
Reset Timer IC for Mobile Equipments

NO.EA-280-190531

OUTLINE

The R3200x is a reset timer IC with two input signals for mobile equipment which require long interval for reset sequence. The long interval prevents unexpected resets caused by accidental key operations. Internally, the R3200x consists of a delay generator circuit and output driver transistors.

The R3200x has two active-low input pins ($\overline{SR0}$ and $\overline{SR1}$) which generate reset signals after output delay time when both active-low input pins are activated at the same time.

The R3200x has two versions that are different in output delay time settings and output release method.

R3200x001x:

Output delay time is selectable from 7.5 s or 11.25 s typ. by connecting the DSR pin to either GND or V_{DD} . A reset signal can be released by making one of the active-low input pins high.

R3200xxx2x, R3200L053B or R3200L064A:

Output delay time is fixed. A reset signal will be released automatically after output release time. Or, by making one of the active-low input pins high, a reset signal can be released before output release time.

The R3200x provides ultra-low supply current while a reset signal is remaining active or after being sent out.

The R3200x is offered in a 8-pin DFN(PLP)2020-8B package or a 8-pin DFN1216-8 package.

FEATURES

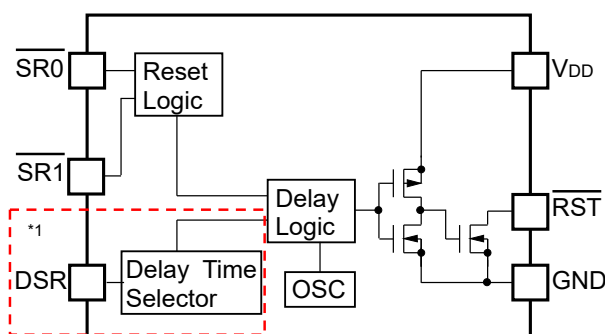
- Operating Voltage Range (Maximum Rating)..... 1.65 V to 5.5 V (6 V)
- Supply Current 1 (at standby) Typ. 0.28 μ A ($V_{DD} = 5.5$ V)
- Supply Current 2 (at active before reset signal output) Typ. 3 μ A ($V_{DD} = 5.5$ V)^{*1}
- Supply Current 3 (at active after reset signal output) Typ. 0.45 μ A ($V_{DD} = 5.5$ V)
- Operating Temperature Range..... -40 to +85°C
- Output Delay Time (R3200x001x)..... Typ. 7.5 s or 11.25 s
 - (R3200x002x) Typ. 7.5 s
 - (R3200L052B)..... Typ. 10 s
 - (R3200L053B) Typ. 10 s
 - (R3200L064A)..... Typ. 3.0 s
- Output Delay Time Accuracy $\pm 10\%$
- Output Release Time (R3200x002x) Typ. 0.234 s
 - (R3200L052B)..... Typ. 0.313 s
 - (R3200L053B)..... Typ. 0.078 s
 - (R3200L064A)..... Typ. 0.1875 s
- Output Release Time Accuracy $\pm 10\%$
- Output Type (R3200xxxxA) Nch Open Drain
 - (R3200xxxxB)..... Nch Open Drain and CMOS
- Packages DFN(PLP)2020-8B, DFN1216-8

^{*1} Guaranteed by design engineering

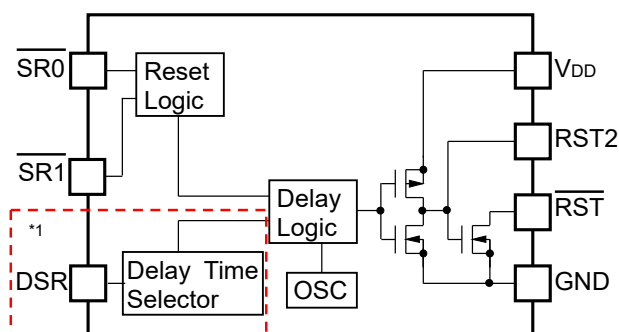
APPLICATIONS

- Mobile phone, Smartphone
- Tablet devices such as E-book etc.
- Portable Games
- Personal Navigation Devices

BLOCK DIAGRAMS



R3200xxxxA



R3200xxxxB

*1 The parts surrounded by red dotted lines are for the R3200x001x only.

SELECTION GUIDE

The package type, the combination of output delay time and output release time, the output type for the device are user-selectable options.

Selection Guide

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R3200Kxxx*-TR	DFN(PLP)2020-8B	5,000 pcs	Yes	Yes
R3200Lxxx*-E2	DFN1216-8	5,000 pcs	Yes	Yes

xxx: Specify the combination of output delay time and output release method.

(001) Select the output delay time from 7.5 s or 11.25 s typ.

A reset signal can be released by making one of the active-low input pins high.

(xx2) / (053) / (064)

A reset signal will be released automatically after output release time.

A reset signal can be released before output release time by making one of the active-low input pins high.

Refer to the table below for the output delay time and the output release time for each device.

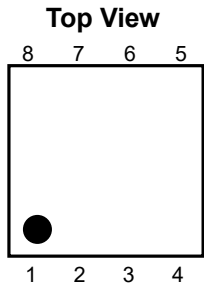
	Output Delay Time	Output Release Time
002	7.5 s	0.234 s
052 (R3200L052B only)	10 s	0.313 s
053 (R3200L053B only)	10 s	0.078 s
064 (R3200L064A only)	3.0 s	0.1875 s

*: Specify the output type.

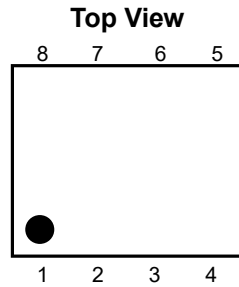
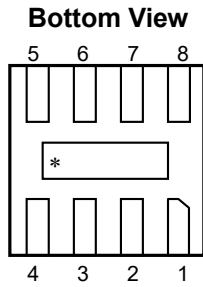
(A) Nch Open Drain

(B) Nch Open Drain and CMOS

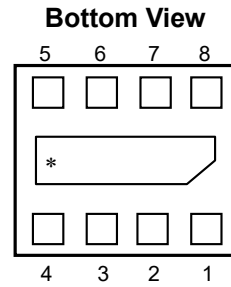
PIN DESCRIPTIONS



DFN(PLP)2020-8B



DFN1216-8



* The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.

DFN(PLP)2020-8B Pin Description/ DFN1216-8 Pin Description

Pin No.	Symbol	Description
1	NC	No Connection (R3200xxxxA)
	RST2	CMOS Output Pin, Active-high (R3200xxxxB)
2	GND	Ground Pin
3	$\overline{SR1}$	Input Pin2, Active-low ^{*1}
4	\overline{RST}	Nch Open Drain Output Pin, Active-low ^{*2}
5	DSR	Output Delay Time Selection Pin (R3200x001x) (GND: 7.5 s, V _{DD} : 11.25 s) ^{*3}
	TEST2	Test Pin 2 ^{*4} (R3200xxx2x/ R3200L053B/ R3200L064A)
6	TEST	Test Pin ^{*4}
7	$\overline{SR0}$	Input Pin1, Active-low ^{*1}
8	V _{DD}	Power Supply Input Pin

^{*1} When only one active-low input pin is used, connect the unused one to GND.

^{*2} The RST pin must be connected to GND or left floating if it is not used (Ex.R3200xxxxB).

