

## FEATURES

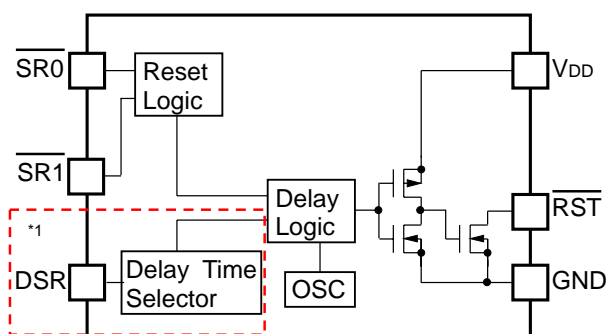
- Operating Voltage Range (Maximum Rating)..... 1.65 V to 5.5 V (6 V)
- Supply Current 1 (at standby) ..... Typ. 0.28  $\mu$ A ( $V_{DD} = 5.5$  V)
- Supply Current 2 (at active before reset signal output) ..... Typ. 3  $\mu$ A ( $V_{DD} = 5.5$  V)\*<sup>1</sup>
- Supply Current 3 (at active after reset signal output) ..... Typ. 0.45  $\mu$ 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

<sup>1</sup> Guaranteed by design engineering

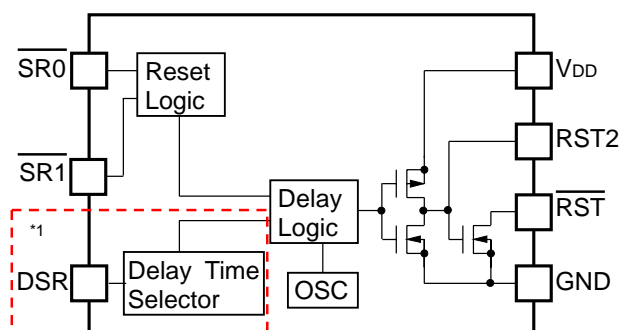
## APPLICATIONS

- 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.

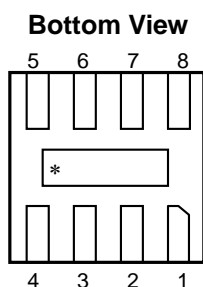
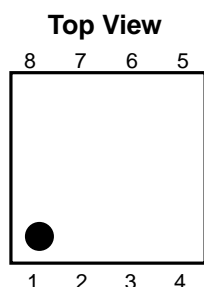
	Output Delay Time	Output Release Time
002	7.5 s	0.234 s
052 (R3200L052B only)	10 s	0.313 s
053 (R3200L053B only)	10 s	0.078 s
064 (R3200L064A only)	3.0 s	0.1875 s

\*: Specify the output type.

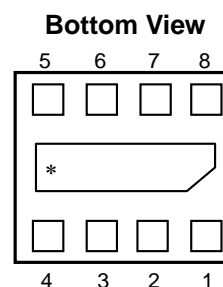
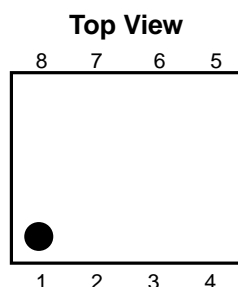
(A) Nch Open Drain

(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	$\overline{\text{SR}}1$	Input Pin2, Active-low <sup>*1</sup>
4	$\overline{\text{RST}}$	Nch Open Drain Output Pin, Active-low <sup>*2</sup>
5	DSR	Output Delay Time Selection Pin (R3200x001x) (GND: 7.5 s, $V_{DD}$ : 11.25 s) <sup>*3</sup>
	TEST2	Test Pin 2 <sup>*4</sup> (R3200xxx2x/ R3200L053B/ R3200L064A)
6	TEST	Test Pin <sup>*4</sup>
7	$\overline{\text{SR}}0$	Input Pin1, Active-low <sup>*1</sup>
8	$V_{DD}$	Power Supply Input Pin

<sup>\*1</sup> When only one active-low input pin is used, connect the unused one to GND.

<sup>\*2</sup> The RST pin must be connected to GND or left floating if it is not used (Ex.R3200xxxxB).

<sup>\*3</sup> The DSR pin must be connected to GND or  $V_{DD}$ .

<sup>\*4</sup> 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 <sub>DD</sub>	Supply Voltage	GND -0.3 to 6		V
V <sub>SR0</sub>	Input Voltage (Input Pin1)	GND -0.3 to 6		V
V <sub>SR1</sub>	Input Voltage (Input Pin2)	GND -0.3 to 6		V
V <sub>RST</sub>	Output Voltage (Reset Signal Output Pin1)	GND -0.3 to 6		V
V <sub>RST2</sub>	Output Voltage (Reset Signal Output Pin2)	GND -0.3 to V <sub>DD</sub> +0.3		V
V <sub>DSR</sub>	Input Voltage (Output Delay Time Selection Pin) (R3200x001x)	GND -0.3 to 6		V
I <sub>OUT</sub>	Output Current	20		mA
P <sub>D</sub>	Power Dissipation (Standard Land Pattern)*1	DFN(PLP)2020-8B	880	mW
		DFN1216-8	625	
T <sub>a</sub>	Operating Temperature Range	-40 to +85		°C
T <sub>stg</sub>	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 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 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 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.

