Reset Timer IC for Mobile Equipment

NO.EA-418-180810

OVERVIEW

The R3201L is a reset timer IC for mobile equipment featuring a shipping mode. This device can detect an external adaptor by the TAIN input signal.

KEY BENEFITS

- Setting shipping mode provides to improve the battery's consumption at shipping a terminal equipment.
- Despite its extensive functions, achieve 0.35 µA low supply current.

KEY SPECIFICATIONS

- Operating Voltage Range (Max. Rating): 2.2 V to 5.5 V (12.0V)
- Supply Current (at Standby / Shipping mode): Typ.0.35 µA
- Operating Temperature Range: -40°C to 85°C
- Reset Request Time: Refer to *Optional Function* for details.
- Reset Request Time Accuracy: ±10%
- Reset Time: Typ.0.4s
- Reset Time Accuracy: ±10%
- Shipping Mode Entry Delay Time (Input pin: OFF): Typ.15 s
- Shipping Mode Entry Command (Input pin: OFF): 5 cycles
- Shipping Mode Exit Delay Time (Input pin: RST0): Typ.2 s
- Output Type (Output pin: SRO, nSRO, DCHGx): Nch. Open Drain and CMOS

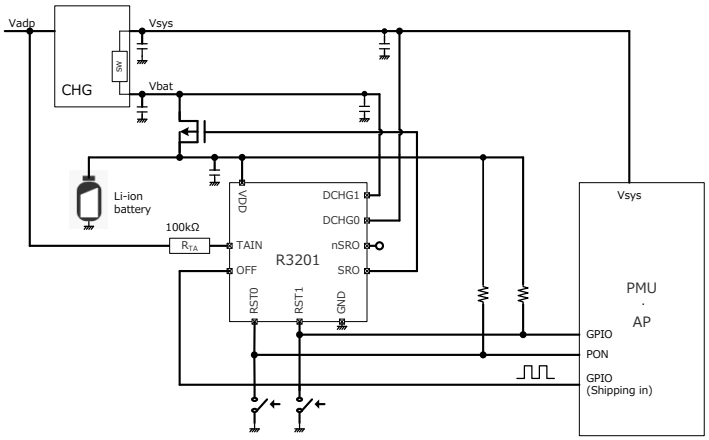
OPTIONAL FUNCTION

Product Name	Package
R3201Lxxx∗-E2	QFN014018-10

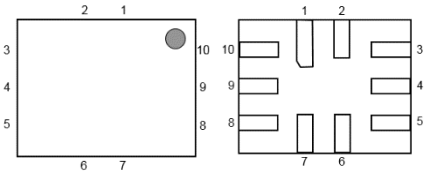
xxx: Specify a delay time for reset signal.

xxx	Reset Request Time
001	8 s
002	10 s
003	12 s
004	16 s

TYPICAL APPLICATIONS



PACKAGE



QFN014018-10

1.40mm x 1.80 mm,

t = 0.4 mm (Max.)

APPLICATIONS

- Battery-powered mobile equipments
- Autdio, Home-use electronical medical, and Image processing devices
- Mobile phone, Smartphone, and Wearable devices
- Portable games

NO.EA-418-180810

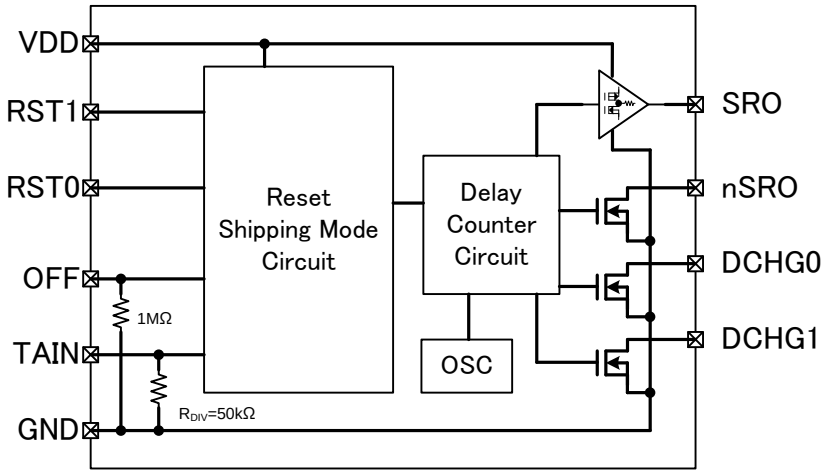
SELECTION GUIDE

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R3201Lxxx∗-E2	QFN014018-10	5,000 pcs	Yes	Yes

xxx : Reset request time
001: 8 s
002: 10 s
003: 12 s
004: 16 s

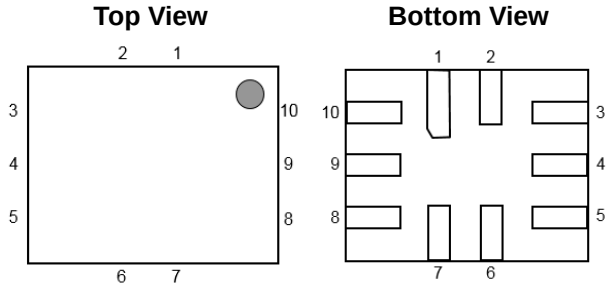
∗ : Output Type
A: Nch Open-drain

BLOCK DIAGRAM



R3201L00xA Block Diagram

PIN DESCRIPTIONS



R3201L (QFN014018-10) Pin Configuration

R3201L Pin Descriptions

Pin No.	Symbol	Description
1	DCHG1	Discharge output pin 1 (Nch. open-drain output)(1)
2	TAIN	Adaptor insert detection pin
3	VDD	Power supply input pin
4	RST0	Reset request input pin 0, Active-low
5	RST1	Reset request input pin 1 , Active-low
6	OFF	Shipping mode enter command input pin(2)
7	GND	Ground pin
8	SRO	CMOS output pin, Active-high
9	nSRO	Nch open drain output pin, Active-low(3)
10	DCHG0	Discharge output pin 0 (Nch. open-drain output)(1)

(1) The DCHG0 and DCHG1 pins must be connected to GND or left floating if it is not used.
(2) The OFF pin must be connected to GND if it is not used (shipping mode is not used).
(3) The nSRO pin must be connected to GND or left floating if it is not used.