^{*3} The DSR pin must be connected to GND or V_{DD}.

^{*4} The TEST pin and the TEST2 pin must be connected to GND when they are used.

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

Symbol	Item	Rating	Unit	
V _{DD}	Supply Voltage	GND -0.3 to 6	V	
V _{SR0}	Input Voltage (Input Pin1)	GND -0.3 to 6	V	
V _{SR1}	Input Voltage (Input Pin2)	GND -0.3 to 6	V	
V _{RST}	Output Voltage (Reset Signal Output Pin1)	GND -0.3 to 6	V	
V _{RST2}	Output Voltage (Reset Signal Output Pin2)	GND -0.3 to V _{DD} +0.3	V	
V _{DSR}	Input Voltage (Output Delay Time Selection Pin) (R3200x001x)	GND -0.3 to 6	V	
I _{OUT}	Output Current	20	mA	
P _D	Power Dissipation (JEDEC STD. 51) ^{*1}	DFN(PLP)2020-8B	1050	mW
		DFN1216-8	1700	
T _a	Operating Temperature Range	-40 to +85	°C	
T _{stg}	Storage Temperature Range	-55 to +125	°C	

^{*1} Refer to *PACKAGE INFORMATION* for detailed information.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage 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 is not assured.

RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

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 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.

R3200x

NO.EA-280-190531

ELECTRICAL CHARACTERISTICSThe specifications surrounded by are guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$.**R3200x001x Electrical Characteristics**

(Ta = 25°C)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{DD}	Supply Voltage		1.65		5.5	V
I _{SS1}	Supply Current 1 ^{*1}	V _{DD} = 5.5 V (at standby)		0.28	1.35	μA
I _{SS2}	Supply Current 2 ^{*2}	V _{DD} = 5.5 V (at active before reset signal output)		3.0	6.5	μA
I _{SS3}	Supply Current 3 ^{*3}	V _{DD} = 5.5 V (at active after reset signal output)		0.45	1.7	μA
V _{OL}	"L" Output Voltage	V _{DD} ≥ 4.5 V I _{OL} = 8 mA			0.3	V
		V _{DD} ≥ 3.3 V I _{OL} = 5 mA				
		V _{DD} ≥ 1.65 V I _{OL} = 3 mA				
V _{OH}	"H" Output Voltage ^{*4}	V _{DD} ≥ 4.5 V I _{OH} = 5 mA			V_{DD} x 0.85	V
		V _{DD} ≥ 3.3 V I _{OH} = 2.5 mA				
		V _{DD} ≥ 1.65 V I _{OH} = 0.8 mA				
I _{LEAKI}	$\overline{\text{SR}}0, \overline{\text{SR}}1$ Input Leakage Current	V _{DD} = 5.5 V			0.1	μA
I _{LEAKO}	Output Leakage Current	V _{DD} = 5.5 V			0.1	μA
tdelay	Output Delay Time	DSR = GND	6.75	7.5	8.25	s
		DSR = V _{DD}	10.125	11.25	12.375	s
V _{IL}	$\overline{\text{SR}}0, \overline{\text{SR}}1$ "L" Input Voltage _{get}				0.3	V
V _{IH}	$\overline{\text{SR}}0, \overline{\text{SR}}1$ "H" Input Voltage _{get}		0.85			V

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

^{*1} Supply current when the device is active and waiting for the reset input.

^{*2} Supply current when both active-low input pins are low and the timer operation is running.

^{*3} Supply current after the completion of timer operation and the output of reset signal.

^{*4} For the R3200xxxxB only (CMOS output).

ELECTRICAL CHARACTERISTICS (continued)

The specifications surrounded by are guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$.

R3200xxx2x, R3200L053B, R3200L064A Electrical Characteristics

($T_a = 25^{\circ}\text{C}$)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Operating Voltage		1.65		5.5	V
I_{SS1}	Supply Current 1 ^{*1}	$V_{DD} = 5.5\text{ V}$ (at standby)		0.28	1.35	μA
I_{SS2}	Supply Current 2 ^{*2}	$V_{DD} = 5.5\text{ V}$ (at active before reset signal output)		3.0	6.5	μA
I_{SS3}	Supply Current 3 ^{*3}	$V_{DD} = 5.5\text{ V}$ (at active after reset signal output)		0.45	1.7	μA
V_{OL}	"L" Output Voltage	$V_{DD} \geq 4.5\text{ V}$ $I_{OL} = 8\text{ mA}$			0.3	V
		$V_{DD} \geq 3.3\text{ V}$ $I_{OL} = 5\text{ mA}$				
		$V_{DD} \geq 1.65\text{ V}$ $I_{OL} = 3\text{ mA}$				
V_{OH}	"H" Output Voltage ^{*4}	$V_{DD} \geq 4.5\text{ V}$ $I_{OH} = 5\text{ mA}$				V
		$V_{DD} \geq 3.3\text{ V}$ $I_{OH} = 2.5\text{ mA}$	$\frac{V_{DD}}{0.85}$			
		$V_{DD} \geq 1.65\text{ V}$ $I_{OH} = 0.8\text{ mA}$				
I_{LEAKI}	$\overline{\text{SR0}}$, $\overline{\text{SR1}}$ Input Leakage Current	$V_{DD} = 5.5\text{ V}$			0.1	μA
I_{LEAKO}	Output Leakage Current	$V_{DD} = 5.5\text{ V}$			0.1	μA
t_{delay}	Output Delay Time ^{*5}		t_{delay_s} $\times 0.9$	t_{delay_s}	t_{delay_s} $\times 1.1$	sec
t_{rec}	Output Release Time ^{*5}		t_{rec_s} $\times 0.9$	t_{rec_s}	t_{rec_s} $\times 1.1$	sec
V_{IL}	$\overline{\text{SR0}}$, $\overline{\text{SR1}}$ "L" Input Voltage				0.3	V
V_{IH}	$\overline{\text{SR0}}$, $\overline{\text{SR1}}$ "H" Input Voltage		0.85			V

All test items listed under *ELECTRICAL CHARACTERISTICS* are done under the pulse load condition ($T_j \approx T_a = 25^{\circ}\text{C}$) except Supply Current 2.

^{*1} Supply current when the device is active and waiting for the reset input.

^{*2} Supply current when both active-low 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.

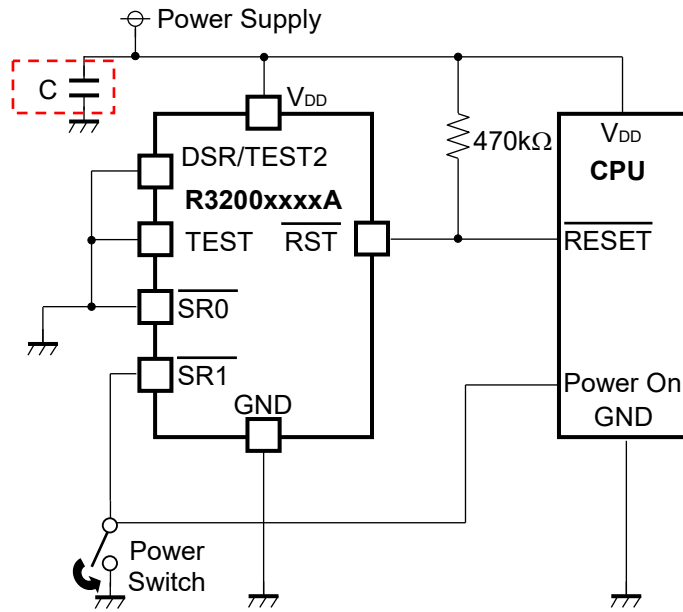
^{*4} For the R3200xxxxB only (CMOS output).