## R3200x

NO.EA-280-140604

## ELECTRICAL CHARACTERISTICS

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

### R3200x001x Electrical Characteristics

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

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
$V_{DD}$	Supply Voltage		<span style="border: 1px solid black; padding: 0 2px;">1.65</span>		<span style="border: 1px solid black; padding: 0 2px;">5.5</span>	V
$I_{SS1}$	Supply Current 1 <sup>*1</sup>	$V_{DD} = 5.5\text{ V}$ (at standby)		0.28	<span style="border: 1px solid black; padding: 0 2px;">1.35</span>	$\mu\text{A}$
$I_{SS2}$	Supply Current 2 <sup>*2</sup>	$V_{DD} = 5.5\text{ V}$ (at active before reset signal output)		3.0	<span style="border: 1px solid black; padding: 0 2px;">6.5</span>	$\mu\text{A}$
$I_{SS3}$	Supply Current 3 <sup>*3</sup>	$V_{DD} = 5.5\text{ V}$ (at active after reset signal output)		0.45	<span style="border: 1px solid black; padding: 0 2px;">1.7</span>	$\mu\text{A}$
$V_{OL}$	"L" Output Voltage	$V_{DD} \geq 4.5\text{ V}$ $I_{OL} = 8\text{ mA}$			<span style="border: 1px solid black; padding: 0 2px;">0.3</span>	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 <sup>*4</sup>	$V_{DD} \geq 4.5\text{ V}$ $I_{OH} = 5\text{ mA}$	<span style="border: 1px solid black; padding: 0 2px;"><math>V_{DD}</math> x 0.85</span>			V
		$V_{DD} \geq 3.3\text{ V}$ $I_{OH} = 2.5\text{ mA}$				
		$V_{DD} \geq 1.65\text{ V}$ $I_{OH} = 0.8\text{ mA}$				
$I_{LEAKI}$	$\overline{\text{SR0}}, \overline{\text{SR1}}$ Input Leakage Current	$V_{DD} = 5.5\text{ V}$			<span style="border: 1px solid black; padding: 0 2px;">0.1</span>	$\mu\text{A}$
$I_{LEAKO}$	Output Leakage Current	$V_{DD} = 5.5\text{ V}$			<span style="border: 1px solid black; padding: 0 2px;">0.1</span>	$\mu\text{A}$
tdelay	Output Delay Time	DSR = GND	<span style="border: 1px solid black; padding: 0 2px;">6.75</span>	7.5	<span style="border: 1px solid black; padding: 0 2px;">8.25</span>	s
		DSR = $V_{DD}$	<span style="border: 1px solid black; padding: 0 2px;">10.125</span>	11.25	<span style="border: 1px solid black; padding: 0 2px;">12.375</span>	s
$V_{IL}$	$\overline{\text{SR0}}, \overline{\text{SR1}}$ "L" Input Voltage <sub>get</sub>				<span style="border: 1px solid black; padding: 0 2px;">0.3</span>	V
$V_{IH}$	$\overline{\text{SR0}}, \overline{\text{SR1}}$ "H" Input Voltage <sub>get</sub>		<span style="border: 1px solid black; padding: 0 2px;">0.85</span>			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.

<sup>\*1</sup> Supply current when the device is active and waiting for the reset input.

<sup>\*2</sup> Supply current when both active-low input pins are low and the timer operation is running.

<sup>\*3</sup> Supply current after the completion of timer operation and the output of reset signal.

<sup>\*4</sup> 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		<span style="border: 1px solid black; padding: 0 2px;">1.65</span>		<span style="border: 1px solid black; padding: 0 2px;">5.5</span>	V
$I_{SS1}$	Supply Current 1 <sup>*1</sup>	$V_{DD} = 5.5\text{ V}$ (at standby)		0.28	<span style="border: 1px solid black; padding: 0 2px;">1.35</span>	$\mu\text{A}$
$I_{SS2}$	Supply Current 2 <sup>*2</sup>	$V_{DD} = 5.5\text{ V}$ (at active before reset signal output)		3.0	<span style="border: 1px solid black; padding: 0 2px;">6.5</span>	$\mu\text{A}$
$I_{SS3}$	Supply Current 3 <sup>*3</sup>	$V_{DD} = 5.5\text{ V}$ (at active after reset signal output)		0.45	<span style="border: 1px solid black; padding: 0 2px;">1.7</span>	$\mu\text{A}$
$V_{OL}$	"L" Output Voltage	$V_{DD} \geq 4.5\text{ V}$ $I_{OL} = 8\text{ mA}$			<span style="border: 1px solid black; padding: 0 2px;">0.3</span>	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 <sup>*4</sup>	$V_{DD} \geq 4.5\text{ V}$ $I_{OH} = 5\text{ mA}$	<span style="border: 1px solid black; padding: 0 2px;"><math>V_{DD}</math> x 0.85</span>			V
		$V_{DD} \geq 3.3\text{ V}$ $I_{OH} = 2.5\text{ mA}$				
		$V_{DD} \geq 1.65\text{ V}$ $I_{OH} = 0.8\text{ mA}$				
$I_{LEAKI}$	$\overline{\text{SR}}0$ , $\overline{\text{SR}}1$ Input Leakage Current	$V_{DD} = 5.5\text{ V}$			<span style="border: 1px solid black; padding: 0 2px;">0.1</span>	$\mu\text{A}$
$I_{LEAKO}$	Output Leakage Current	$V_{DD} = 5.5\text{ V}$			<span style="border: 1px solid black; padding: 0 2px;">0.1</span>	$\mu\text{A}$
$t_{\text{delay}}$	Output Delay Time <sup>*5</sup>		<span style="border: 1px solid black; padding: 0 2px;"><math>t_{\text{delay\_s}}</math> x 0.9</span>	$t_{\text{delay\_s}}$	<span style="border: 1px solid black; padding: 0 2px;"><math>t_{\text{delay\_s}}</math> x 1.1</span>	sec
$t_{\text{rec}}$	Output Release Time <sup>*5</sup>		<span style="border: 1px solid black; padding: 0 2px;"><math>t_{\text{rec\_s}}</math> x 0.9</span>	$t_{\text{rec\_s}}$	<span style="border: 1px solid black; padding: 0 2px;"><math>t_{\text{rec\_s}}</math> x 1.1</span>	sec
$V_{IL}$	$\overline{\text{SR}}0$ , $\overline{\text{SR}}1$ "L" Input Voltage				<span style="border: 1px solid black; padding: 0 2px;">0.3</span>	V
$V_{IH}$	$\overline{\text{SR}}0$ , $\overline{\text{SR}}1$ "H" Input Voltage		<span style="border: 1px solid black; padding: 0 2px;">0.85</span>			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.

<sup>\*1</sup> Supply current when the device is active and waiting for the reset input.

<sup>\*2</sup> Supply current when both active-low input pins are low and the timer operation is running.

<sup>\*3</sup> Supply current after the automatic cancellation of reset signal following the completion of timer operation and the output of rest signal.

