

# RNA52A10MM

## Dual CMOS system-RESET IC

REJ03D0858-0400

Rev.4.00

Feb 23, 2007

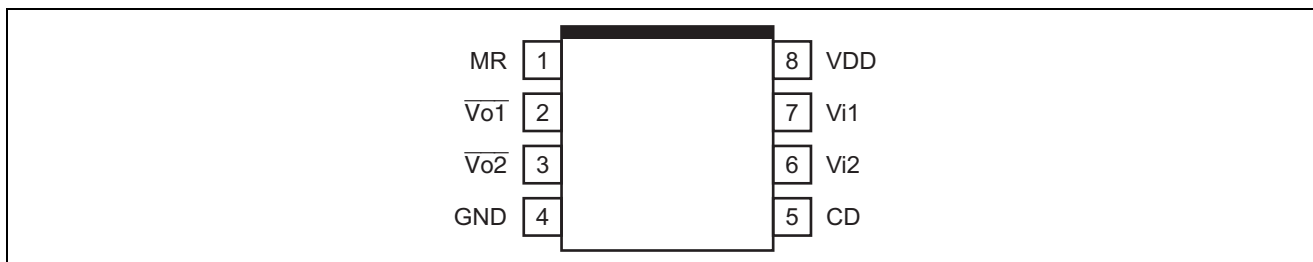
### Description

The RNA52A10MM incorporates two reset circuits, one with and one without a delay function, allowing the generation of separate reset signals for a microprocessor and associated system circuits. The detection voltage of each reset circuit is determined by the value of an external resistor, and the internal reference voltage is 1.0 V. The CMOS process for the RNA52A10MM means that the device draws only 1.1  $\mu$ A (typ.). The reset cancellation delay time is set with a high degree of accuracy by the values of a capacitor and resistor connected with the CD pin. The MR (manual reset) input pin is provided for the reset circuit with the delay function, and the reset signal is output in response to a high level on the MR input pin. The MR pin is pulled down by a 2-M $\Omega$  internal resistor. Output pins Vo1 and Vo2 are open drain.

### Features

- Two CMOS reset circuits, one with and one without the delay function
- Reference voltage: 1.0 V
- Reference voltage accuracy:  $\pm 50$  mV
- Reference voltage hysteresis: 6% (typ.)
- Low current consumption: 1.1  $\mu$ A (typ.)
- Delay time set by an external CR circuit
- Manual reset input
- Open-drain output
- MMPAK-8 (8-pin) package
- Operating temperature range:  $-40$  to  $85^{\circ}\text{C}$

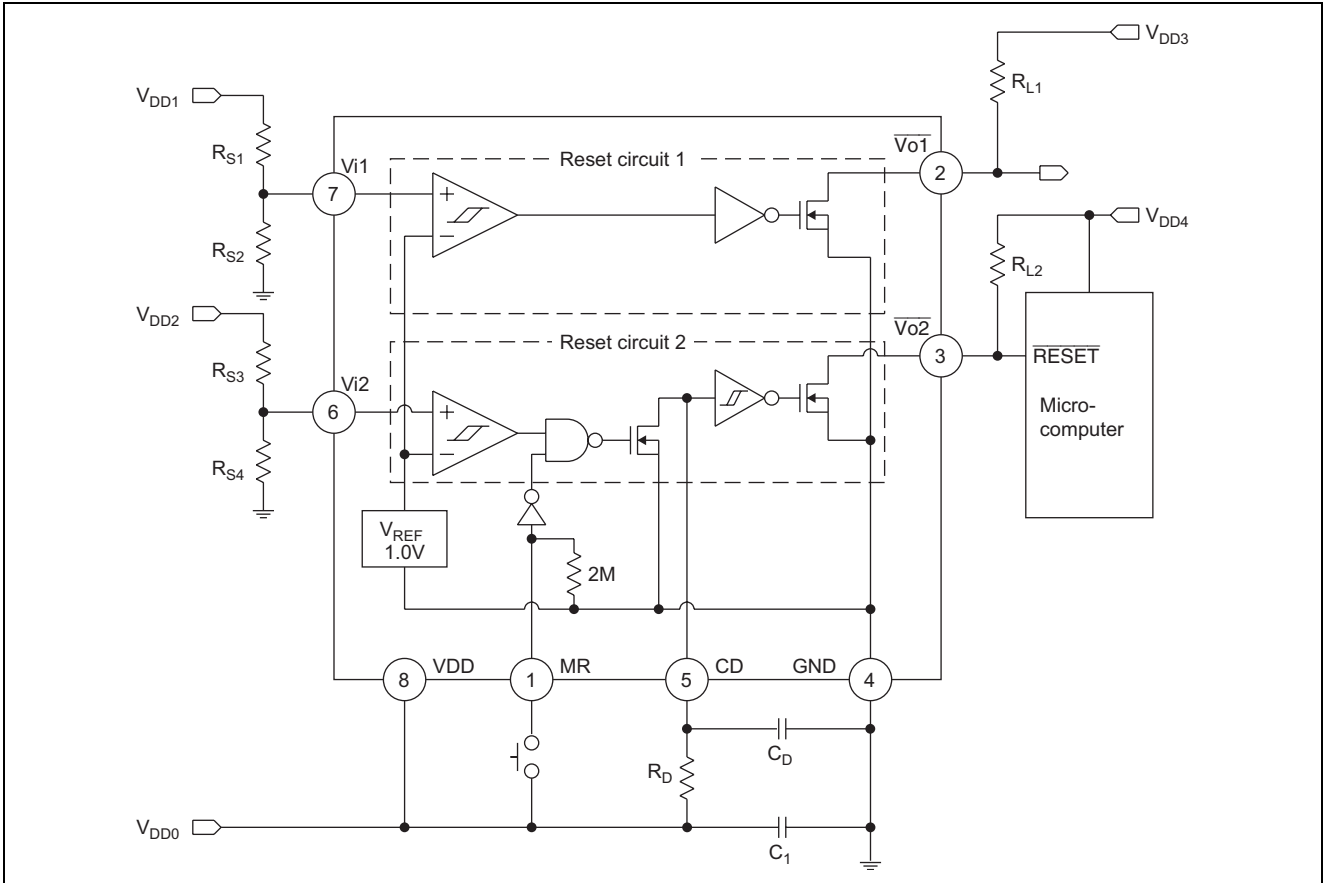
### Pin Arrangement



### Application

- Power-supply monitoring and resetting for microprocessors
- Power supply sequence control for microprocessors
- Desktop and laptop PCs
- PC peripheral devices such as printers
- Digital still cameras, digital video cameras, and PDAs
- Battery-driven products
- Wireless communications systems

### Functional Block Diagram and Typical application Circuit



Notes: 1. Please refer to the following equations to set up reset-threshold voltages for power supplies  $V_{DD1}$  and  $V_{DD2}$ , and to set up external voltage-dividing resistor pairs  $R_{S1}$  and  $R_{S2}$ , and  $R_{S3}$  and  $R_{S4}$ .

