RICOH

R3115Z SERIES

LOW VOLTAGE DETECTOR WITH OUTPUT DELAY

NO.EA-098-160315

OUTLINE

The R3115Z Series are CMOS-based voltage detector ICs with high detector threshold accuracy and ultra-low supply current, which can be operated at an extremely low voltage and is used for system reset as an example.

Each of these ICs consists of a voltage reference unit, a comparator, resistor net for detector threshold setting, an output driver, a hysteresis circuit, and an output delay circuit. The detector threshold is fixed with high accuracy internally and does not require any adjustment. Two output types, Nch open drain type and CMOS type are available.

Since the package is WLCSP-4-P2, high density mounting on boards is possible.

FEATURES

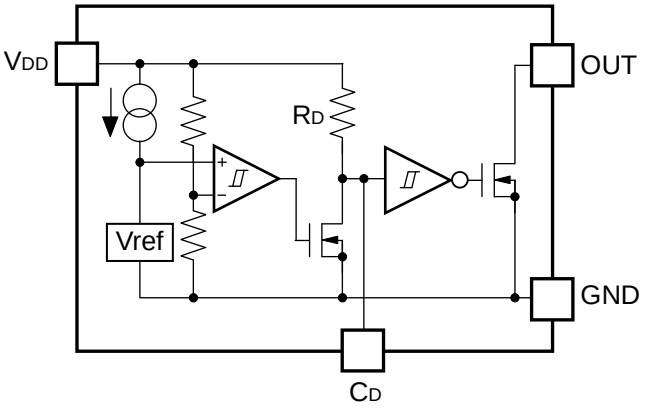
- Built-in Output Delay Circuit ..... Typ. 100ms with an external capacitor: 0.022μF
- Supply Current ..... Typ. 0.8μA (V_{DD}=3.5V)
- Operating Voltage Range ..... 0.7 to 6.0V (Topt=25°C)
- Detector Threshold ..... 0.9V to 5.0V
- Accuracy Detector Threshold ..... ±2.0%
- Temperature-Drift Coefficient of Detector Threshold ..... Typ. ±100ppm/°C
- Two Output Types ..... Nch Open Drain and CMOS
- Package WLCSP-4-P2

APPLICATIONS

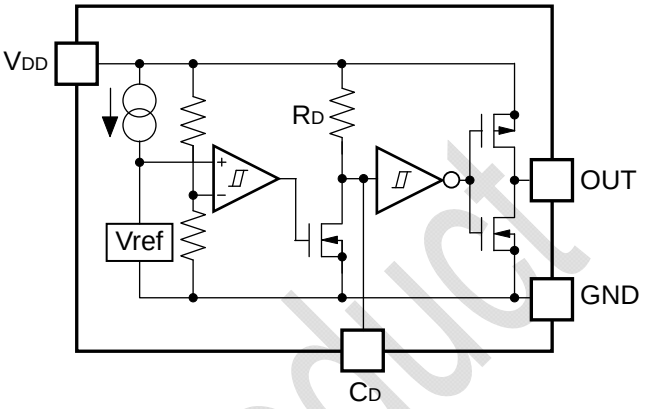
- Micro controller and Logic Circuit Reset
- Battery Checker
- Window Comparator
- Wave Shaping Circuit
- Battery Back-up Circuit
- Power Failure Detector

BLOCK DIAGRAMS

Nch Open Drain Output (R3115Zxx1A)



CMOS Output (R3115Zxx1C)



SELECTION GUIDE

The detector threshold, the output type, and the taping type of R3115Z Series can be designated at the users' request by specifying the part number as follows;

R3115Z<u>xx</u>1<u>x</u>-<u>xx</u>-<u>x</u>←Part Number

↑ ↑ ↑ ↑ ↑

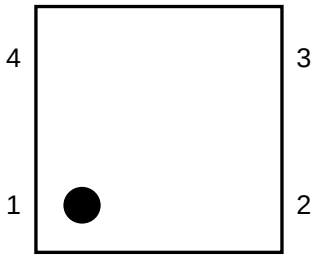
a b c d e

Code	Contents
a	Designation of Package Type; Z: WLCSP-4-P2
b	Setting Detector Threshold ($-V_{DET}$); Stepwise setting with a step of 0.1V in the range of 0.9V to 5.0V is possible.
c	Designation of Output Type; A: Nch Open Drain C: CMOS
d	Designation of Taping Type; TR is prescribed as standard directions. (Refer to Taping Specifications)
e	Designation of Composition of pin plating. –F: Leed free plating

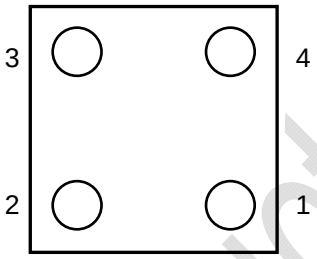
PIN CONFIGURATIONS

WLCSP-4-P2

Mark Side



Bump Side



PIN DESCRIPTIONS

Pin No.	Symbol	Description
1	GND	Ground Pin
2	C_D	Pin for External Capacitor (for setting output delay)
3	OUT	Output Pin (Output “L” at detector threshold, Output “H” atreleased voltage)
4	V_{DD}	Supply Voltage Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{DD}	Supply Voltage	6.5	V
V_{OUT1}	Output Voltage (CMOS)	V_{SS}–0.3 to V_{DD}+0.3	V
V_{OUT2}	Output Voltage (Nch)	V_{SS}–0.3 to 6.5	V
I_{OUT}	Output Current	20	mA
P_D	Power Dissipation(WLCSP-4-P2)*1	530	mW
Topt	Operating Temperature Range	–40 to 85	°C
Tstg	Storage Temperature Range	–55 to 125	°C

1) For Power Dissipation, please refer to PACKAGE INFORNATION to be described.

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum ratings are threshold limit values that must not be exceeded ever for an instant under any conditions. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits.

ELECTRICAL CHARACTERISTICS

- **R3115Z091A/C**

Topt=25°C

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$-V_{DET}$	Detector Threshold			0.882	0.900	0.918	V
V_{HYS}	Detector Threshold Hysteresis			0.027	0.045	0.063	V
I_{SS}	Supply Current	V_{DD}=0.8V			0.6	2.0	μA
		V_{DD}=1.9V			0.5	2.0	
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL}	Minimum Operating Voltage*Note1	Topt=25°C				0.7	V
		−40°C ≦ Topt ≦ 85°C				0.8	
I_{OUT}	Output Current (Driver Output Pin)	Nch	V_{DS}=0.05V, V_{DD}=0.70V	10	120		μA
			V_{DS}=0.50V, V_{DD}=0.85V	0.05	0.90		mA
		Pch	V_{DS}=−2.1V, V_{DD}=4.5V	1.0	3.5		mA
V_{TCD}	C_D pin Threshold Voltage	V_{DD}=0.99V		0.396	0.495	0.594	V
I_{CD}	C_D pin Output Current	V_{DS}=0.10V, V_{DD}=0.70V		2	70		μA
		V_{DS}=0.50V, V_{DD}=0.85V		10	400		
R_D	Output Delay Resistance			3.25	6.50	13.00	MΩ
$\Delta-V_{DET}/\Delta Topt$	Detector Threshold Temperature Coefficient	−40°C ≦ Topt ≦ 85°C			±100		ppm/°C

*Note 1: Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less. (In the case of Nch Open Drain Type, Output pin is pulled up with a resistance of 470kΩ to 5.0V.)

- **R3115Z271A/C**

Topt=25°C

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$-V_{DET}$	Detector Threshold			2.646	2.700	2.754	V
V_{HYS}	Detector Threshold Hysteresis			0.081	0.135	0.189	V
I_{SS}	Supply Current	V_{DD}=2.6V			1.0	3.0	μA
		V_{DD}=3.7V			0.5	2.5	
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL}	Minimum Operating Voltage*Note1	Topt=25°C				0.7	V
		−40°C ≦ Topt ≦ 85°C				0.8	
I_{OUT}	Output Current (Driver Output Pin)	Nch	V_{DS}=0.05V, V_{DD}=0.70V	10	120		μA
			V_{DS}=0.50V, V_{DD}=1.50V	1.0	3.0		mA
		Pch	V_{DS}=−2.1V, V_{DD}=4.5V	1.0	3.5		mA
V_{TCD}	C_D pin Threshold Voltage	V_{DD}=2.97V		1.188	1.485	1.782	V
I_{CD}	C_D pin Output Current	V_{DS}=0.1V, V_{DD}=0.7V		2.0	70.0		μA
		V_{DS}=0.5V, V_{DD}=1.5V		200	500		
R_D	Output Delay Resistance			3.25	6.50	13.00	MΩ
$\Delta-V_{DET}/\Delta Topt$	Detector Threshold Temperature Coefficient	−40°C ≦ Topt ≦ 85°C			±100		ppm/°C

*Note 1: Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less. (In the case of Nch Open Drain Type, Output pin is pulled up with a resistance of 470kΩ to 5.0V.)

- **R3115Z501A/C**

Topt=25°C

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$-V_{DET}$	Detector Threshold			4.900	5.000	5.100	V
V_{HYS}	Detector Threshold Hysteresis			0.150	0.250	0.350	V
I_{SS}	Supply Current	V_{DD}=4.9V			1.5	3.0	μA
		V_{DD}=6.0V			0.6	2.5	
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL}	Minimum Operating Voltage*Note1	Topt=25°C				0.7	V
		−40°C ≦ Topt ≦ 85°C				0.8	
I_{OUT}	Output Current (Driver Output Pin)	Nch	V_{DS}=0.05V, V_{DD}=0.70V	10	120		μA
			V_{DS}=0.50V, V_{DD}=1.50V	1.0	3.0		mA
		Pch	V_{DS}=−2.1V, V_{DD}=6.0V	1.5	4.5		mA
V_{TCD}	C_D pin Threshold Voltage	V_{DD}=5.50V		2.200	2.750	3.300	V
I_{CD}	C_D pin Output Current	V_{DS}=0.1V, V_{DD}=0.7V		2.0	70.0		μA
		V_{DS}=0.5V, V_{DD}=1.5V		200	500		
R_D	Output Delay Resistance			3.25	6.50	13.00	MΩ
$\Delta-V_{DET}/\Delta Topt$	Detector Threshold Temperature Coefficient	−40°C ≦ Topt ≦ 85°C			±100		ppm/°C

*Note 1: Minimum Operating Voltage means the value of input voltage when output voltage maintains 0.1V or less. (In the case of Nch Open Drain Type, Output pin is pulled up with a resistance of 470kΩ to 5.0V.)