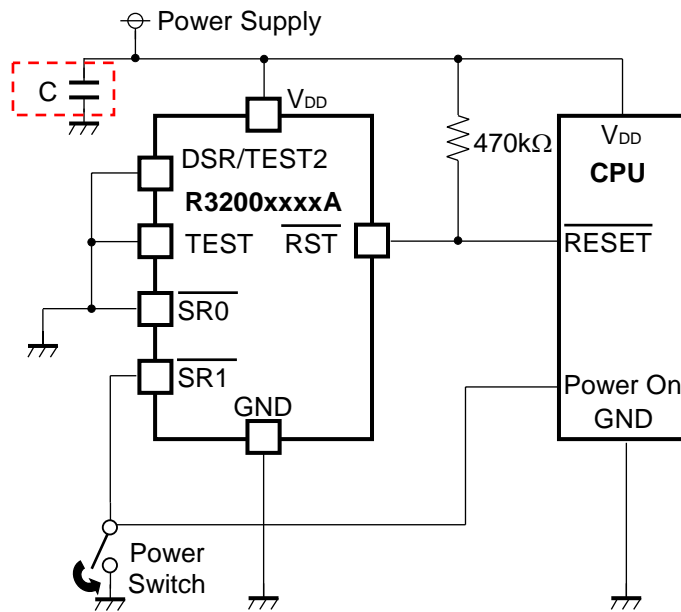
<sup>\*4</sup> For the R3200xxxxB only (CMOS output).

<sup>\*5</sup> Refer to *Output Delay Time and Output Release Time of R3200x*.

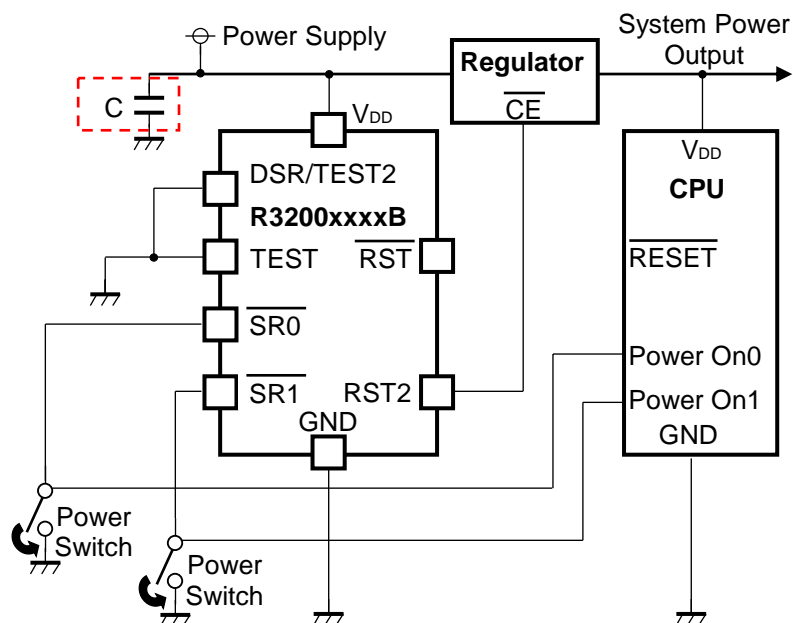
### Output Delay Time and Output Release Time of R3200x

Product Name	$t_{\text{delay\_s}}$	$t_{\text{rec\_s}}$
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**



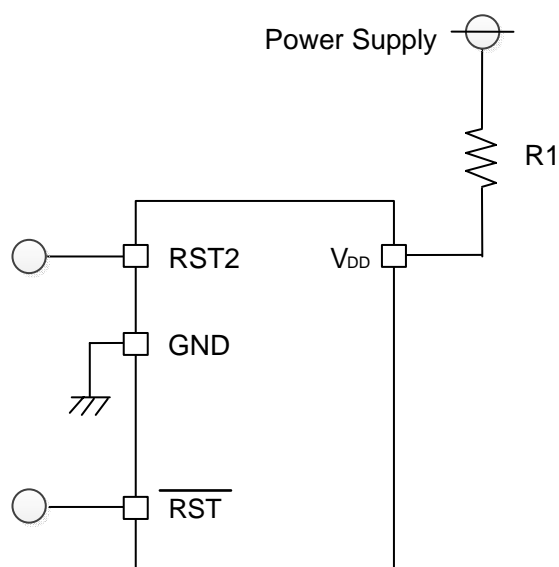
**R3200xxxxB Typical Application**

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.

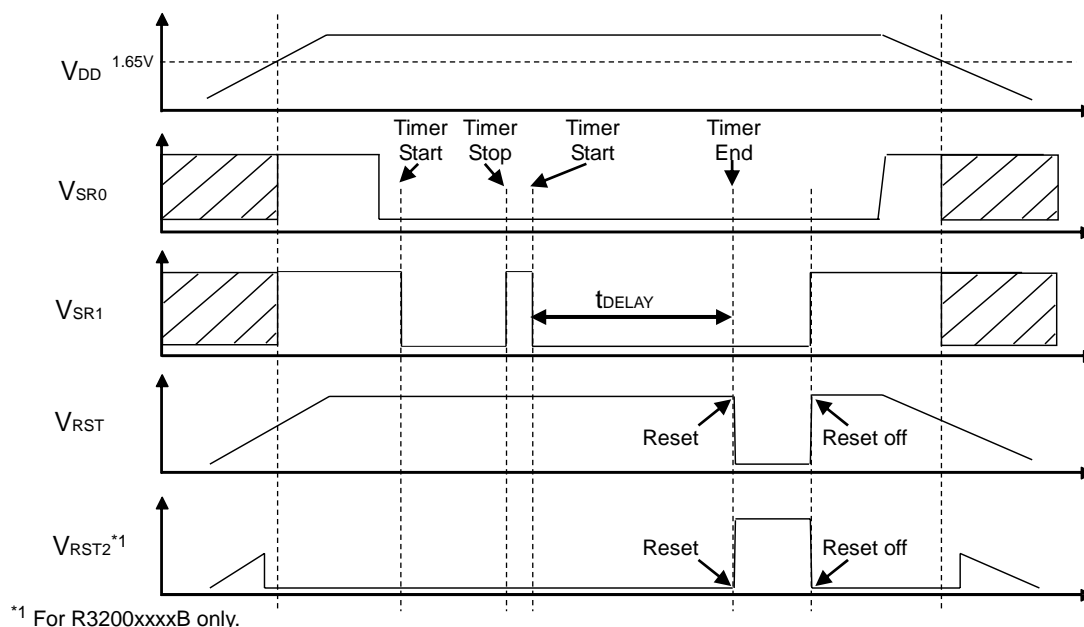
- When only one active-low input pins is used (refer to *R3200xxxxA Typical Application*) connect the unused one to GND.
- In the case of applying the following circuit configuration to the R3200x, the supply current of the device itself may cause significant voltage drop on the  $V_{DD}$  pin if the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