(1)  $V_{DD1}$  reset-threshold voltage =  $V_{REF} \times (R_{S1}+R_{S2})/R_{S2}$

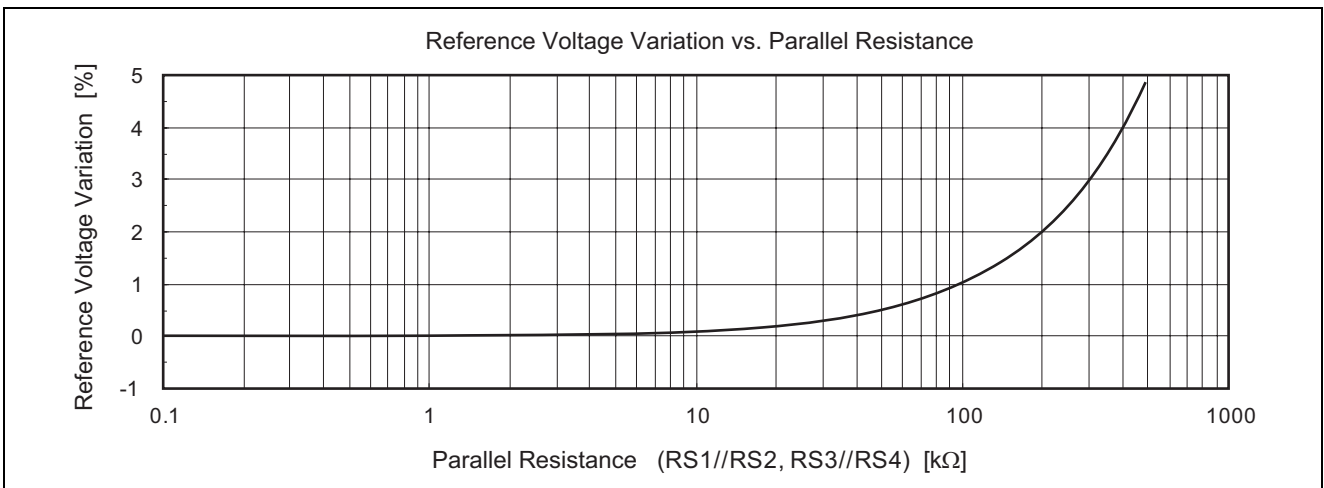
(2)  $V_{DD2}$  reset-threshold voltage =  $V_{REF} \times (R_{S3}+R_{S4})/R_{S4}$

Note that values must be set up within the following range:  $R_{S1}, R_{S2}, R_{S3}, R_{S4} \leq 50 \text{ k}\Omega$

See the following graph for the relationship between the reference voltage variation and the value selected for  $R_{S1}, R_{S2}, R_{S3}$  and  $R_{S4}$ .

2. For capacitor  $C_1$ , select a type which has excellent frequency characteristics. For stable operation, place it between the VDD pin and the GND pin and as close as is possible to the chip.

The value of capacitor  $C_1$  must suit the system environment in terms of the quality of the power supply and so forth.

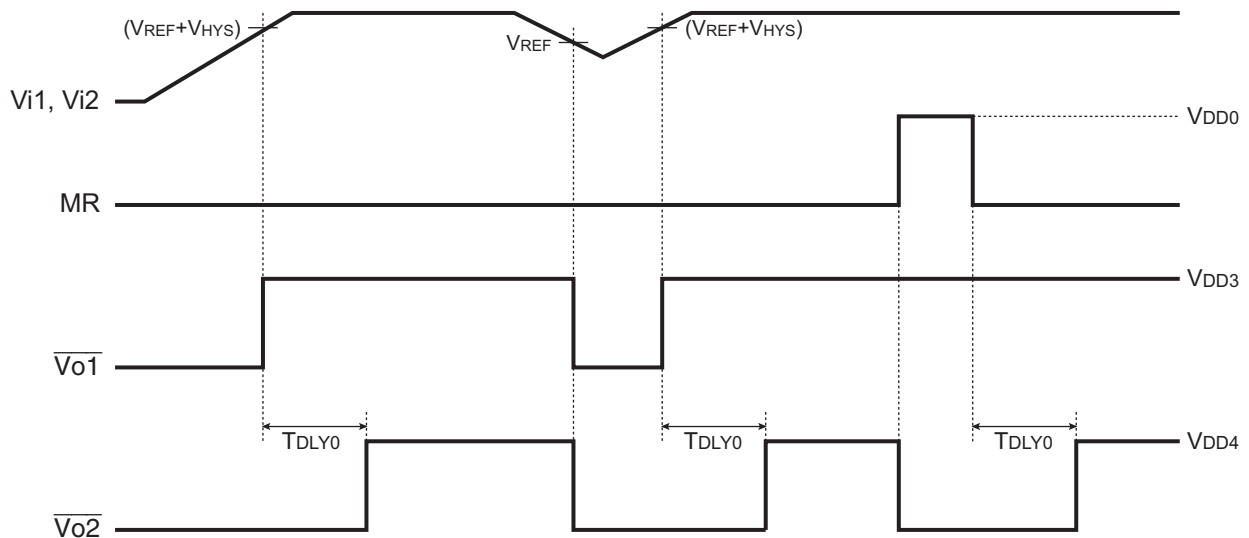


## Timing Diagram

### 1. I/O Table

MR	Vi1, Vi2	$\overline{Vo1}$	$\overline{Vo2}$
L	$\leq V_{REF}$	L	L
	$\geq (V_{REF}+V_{HYS})$	H	H (after $T_{DLY0}$ )
H	$\leq V_{REF}$	L	L
	$\geq (V_{REF}+V_{HYS})$	H	