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

Symbol	Item	Rating	Unit
V_{DD}	Supply Voltage	GND −0.3 to 12	V
V_{RST0}	RST0 Pin Input Voltage (Input Pin-0)	GND −0.3 to 12	V
V_{RST1}	RST1 Pin Input Voltage (Input Pin-1)	GND −0.3 to 12	V
V_{SRO}	SRO Pin Output Voltage (Reset Signal Output Pin-0)	GND −0.3 to V_{DD} +0.3	V
V_{nSRO}	nSRO Pin Output Voltage (Reset Signal Output Pin-1)	GND −0.3 to 6	V
V_{TAIN}	TAIN Pin Input Voltage(1)	GND −0.3 to 12	V
V_{OFF}	OFF Pin Input Voltage	GND −0.3 to 6	V
V_{DCHG0}	DCHG0 Pin Output Voltage	GND −0.3 to 12	V
V_{DCHG1}	DCHG1 Pin Output Voltage	GND −0.3 to 12	V
P_D	Power Dissipation(2) (QFN014018-10, EDEC STD.51-7 Test Land Pattern)	625	mW
Tj	Junction Temperature Range	-40 to 125	°C
Tstg	Storage Temperature Range	−55 to 125	°C

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field.
The functional operation at or over these absolute maximum ratings are not assured.

RECOMMENDED OPERATING CONDITIONS

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{DD}	Supply Voltage	2.2 to 5.5	V
Ta	Operating Temperature Range	−40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions. The device electrical characteristics up to 125°C are evaluated at preproduction.

(1) Refer to *TAIN Test Circuit* information.
(2) Refer to *POWER DISSIPATION* for detailed information.

ELECTRICAL CHARACTERISTICS

The specifications surrounded by ☐ are guaranteed by design engineering at −40°C ≤ Ta ≤ 85°C.

R3201L Electrical Characteristics (Ta = 25°C)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
I_{SS1}	Supply current 1(1)	V_{DD} = 4.0 V (at standby)		0.35	1.0	µA
I_{SS2}	Supply current 2(2)	V_{DD} = 4.0V (at active reset counter & reset signal output)		3	10	µA
I_{SS3}	Supply current 3(3)	V_{DD} = 4.0V (at active after reset signal output)		0.4	1.7	µA
V_{IL1}	RST0/RST1 input voltage, low				0.3	V
V_{IH1}	RST0/RST1 input voltage, high		1.15		V_{DD}	V
V_{IL2}	OFF input voltage, low				0.4	V
V_{IH2}	OFF input voltage, high		1.0		5.5	V
I_{IIL}	OFF (pull-down pin) input leakage current, low	V_I = 0 V	-0.1		0.1	µA
I_{IIH}	OFF (pull-down pin) input leakage current, high	V_{DD} = 5.5 V , V_I = V_{DD}		5.5		µA
T_{DEB}	Debounce time of RST0/RST1			10		msec
■ **RESET Operation**						
T_R	Reset request time	R3201L001	7.2	8	8.8	sec
		R3201L002	9	10	11	
		R3201L003	10.8	12	13.2	
		R3201L004	14.4	16	17.6	
T_D	Reset time		0.36	0.4	0.44	sec
T0	SRO output pin slew rate time (rising and falling time)	V_{DD} = 4 V, Qg = 20nC	1	2	3	msec
T_{DD}	Discharge active of DCHG0/1 delay time		3	4	5	msec
I_D	Discharge current of DCHG0/1	V_{DD} = $V_{DCHG0,1}$ = 4 V		50		mA
V_{OL}	nSRO output voltage, low	I_{OL} = 2 mA			0.3	V
I_{LEAKO}	nSRO output leakage current	V_{DD} = 5.5 V			0.1	µA

(1) Supply current when the device is active and waiting for the reset input.
(2) Supply current when the RST0 and RST1 input pins are low and the timer operation is running.
(3) Supply current after the automatic cancellation of reset signal following the completion of timer operation and the output of rest signal.

The specifications surrounded by ☐ are guaranteed by design engineering at −40°C ≤ Ta ≤ 85°C.

