

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# RD15LD74AP, RD15LD74ANP, RD15LD74AT

## 8-bit D-type Flip-Flop Driver (with Clear)

REJ03D0894-0300

Rev.3.00

Feb 29, 2008

### Description

RD15LD74AP, RD15LD74ANP, RD15LD74AT have eight D-type flip-flop drivers and high voltage NMOS output (open drain output) in a 20 pin package. Each bit, there are a common clear and clock input. The input signal is output with the rising edge of clock signals. The voltage of maximum 15 V can be impressed to the drain-source voltage.

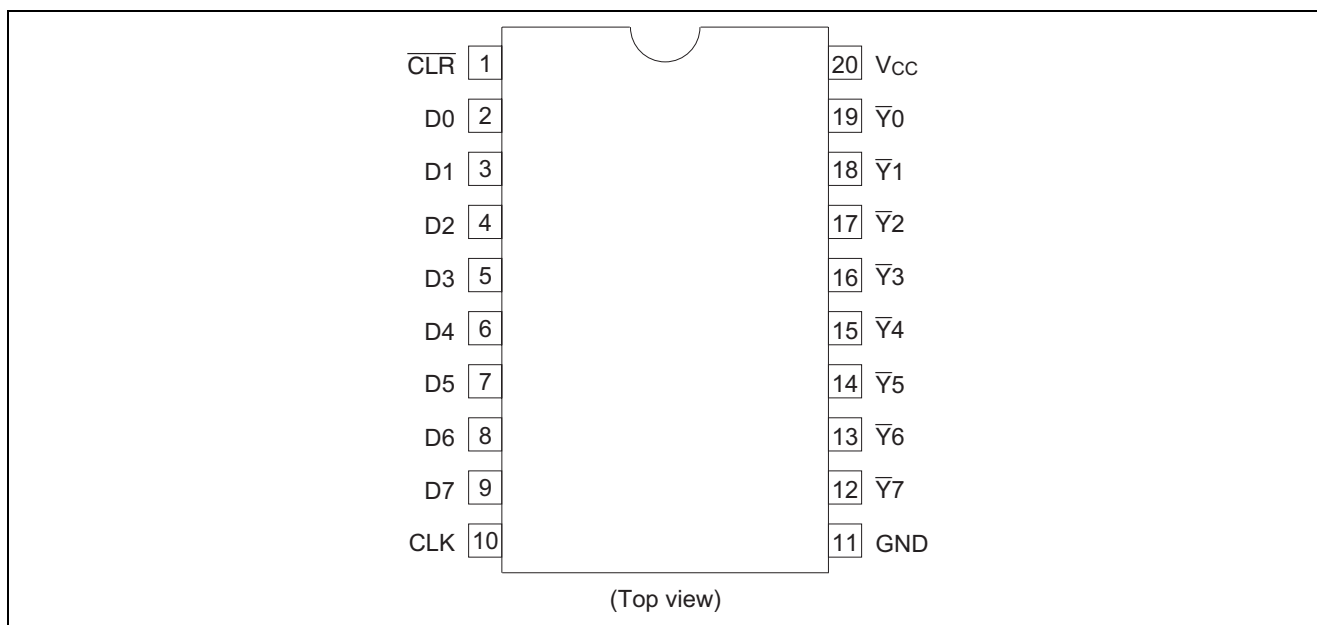
### Features

- Application of amusement equipment.
- Output voltage :  $V_{DS}(\text{max}) = 15 \text{ V}$
- Output current :  $I_{DS}(\text{max}) = 200 \text{ mA}$  (par pin)
- Supply voltage range : 3.0 to 5.5 V
- Operating temperature range :  $-20$  to  $+85 \text{ }^\circ\text{C}$
- Quiescent supply current :  $5 \mu\text{A}$  max.
- Low input current :  $1 \mu\text{A}$  max.
- Ordering Information