^{*5} Refer to *Output Delay Time and Output Release Time of R3200x*.

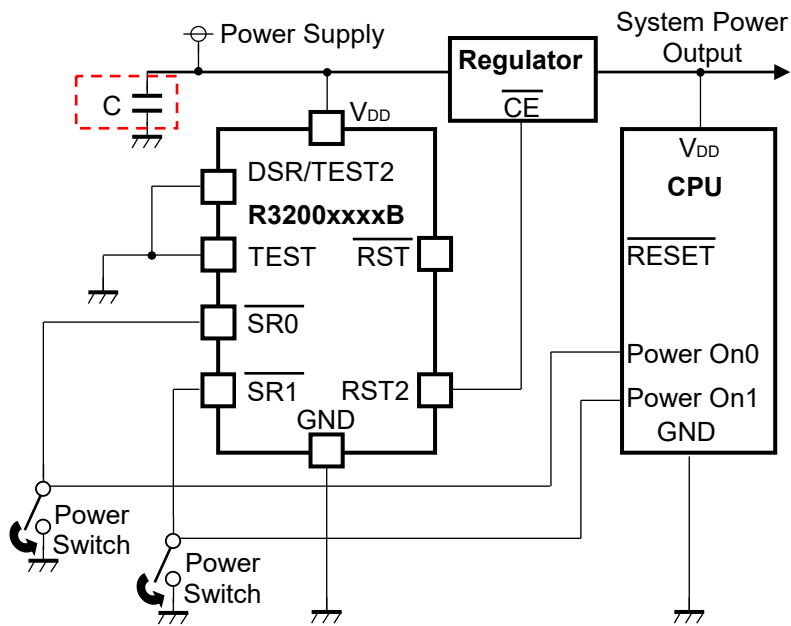
Output Delay Time and Output Release Time of R3200x

Product Name	t_{delay_s}	t_{rec_s}
R3200x002x	7.5 s	0.234 s
R3200L052B	10 s	0.313 s
R3200L053B	10 s	0.078 s
R3200L064A	3.0 s	0.1875 s

TYPICAL APPLICATIONS



R3200xxxxA Typical Application



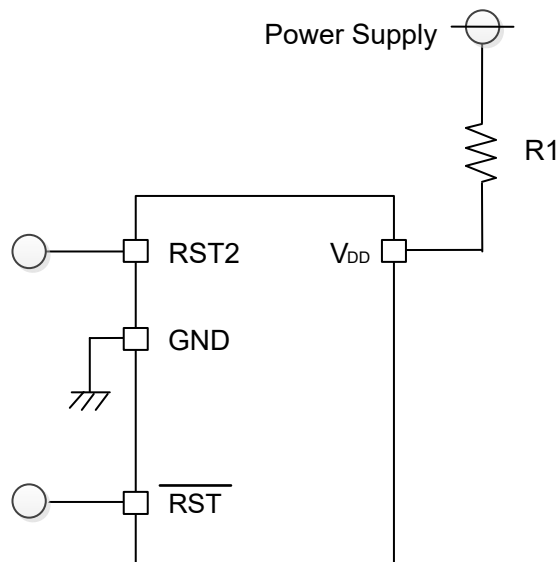
R3200xxxxB Typical Application

A bypass capacitor between the power supply line and the GND line is not necessarily required. If the device operation is affected by power supply noise, connect an appropriately selected bypass capacitor.

TECHNICAL NOTES

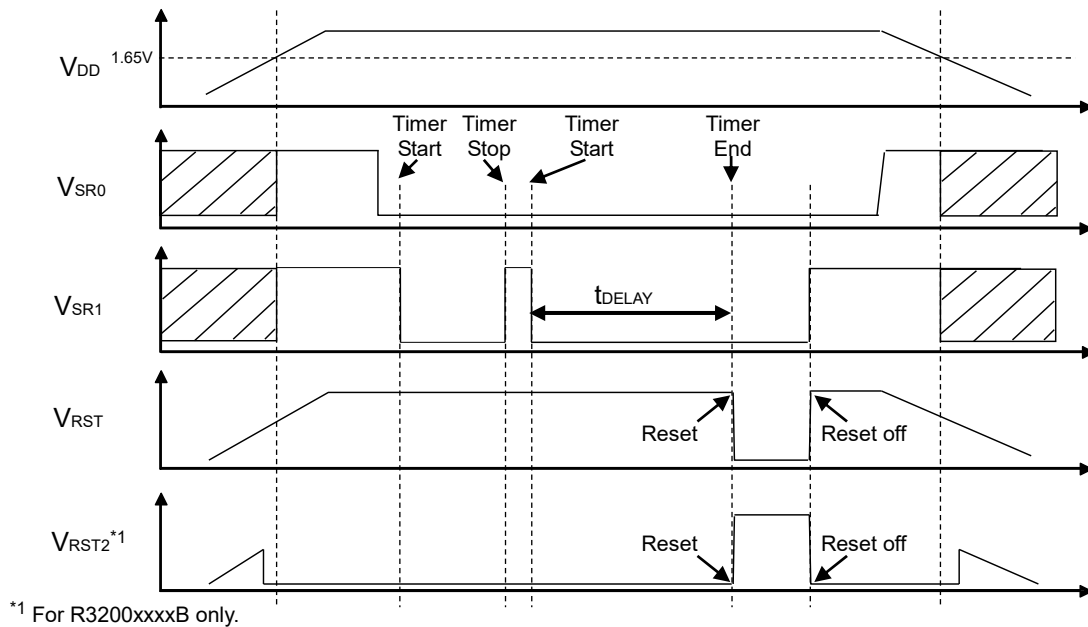
The performance of power source circuits using this device largely depends on the peripheral circuits. When selecting the peripheral components, consider the conditions of use. Do not allow each component, PCB pattern and the device to exceed their respected rated values (voltage, current and power) when designing the peripheral circuits.

- When only one active-low input pins is used (refer to *R3200xxxxA Typical Application*) connect the unused one to GND.
- In the case of applying the following circuit configuration to the R3200x, the supply current of the device itself may cause significant voltage drop on the V_{DD} pin if the R1 value is high. As a result, the V_{DD} voltage may fall below the minimum operating voltage.