ELECTRICAL CHARACTERISTICS BY DETECTOR THRESHOLD

Product Code	Detector Threshold			Hysteresis Range			Supply Current 1			Supply Current 2			Output Current 1			Output Current 2			
	$-V_{DET}$[V]			V_{HYS}[V]			I_{SS1}[µA]			I_{SS2}[µA]			I_{OUT1}[mA]			I_{OUT2}[mA]			
	Min.	Typ.	Max.	Min.	Typ.	Max.	Condition	Typ.	Min.	Condition	Typ.	Max.	Condition	Min.	Typ.	Conditions	Min.	Typ.
R3115Z091A/C	0.882	0.900	0.918	0.027	0.045	0.063	V_{DD}= $-V_{DET}$ -0.1V	0.6	2.0	V_{DD}= $-V_{DET}$ +0.1V	0.5	2.0	V_{DS}= 0.05V V_{DD}= 0.7V	0.01	0.12	Nch	V_{DS}= 0.5V V_{DD}= 0.85V	0.05	0.9
R3115Z101A/C	0.980	1.000	1.020	0.030	0.050	0.070													
R3115Z111A/C	1.078	1.100	1.122	0.033	0.055	0.077		0.7	2.5									0.2	1.8
R3115Z121A/C	1.176	1.200	1.224	0.036	0.060	0.084													
R3115Z131A/C	1.274	1.300	1.326	0.039	0.065	0.091													
R3115Z141A/C	1.372	1.400	1.428	0.042	0.070	0.098													
R3115Z151A/C	1.470	1.500	1.530	0.045	0.075	0.105													
R3115Z161A/C	1.568	1.600	1.632	0.048	0.080	0.112		1.0	3.0		0.5	2.5							
R3115Z171A/C	1.666	1.700	1.734	0.051	0.085	0.119													
R3115Z181A/C	1.764	1.800	1.836	0.054	0.090	0.126													
R3115Z191A/C	1.862	1.900	1.938	0.057	0.095	0.133													
R3115Z201A/C	1.960	2.000	2.040	0.060	0.100	0.140													
R3115Z211A/C	2.058	2.100	2.142	0.063	0.105	0.147													
R3115Z221A/C	2.156	2.200	2.244	0.066	0.110	0.154													
R3115Z231A/C	2.254	2.300	2.346	0.069	0.115	0.161													
R3115Z241A/C	2.352	2.400	2.448	0.072	0.120	0.168													
R3115Z251A/C	2.450	2.500	2.550	0.075	0.125	0.175													
R3115Z261A/C	2.548	2.600	2.652	0.078	0.130	0.182													
R3115Z271A/C	2.646	2.700	2.754	0.081	0.135	0.189													
R3115Z281A/C	2.744	2.800	2.856	0.084	0.140	0.196													
R3115Z291A/C	2.842	2.900	2.958	0.087	0.145	0.203													
R3115Z301A/C	2.940	3.000	3.060	0.090	0.150	0.210													
R3115Z311A/C	3.038	3.100	3.162	0.093	0.155	0.217		1.2	3.0		0.6	2.5					V_{DS}= 0.5V V_{DD}= 1.5V	1.0	3.0
R3115Z321A/C	3.136	3.200	3.264	0.096	0.160	0.224													
R3115Z331A/C	3.234	3.300	3.366	0.099	0.165	0.231													
R3115Z341A/C	3.332	3.400	3.468	0.102	0.170	0.238													
R3115Z351A/C	3.430	3.500	3.570	0.105	0.175	0.245													
R3115Z361A/C	3.528	3.600	3.672	0.108	0.180	0.252													
R3115Z371A/C	3.626	3.700	3.774	0.111	0.185	0.259													
R3115Z381A/C	3.724	3.800	3.876	0.114	0.190	0.266													
R3115Z391A/C	3.822	3.900	3.978	0.117	0.195	0.273													
R3115Z401A/C	3.920	4.000	4.080	0.120	0.200	0.280													
R3115Z411A/C	4.018	4.100	4.182	0.123	0.205	0.287		1.5	3.0		0.6	2.5							
R3115Z421A/C	4.116	4.200	4.284	0.126	0.210	0.294													
R3115Z431A/C	4.214	4.300	4.386	0.129	0.215	0.301													
R3115Z441A/C	4.312	4.400	4.488	0.132	0.220	0.308													
R3115Z451A/C	4.410	4.500	4.590	0.135	0.225	0.315													
R3115Z461A/C	4.508	4.600	4.692	0.138	0.230	0.322													
R3115Z471A/C	4.606	4.700	4.794	0.141	0.235	0.329													
R3115Z481A/C	4.704	4.800	4.896	0.144	0.240	0.336													
R3115Z491A/C	4.802	4.900	4.998	0.147	0.245	0.343													
R3115Z501A/C	4.900	5.000	5.100	0.150	0.250	0.350													

Output Current 3				Minimum Operating Voltage				C_D pin Threshold Voltage				C_D pin Output Current 1			C_D pin Output Current 2			Resistance for Output Delay			Detector Threshold Temperature Coefficient	
I_{OUT3}[mA]				V_{DDL}[V]				V_{TCD}[V]				I_{CD1}[μA]			I_{CD2}[μA]			R_D[MΩ]			Δ-V_{DET}/ΔTopt [ppm/°C]	
Condition		Min.	Typ.	Condition	Max.	Condition	Max.	Condition	Min.	Typ.	Max.	Condition	Min.	Typ.	Condition	Min.	Typ.	Min.	Typ.	Max.	Condition	Typ.
Pch	V_{DS}= -2.1V V_{DD}= 4.5V	1.5	3.5	Topt= 25°C	0.7	-40°C ≦ Topt ≦ 85°C	0.8	V_{DD}= (-V_{DET}) ×1.1V	0.396	0.495	0.594	V_{DS}= 0.1V V_{DD}= 0.7V	20	70	V_{DS}= 0.5V V_{DD}= 0.85V	0.01	400	3.25	6.5	13.0	-40°C ≦ Topt ≦ 85°C	±100
									0.440	0.550	0.660											
									0.484	0.605	0.726					0.05	450					
									0.528	0.660	0.792											
									0.572	0.715	0.858											
									0.616	0.770	0.924											
									0.660	0.825	0.990											
									0.704	0.880	1.056											
									0.748	0.935	1.122											
									0.792	0.990	1.188											
									0.836	1.045	1.254											
									0.880	1.100	1.320											
									0.924	1.155	1.386											
									0.968	1.210	1.452											
									1.012	1.265	1.518											
									1.056	1.320	1.584											
									1.100	1.375	1.650											
									1.144	1.430	1.716											
									1.188	1.485	1.782											
									1.232	1.540	1.848											
									1.276	1.595	1.914											
									1.320	1.650	1.980											
									1.364	1.705	2.046											
									1.408	1.760	2.112				V_{DS}= 0.5V V_{DD}= 1.5V	0.20	500					
									1.452	1.815	2.178											
									1.496	1.870	2.244											
									1.540	1.925	2.310											
									1.584	1.980	2.376											
									1.628	2.035	2.442											
									1.672	2.090	2.508											
									1.716	2.145	2.574											
									1.760	2.200	2.640											
									1.804	2.255	2.706											
									1.848	2.310	2.772											
									1.892	2.365	2.838											
									1.936	2.420	2.904											
	V_{DS}= -2.1V V_{DD}= 6.0V	2.0	4.5						1.980	2.475	2.970											
									2.024	2.530	3.036											
									2.068	2.585	3.102											
									2.112	2.640	3.168											
									2.156	2.695	3.234											
									2.200	2.750	3.300											

OPERATION

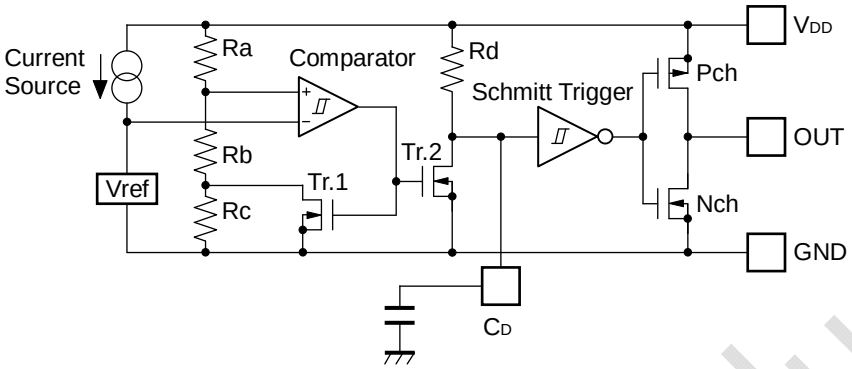
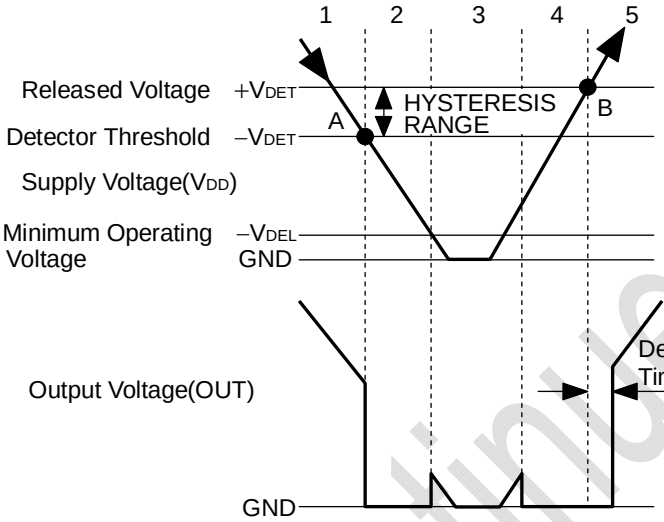


Fig. 1 Block Diagram with an external capacitor



Operation Status		1	2	3	4	5
Compartor (–) Pin Input Voltage		I	II	II	II	I
Compartor Output		L	H	Indefinite	ON	OFF
Tr.1,2		OFF	ON	Indefinite	ON	OFF
Output Tr.	Nch	OFF	ON	Indefinite	ON	OFF
	Pch	ON	OFF	Indefinite	OFF	ON