### 2. Timing Chart



## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage (VDD)	$V_{DD}$	6.0	V
Input voltage (Vi1, Vi2, MR, CD)	$V_{IN}$	-0.3 to $V_{DD}$	V
Output voltage ( $\overline{Vo1}$ , $\overline{Vo2}$ )	$V_{OUT}$	-0.3 to 6.0	V
Output current ( $\overline{Vo1}$ , $\overline{Vo2}$ )	$I_{OUT}$	30	mA
Continuous power dissipation ( $T_a = 25^\circ\text{C}$ , in still air)	$P_D$	145	mW
Operating temperature	$T_{OPR}$	-40 to 85	$^\circ\text{C}$
Storage temperature	$T_{STG}$	-55 to 125	$^\circ\text{C}$

Note: Refer to the relevant characteristic curve on page 5 for continuous power dissipation.

## Recommended Operating Conditions

Item	Symbol	Min.	Max.	Unit
Supply voltage (VDD)	$V_{DD}$	1.4	5.5	V
Input voltage (Vi1, Vi2, MR, CD)	$V_{IN}$	0	$V_{DD}$	V
Output voltage ( $\overline{Vo1}$ , $\overline{Vo2}$ )	$V_{OUT}$	0	5.5	V
Output current ( $\overline{Vo1}$ , $\overline{Vo2}$ )	$I_{OUT}$	0	15	mA
Operating temperature	$T_{OPR}$	-40	85	$^\circ\text{C}$

Electrical Characteristics

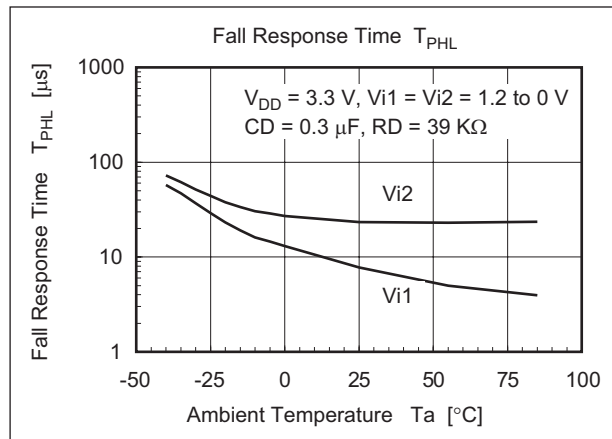
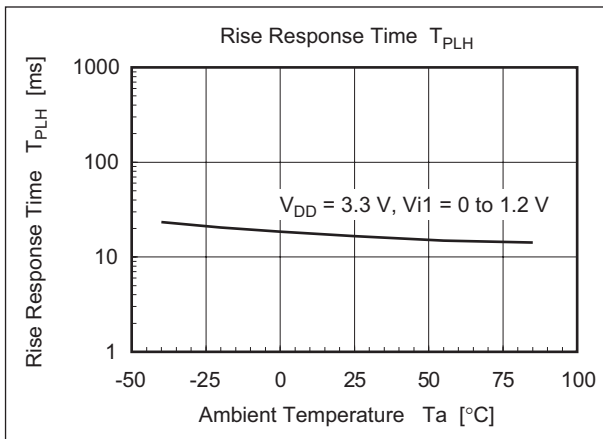
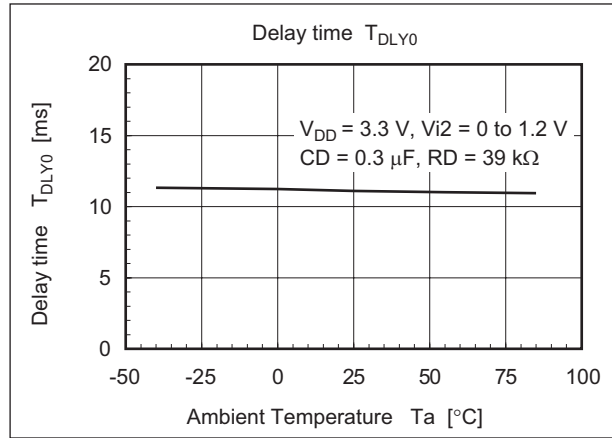
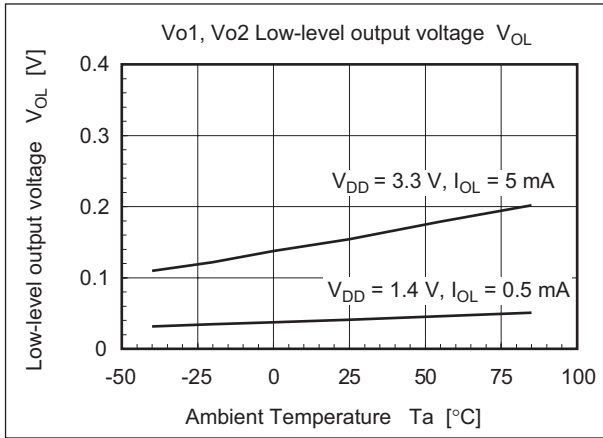
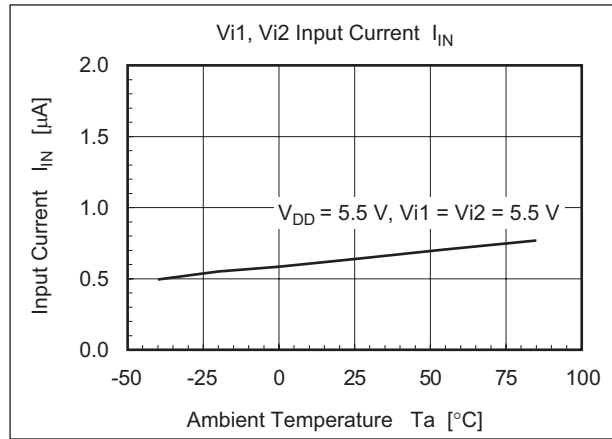
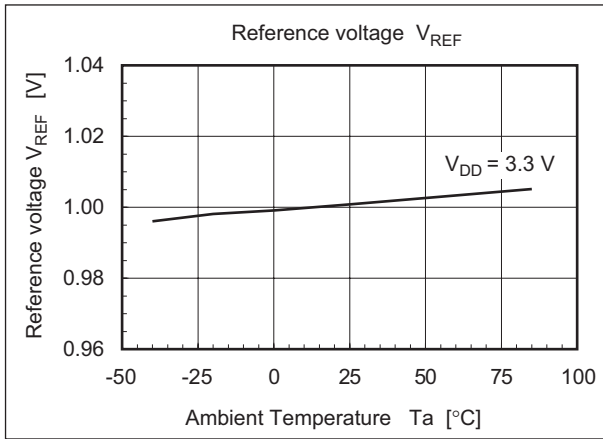
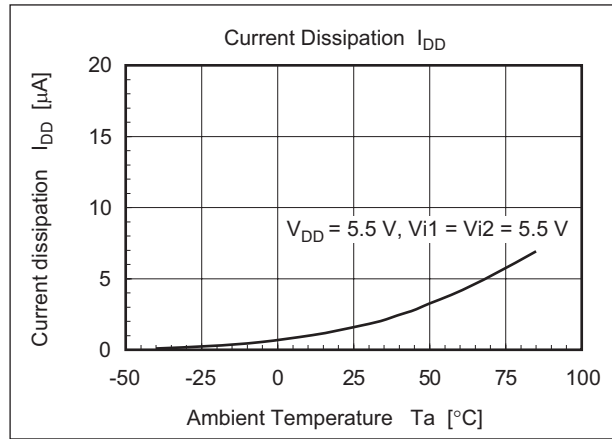
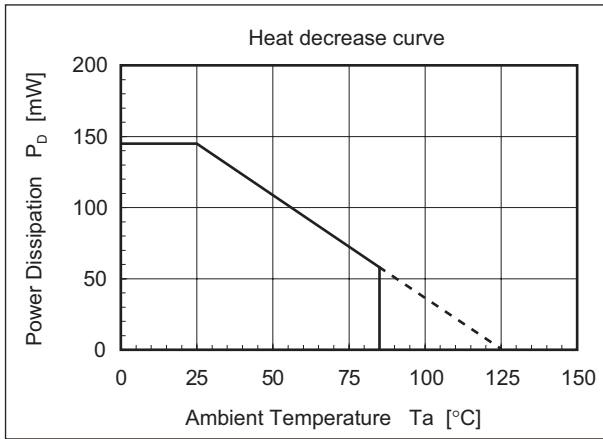
(Ta = 25°C, unless otherwise noted)