Circuit Configuration Example

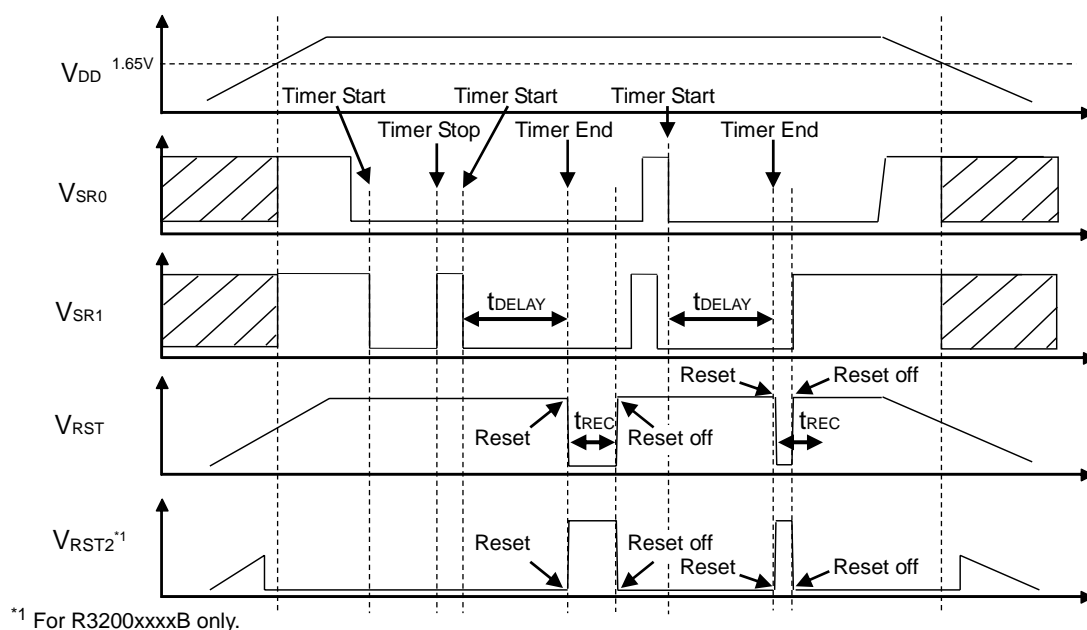


## THEORY OF OPERATION



**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.

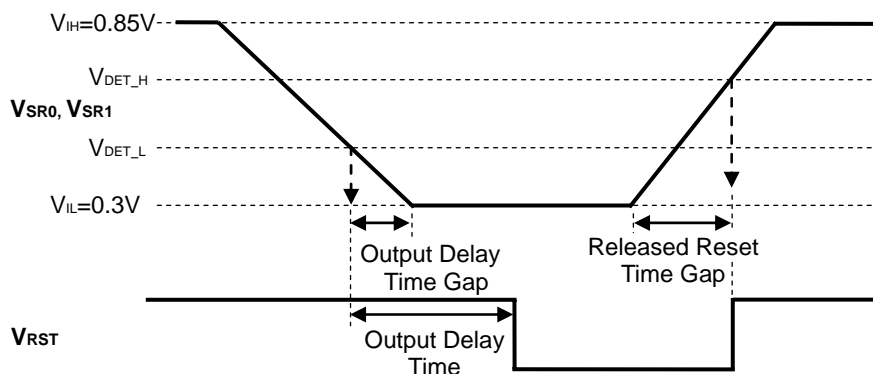


R3200xxx2x, R3200L053B, R3200L064A Timing Chart

- When both active-low input pins become the low voltage level, the timer operation starts. After the output delay time ( $t_{\text{DELAY}}$ ), 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  $t_{\text{DELAY}}$ , 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  $t_{\text{DELAY}}$ .
- A reset signal will be released automatically after the reset delay time ( $t_{\text{REC}}$ ), 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  $0.001 \text{ V}/\mu\text{s}$  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)

Power Dissipation ( $P_D$ ) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

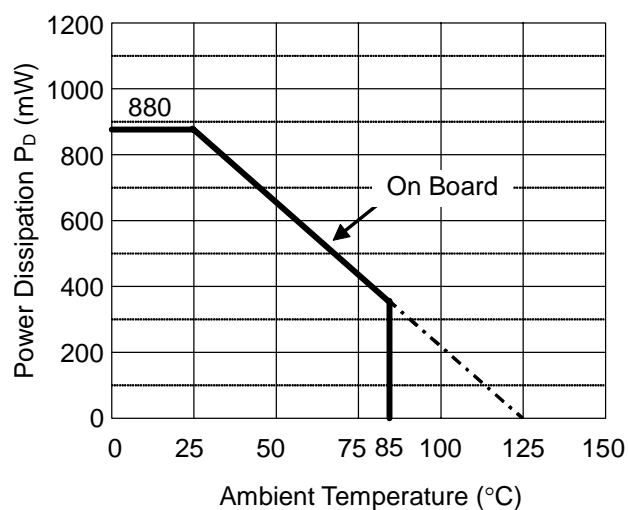
#### Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	40 mm x 40 mm x 1.6 mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-holes	$\phi$ 0.54 mm x 30 pcs