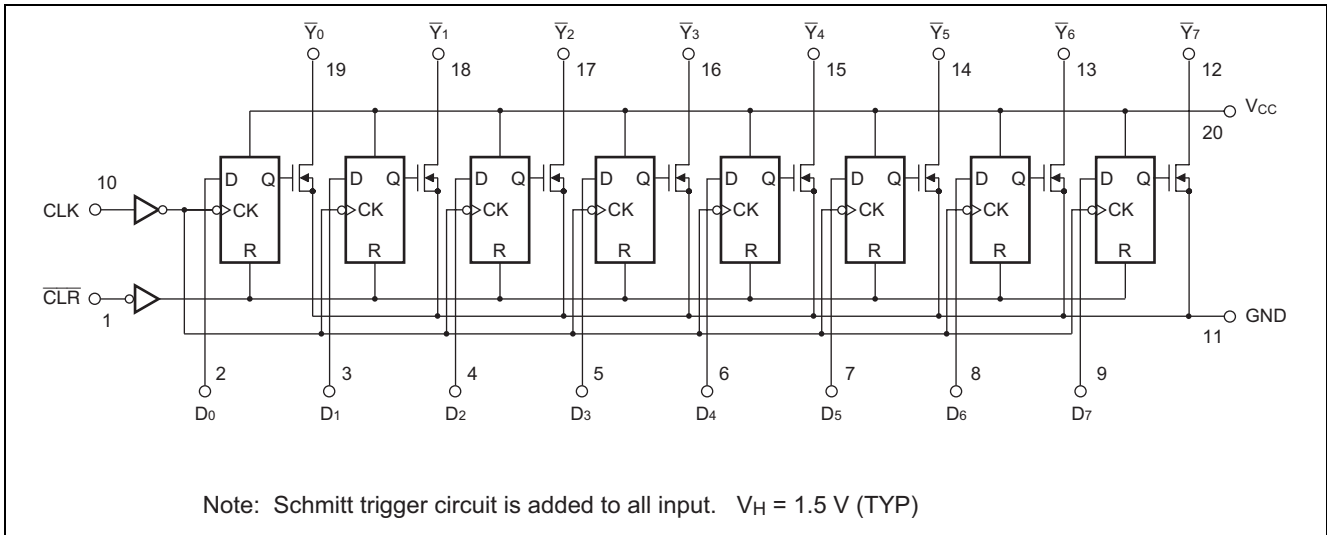
Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Packing Abbreviation (Quantity)	Surface Treatment
RD15LD74APT0	SDIP-20 pin	PRDP0020BA-A (20P4B)	P	T (1,125 pcs/box)	0 (Sn-Cu)
RD15LD74ANPT0	DILP-20 pin	PRDP0020AC-B (DP-20NEV)	P	T (1,000 pcs/box)	0 (Ni/Pd/Au)
RD15LD74ATH0	TSSOP-20 pin	PTSP0020JB-A (TTP-20DAV)	T	H (2,000 pcs/reel)	0 (Ni/Pd/Au)

Note: Please consult the sales office for the above package availability.

### Pin Arrangement



### Logic Diagram



### Function Table

Inputs			Output
$\overline{\text{CLR}}$	CLK	D	$\overline{\text{Y}}$
L	X	X	Z
H	$\uparrow$	L	Z
H	$\uparrow$	H	L
H	L	X	$\text{Y}_0$
H	$\downarrow$	X	$\text{Y}_0$