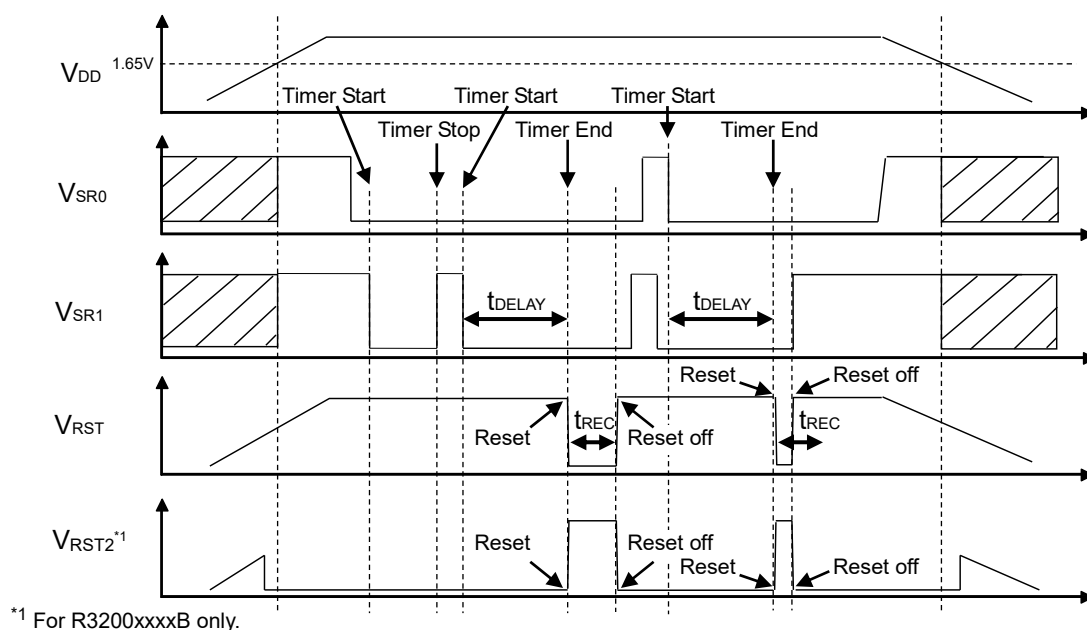
Circuit Configuration Example

THEORY OF OPERATION



R3200x001x Timing Chart

- When both active-low input pins become the low voltage level, the timer operation starts. After the output delay time (t_{delay}), a reset signal will be sent out. When one of the active-low input pins becomes the high voltage level, the timer operation stops.
- During t_{delay} , if one of the active-low input pins becomes the high voltage level, the timer operation stops. If both active-low input pins become the low voltage level again, a reset signal will be sent out after t_{delay} .
- A reset signal will be released if one of the active-low input pins becomes the high voltage level. Until one of the active-low input pins becomes the high voltage level, a reset signal will be continually sent out.
- t_{delay} can be selected from 7.5 s or 11.25 s typ. by connecting the DSR pin to either GND or V_{DD}. However, if the DSR pin is switched during the operations, the output would become unstable and may cause false operations. Switching of the DSR pin must be done during power-off. Also, the DSR pin must be connected to either GND or V_{DD}, otherwise the output would become unstable and may cause false operations.

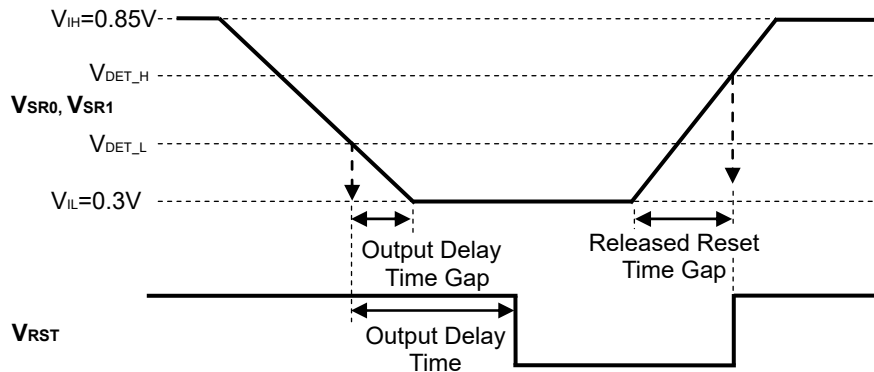


R3200xxx2x, R3200L053B, R3200L064A Timing Chart

- When both active-low input pins become the low voltage level, the timer operation starts. After the output delay time (t_{DELAY}), a reset signal will be sent out. If one of the active-low input pins becomes the high voltage level, the timer operation stops.
- During t_{DELAY} , if one of the active-low input pins becomes the high voltage level, the timer operation stops. If both active-low input pins become the low voltage level again, a reset signal will be sent out after t_{DELAY} .
- A reset signal will be released automatically after the reset delay time (t_{REC}), or it will be released if one of the active-low input pins becomes the high voltage level.

OUTPUT DELAY TIME GAP

The threshold voltages of the active-low input pins are between V_{IL} and V_{IH} . Therefore, if the rising or falling slew rate is very slow, the timer will start at the point of crossing the threshold voltage and may cause errors in the output delay time (t_{delay}) and the output release time (t_{rec}).



Relation between the Rising and Falling Slew Rate and the Time Gap

V_{DD} START-UP DURING LOW INPUT

When starting up V_{DD} at slow slew rate of $0.001 V/\mu s$ or less while the active-low input pins are the low voltage level, the device may start the operation at lower than the minimum operating voltage, thus t_{delay} may exceed the guaranteed time.

PACKAGE INFORMATION

Power Dissipation (DFN(PLP)2020-8B)

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 × 23 pcs

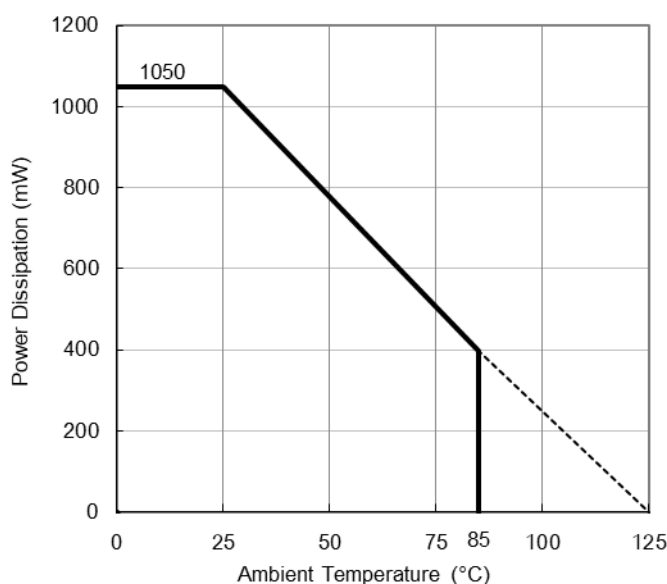
Measurement Result

(Ta = 25°C, Tjmax = 125°C)

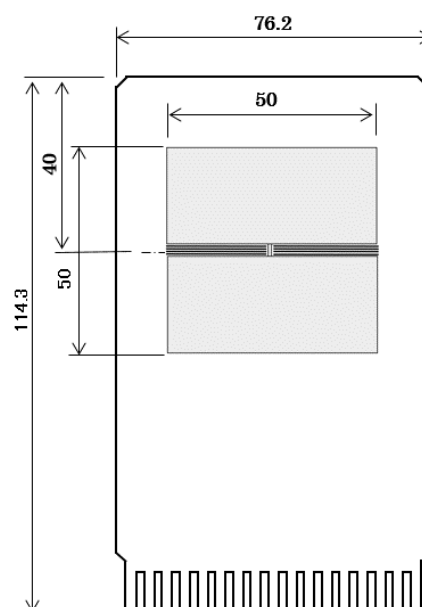
Item	Measurement Result
Power Dissipation	1050 mW
Thermal Resistance (θ_{ja})	$\theta_{ja} = 92^{\circ}\text{C/W}$
Thermal Characterization Parameter (ψ_{jt})	$\psi_{jt} = 60^{\circ}\text{C/W}$