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	Test Circuit	
Supply voltage	V <sub>DD</sub>	1.4	—	5.5	V		—	
Current consumption	I <sub>DD</sub>	—	1.1	19	μA	V <sub>DD</sub> = 5.5 V V <sub>i1</sub> = V <sub>i2</sub> = 5.5 V	1	
Reference voltage	V <sub>REF</sub>	0.95	1.00	1.05	V	V <sub>DD</sub> = 3.3 V	2	
Reference voltage temperature coefficient (Reference value for design)	$\frac{\Delta V_{REF}}{V_{REF} \cdot \Delta T_a}$	—	±100	—	$\frac{\text{ppm}}{^\circ\text{C}}$	T <sub>a</sub> = -40 to 85°C	2	
Vi1, Vi2 input hysteresis voltage	V <sub>HYS</sub>	28.5 (V <sub>REF</sub> ×3%)	60 (V <sub>REF</sub> ×6%)	94.5 (V <sub>REF</sub> ×9%)	mV	V <sub>DD</sub> = 3.3 V	2	
Vi1, Vi2 input current	I <sub>IN</sub>	—	0.6	2.2	μA	V <sub>DD</sub> = 5.5 V V <sub>i1</sub> = V <sub>i2</sub> = 5.5 V	3	
CD input threshold voltage	V <sub>DLY</sub>	V <sub>DD</sub> ×0.43	V <sub>DD</sub> ×0.63	V <sub>DD</sub> ×0.83	V	V <sub>DD</sub> = 3.3 V V <sub>i1</sub> = V <sub>i2</sub> = 1.2 V	4	
Vo1, Vo2 low-level output voltage	V <sub>OL</sub>	—	0.05	0.15	V	V <sub>DD</sub> = 1.4V V <sub>i1</sub> = V <sub>i2</sub> = 0 V I <sub>OL</sub> = 0.5 mA	5	
		—	0.15	0.35	V	V <sub>DD</sub> = 3.3V V <sub>i1</sub> = V <sub>i2</sub> = 0 V I <sub>OL</sub> = 5 mA	6	
Vo1, Vo2 output leakage current	I <sub>LK</sub>	—	—	100	nA	V <sub>DD</sub> = V <sub>O1</sub> = V <sub>O2</sub> = 5.5 V V <sub>i1</sub> = V <sub>i2</sub> = 1.2 V	7	
Vo2 Delay time <sup>Note1</sup>	Incomplete discharge of capacity CD	T <sub>DLY</sub>	1.1	11	17	ms	V <sub>DD</sub> = 3.3 V V <sub>i2</sub> = 0 V → 1.2 V C <sub>D</sub> = 0.3 μF, R <sub>D</sub> = 39 kΩ	8
	complete discharge of capacity CD	T <sub>DLY0</sub>	7	11	17	ms		8
Vo1 Rise response time	T <sub>PLH</sub>	—	30	300	μs	V <sub>DD</sub> = 3.3 V V <sub>i1</sub> = 0 V → 1.2 V	9	
Vo1, Vo2 fall response time	T <sub>PHL</sub>	—	30	800	μs	V <sub>DD</sub> = 3.3 V V <sub>i1</sub> = V <sub>i2</sub> = 1.2 V → 0 V C <sub>D</sub> = 0.3 μF, R <sub>D</sub> = 39 kΩ	10	
MR low-level input voltage	V <sub>IL</sub>	—	—	V <sub>DD</sub> ×0.2	V	V <sub>DD</sub> = 3.3 V V <sub>i1</sub> = V <sub>i2</sub> = 1.2 V	11	
MR high-level input voltage	V <sub>DD</sub> < 4.5V	V <sub>IH</sub>	V <sub>DD</sub> ×0.75	—	—	V	V <sub>DD</sub> = 3.3 V V <sub>i1</sub> = V <sub>i2</sub> = 1.2 V	11
	V <sub>DD</sub> ≥ 4.5V	V <sub>IH</sub>	V <sub>DD</sub> ×0.5	—	—	V	V <sub>DD</sub> = 5.0 V V <sub>i1</sub> = V <sub>i2</sub> = 1.2 V	12
MR input pull-down resistance	R <sub>MR</sub>	0.5	2	—	MΩ	V <sub>DD</sub> = 5.5 V V <sub>MR</sub> = 5.5 V	13	