H : High level

L : Low level

X : Immaterial

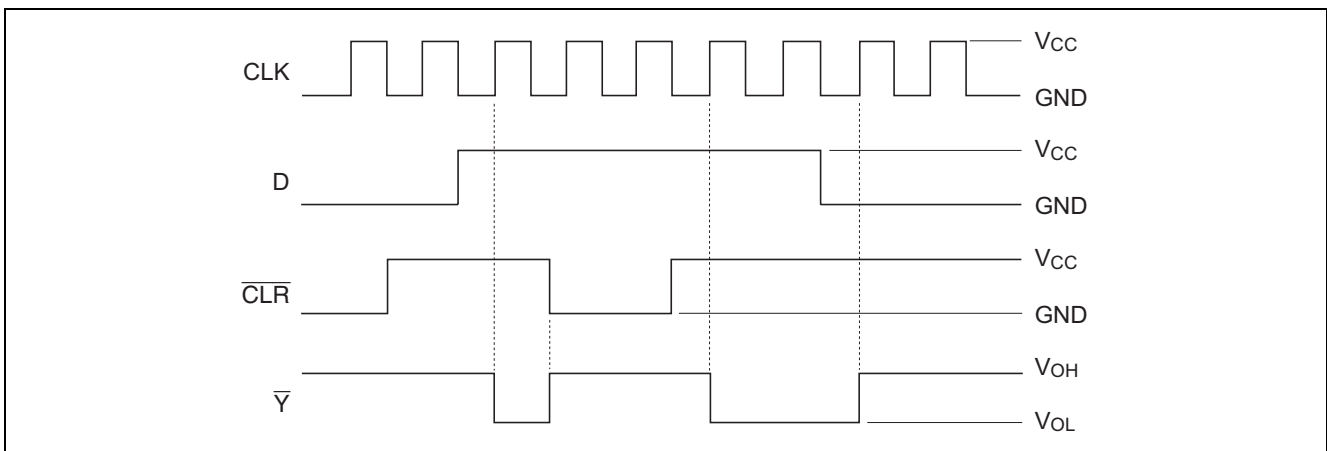
Z : High Impedance

$\uparrow$  : Low to High transition

$\downarrow$  : High to Low transition

$\text{Y}_0$  : Level of  $\overline{\text{Y}}$  before the indicated steady input conditions were established.

### Timing Figure



## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions	
Supply voltage	$V_{CC}$	6.5	V		
Input voltage	$V_I$	-0.5 to $V_{CC}$	V		
Output voltage	$V_{DS}$	-0.5 to 15	V	Output : "Z" (off)	
Output current	$I_{DS}$	200	mA	Output : "on", Current of one circuit	
Maximum power dissipation <sup>*1</sup>	$P_T$	1.47	W	SDIP	Ta = 25°C Base implementation
		1.38		DILP	
		0.76		TSSOP	
Storage temperature	Tstg	-55 to +125	°C		

Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore no two of which may be realized at the same time.

1. The maximum package power dissipation was calculated using a junction temperature of 150°C

## Recommended Operating Conditions

Item	Symbol	Ratings		Unit	Conditions	
Supply voltage	$V_{CC}$	3.0	5.5	V		
Input voltage	$V_I$	0	$V_{CC}$	V		
Output voltage	$V_{DS}$	0	15	V	Output "Z" (off)	
Output current (Current of an one circuit, when eight circuit operation)	$I_{DS}$	0	200	mA	SDIP	Duty cycle ≤ 60%
		0	150			Duty cycle ≤ 100%
		0	200	mA	DILP	Duty cycle ≤ 55%
		0	140			Duty cycle ≤ 100%
		0	200	mA	TSSOP	Duty cycle ≤ 25%
		0	105			Duty cycle ≤ 100%
Input rise / fall time	$t_r, t_f$	0	500	ns	$V_{CC} = 3.0\text{ V}, 4.5\text{ V}$	
Operating temperature	Ta	-20	85	°C		

Note: Unused or floating inputs must be held high or low.

## Electrical Characteristics

(Ta = -20 to +85°C)