I, I $\quad \frac{Rb+Rc}{Ra+Rb+Rc} \times V_{DD}$

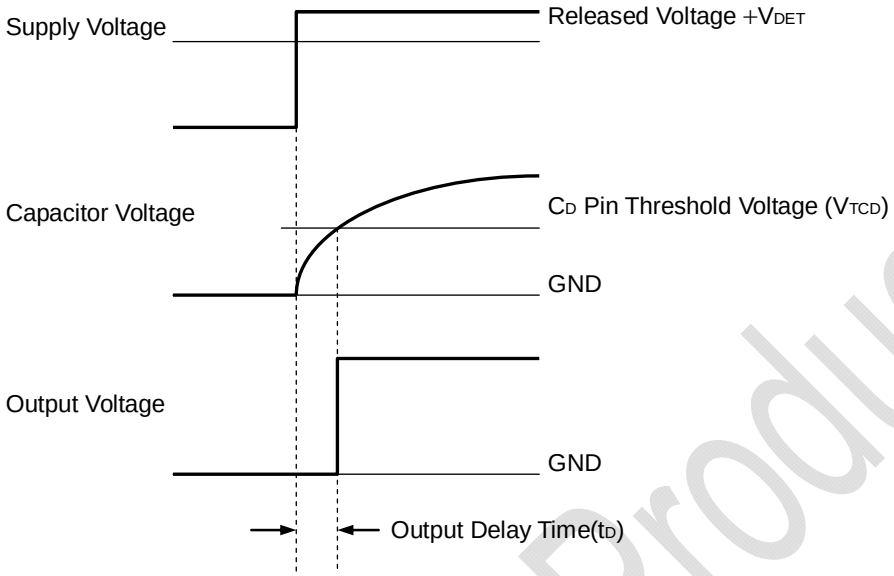
II $\quad \frac{Rb}{Ra+Rb} \times V_{DD}$

Fig. 2 Operation Diagram

1. Output voltage is equal to supply voltage. (As for Nch open drain type, equal to pull-up voltage.)
2. When the supply voltage is down to the detector threshold voltage level(Point A), Vref ≧ $V_{DD}\times(Rb+Rc)/(Ra+Rb+Rc)$ is true, then output of the comparator is reversed from “L” to “H”, therefore output voltage becomes GND level.
3. When the supply voltage is lower than minimum operating voltage, the operation of output transistor is indefinite. In the case of Nch open drain type, output voltage is equal to pull-up voltage.
4. Output Voltage becomes GND level.
5. When the supply voltage is higher than released voltage (Point B), Vref ≦ $V_{DD}\times Rb/(Ra+Rb)$ is true, then output of the comparator reaches the threshold level, and Output of Shmitt Trigger is reversed from “H” to “L”, then output voltage is equal to supply voltage. (As for Nch open drain type, equal to pull-up voltage.)

∗) The difference between released voltage and detector threshold voltage means hysteresis range voltage.

- **Operation of Output Delay**



When the supply voltage which is higher than released voltage is forced to V_{DD} pin, charge to an external capacitor starts, then capacitor voltage increases. Until the capacitor voltage reaches to C_D Pin threshold voltage, output voltage maintains “L”. When the capacitor voltage becomes higher than C_D pin threshold voltage, output voltage is reversed from "L” to "H". Where, the time interval between the rising edge of supply voltage and output voltage reverse point means output delay time.

- **Output Delay Time**

Output Delay Time (t_D) can be calculated with the next formula.

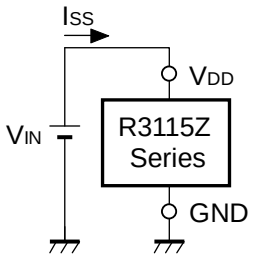
$t_D=0.69\times R_D\times C_D(s)$

R_D is internal resistor and set at 6.5MΩ(Typ.) typically. C_D(F) describes the capacitance value of an external capacitor. Therefore,

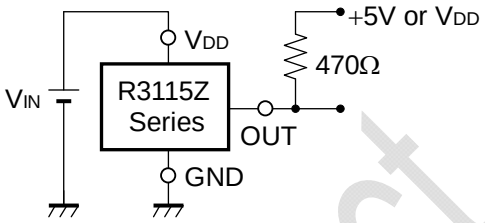
$t_D=0.69\times 6.5\times 10^6\times C_D(s)$

TEST CIRCUITS

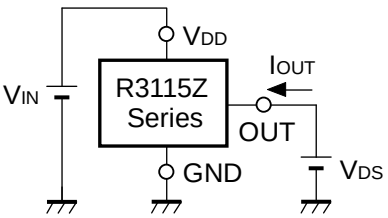
*Pull-up circuit is not necessary for CMOS Output type, or R3115xxxxC.



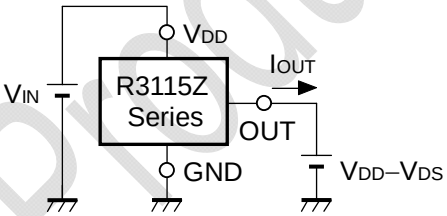
Supply Current Test Circuit



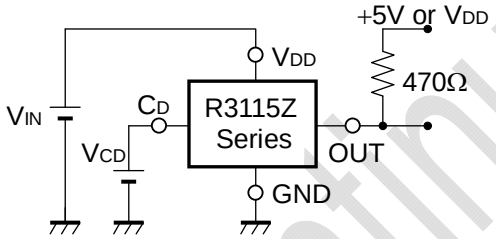
Detector Threshold Test Circuit



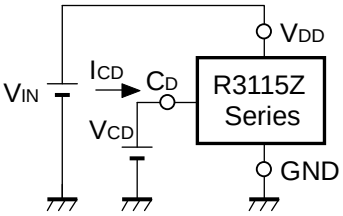
Nch Driver Output Current Test Circuit



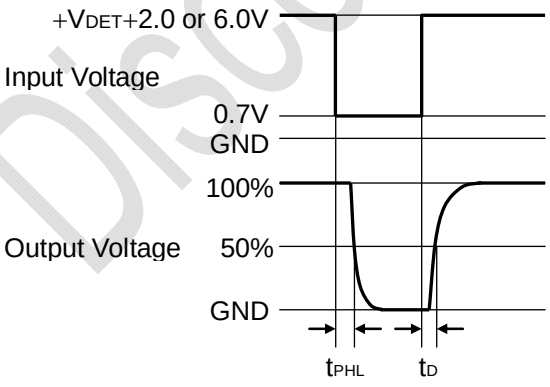
Pch Driver Output Current Test Circuit ***Apply only to CMOS**



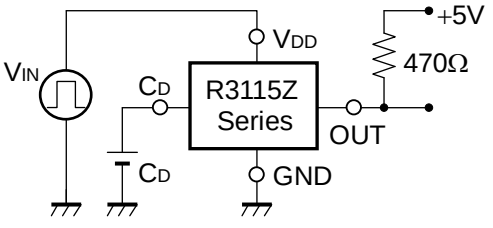
C_D Pin Threshold Test Circuit



C_D Pin Output Current Test Circuit



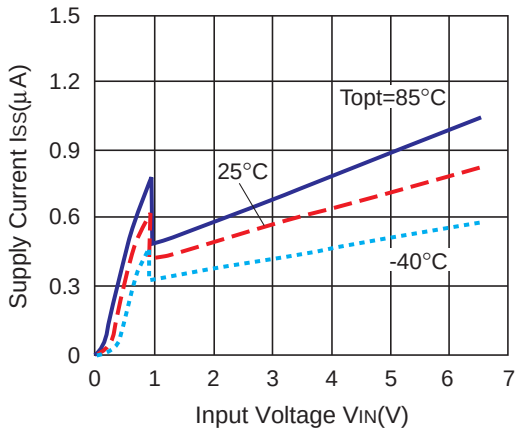
Output Delay Time Test Circuit



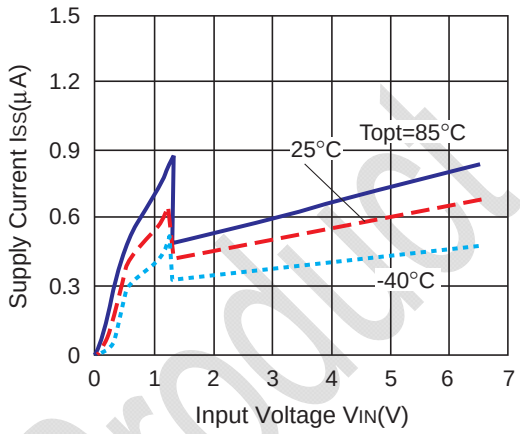
TYPICAL CHARACTERISTICS

1) Supply Current vs. Input Voltage

R3115Z091x



R3115Z131x



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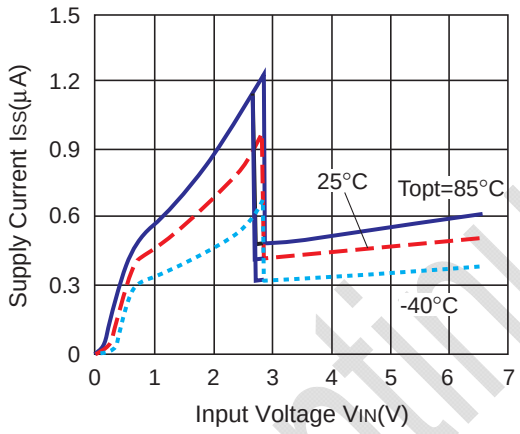

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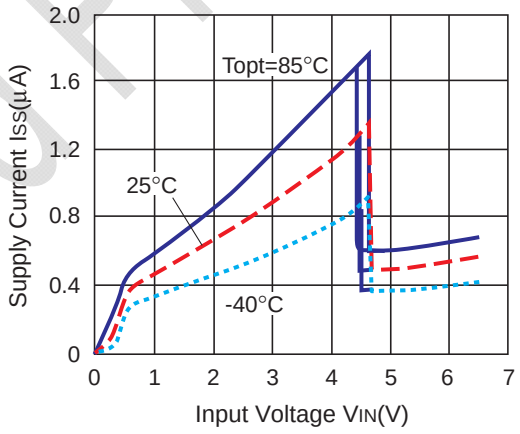