θ_{ja} : Junction-to-Ambient Thermal Resistance

ψ_{jt} : Junction-to-Top Thermal Characterization Parameter

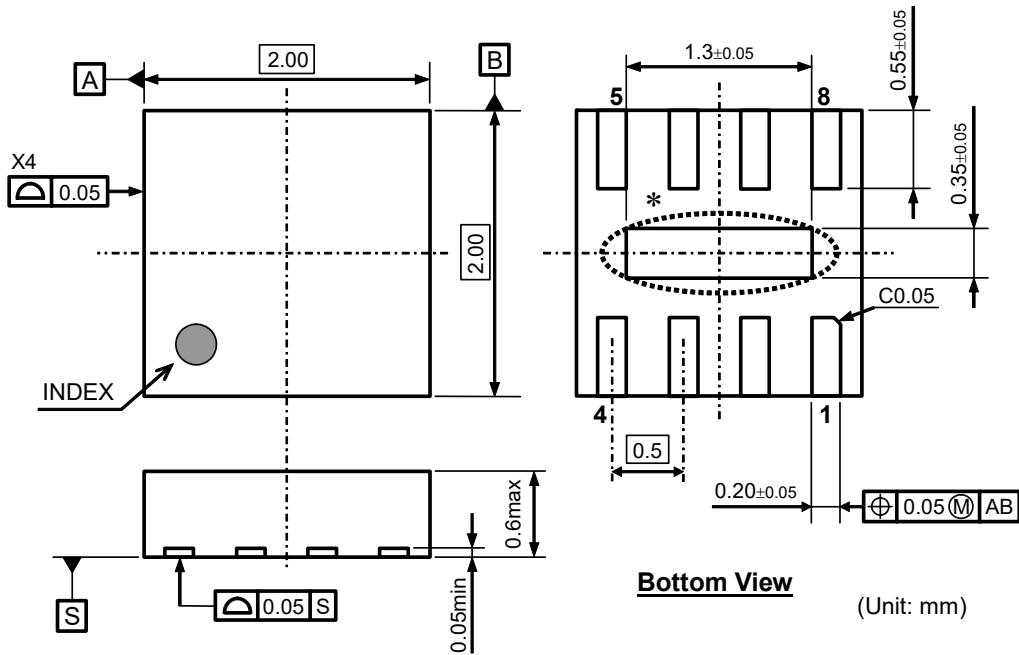


Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

PACKAGE DIMENSIONS (DFN(PLP)2020-8B)

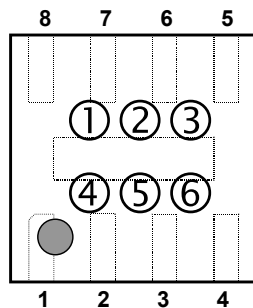


* The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.

DFN(PLP)2020-8B Package Dimensions

MARK SPECIFICATION (DFN(PLP)2020-8B)

- ①②③④: Product Code ... **Refer to MARK SPECIFICATION TABLE (DFN(PLP)2020-8B).**
- ⑤⑥: Lot Number ... Alphanumeric Serial Number



DFN(PLP)2020-8B Mark Specification

MARK SPECIFICATION TABLE (DFN(PLP)2020-8B)**R3200K Mark Specification Table**

Product Name	①②③④
R3200K001A	D 0 0 1
R3200K001B	D D 0 2
R3200K002A	D D 0 3
R3200K002B	D D 0 4

R3200x

NO.EA-280-190531

Power Dissipation (DFN1216-8)

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following 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 0.2 mm × 15 pcs

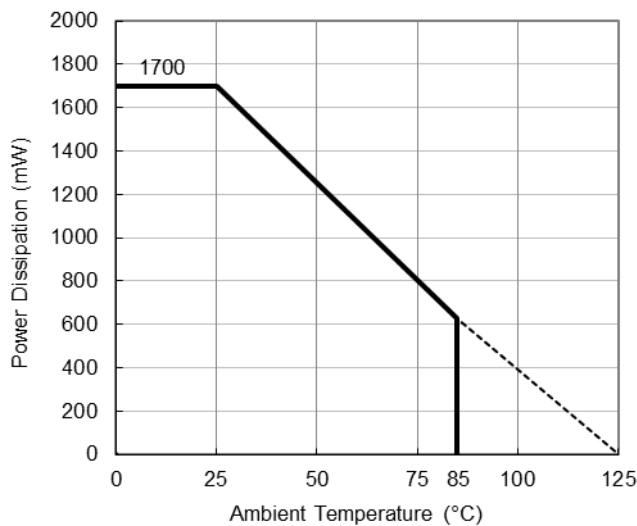
Measurement Result

(Ta = 25°C, Tjmax = 125°C)

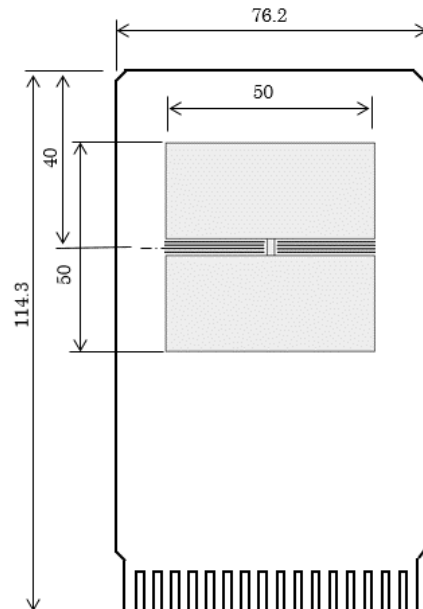
Item	Measurement Result
Power Dissipation	1700 mW
Thermal Resistance (θ_{ja})	$\theta_{ja} = 56^{\circ}\text{C/W}$
Thermal Characterization Parameter (ψ_{jt})	$\psi_{jt} = 18^{\circ}\text{C/W}$