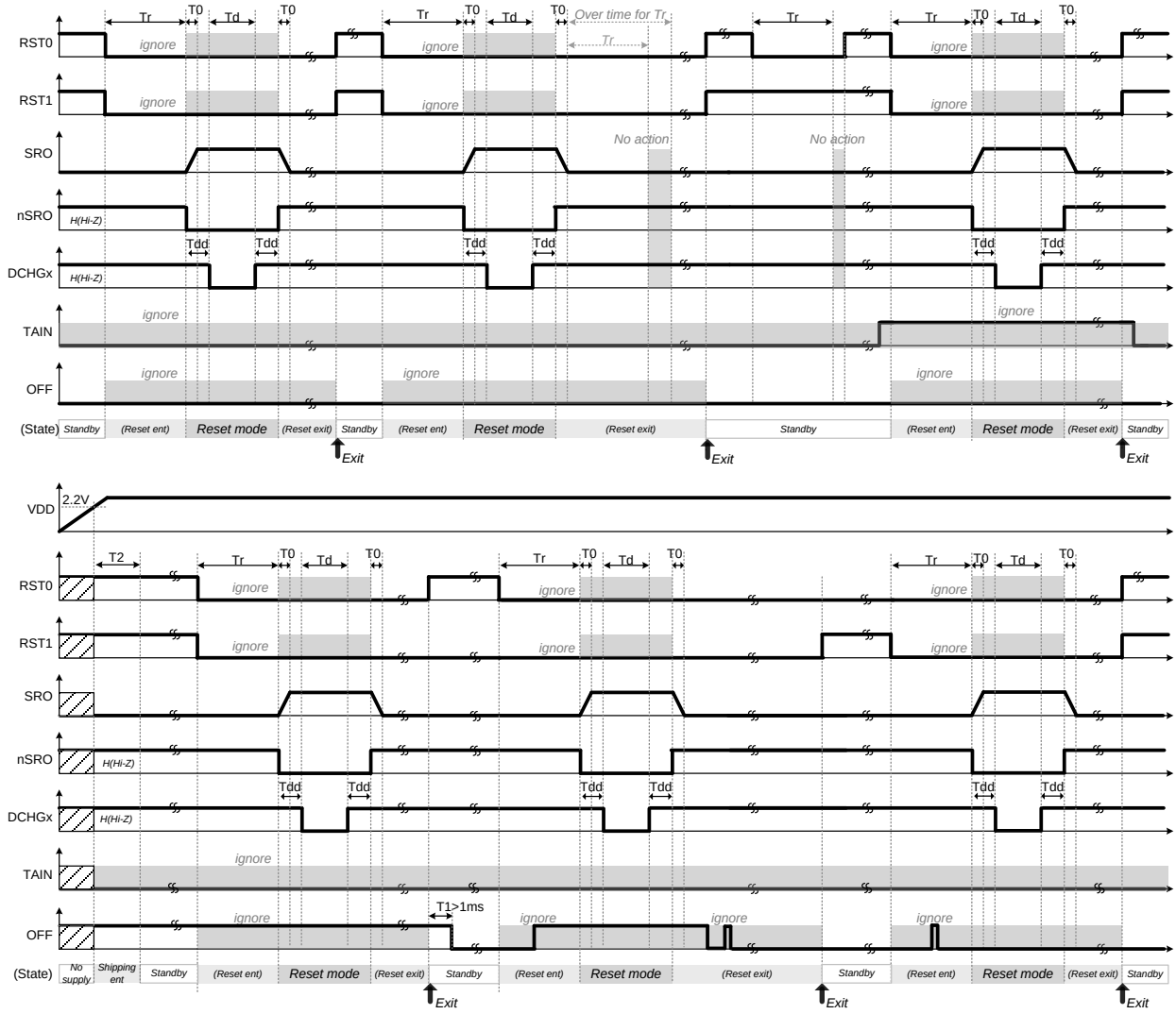
R3201L Electrical Characteristics (Continued) (Ta = 25°C)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
■ **TAIN Detect Operation**						
V_{TA_DET}	Input detection voltage for R_{TA}	R_{TA} = 100kΩ, R_{DIV} = 50kΩ	2		4.4	V
$V_{TA\_RELEASE}$	Input release voltage for R_{TA}	R_{TA} = 100kΩ, R_{DIV} = 50kΩ	1		3.4	V
V_{TA_HYS}	Input hysteresis voltage for R_{TA}	R_{TA} = 100kΩ, R_{DIV} = 50kΩ	0.8			V
T_{TA}	TAIN input detection delay Time		20	50	100	ms
■ **Shipping Mode Operation**						
T_S	Shipping mode entry delay time		12	15	18	sec
N_{OFF}	Shipping mode entry command			5		Cycle
T1	HIGH and LOW hold time of OFF-pin input pulse		1	2		msec
T2	Entry limited time at shipping mode	Total 5 pulses Time of OFF-pin input pulse			100	msec
T3	Shipping mode exit delay time		1.6	2	2.4	sec
I_{OFF}	Supply current at shipping mode	V_{DD} = 4.0 V		0.35	1.0	µA

All test items listed under *ELECTRICAL CHARACTERISTICS* are done under the pulse load condition (Tj ≈ Ta = 25°C) except Supply Current 2.