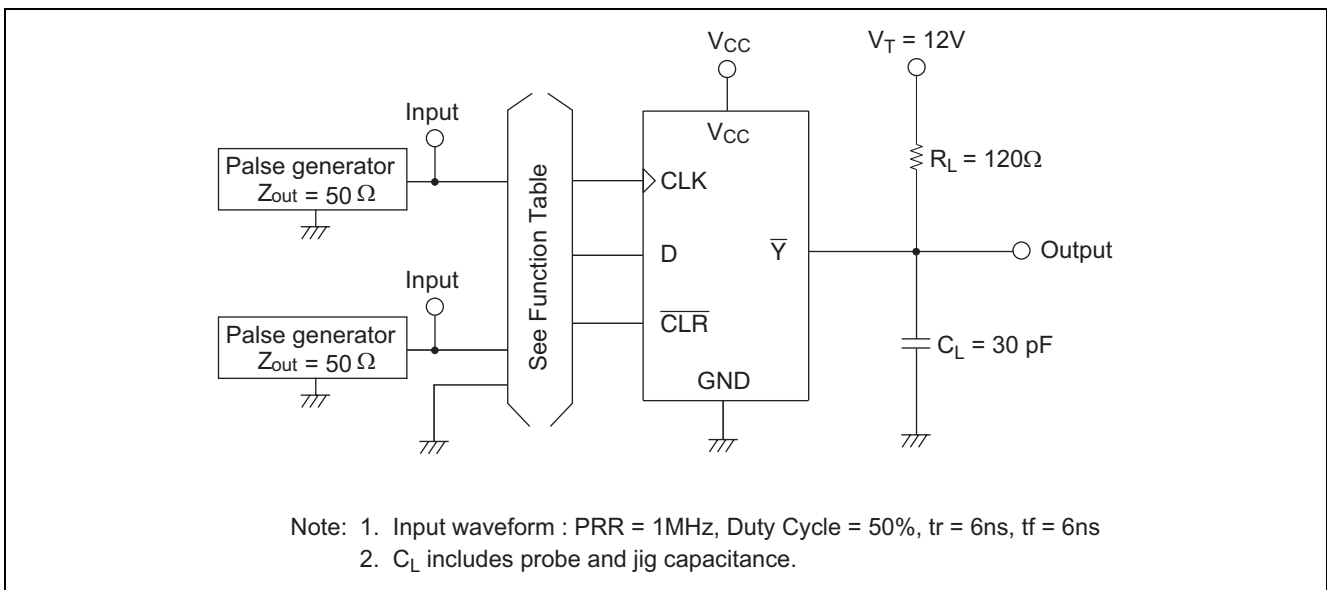
Item	Symbol	VCC (V)	Ratings			Unit	Conditions
			Min	Typ	Max		
Input voltage	$V_{IH}$	3.0 to 3.6	$V_{CC} \times 0.84$	—	—	V	
		4.5 to 5.5	$V_{CC} \times 0.76$	—	—		
	$V_{IL}$	3.0 to 3.6	—	—	$V_{CC} \times 0.16$	V	
		4.5 to 5.5	—	—	$V_{CC} \times 0.24$		
Output voltage	$V_{DS}$	3.0 to 3.6	—	0.30	0.45	V	$I_{DS} = 100\text{ mA}$
		4.5 to 5.5	—	0.25	0.38		
		3.0 to 3.6	—	0.60	0.90		$I_{DS} = 200\text{ mA}$
		4.5 to 5.5	—	0.51	0.77		
"H" input current	$I_{IH}$	3.0 to 5.5	—	0.005	1.0	μA	$V_I = V_{CC}$
"L" input current	$I_{IL}$	3.0 to 5.5	—	0.005	-1.0	μA	$V_I = 0\text{ V}$
Quiescent supply current	$I_{CC}$	5.5	—	0.005	5.0	μA	All output "Z" (off) $V_I = V_{CC}$ or GND
		5.5	—	0.005	5.0		All output "on", $V_I = V_{CC}$ or GND
Output off state leak current	$I_{DS}$	5.0	—	0.002	5.0	μA	$V_{DS} = 12\text{ V}$
Output on resister	$R_{DS}$	4.5	—	2.5	3.8	Ω	$I_{DS} = 100\text{ mA}$

## Switching Characteristics

( $T_a = -20$  to  $+85^\circ\text{C}$ ,  $C_L = 30$  pF,  $t_r = t_f = 6$  ns)