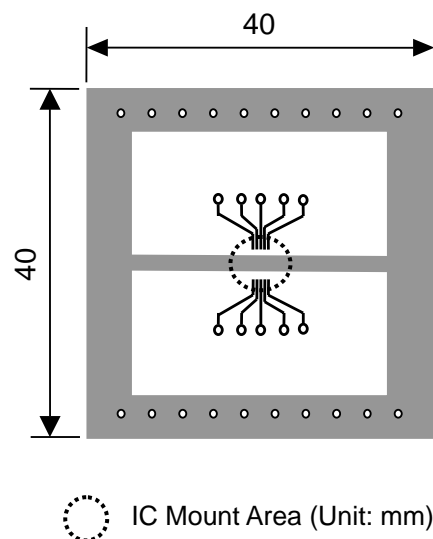
#### Measurement Result

( $T_a = 25^\circ\text{C}$ ,  $T_{j\text{max}} = 125^\circ\text{C}$ )

	Standard Land Pattern
Power Dissipation	880 mW
Thermal Resistance	$\theta_{ja} = (125 - 25^\circ\text{C}) / 0.88 \text{ W} = 114^\circ\text{C/W}$
	$\theta_{jc} = 22.8^\circ\text{C/W}$

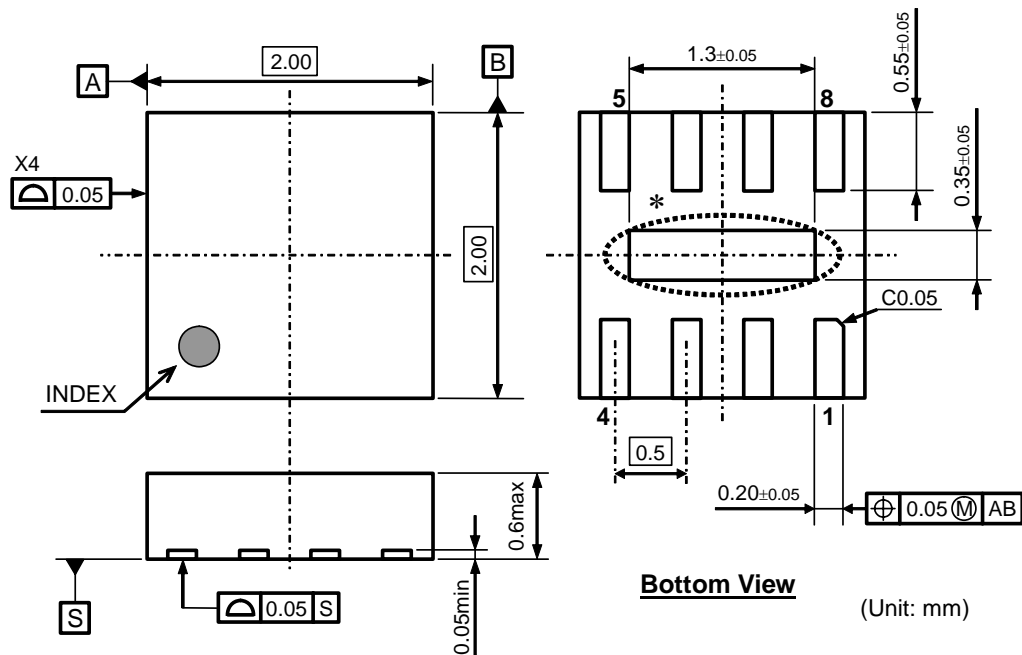


Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

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

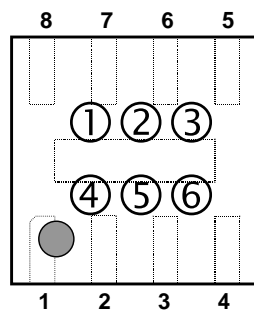


\* The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board, or otherwise be left floating.

## 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**

<b>Product Name</b>	<b>①②③④</b>
R3200K001A	D 0 0 1
R3200K001B	D D 0 2
R3200K002A	D D 0 3
R3200K002B	D D 0 4

**POWER DISSIPATION (DFN1216-8)**

Power Dissipation ( $P_D$ ) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

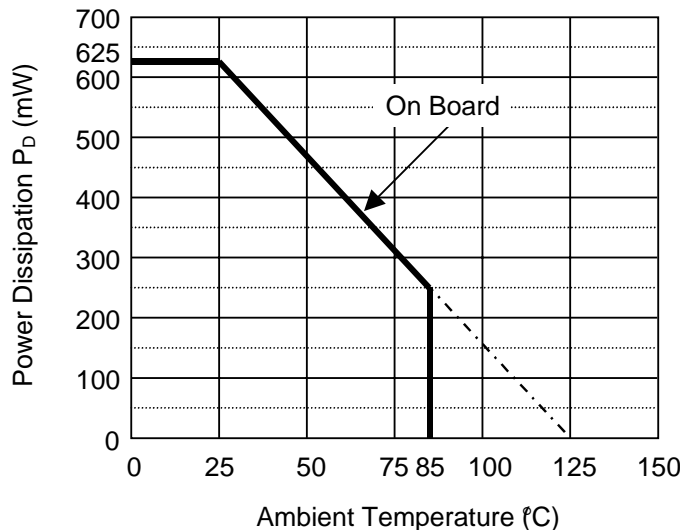
**Measurement Conditions**

	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Double-sided)
Board Dimensions	40 mm x 40 mm x 1.6 mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-holes	$\phi$ 0.5 mm x 28 pcs

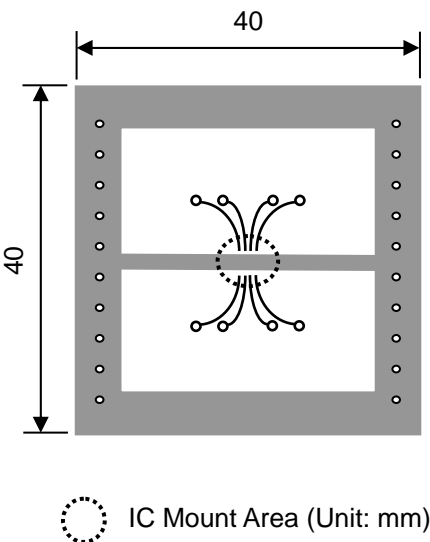
**Measurement Result**

( $T_a = 25^\circ\text{C}$ ,  $T_{j\text{max}} = 125^\circ\text{C}$ )