THEORY OF OPERATION

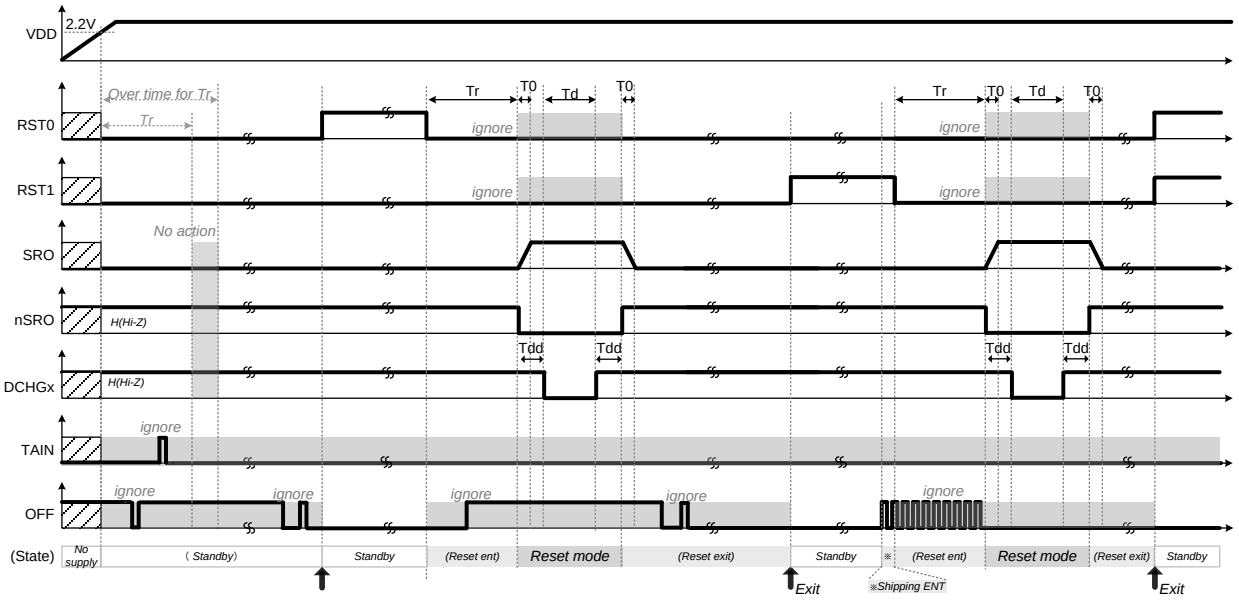
Reset Operation-1



Reset Timing Chart 1

1. When both active-low input pins (RST0 and RST1) become Low level, Reset operation starts.
2. After the period of Tr time, R3201L enters into Reset mode.
3. If RST0 or RST1 becomes High level before Reset mode, reset operation will be cancelled.
4. Once the R3201L finishes the Reset mode, it keep same state (Reset exit state) as long as both RST0 and RST1 remain Low level.
5. In order to move to Standby, High level input is needed to RST0 or RST1.
6. The debounce time of RST0 and RST1 (L→H, H→L) is 10 [msec].

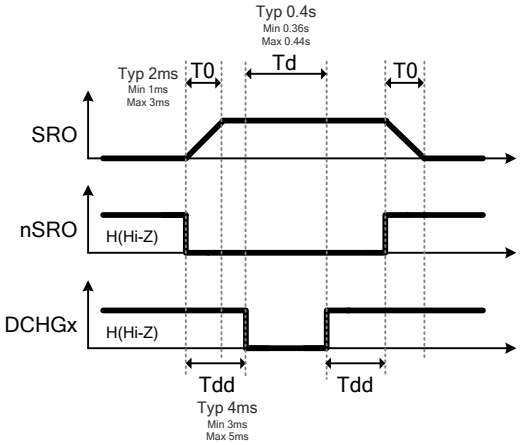
Reset Operation-2



Reset Timing Chart 2

SRO/ nSRO/ DCHGx Operation

SRO slew rate time, nSRO and Discharge ON/OFF timing (DCHGx) follow;

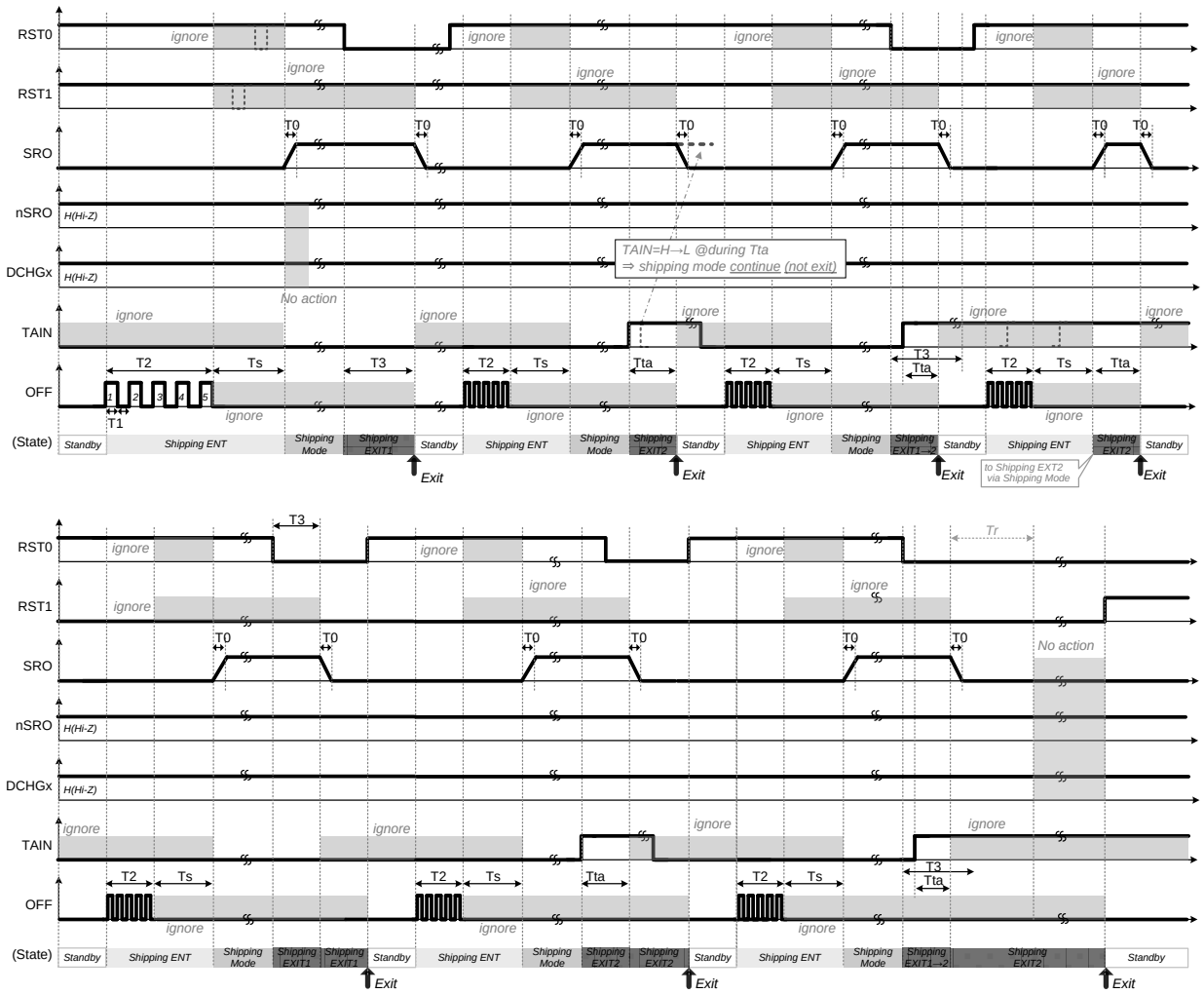


Qg = 20 nC (external P-MOSFET @SRO pin control)