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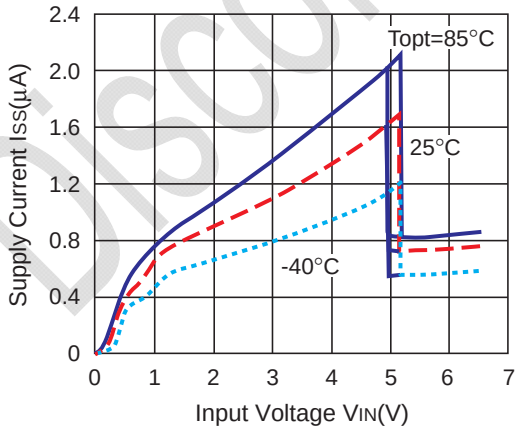
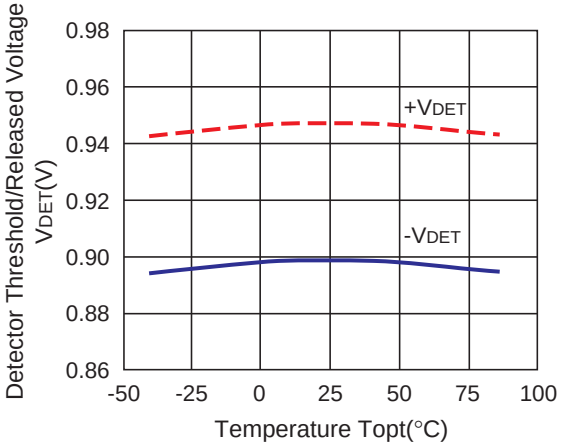


2) Detector Threshold vs. Temperature

R3115Z091x



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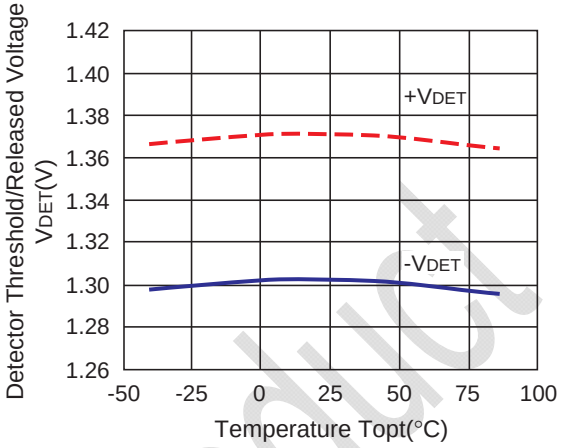

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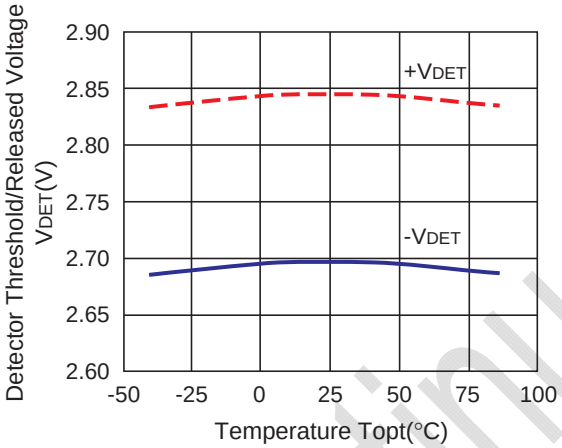

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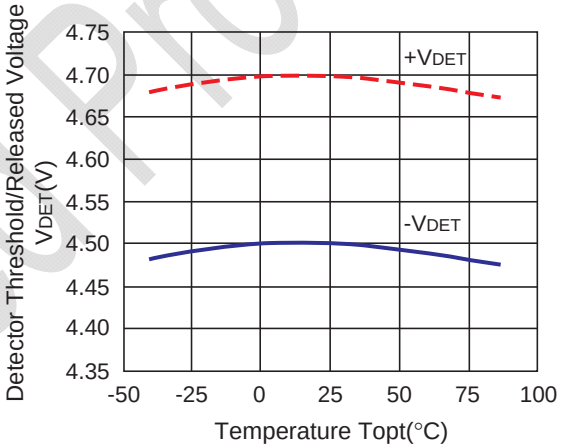

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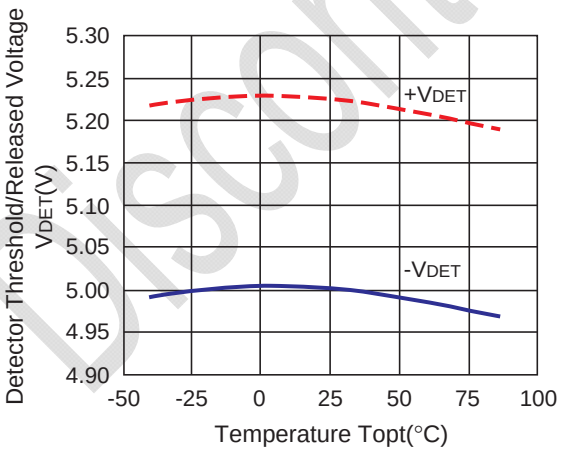
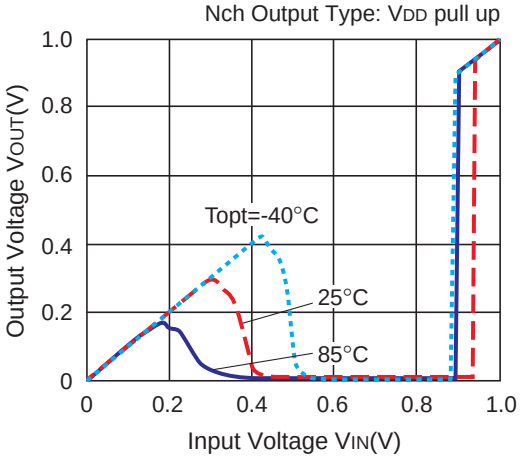


3) Output Voltage vs. Input Voltage

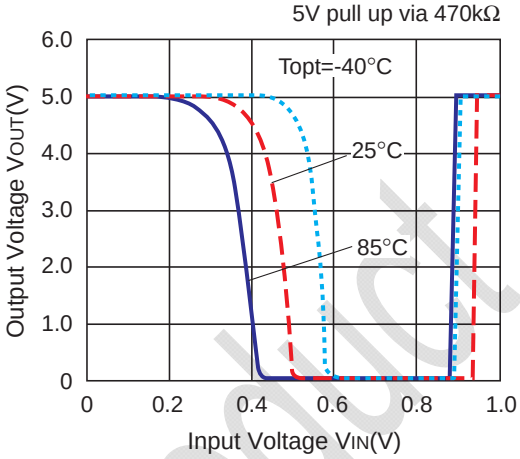
R3115Z091x

Nch Output Type: VDD pull up



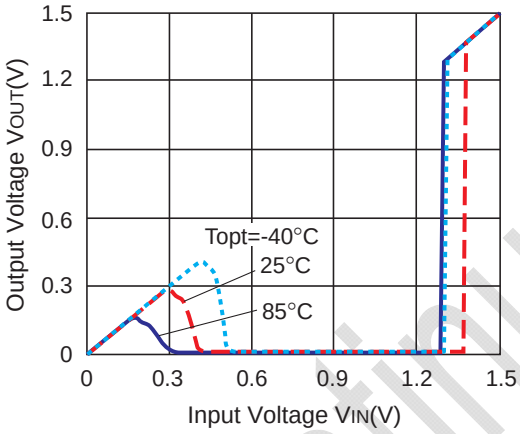
R3115Z091A

5V pull up via 470kΩ



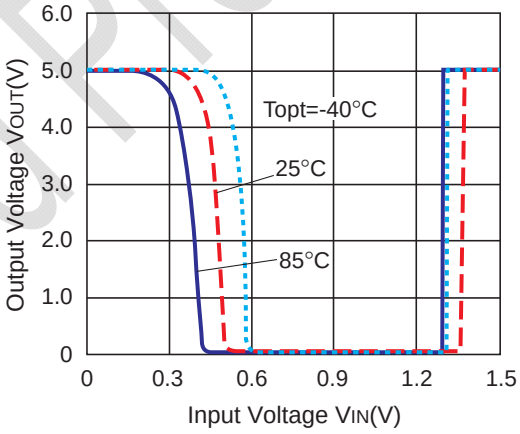
R3115Z131x

Nch Output Type: VDD pull up



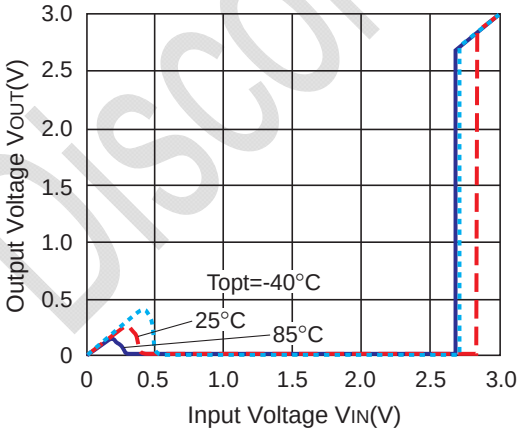
R3115Z131A

5V pull up via 470kΩ



R3115Z271x

Nch Output Type: VDD pull up



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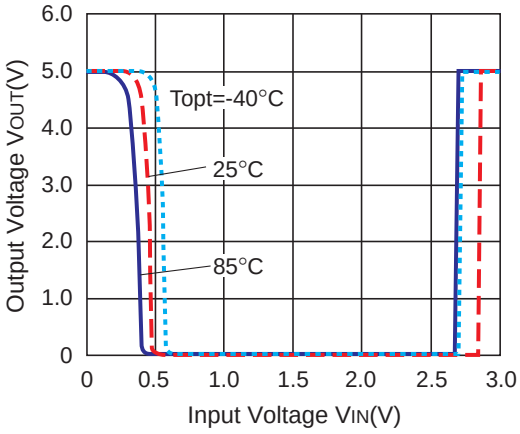
5V pull up via 470kΩ



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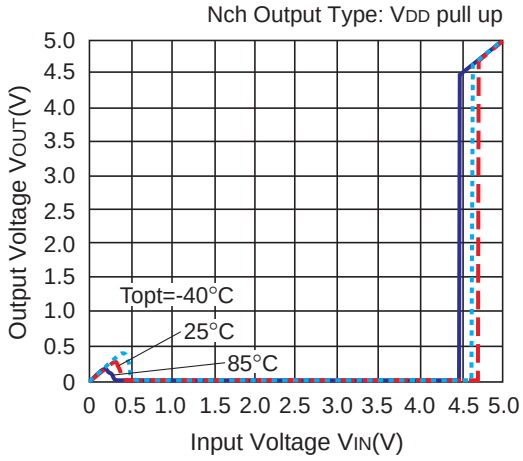