Notes: 1. When capacitor C<sub>D</sub> is completely discharged and charging starts in the state that C<sub>D</sub> pin voltage is 0 V, the minimum value of delay time T<sub>DLY0</sub> is 7 ms. However, when the discharging time is short and charging starts in the state that the voltage does not completely fall to 0 V, the minimum value of delay time T<sub>DLY</sub> is 1.1 ms. Then, the minimum value of Low time (reset time) of Vo2 is 1.1 ms as the delay time T<sub>DLY</sub>. Refer to Regulations for state of capacitor C<sub>D</sub> electrical discharge and delay time on page 9 for details.

2. Refer to the characteristic curves on page 5 for temperature dependence of the main characteristics.
3. Refer to pages 7 and 8 for the test circuits.

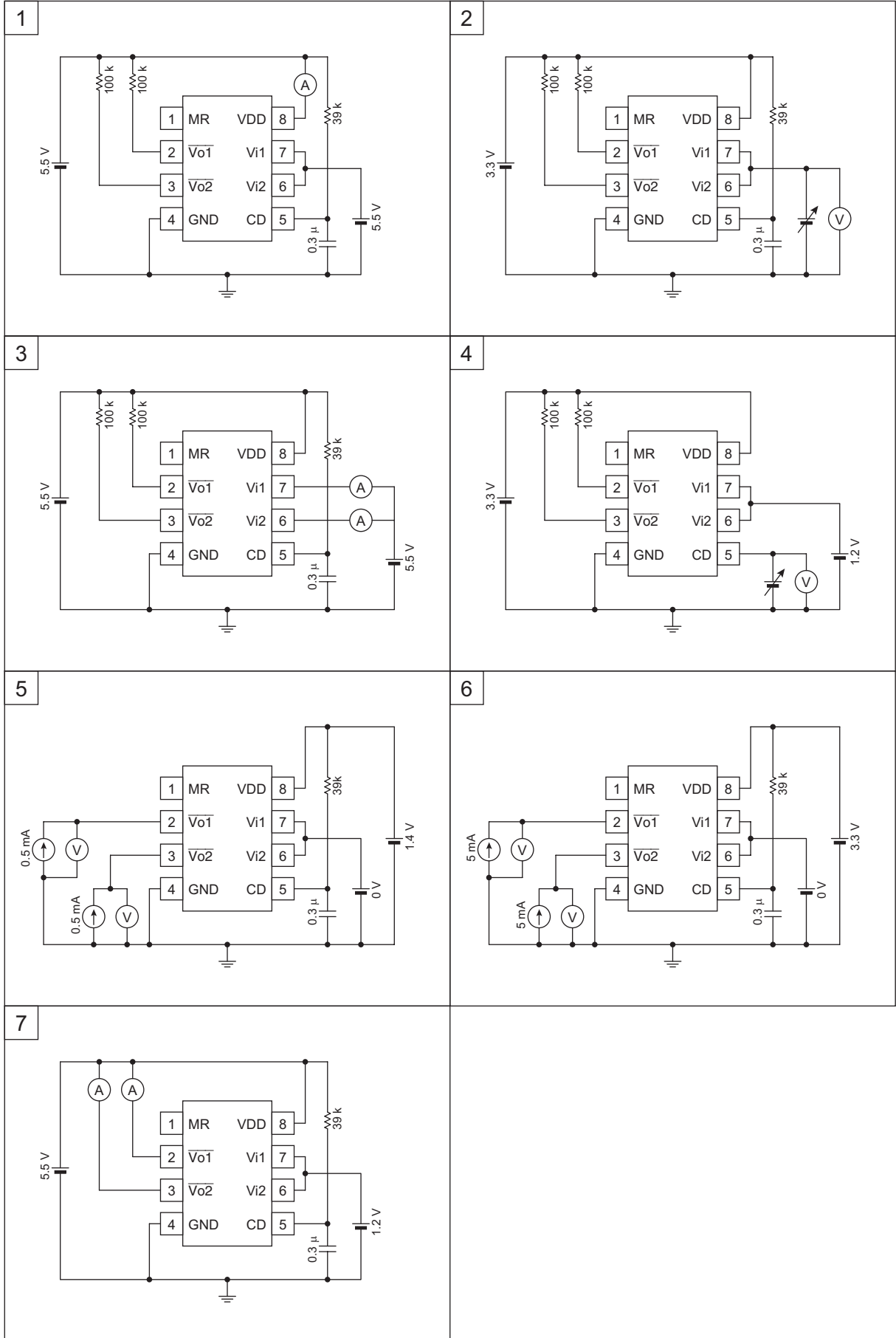
Characteristic curves



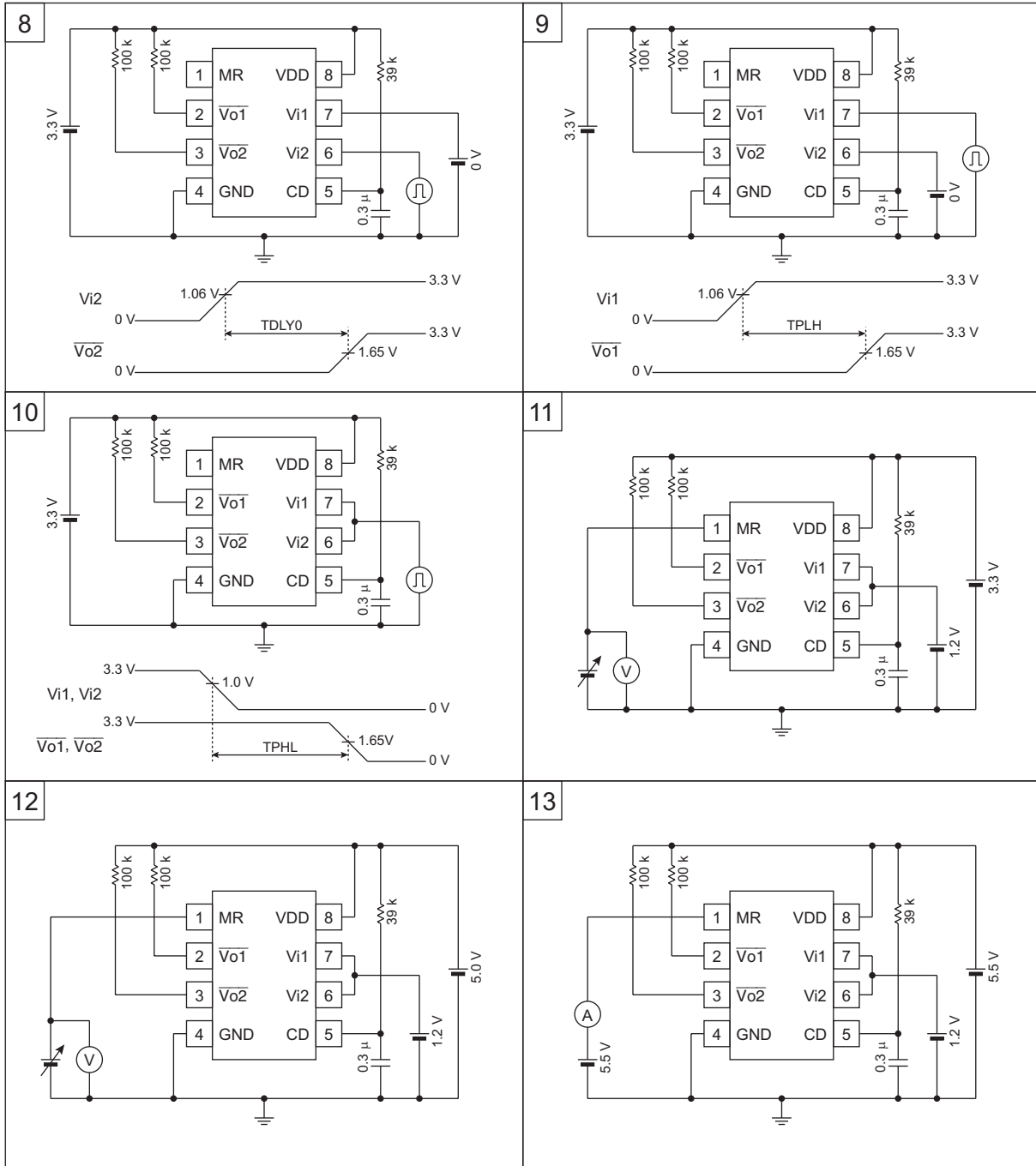
## Pin Descriptions

Pin No.	Pin Name	Function
1	MR	Manual reset input pin for reset circuit 2 (the circuit with the delay function). The MR signal is active high, so applying a high level to MR sets the Vo2 pin to the low level. If $V_{i2} > V_{REF}$ when the signal on the MR pin is changed back from the high to the low level, the Vo2 pin is returned from the low to the high level after a delay time $T_{DLY0}$ . This can be set as required. The MR pin is pulled down to the GND level via an internal 2-M $\Omega$ resistor. However, we recommend connection of the pin to the GND line when it is not in use.
2	$\overline{Vo1}$	Reset signal output pin for reset circuit 1 (the circuit with no delay function). The output is open-drain. The recommended value of the pull-up resistor ( $R_{L1}$ ) is 3 k to 100 k $\Omega$ . When the voltage input on pin Vi1 falls to or below $V_{REF}$ , the signal output from the $\overline{Vo1}$ pin is changed from the high to the low level. Since the characteristic includes hysteresis, the signal output from the $\overline{Vo1}$ pin changes from the low to the high level when the voltage input on pin Vi1 rises to or above $V_{REF}+V_{HYS}$ . Refer to the timing diagram on page 3 for details.
3	$\overline{Vo2}$	Reset signal output pin for reset circuit 2 (the circuit with the delay function). The output is open-drain. The recommended value for the pull-up resistor ( $R_{L2}$ ) is 3 k to 100 k $\Omega$ . When the voltage input on pin Vi2 falls to or below $V_{REF}$ , the signal output from the $\overline{Vo2}$ pin is changed from the high to the low level. Since the input characteristic includes hysteresis, the signal output from the $\overline{Vo2}$ pin changes from the low to the high level when the voltage input on pin Vi2 rises to or above $V_{REF}+V_{HYS}$ and the set delay time $T_{DLY0}$ has elapsed. Refer to the timing diagram on page 3 and regulations for state of capacitor $C_D$ electrical discharge and delay time on page 9 for details.
4	GND	GND pin