T0 [s] = (Qg / V_{DD}) x (132k[Ω]) x 3　※132kΩ…IC internal resistance

SRO/ nSRO/ DCHGx Timing

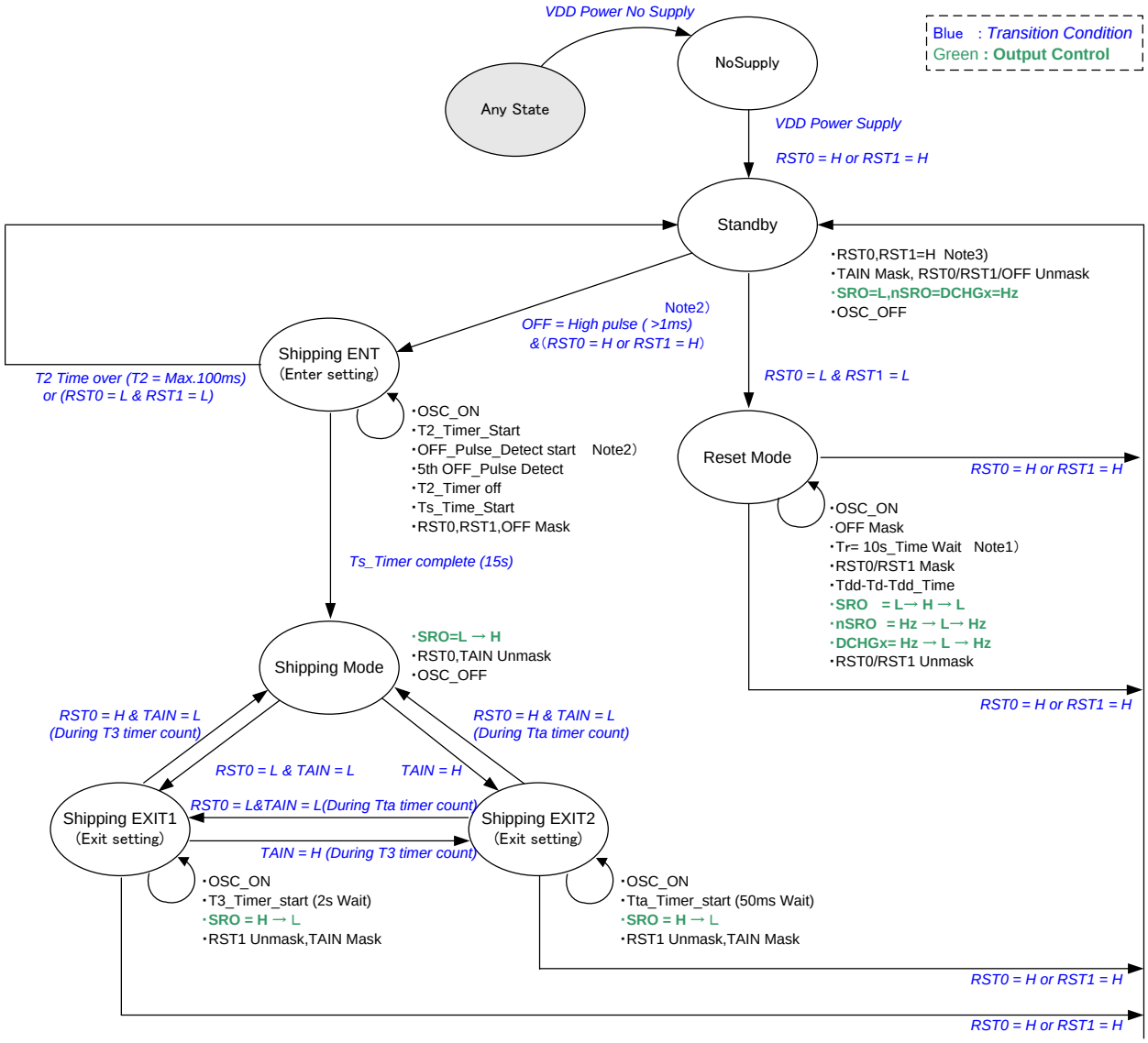
Shipping Mode Operation



Shipping Mode Timing Chart

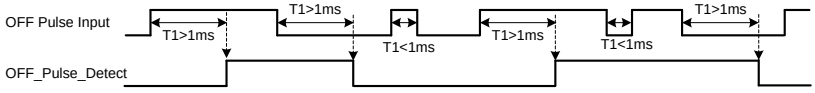
1. If High Pulse to OFF-pin is input, when RST0 or RST1 input pins are High level, Shipping ENT starts.
2. During the period of T2 time, if both of RST0 and RST1 input pins become Low level, Shipping ENT stops, and Reset operation starts.
3. When the 5th Pulse input of OFF-pin (N_{OFF}) is NOT inputted until T2 time, R3201L is NOT moved to the shipping mode by lack of the shipping mode setting request.
4. The setting condition priority of the shipping mode exit is higher TAIN detection (R_{TA} input > min 4V) than RST0=L during T3 time.
5. The debounce time of RST0 and RST1 (L→H, H→L) is 10 [msec].

