | 2.0 | 2.23 | 2.46 | V |
| $V_{CC3S}$ U.V.L.O | | | | | | |
| U.V.L.O start voltage | $V_{CC3SON}$ | BATSW=GND | 1.331 | 1.418 | 1.505 | V |
| U.V.L.O stop voltage | $V_{CC3OFF}$ | BATSW=GND | 1.251 | 1.338 | 1.425 | V |
| **Output block** | | | | | | |
| UD1 High-level output voltage (ch.1 UD1) | $V_{HUD1}$ | $I_{OH}$=-1mA | $V_{CC1BP}$ -0.1V | - | - | V |
| UD2/3 High-level output voltage (ch.1 UD2/3) | $V_{HUD2/3}$ | $I_{OH}$=-1mA | $V_{CC1AP}$ -0.1V | - | - | V |
| UD4 o High-level output voltage (ch.1 UD4) | $V_{HUD4}$ | $I_{OH}$=-1mA | $V_{CC1AP}$ -1.0V | $V_{CC1AP}$ -0.7V | $V_{CC1AP}$ -0.4V | V |
| UD1/2/3/4 Low-level output voltage (ch.1) | $V_{LUD1/2/3/4}$ | $I_{OH}$=-1mA | - | - | 0.1 | V |
| OUT21/22 High-level output voltage (ch.21/22) | $V_{H21/22}$ | | $V_{CC1AP}$ -0.1V | - | - | V |
| OUT21/22 Low-level output voltage (ch.21/22) | $V_{L21/22}$ | | - | - | 0.1 | V |
| Pch- on resistance UD1/2/3/4 | $R_{up1/2/3/4}$ | | - | 3 | 10 | Ω |
| Nch- on resistance UD1/2/3/4 | $R_{un1/2/3/4}$ | | - | 3 | 10 | Ω |
| Pch- on resistance OUT21/22 | $R_{P21/22}$ | | - | 3 | 10 | Ω |
| Nch- on resistance OUT21/22 | $R_{n21/22}$ | | - | 3 | 10 | Ω |
| Ch.1 maximum duty | Dumax1 | | 81 | 88 | 95 | % |
| **Oscillator** | | | | | | |
| Oscillator frequency at the time ch.1 startup | fst | $V_{CC2S}$=3V | 110 | 270 | 430 | kHz |
| Ch.1 startup duty | Dust | $V_{CC2S}$=3V | 54 | 65 | 76 | % |
| Ch.1/2 oscillation frequency | Fout1/2 | | 480 | 550 | 620 | kHz |

■ Electric characteristics (continued)