5	CD	Pin for connection to the resistor ( $R_D$ ) and capacitor ( $C_D$ ) for setting of the delay time, $T_{DLY0}$ . Refer to the Block Diagram and Typical Application Circuit on page 2 for an example of the connection. The relation by which the resistance and capacitance set up the delay time can be expressed as $T_{DLY0} = 0.94 \times C_D \times R_D$ . Refer to this formula in determining the values of resistance and capacitance. Resistance $R_D$ must use the one within the range of 1 k to 1 M $\Omega$ . Ensure that capacitor $C_D$ has a value no greater than 1.3 $\mu$ F. The dependence of delay time $T_{DLY0}$ on the values of external capacitor $C_D$ and external resistor $R_D$ is illustrated on page 10. To avoid errors due to noise input via the CD pin, this input includes a Schmitt-trigger inverter.
6	Vi2	Voltage input pin for reset circuit 2 (the circuit with the delay function). When the input voltage falls to or below $V_{REF}$ , the signal output from the $\overline{Vo2}$ pin is changed to the low level. Since the input characteristic includes hysteresis, the signal output from the $\overline{Vo2}$ pin is changed from the low to the high level after the voltage input on pin Vi2 has risen to or above $V_{REF}+V_{HYS}$ and delay time $T_{DLY}$ has elapsed. The reset-threshold voltage is derived from the power-supply voltage $V_{DD2}$ according to the division ratio set up by resistors $R_{S3}$ and $R_{S4}$ as described under the block diagram and typical application circuit on page 2. To avoid shifting of the reset detection voltage being shifted by input current via the Vi2 pin, select a value no greater than 25 k $\Omega$ for parallel resistors $R_{S3}$ and $R_{S4}$ . Refer to the graph on page 2 for details. Besides, to avoid errors due to noise in power-supply voltage $V_{DD2}$ , select a capacitor with superior frequency characteristics and connect it between the Vi2 and GND pins.
7	Vi1	Voltage input pin for reset circuit 1 (the circuit without the delay function). When the input voltage falls to or below $V_{REF}$ , the signal output from the $\overline{Vo1}$ pin is changed to the low level. Since the input characteristic includes hysteresis, the signal output from the $\overline{Vo1}$ pin is changed from the low to the high level after the voltage input on pin Vi1 has risen to or above $V_{REF}+V_{HYS}$ . The reset-threshold voltage is derived from the power-supply voltage $V_{DD1}$ according to the division ratio set up by resistors $R_{S1}$ and $R_{S2}$ as described under the block diagram and typical application circuit on page 2. To avoid shifting of the reset detection voltage being shifted by input current via the Vi1 pin, select a value no greater than 25 k $\Omega$ for parallel resistors $R_{S1}$ and $R_{S2}$ . Refer to the graph on page 2 for details. Besides, to avoid errors due to noise in power-supply voltage $V_{DD1}$ , select a capacitor with superior frequency characteristics and connect it between the Vi2 and GND pins.
8	VDD	Power-supply pin for the chip. For stable operation, select a capacitor with superior frequency characteristics and connect it between the VDD and GND pins and as close to the chip as possible. When selecting the value of the capacitor, consider aspects of the system environment such as the quality of the power supply. Refer to the block diagram and typical application circuit on page 2 for details.