State Diagram



Note1) 8s, 10s, 12s, 16s code selectable option

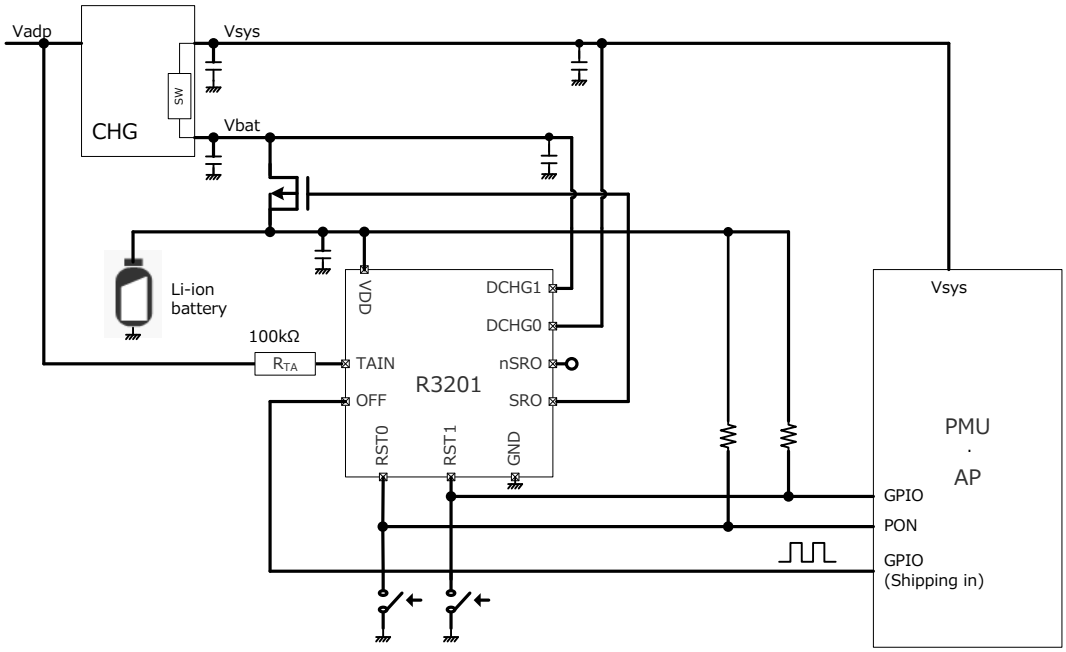
Note2) OFF input pin supports debounce function. The initial value in the debounce circuit is "OFF=L" at Power ON.
Input pulse width of OFF pin must be at least T1 time (min.1ms). If the pulse width is shorter than T1 time, R3201x may not be able to recognize pulse input.
When the 5th Pulse input of OFF-pin is not inputted by T2 time, R3201x is not moved to the shipping mode by lack of the shipping mode setting request.



Note3) RST0/RST1 input pins support debounce function. Debounce circuit for RST0/RST1 is reset on transition to Standby state (except from Shipping ENT state).
Initial values of debounce circuit are "H".

APPLICATION INFORMATION

Typical Application Circuit

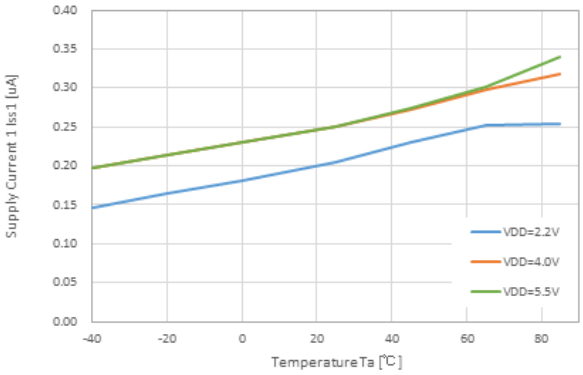


R3201L Typical Application Circuit

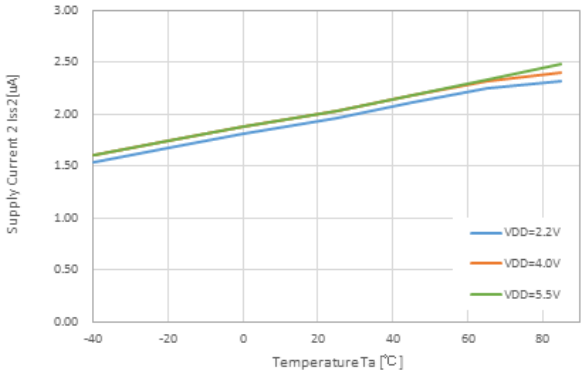
TYPICAL CHARACTERISTICS

Note: Typical Characteristics are intended to be used as reference data, they are not guaranteed.