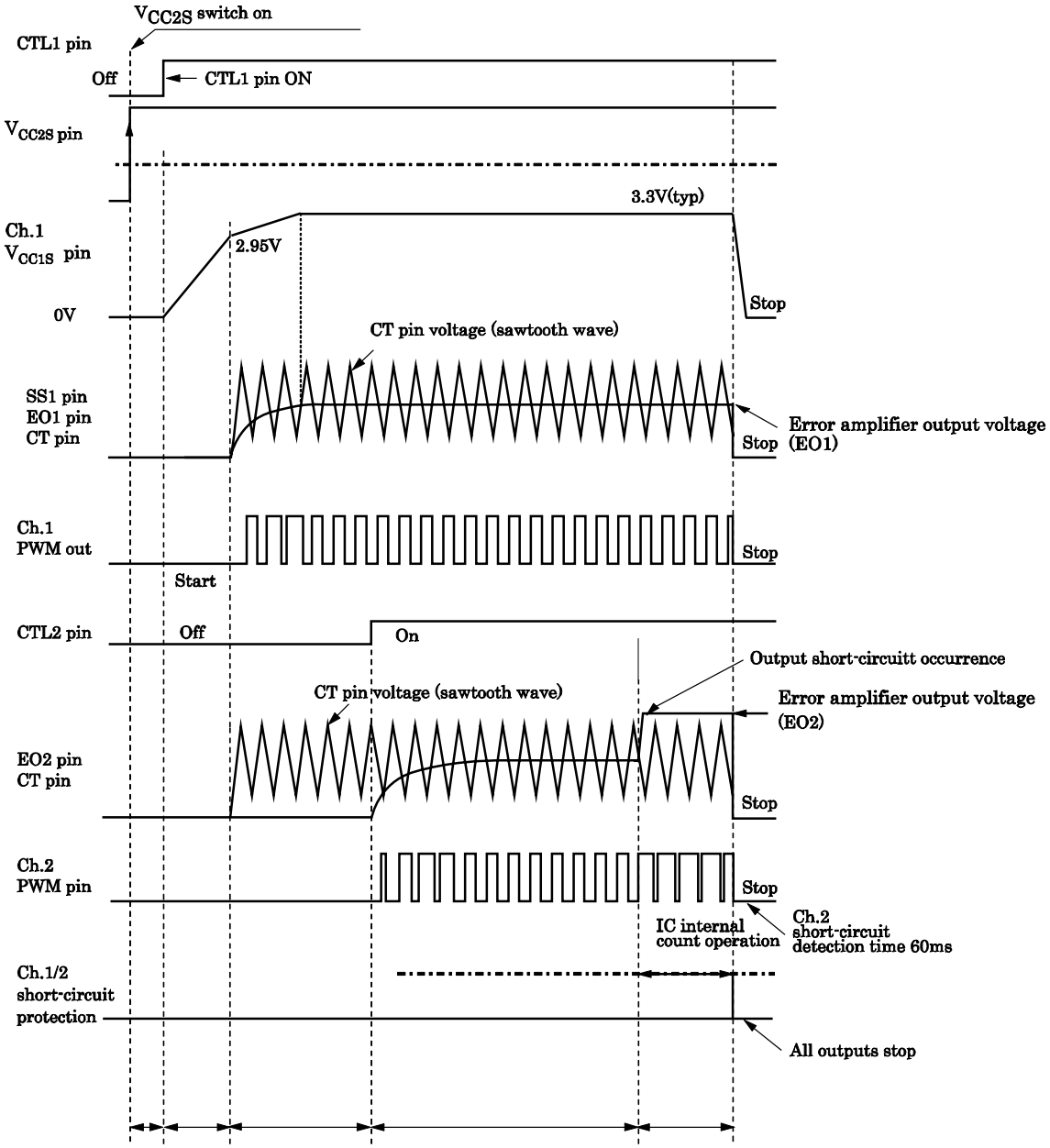
| Parameter | Symbol | Condition | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Error amplifier ch.1 to ch.2 | | | | | | |
| Input threshold voltage IN1 | $V_{TH1}$ | | 1.213 | 1.25 | 1.287 | V |
| Input bias current IN1/21/22 | IN1/21/22 | | -0.2 | – | 0.2 | V |
| High-level output voltage EO1 | $V_{EH1}$ | | 1.0 | – | – | V |
| Low-level output voltage EO1 | $V_{EL1}$ | | – | – | 0.2 | V |
| Output source current EO1 | $I_{SO1}$ | | 50 | 80 | 110 | μA |
| Output sink current EO1 | $I_{SI1}$ | | 0.5 | – | – | mA |
| Short-circuit protection circuit ch.1 to ch.2 | | | | | | |
| Short-circuit detection time | $V_{SCPT}$ | | 45 | 60 | 90 | ms |
| Control pin circuit | | | | | | |
| CTL pin current ICTL1/2 | $I_{CTL1/2}$ | | -1 | – | 10 | μA |
| MPX pin current IMPX | $I_{MPX}$ | | -1 | – | 10 | μA |
| CTL1/2 H-level input voltage | $V_{CTL1H}$ | | 1.5 | – | – | V |
| CTL1/2 L-level input voltage | $V_{CTL1L}$ | | – | – | 0.3 | V |
| CTL1/2 H-level input voltage | $V_{MPXH}$ | | 1.5 | – | – | V |
| CTL1/2 L-level input voltage | $V_{CTL1L}$ | | – | – | 0.3 | V |
| Current consumption | | | | | | |
| Average quiescent consumption current at startup | $I_{ST}$ | $V_{CC2S}$ 3V | – | 450 | 700 | μA |
| Average quiescent consumption current | $I_{CC}$ | | – | 2 | 4 | mA |
| Stand-by current | $I_{SB}$ | $V_{CC2S}$ +$V_{CC1S}$ | – | 0 | 5 | μA |
| Time-sharing control amplifier | | | | | | |
| Input threshold voltage | | | 0.228 | 0.25 | 0.272 | V |
| High-level output voltage | | | 1.0 | – | – | V |
| Low-level output voltage | | | – | – | 0.2 | V |