	Standard Land Pattern
Power Dissipation	625 mW
Thermal Resistance	$\theta_{ja} = (125 - 25^\circ\text{C}) / 0.625 \text{ W} = 160^\circ\text{C/W}$
	$\theta_{jc} = 26^\circ\text{C/W}$



**Power Dissipation vs. Ambient Temperature**



**Measurement Board Pattern**





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**R3200x**

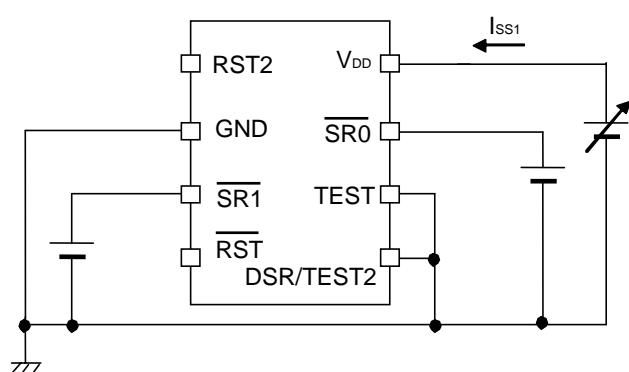
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NO.EA-280-140604

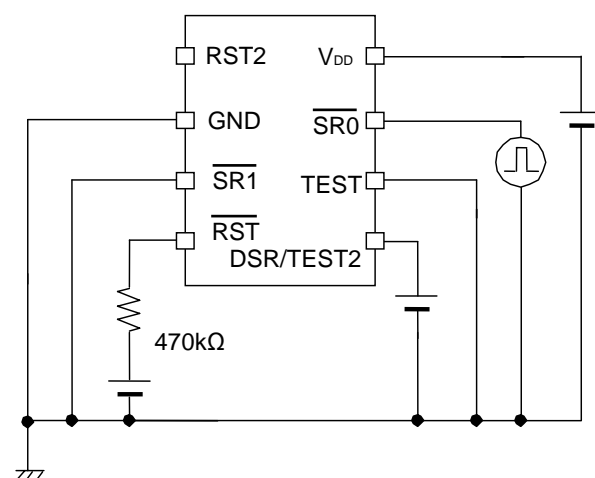
**MARK SPECIFICATION TABLE (DFN1216-8)****R3200L Mark Specification Table**

Product Name	①②③④
R3200L001A	D E 0 1
R3200L001B	D F 0 2
R3200L002A	D E 0 3
R3200L002B	D E 0 4
R3200L052B	D E 0 5
R3200L053B	D E 0 6
R3200L064A	D E 0 7

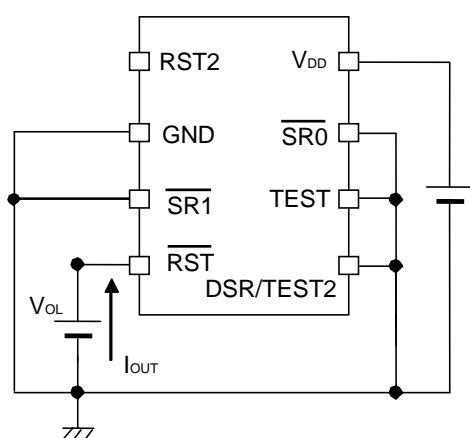
## TEST CIRCUITS



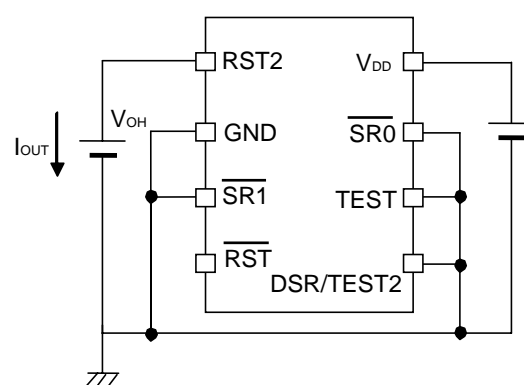
Supply Current Test Circuit



Output Delay Time Test Circuit



Nch Driver Output Voltage Test Circuit

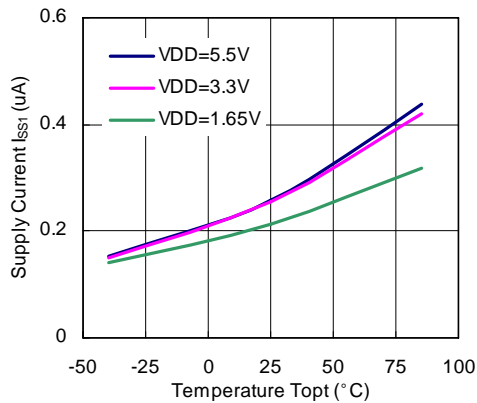


CMOS Driver Output Voltage Test Circuit  
(For the R3200xxxxB only.)

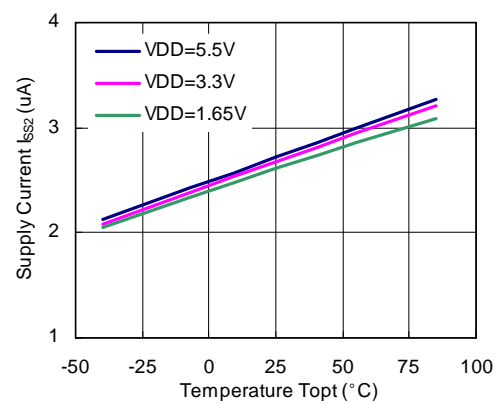
## TYPICAL CHARACTERISTICS

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

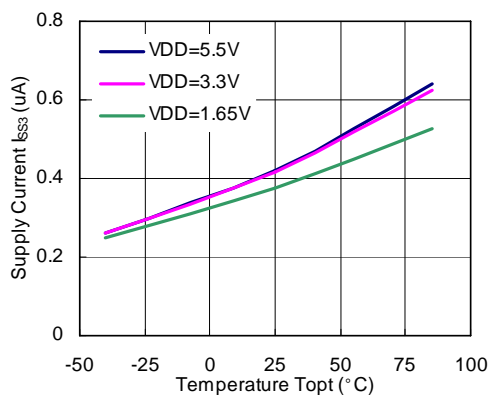
### 1) Supply Current 1 vs. Temperature R3200x (at standby)