θ_{ja} : Junction-to-Ambient Thermal Resistance

ψ_{jt} : Junction-to-Top Thermal Characterization Parameter

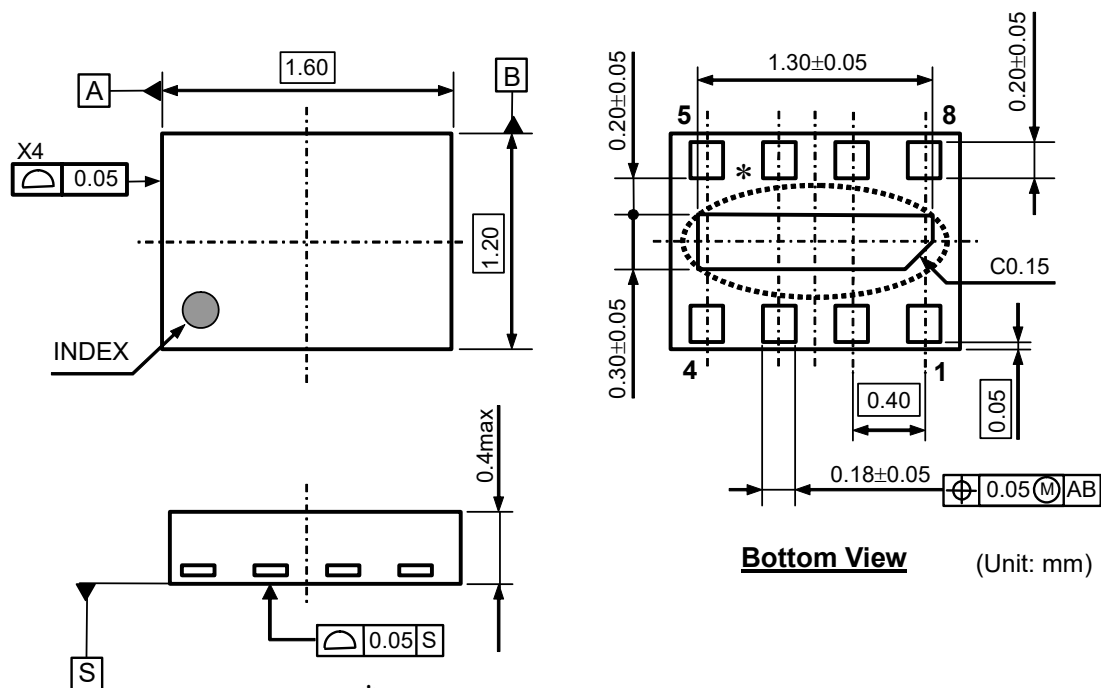


Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

PACKAGE DIMENSIONS (DFN1216-8)



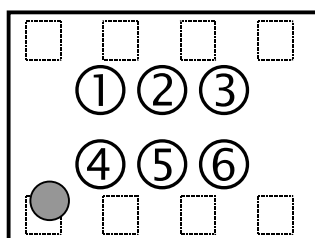
* The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.

DFN1216-8 Package Dimensions

MARK SPECIFICATION (DFN1216-8)

①②③④: Product Code ... **Refer to MARK SPECIFICATION TABLE (DFN1216-8).**

⑤⑥: Lot Number ... Alphanumeric Serial Number



DFN1216-8 Mark Specification

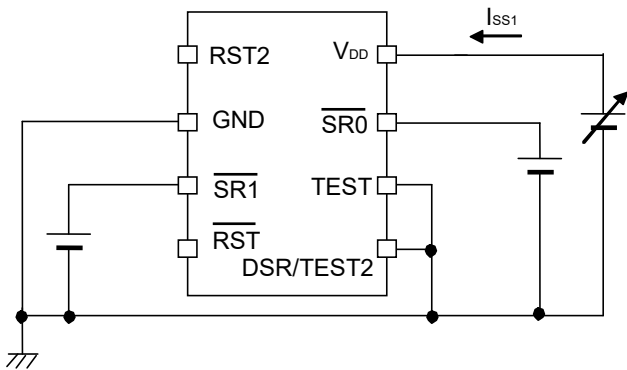
R3200x

NO.EA-280-190531

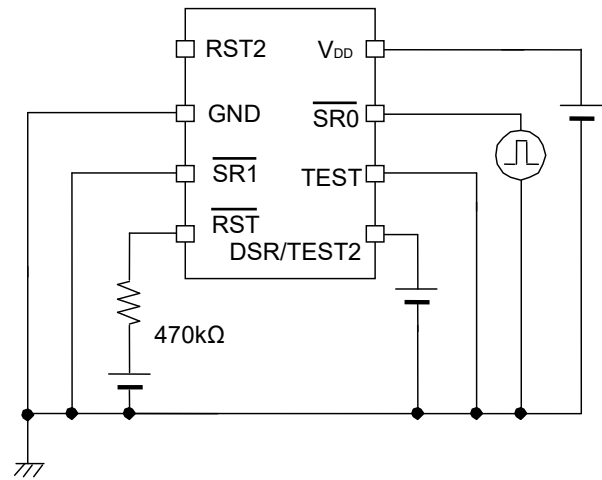
MARK SPECIFICATION TABLE (DFN1216-8)**R3200L Mark Specification Table**

Product Name	①②③④
R3200L001A	DE 0 1
R3200L001B	DF 0 2
R3200L002A	DE 0 3
R3200L002B	DE 0 4
R3200L052B	DE 0 5
R3200L053B	DE 0 6
R3200L064A	DE 0 7

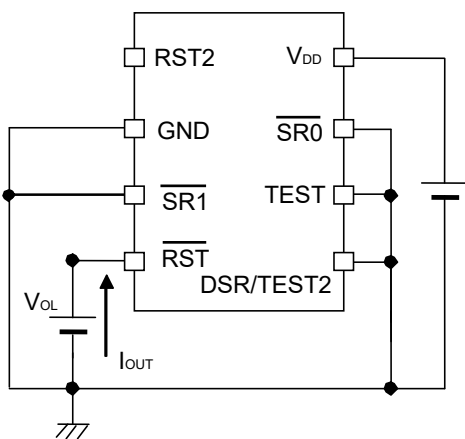
TEST CIRCUITS



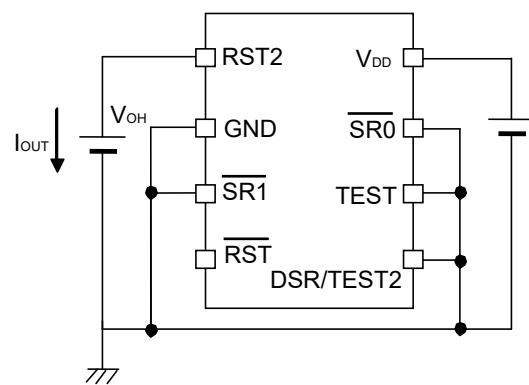
Supply Current Test Circuit



Output Delay Time Test Circuit



Nch Driver Output Voltage Test Circuit

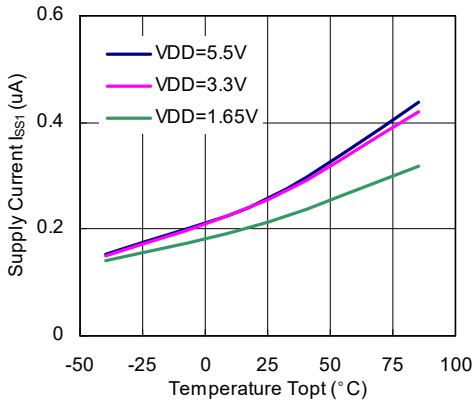


CMOS Driver Output Voltage Test Circuit
(For the R3200xxxxB only.)

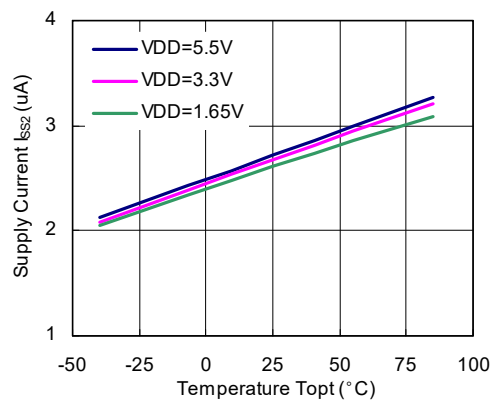
TYPICAL CHARACTERISTICS

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

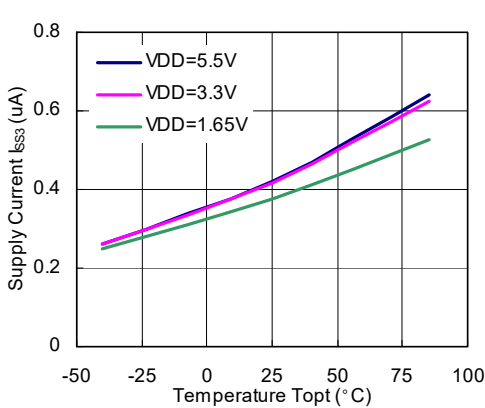
**1) Supply Current 1 vs. Temperature
R3200x (at standby)**