## ■ Timing chart

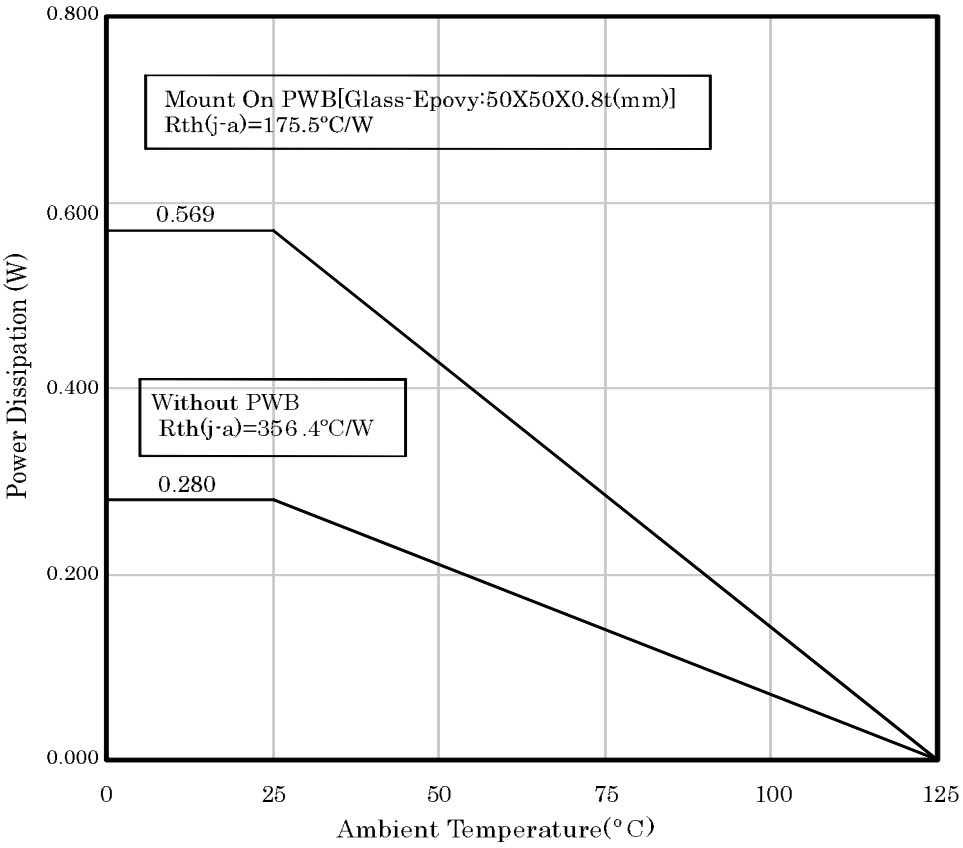
1. Start sequence (lithium battery, one cell)



2. Start and short-circuit



■ Power Dissipation



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