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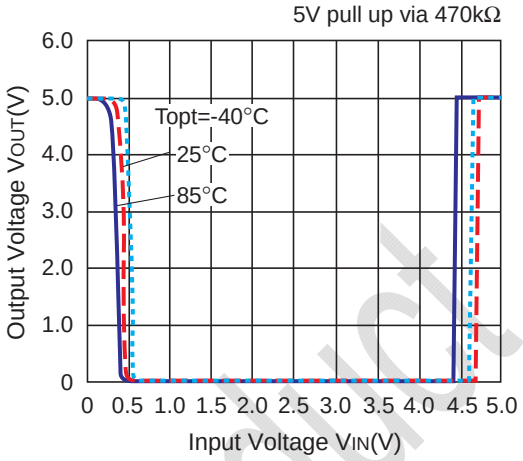

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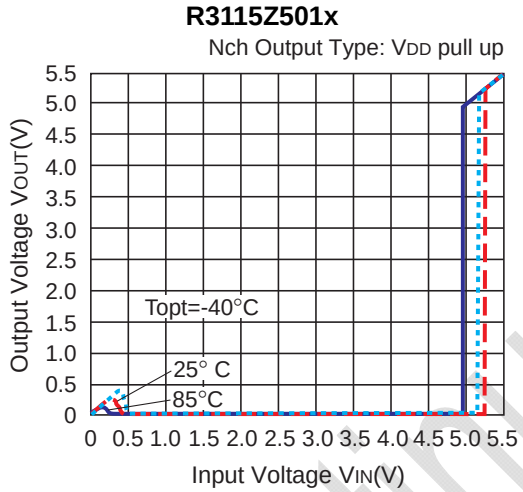

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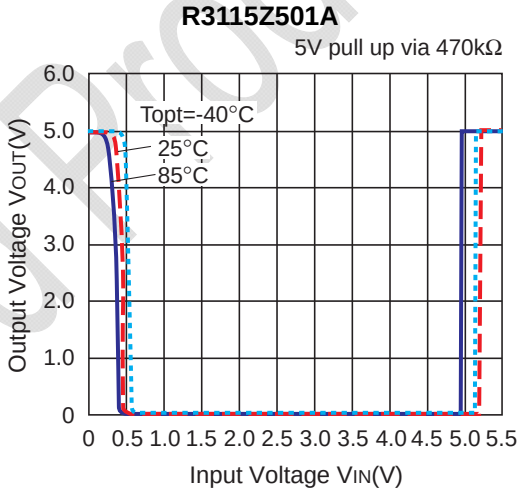
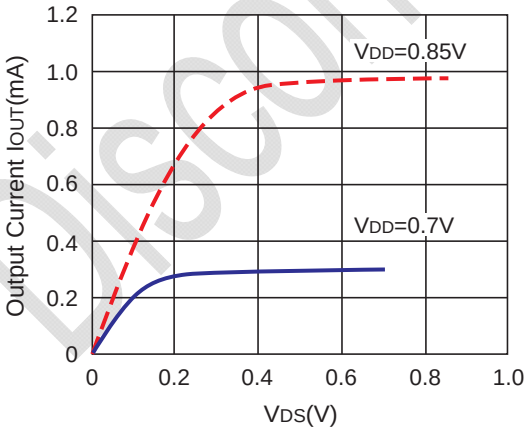


4) Nch Driver Output Current vs. V_{DS}

R3115Z091x



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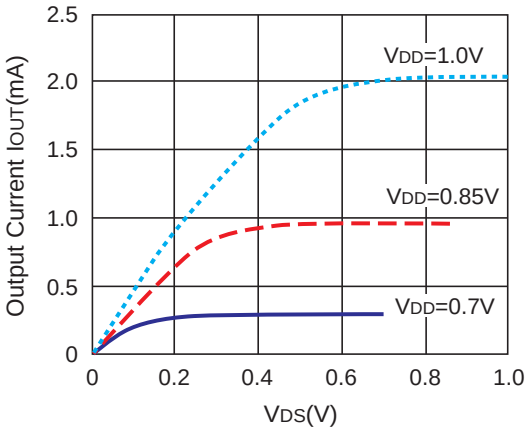

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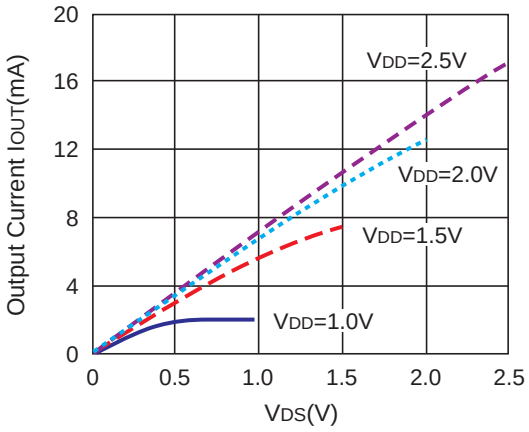

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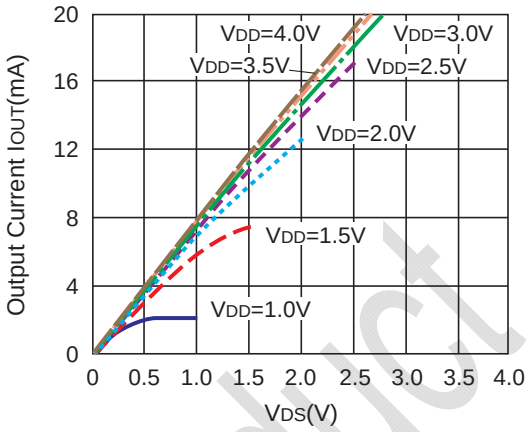

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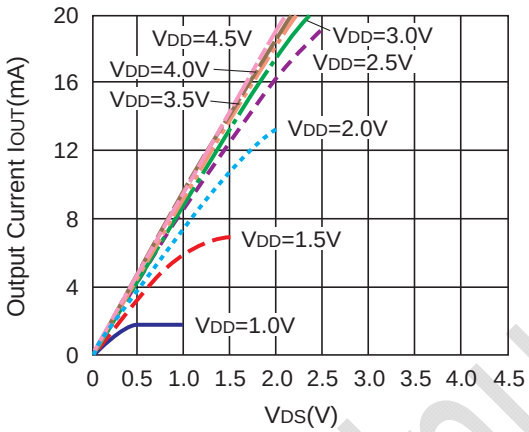
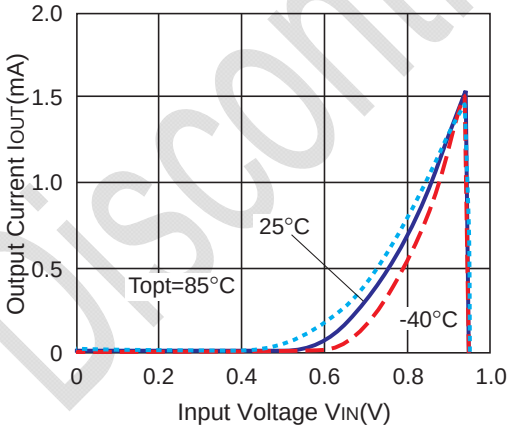


5) Nch Driver Output Current vs. Input Voltage

R3115Z091x



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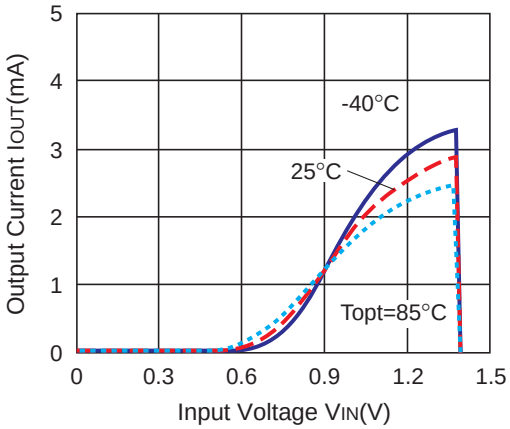

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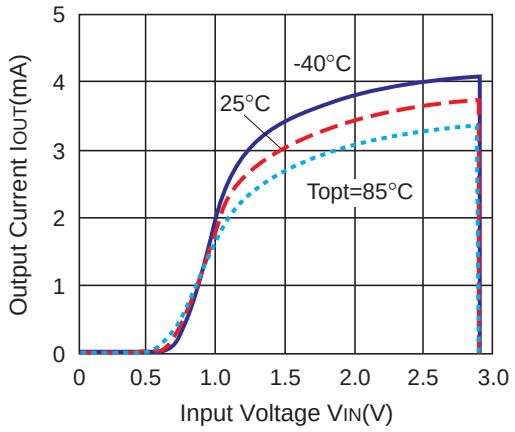

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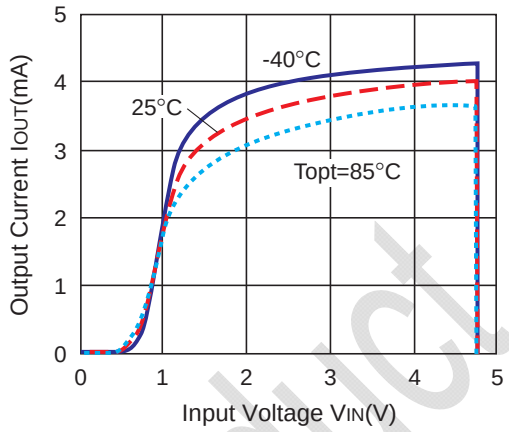