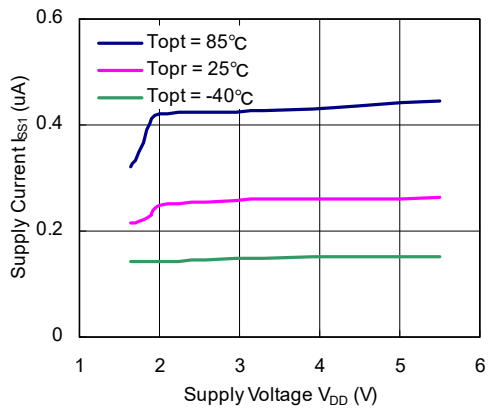
**2) Supply Current 2 vs. Temperature
R3200x (before the reset signal output)**



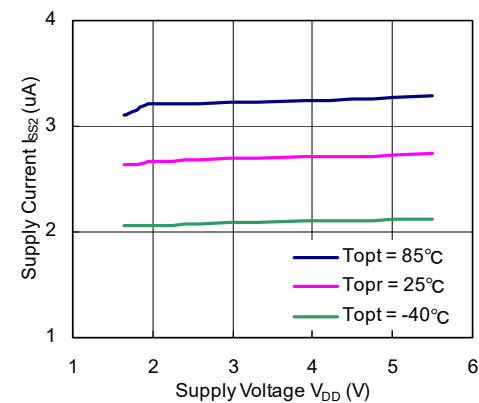
**3) Supply Current 3 vs. Temperature
R3200x (after the reset signal output)**



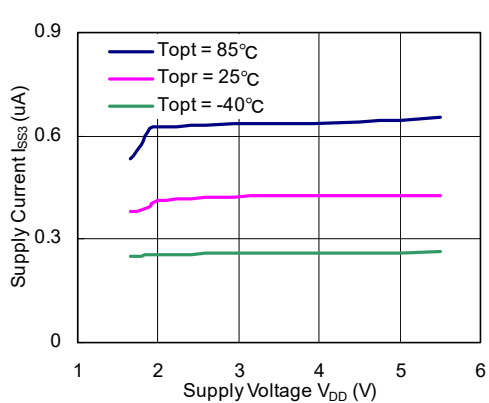
**4) Supply Current 1 vs. Supply Voltage
R3200x (at standby)**



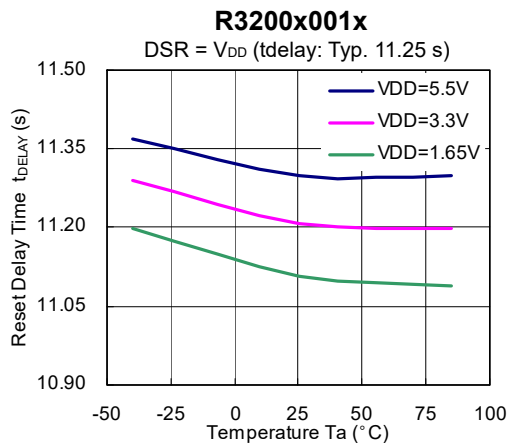
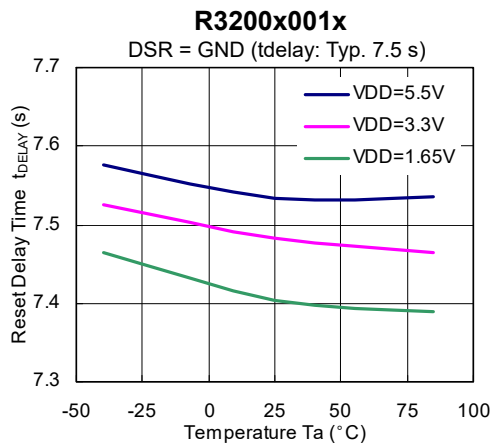
**5) Supply Current 2 vs. Supply Voltage
R3200x (before the reset signal output)**



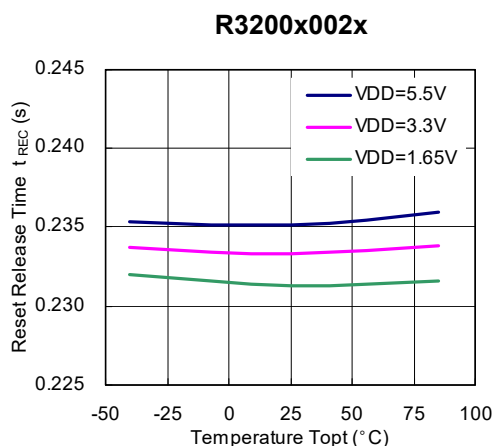
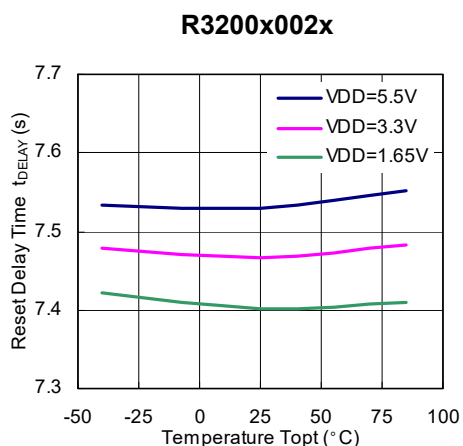
**6) Supply Current 3 vs. Supply Voltage
R3200x (after the reset signal output)**



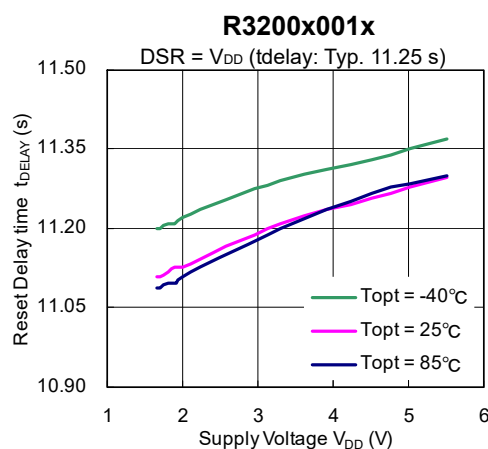
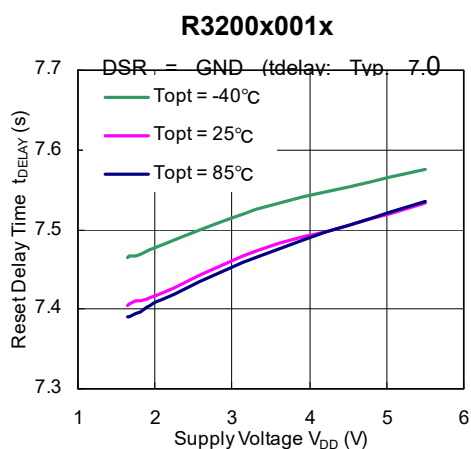
7) Output Delay Time vs. Temperature