Test Circuits

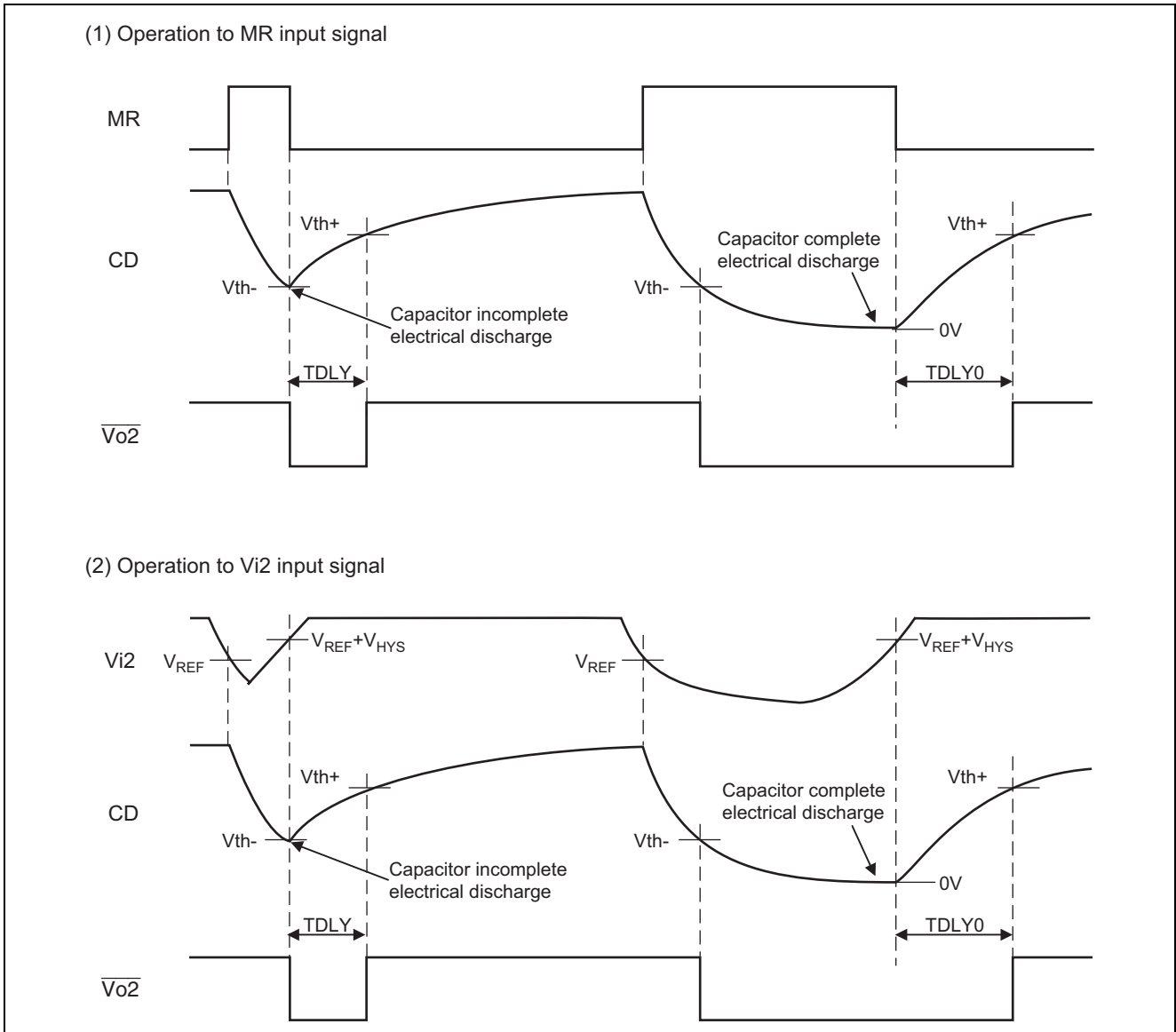


Test Circuits (cont.)