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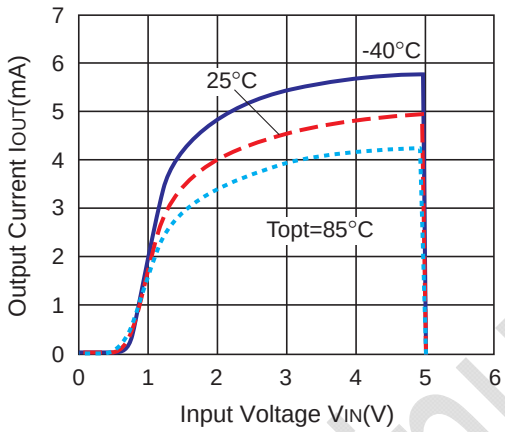
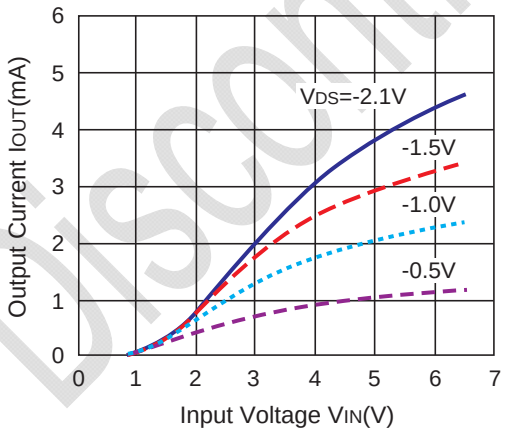


6) Pch Driver Output Current vs. Input Voltage

R3115Z091C



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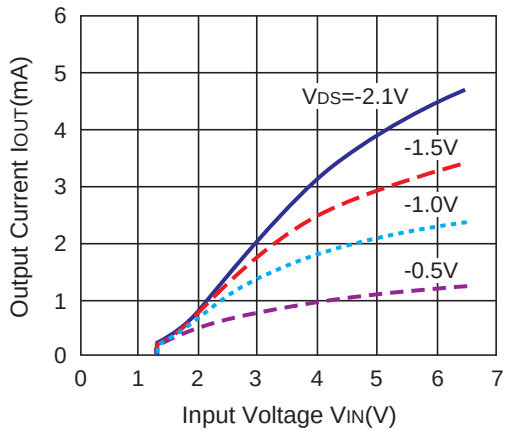

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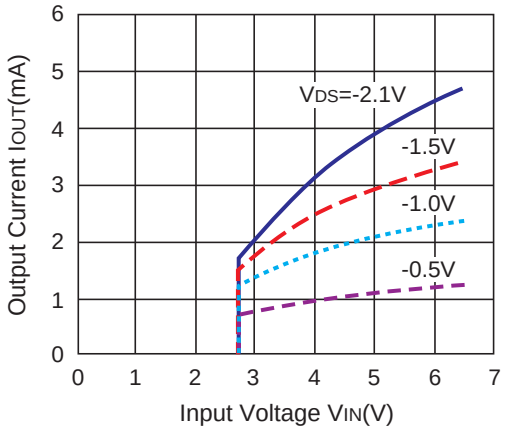

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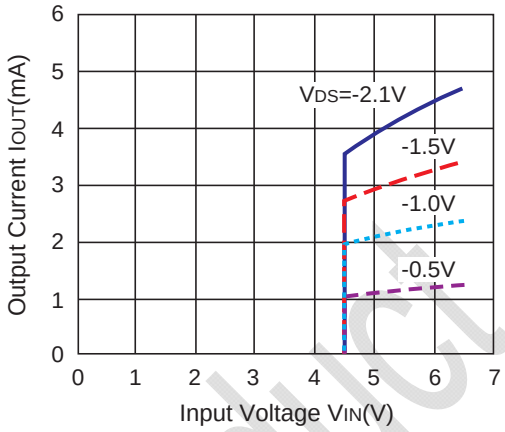

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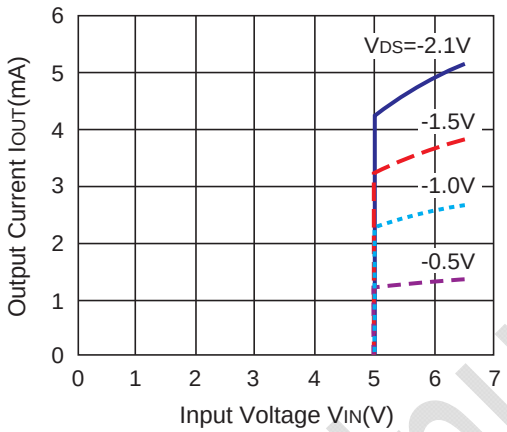
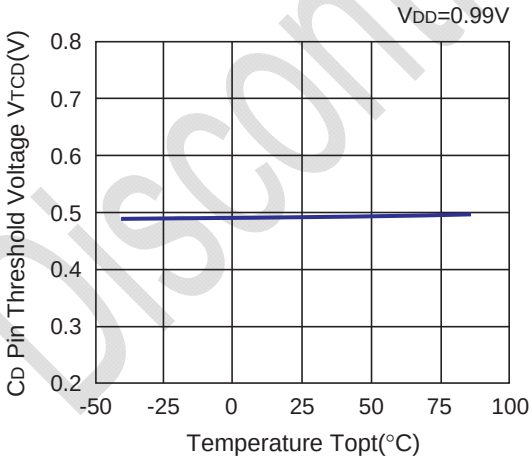


7) C_D Pin Threshold Voltage vs. Temperature

R3115Z091x



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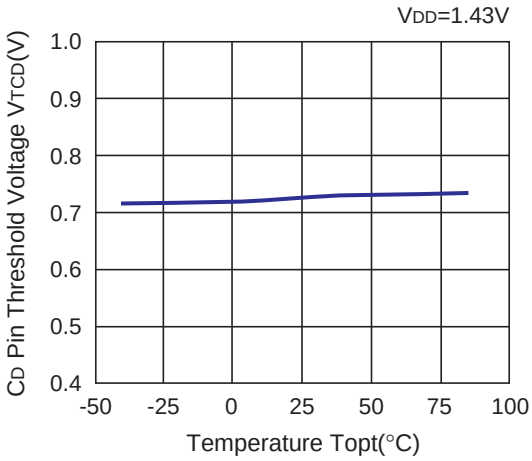

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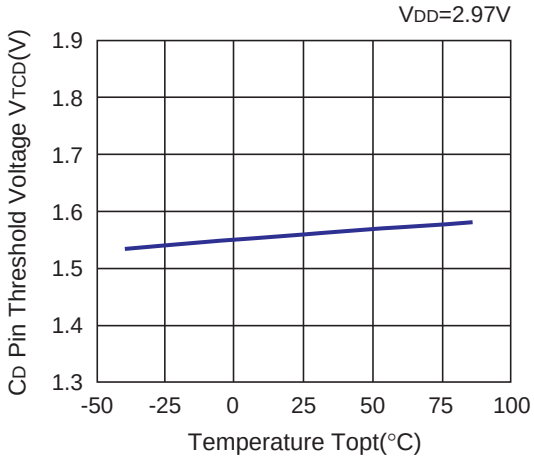

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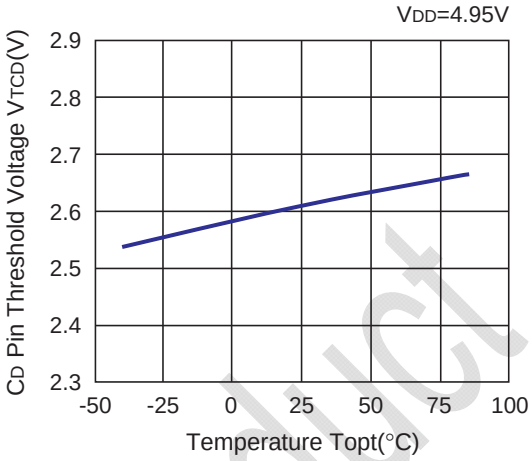

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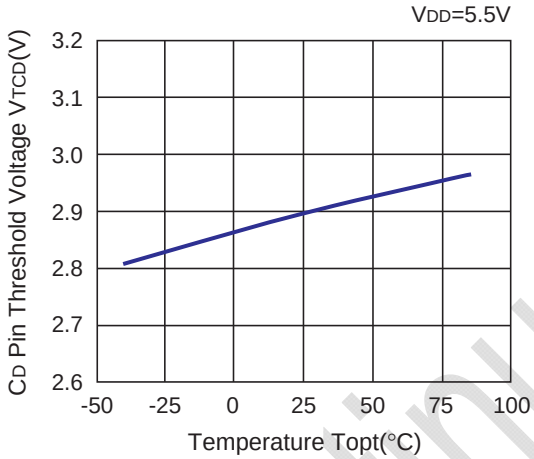
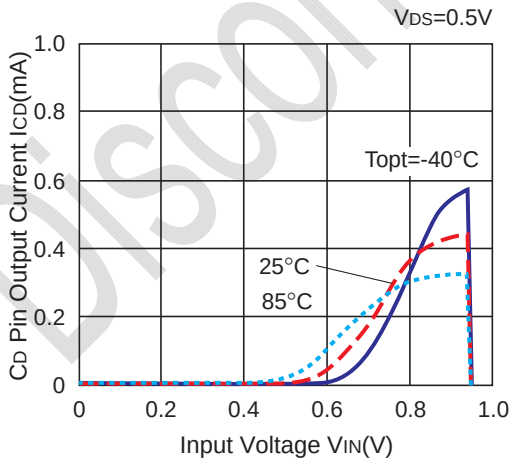


8) C_D Pin Output Current vs. Input Voltage

R3115Z091x



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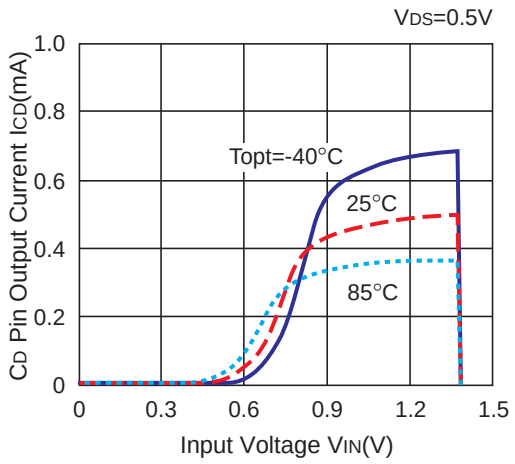

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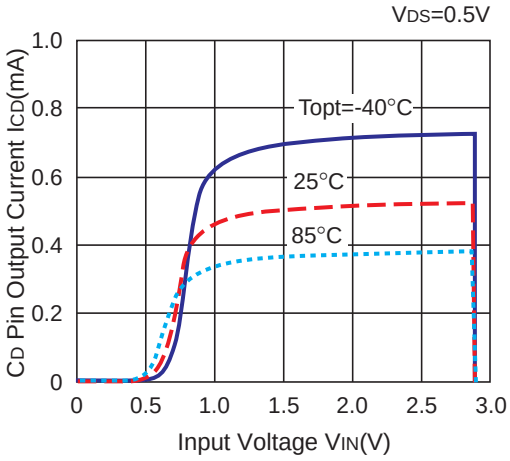