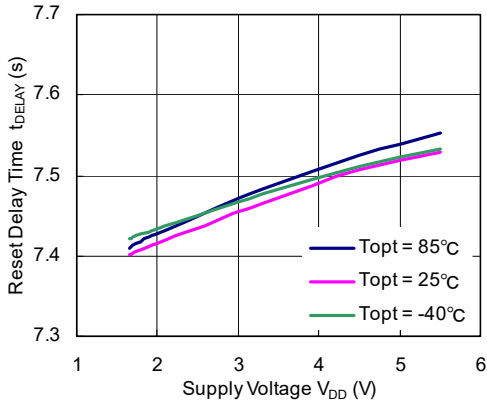
8) Output Release Time vs. Temperature



9) Output Delay Time vs. Supply Voltage

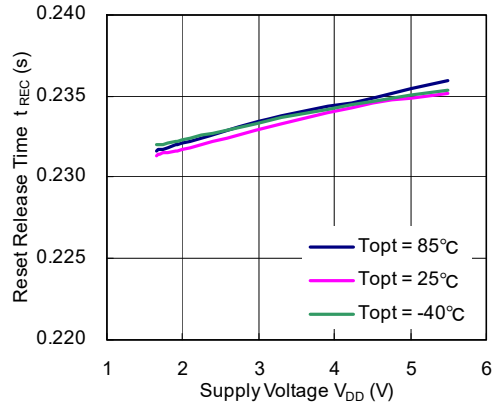


R3200x002x



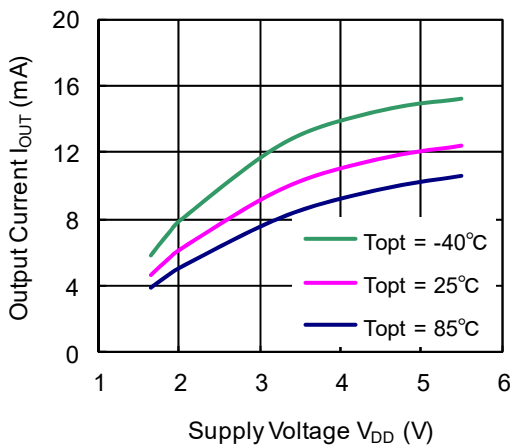
10) Output Release Time vs. Supply Voltage

R3200x002x

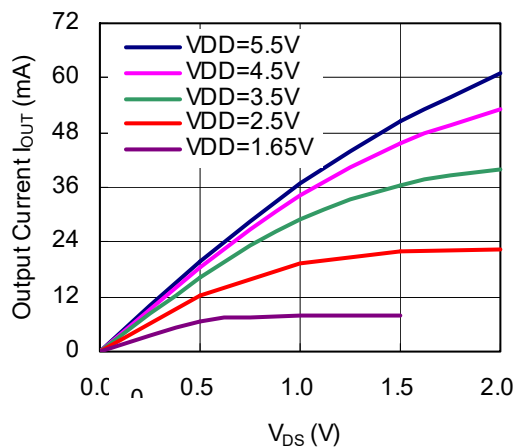


11) Nch Driver Output Current vs. Supply Voltage

V_{DS} = 0.3 V

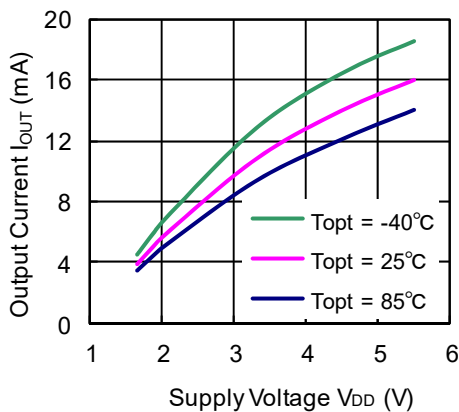


12) Nch Driver Output Current vs. V_{DS}

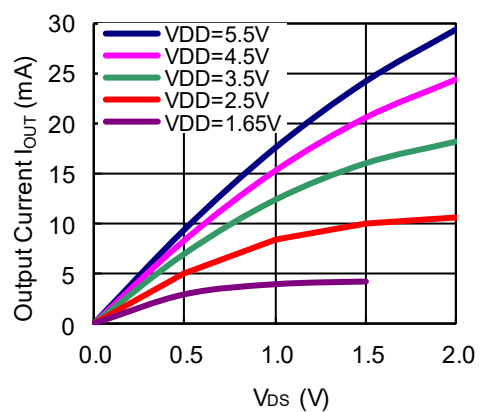


13) Pch Driver Output Current vs. Supply Voltage

V_{DS} = 0.9 V



14) Pch Driver Output Current vs. V_{DS}





1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to Ricoh sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without prior written consent of Ricoh.
3. Please be sure to take any necessary formalities under relevant laws or regulations before exporting or otherwise taking out of your country the products or the technical information described herein.
4. The technical information described in this document shows typical characteristics of and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under Ricoh's or any third party's intellectual property rights or any other rights.
5. The products listed in this document are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment, measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death (aircraft, spacevehicle, nuclear reactor control system, traffic control system, automotive and transportation equipment, combustion equipment, safety devices, life support system etc.) should first contact us.
6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. Anti-radiation design is not implemented in the products described in this document.
8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
9. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
10. There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact Ricoh sales or our distributor before attempting to use AOI.
11. Please contact Ricoh sales representatives should you have any questions or comments concerning the products or the technical information.



Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.

Ricoh has been providing RoHS compliant products since April 1, 2006 and Halogen-free products since April 1, 2012.

RICOH RICOH ELECTRONIC DEVICES CO., LTD.

<https://www.e-devices.ricoh.co.jp/en/>

Sales & Support Offices

Ricoh Electronic Devices Co., Ltd.

Shin-Yokohama Office (International Sales)

2-3, Shin-Yokohama 3-chome, Kohoku-ku, Yokohama-shi, Kanagawa, 222-8530, Japan
Phone: +81-50-3814-7687 Fax: +81-45-474-0074

Ricoh Americas Holdings, Inc.

675 Campbell Technology Parkway, Suite 200 Campbell, CA 95008, U.S.A.
Phone: +1-408-610-3105

Ricoh Europe (Netherlands) B.V.

Semiconductor Support Centre

Prof. W.H. Keesomlaan 1, 1183 DJ Amstelveen, The Netherlands
Phone: +31-20-5474-309

Ricoh International B.V. - German Branch

Semiconductor Sales and Support Centre

Oberrather Strasse 6, 40472 Düsseldorf, Germany
Phone: +49-211-6546-0

Ricoh Electronic Devices Korea Co., Ltd.

3F, Haesung Bldg, 504, Teheran-ro, Gangnam-gu, Seoul, 135-725, Korea
Phone: +82-2-2135-5700 Fax: +82-2-2051-5713

Ricoh Electronic Devices Shanghai Co., Ltd.

Room 403, No.2 Building, No.690 Bibo Road, Pu Dong New District, Shanghai 201203,
People's Republic of China
Phone: +86-21-5027-3200 Fax: +86-21-5027-3299

Ricoh Electronic Devices Shanghai Co., Ltd.

Shenzhen Branch

1205, Block D (Jinlong Building), Kingkey 100, Hongbao Road, Luohu District,
Shenzhen, China
Phone: +86-755-8348-7600 Ext 225

Ricoh Electronic Devices Co., Ltd.

Taipei office

Room 109, 10F-1, No.51, Hengyang Rd., Taipei City, Taiwan
Phone: +886-2-2313-1621/1622 Fax: +886-2-2313-1623