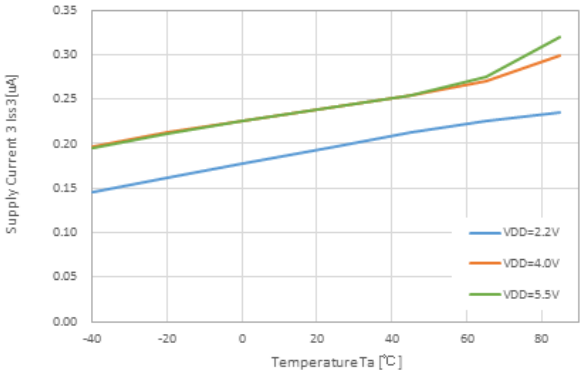
1) Supply Current 1
R3201Lxxx



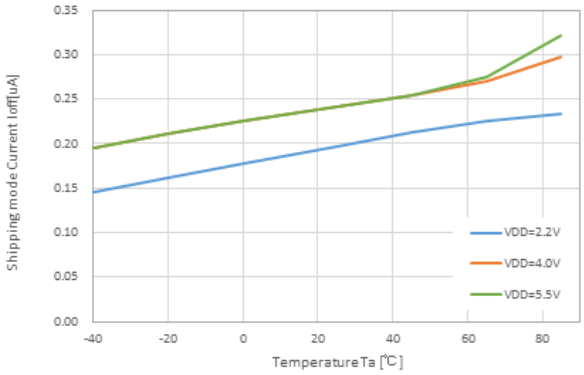
2) Supply Current 2
R3201Lxxx



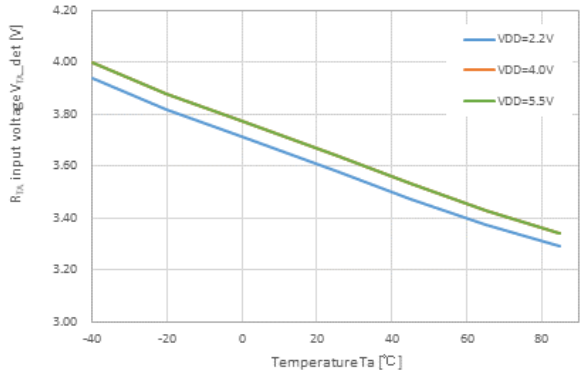
3) Supply Current 3
R3201Lxxx



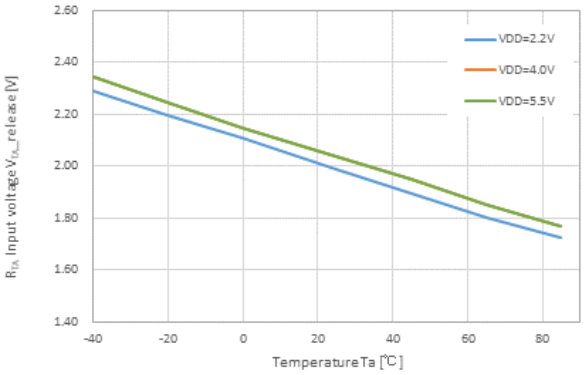
4) Supply Current at Shipping Mode
R3201Lxxx



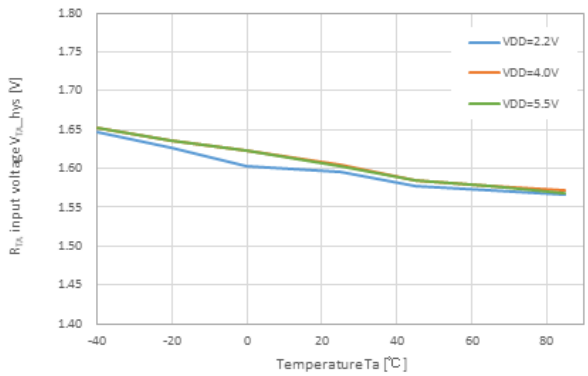
5) R_{TA} Input Detection Voltage
R3201Lxxx



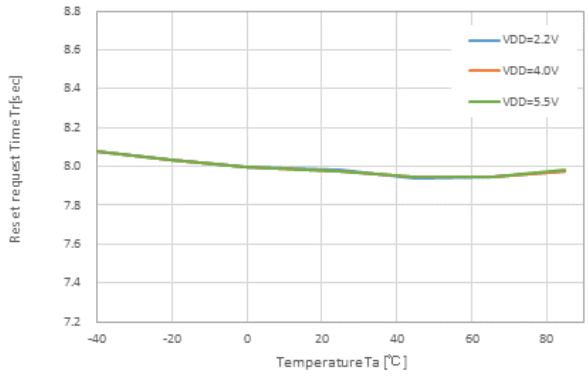
6) R_{TA} Input Release Voltage
R3201Lxxx



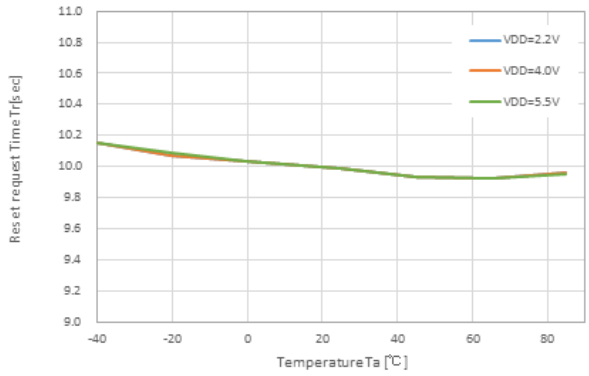
7) R_{TA} Input Hysteresis Voltage
R3201Lxxx



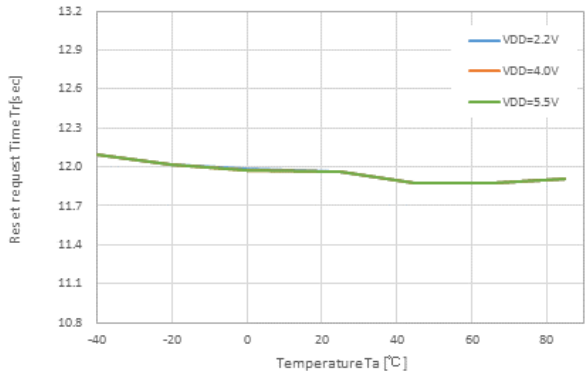
8) Reset Request Time
R3201Lxx1(8s)



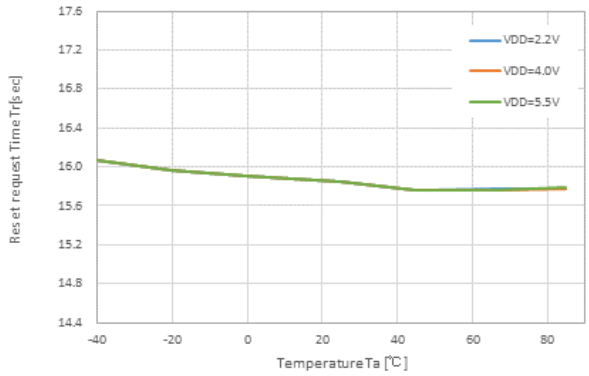
R3201Lxx2(10s)



R3201Lxx3(12s)



R3201Lxx4(16s)