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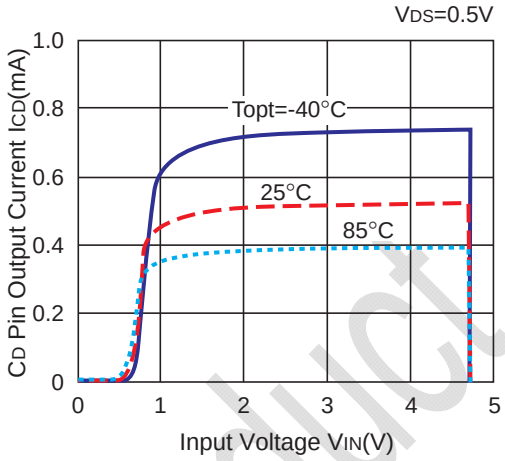

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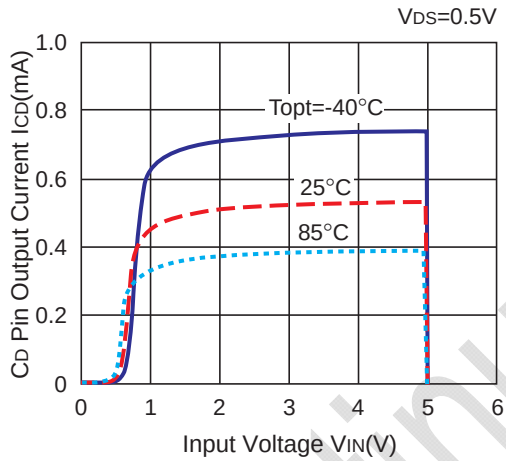
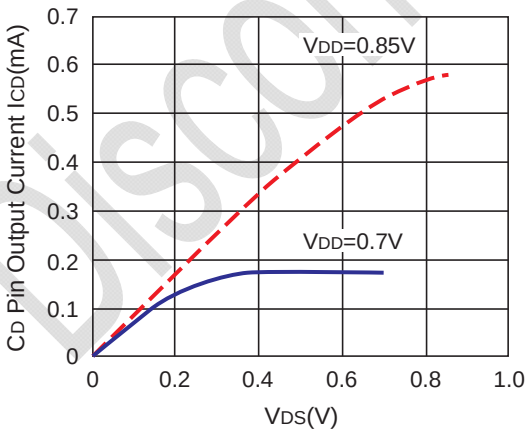


9) C_D Pin Output Current vs. V_{DS} (Topt=25°C)

R3115Z091x



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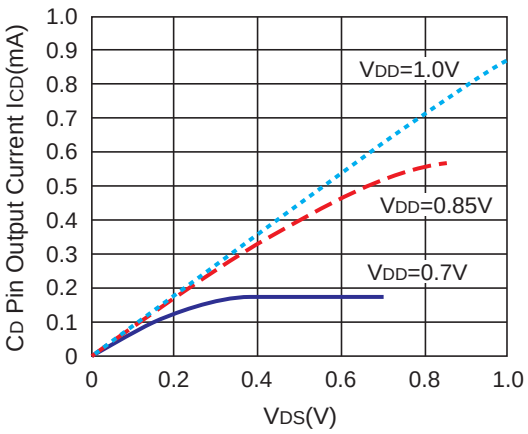

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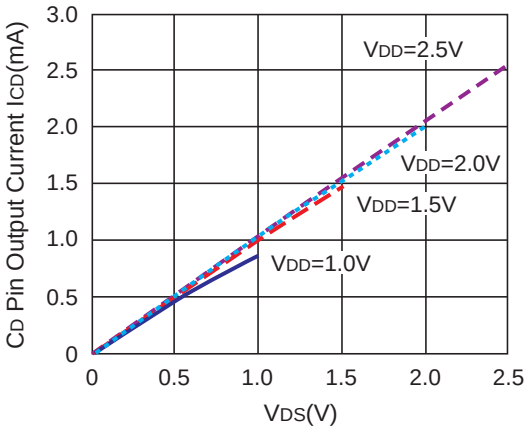

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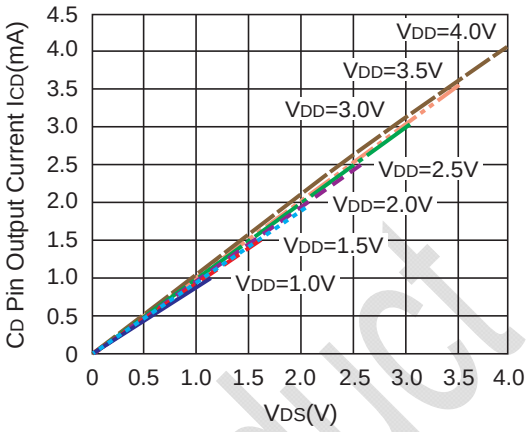

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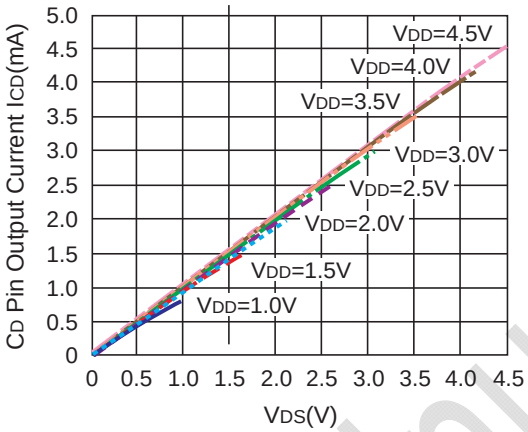
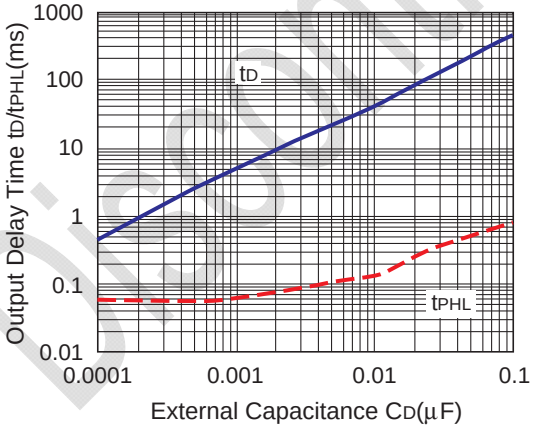


10) Output Delay Time vs. External Capacitance (Topt=25°C)

R3115Z091x



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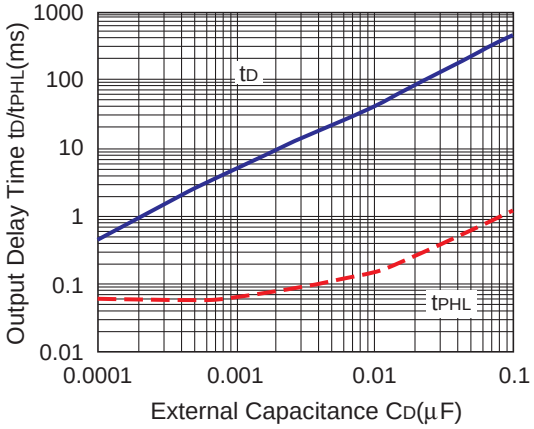

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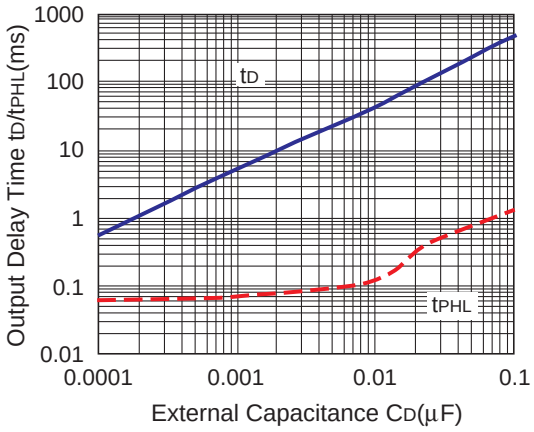

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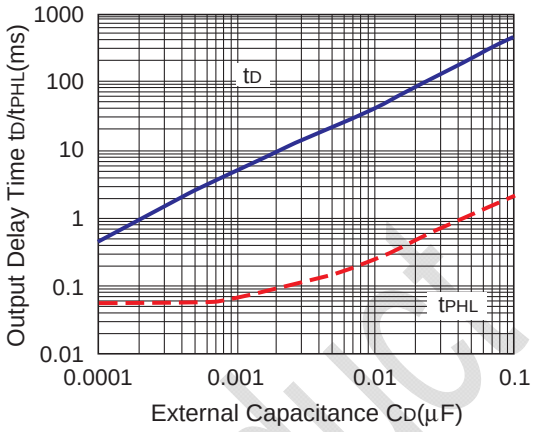
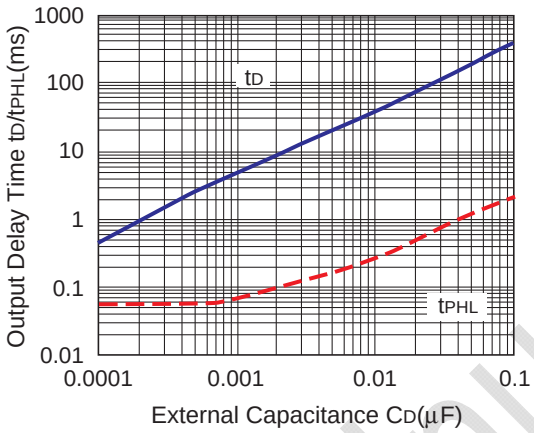
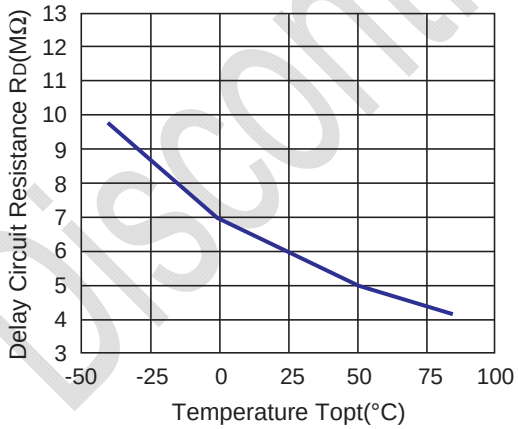