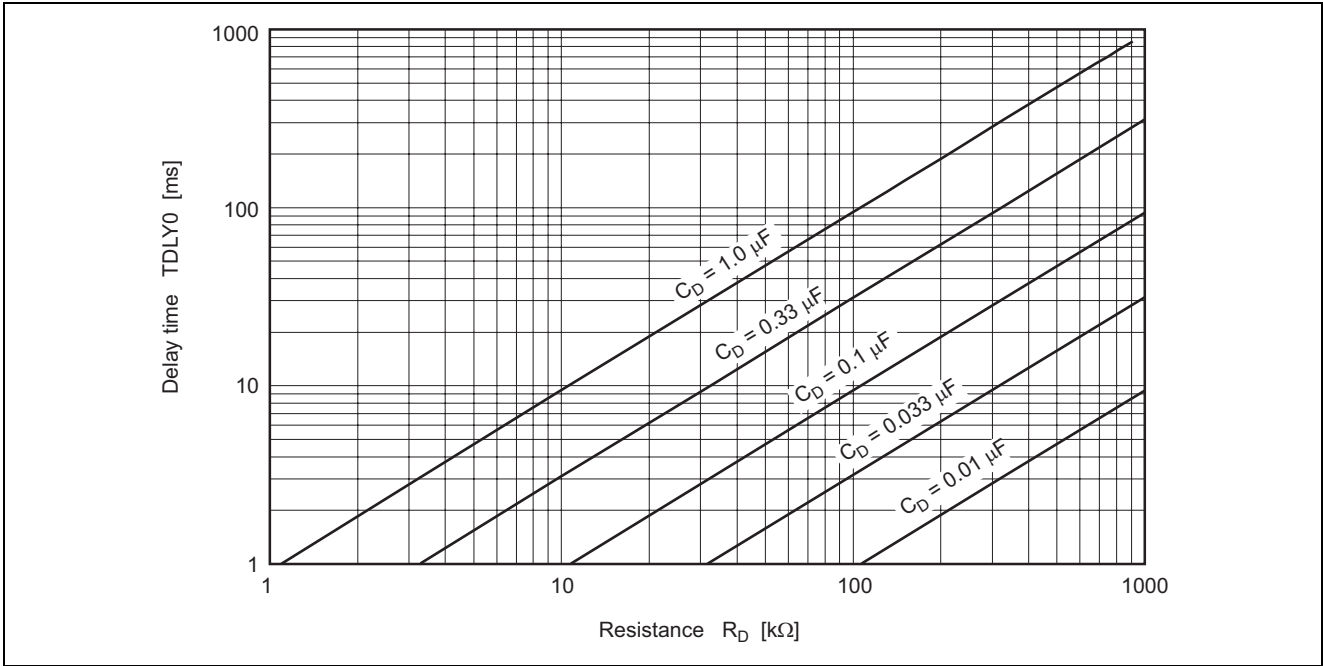




Regulations for state of capacitor  $C_D$  electrical discharge and delay time



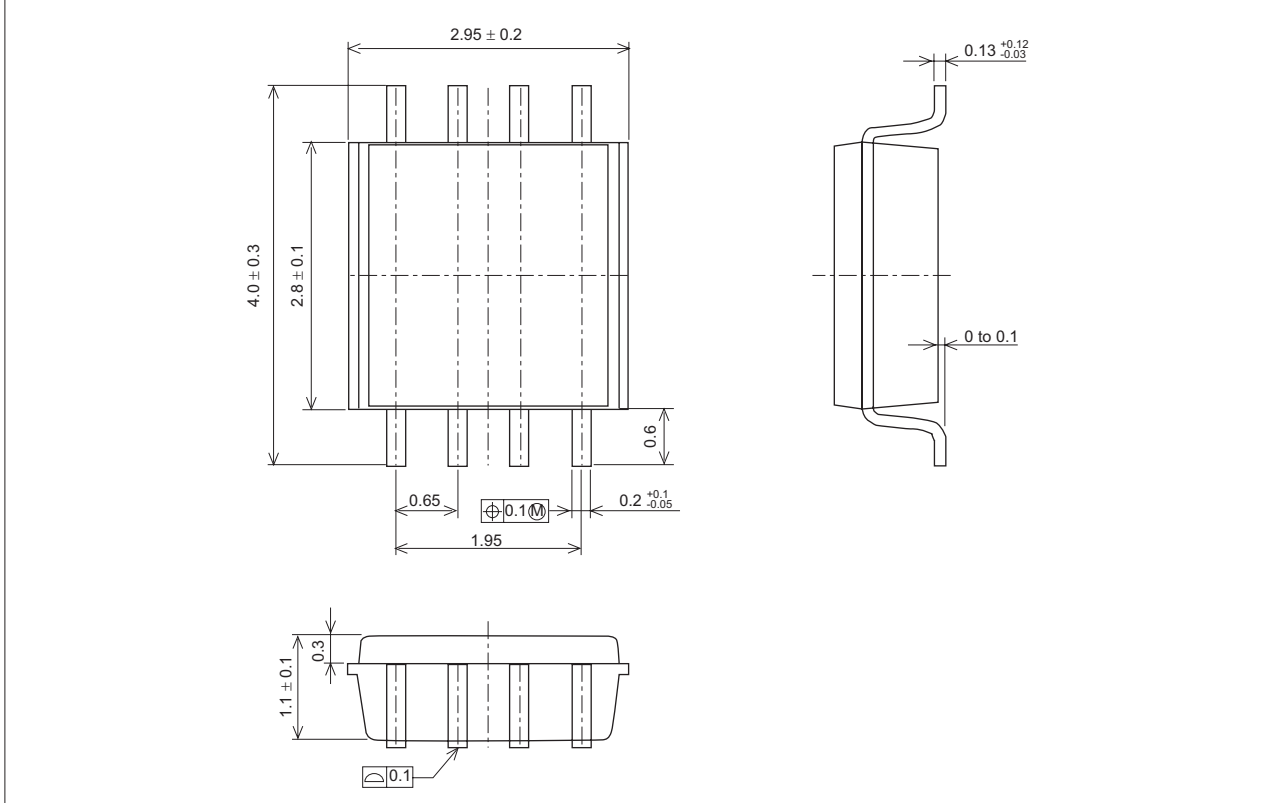
Relation between Delay Time  $T_{DLY}$  and External Component Values  $C_D, R_D$



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
MMPAK-8	P-LSOP8-2.8 x 2.95 - 0.65	PLSP0008JC-A	—	0.02 g

Unit: mm



Notes:

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