Ver. A

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

Measurement Conditions

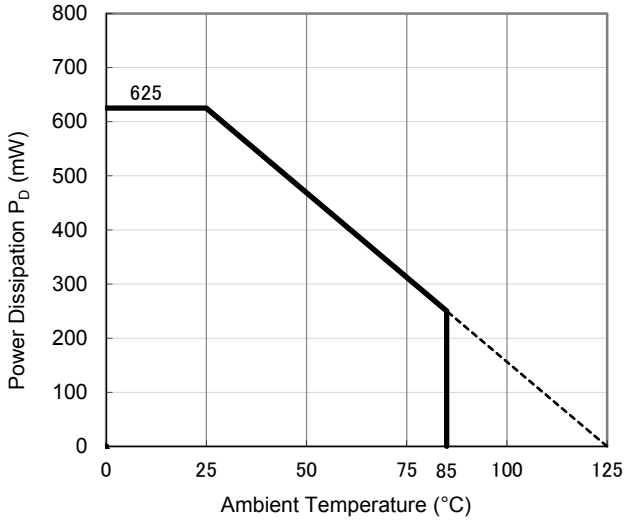
Item	Measurement Conditions
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm
Copper Ratio	Outer Layer (First Layer): Less than 95% of 50 mm Square Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square
Through-holes	ϕ 0.3 mm × 36 pcs

Measurement Result (Ta = 25°C, Tjmax = 125°C)

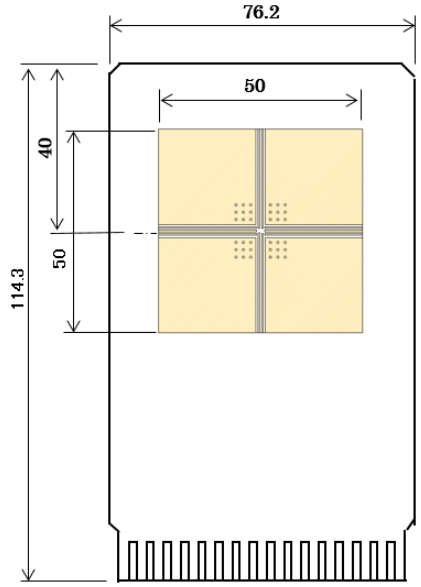
Item	Measurement Result
Power Dissipation	625 mW
Thermal Resistance (θja)	θja = 160°C/W
Thermal Characterization Parameter (ψjt)	ψjt = 76°C/W

θja: Junction-to-Ambient Thermal Resistance

ψjt: Junction-to-Top Thermal Characterization Parameter



Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

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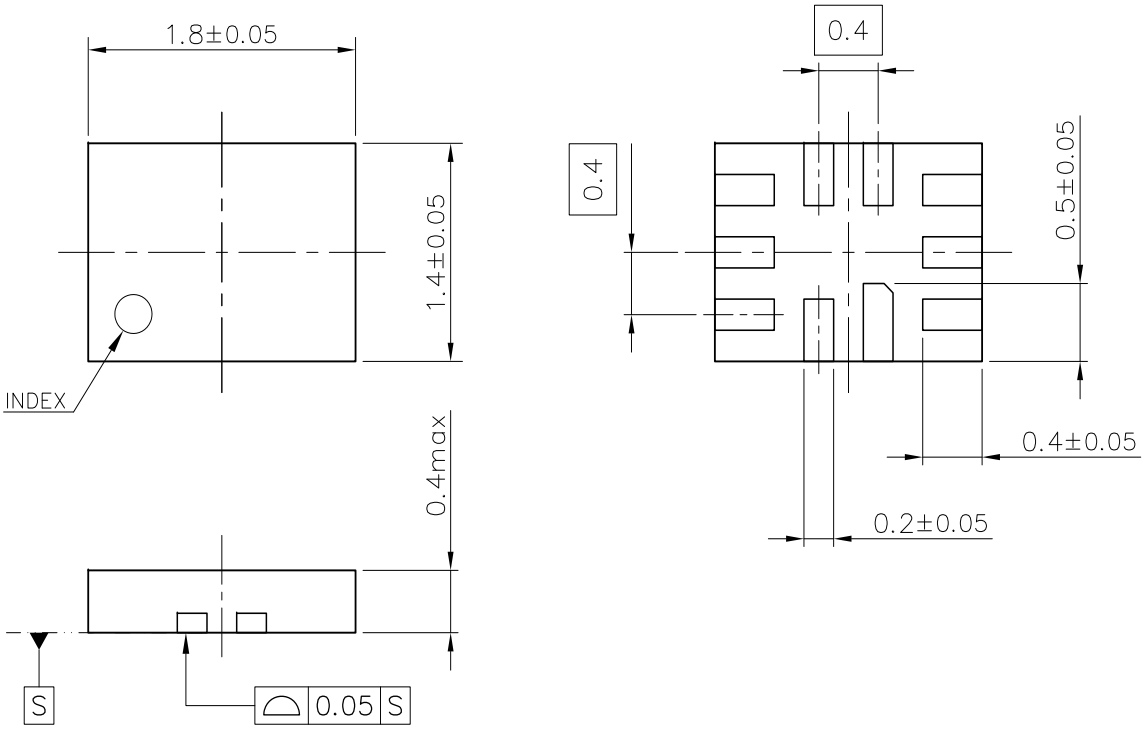
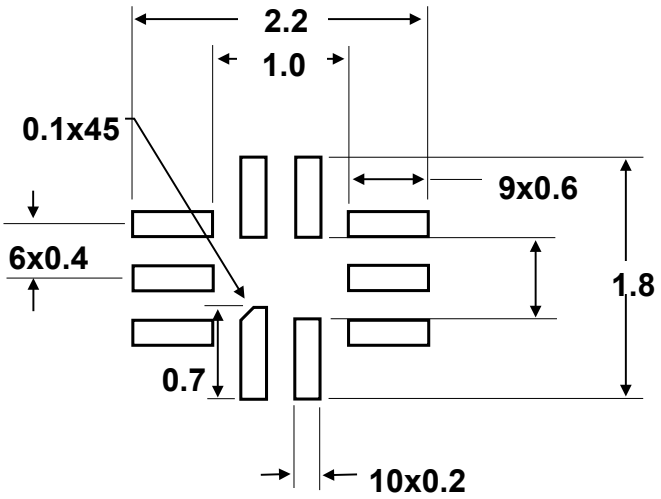
Ver. B



QFN014018-10 Package Dimensions (Unit: mm)



QFN014018-10 Recommended Land Pattern (Unit: mm)

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