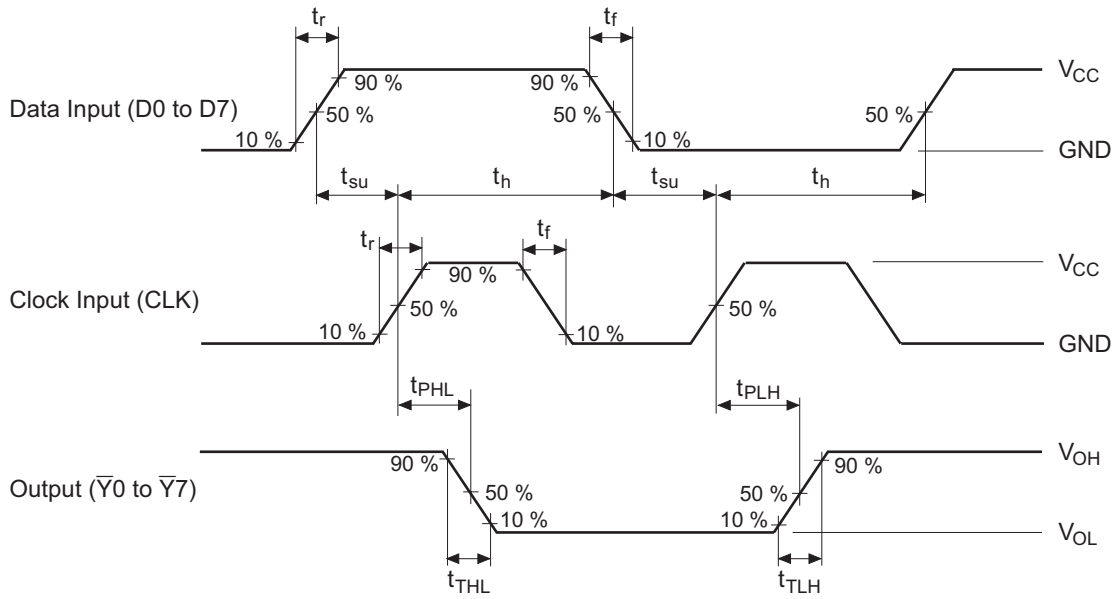
Item	Symbol	VCC (V)	Ratings		Unit	Conditions
			Min	Max		
Maximum clock frequency	$f_{\max}$	$3.3 \pm 0.3$	—	15	MHz	
		$5.0 \pm 0.5$	—	20		
Propagation delay time	$t_{\text{PLH}}$	$3.3 \pm 0.3$	1.0	65	ns	CLK, $\overline{\text{CLR}}$ to $\overline{\text{Y}}$
		$5.0 \pm 0.5$	1.0	50		
Propagation delay time	$t_{\text{PHL}}$	$3.3 \pm 0.3$	1.0	60	ns	CLK to $\overline{\text{Y}}$
		$5.0 \pm 0.5$	1.0	45		
Setup time	$t_{\text{su}}$	$3.3 \pm 0.3$	25	—	ns	D to CLK
		$5.0 \pm 0.5$	20	—		
Hold time	$t_{\text{h}}$	$3.3 \pm 0.3$	3	—	ns	CLK to D
		$5.0 \pm 0.5$	3	—		
Pulse width	$t_{\text{w}}$	$3.3 \pm 0.3$	50	—	ns	CLK, $\overline{\text{CLR}}$
		$5.0 \pm 0.5$	40	—		
Output rise time	$t_{\text{TLH}}$	$3.3 \pm 0.3$	—	30	ns	$\overline{\text{Y}}$
		$5.0 \pm 0.5$	—	20		
Output fall time	$t_{\text{THL}}$	$3.3 \pm 0.3$	—	10	ns	$\overline{\text{Y}}$
		$5.0 \pm 0.5$	—	5		