R3115Z501x



11) Delay Circuit Resistance vs. Temperature

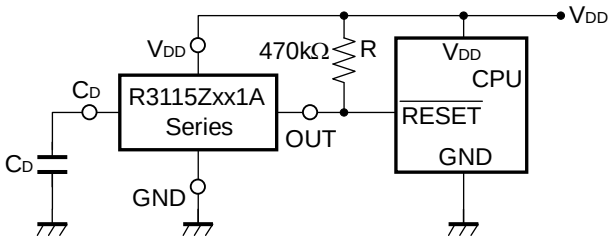
R3115Zxx1x



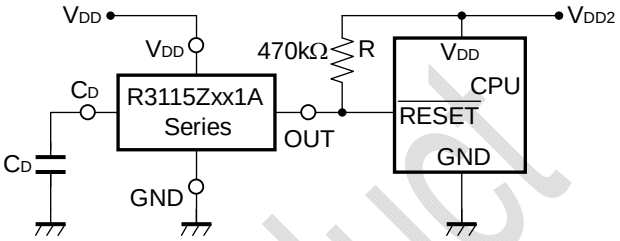
TYPICAL APPLICATION

- **R3115Zxx1A CPU Reset Circuit (Nch Open Drain Output)**

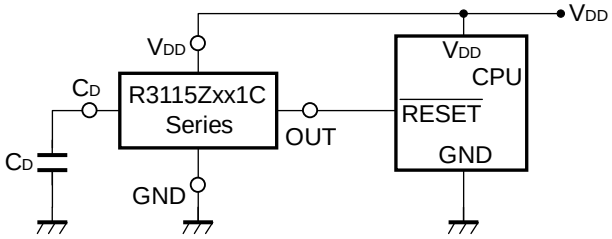
Case 1.InputVoltage to R3115Zxx1A is equal to Input Voltage to CPU



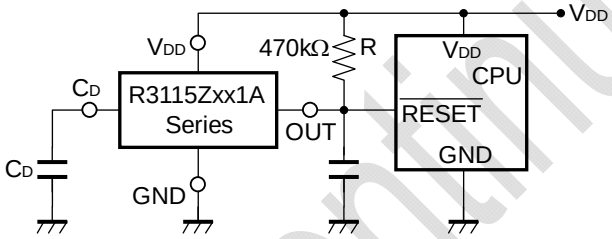
Case 2.Input Voltage to R3115Zxx1A is unequal to Input Voltage to CPU



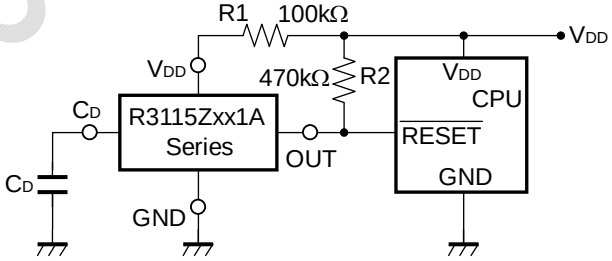
- **R3115Zxx1C CPU Reset Circuit CMOS Output**



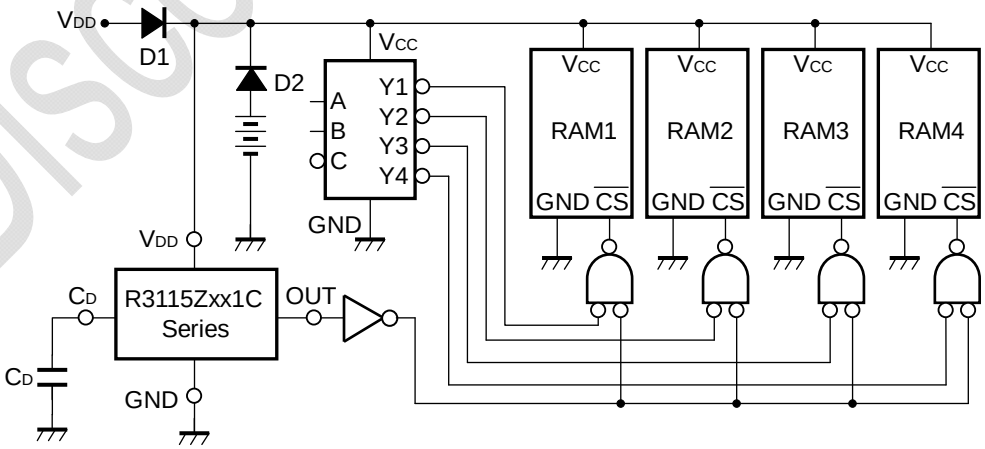
- **R3115Zxx1A Output Delay Time Circuit 1 (Nch Open Drain Output)**



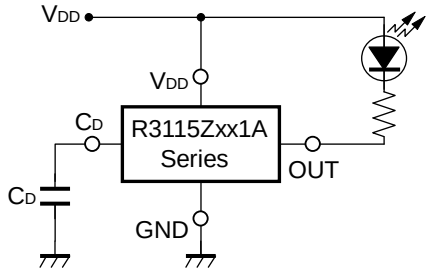
- **R3115Zxx1A Output Delay Time Circuit 2 (Nch Open Drain Output)**



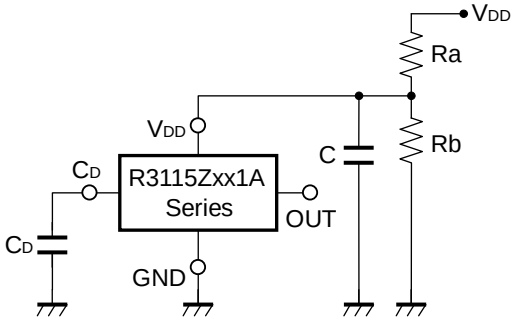
- **Memory Back-up Circuit**



- **Voltage level Indicator Circuit (lighted when the power runs out)**
  (Nch Open Drain Output)



- **Detector Threshold Adjustable Circuit**
  (Nch Open Drain Output)

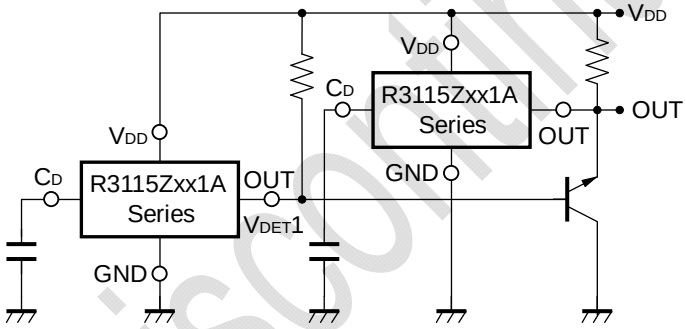


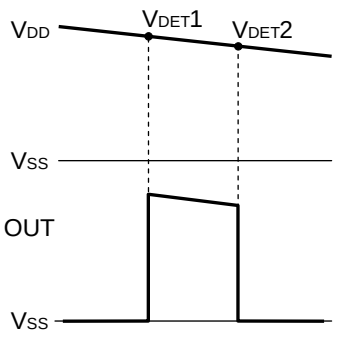
Adjusted Detector Threshold
$=(-V_{DET})\times(Ra+Rb)/Rb$

Hysteresis Voltage
$=(V_{HYS})\times(Ra+Rb)/Rb$

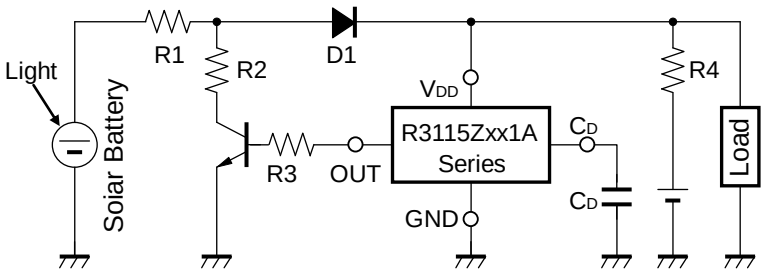
∗) If the value of Ra is set excessively large, voltage drop may occur caused by the supply current of IC itself, and detector threshold may vary.

- **Window Comparator Circuit**
  (Nch Open Drain Output)





- **Over-charge priventing Circuit**



TECHNICAL NOTES

When connecting resistors to the device's input pin

When connecting a resistor (R1) to an input of this device, the input voltage decreases by [Device's Consumption Current] x [Resistance Value] only. And, the cross conduction current*1, which occurs when changing from the detecting state to the release state, is decreased the input voltage by [Cross Conduction Current] x [Resistance Value] only. And then, this device will enter the re-detecting state if the input voltage reduction is larger than the difference between the detector voltage and the released voltage.

When the input resistance value is large and the VDD is gone up at mildly in the vicinity of the released voltage, repeating the above operation may result in the occurrence of output.

As shown in Figure A/B, set R1 to become 100 kΩ or less as a guide, and connect C_{IN} of 0.1 µF and more to between the input pin and GND. Besides, make evaluations including temperature properties under the actual usage condition, with using the evaluation board like this way. As a result, make sure that the cross conduction current has no problem.

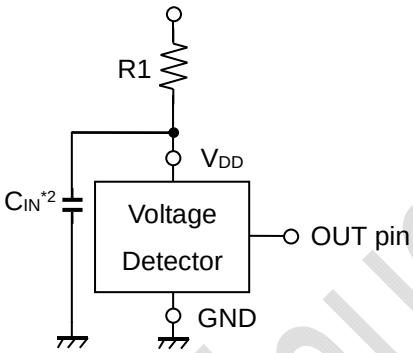


Figure A

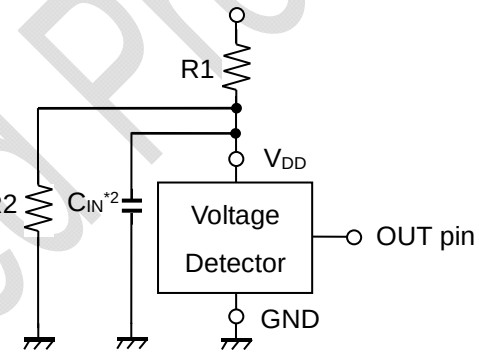


Figure B

*1 In the CMOS output type, a charging current for OUT pin is included.

*2 Note the bias dependence of capacitors.

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