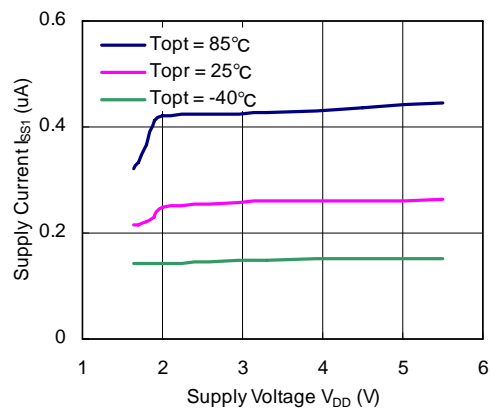
### 2) Supply Current 2 vs. Temperature R3200x (before the reset signal output)



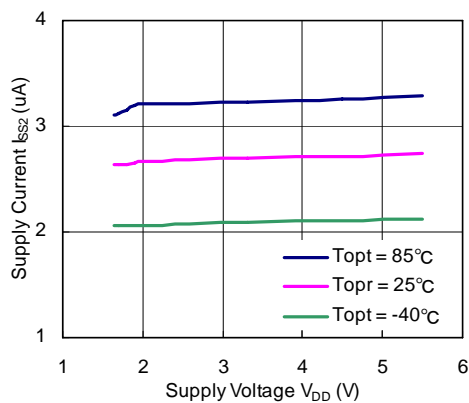
### 3) Supply Current 3 vs. Temperature R3200x (after the reset signal output)



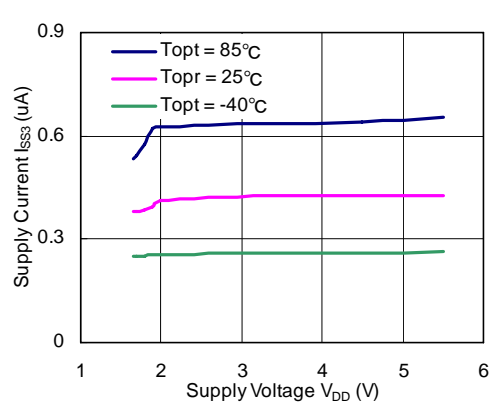
### 4) Supply Current 1 vs. Supply Voltage R3200x (at standby)



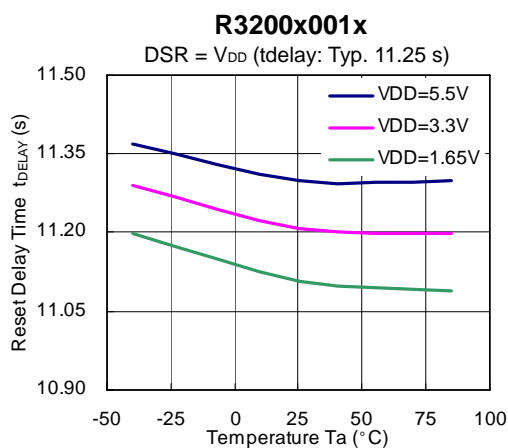
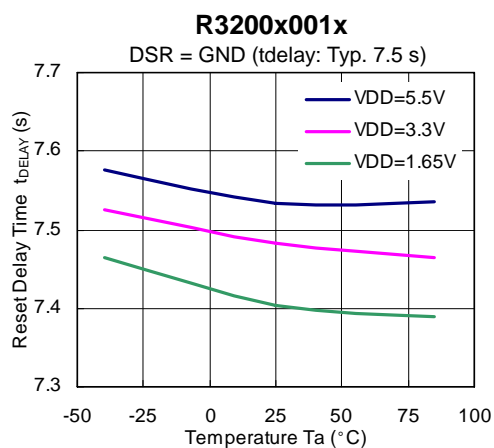
### 5) Supply Current 2 vs. Supply Voltage R3200x (before the reset signal output)



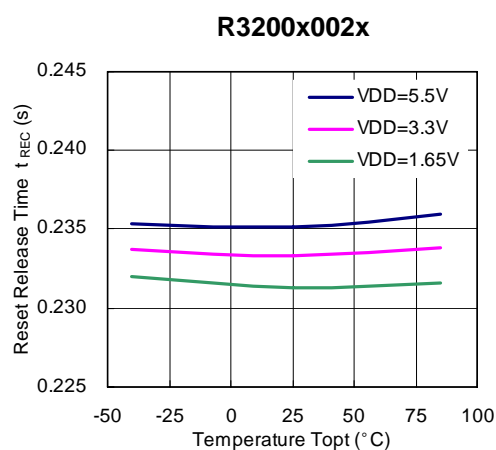
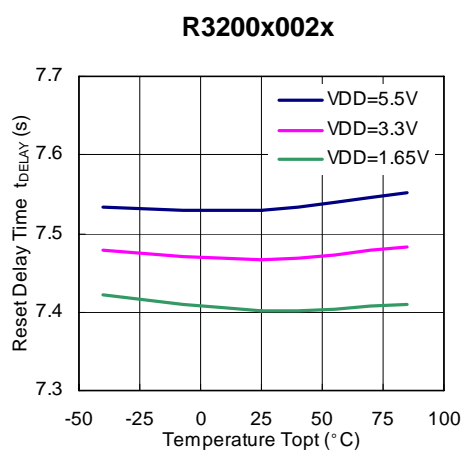
### 6) Supply Current 2 vs. Supply Voltage R3200x (after the reset signal output)