## Test Circuit

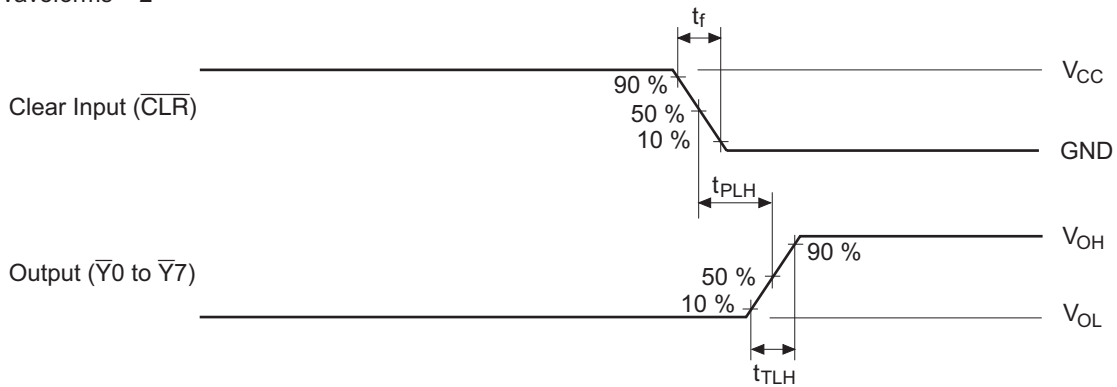


Waveforms

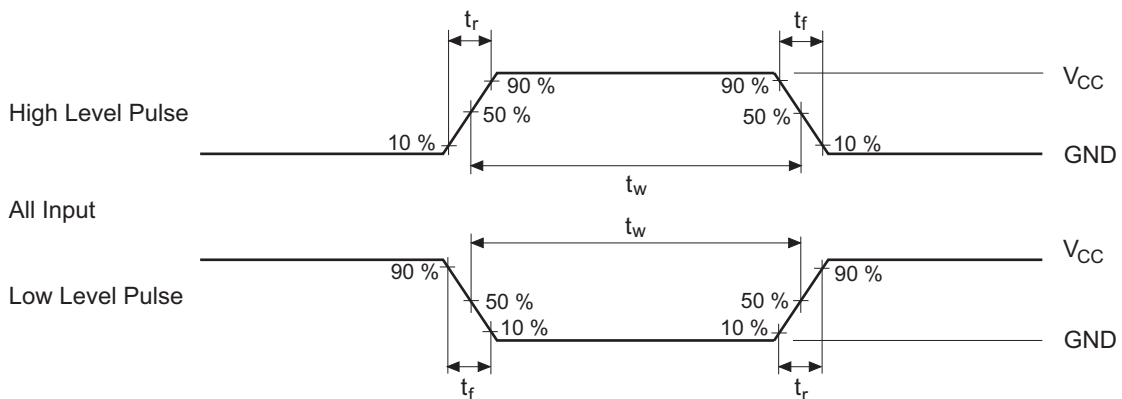
• Waveforms – 1



• Waveforms – 2

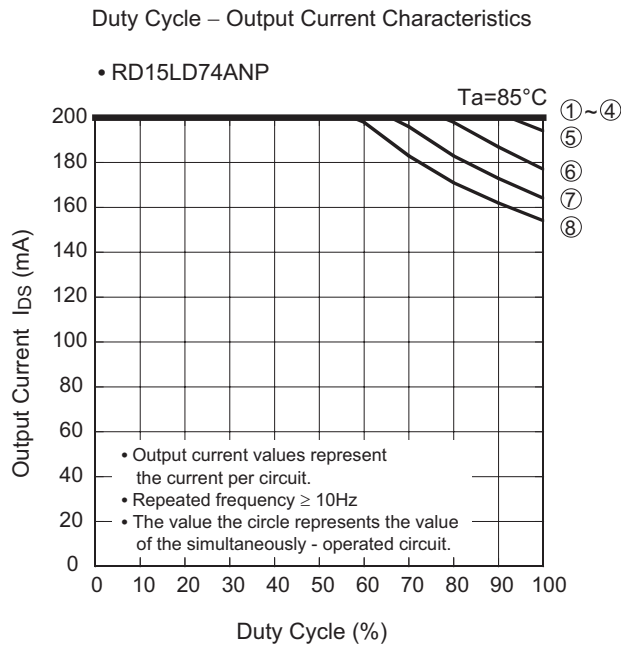
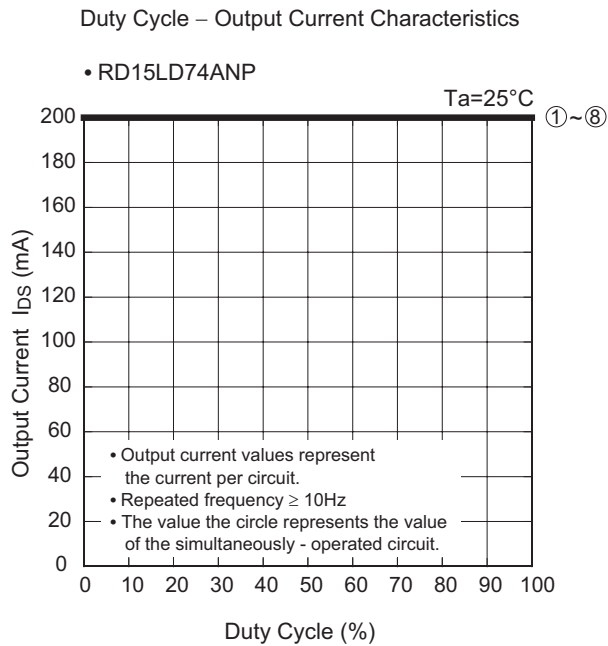
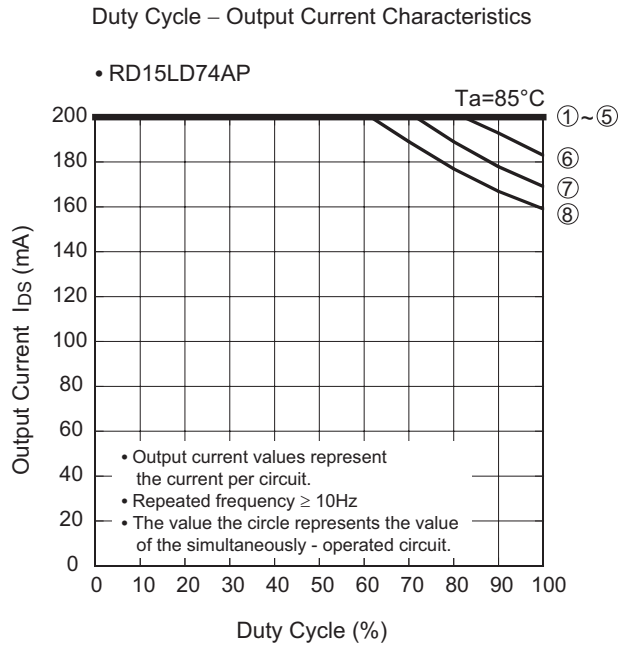
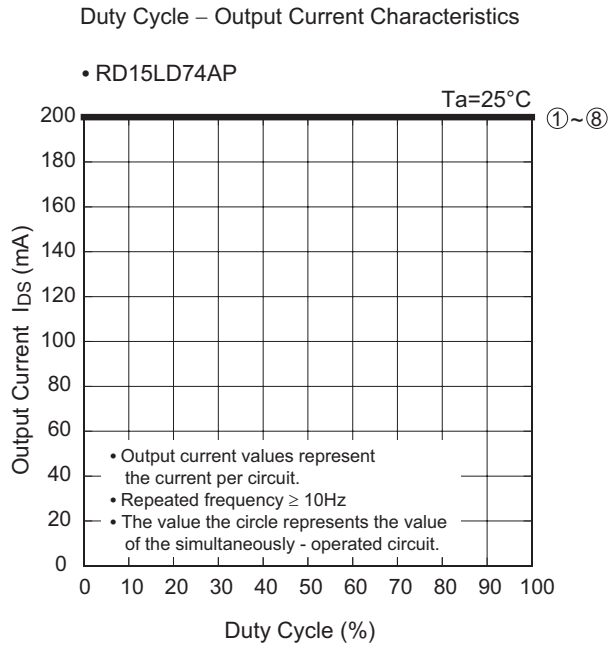