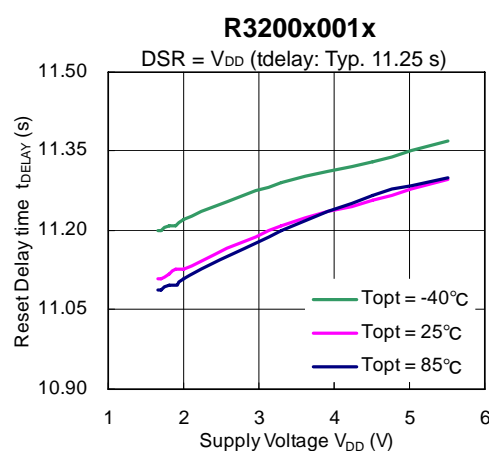
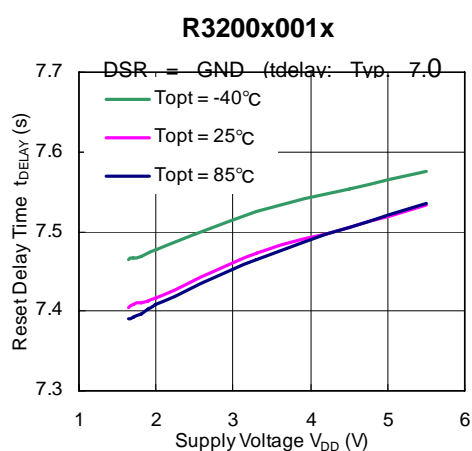
## 7) Output Delay Time vs. Temperature



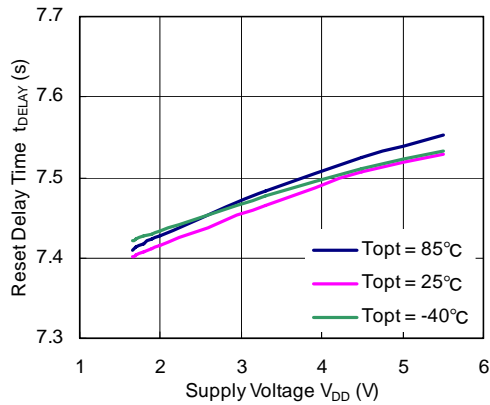
## 8) Output Release Time vs. Temperature



## 9) Output Delay Time vs. Supply Voltage

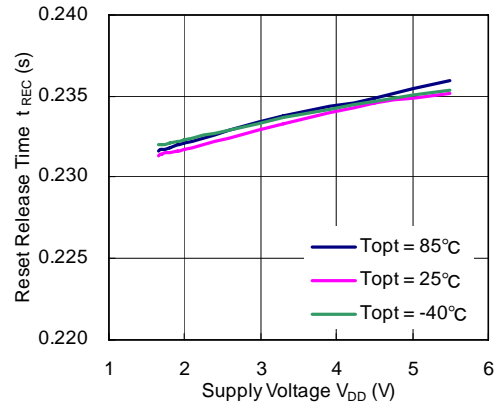


**R3200x002x**



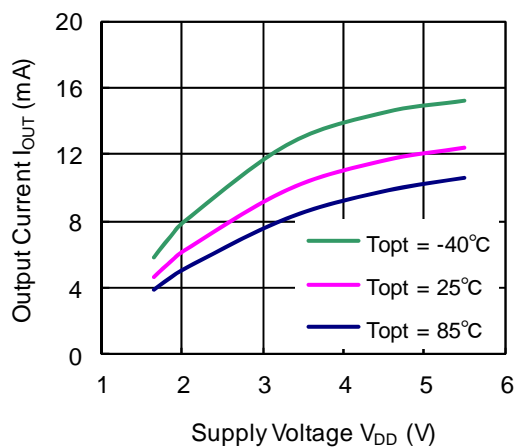
**10) Output Release Time vs. Supply Voltage**

**R3200x002x**

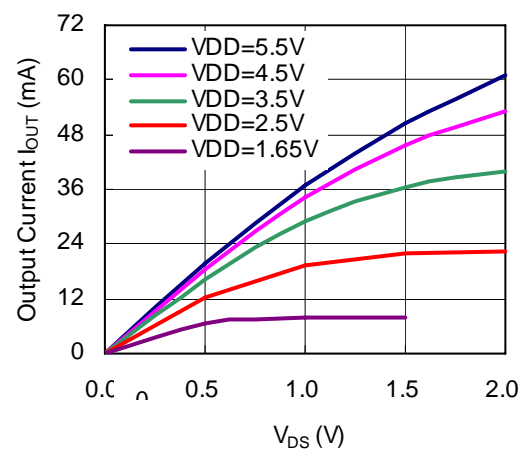


**11) Nch Driver Output Current vs. Supply Voltage**

$V_{DS} = 0.3 \text{ V}$

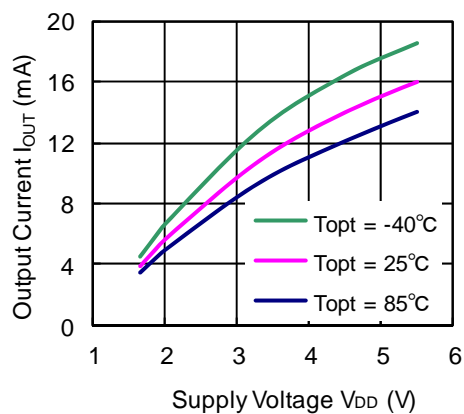


**12) Nch Driver Output Current vs.  $V_{DS}$**

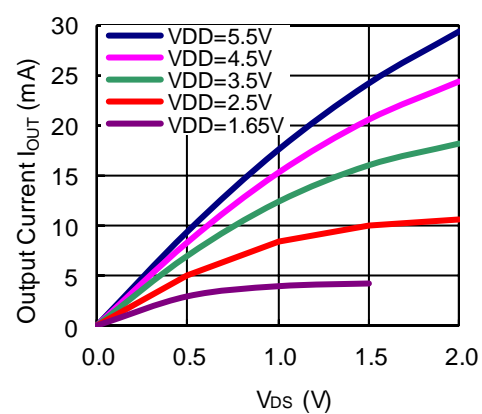


**13) Pch Driver Output Current vs. Supply Voltage**

$V_{DS} = 0.9 \text{ V}$



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





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