• Waveforms – 3



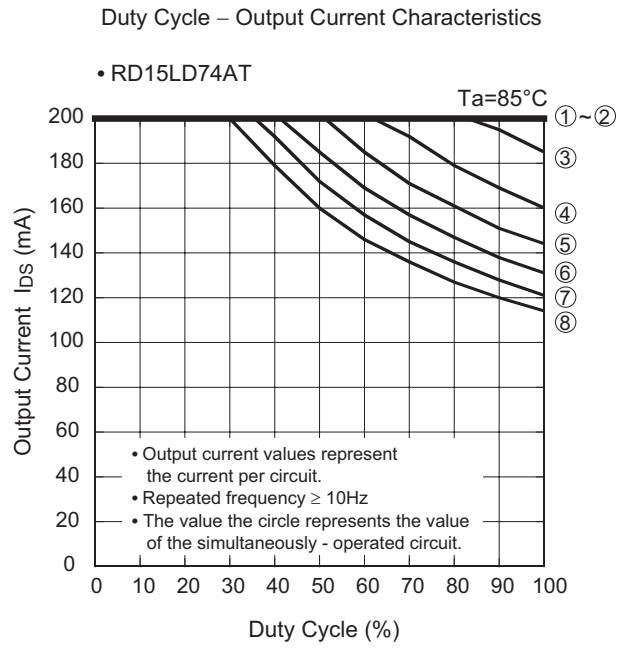
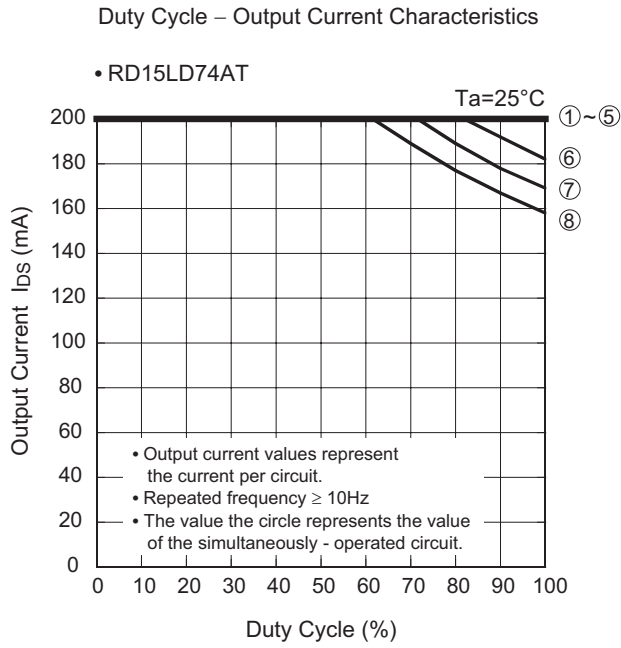
- Notes: 1. Input waveform : PRR  $\leq$  1 MHz,  $Z_o = 50 \Omega$ ,  $t_r \leq 6$  ns,  $t_f \leq 6$  ns  
 2. The input and output is measured one at a time with one transition per measurement.

Application Data

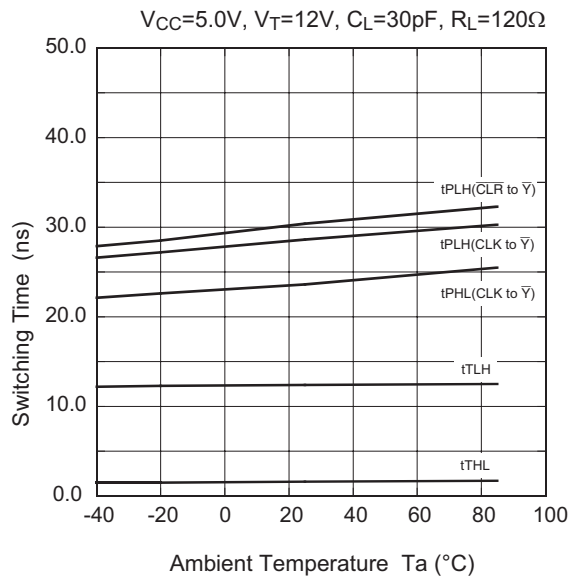




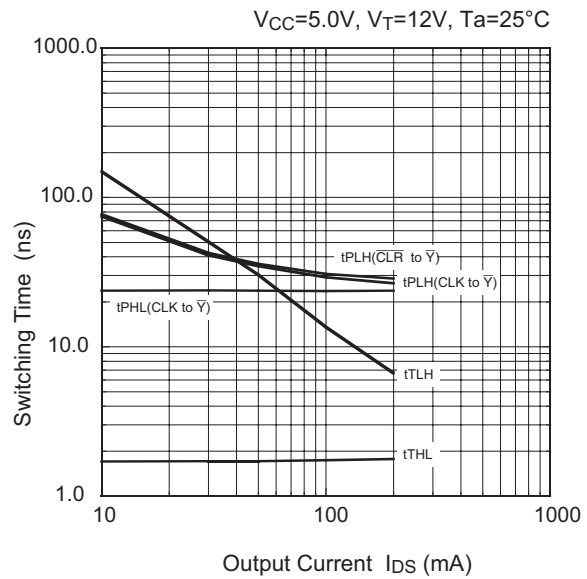
Application Data



Switching Time – Ambient Temperature Characteristics

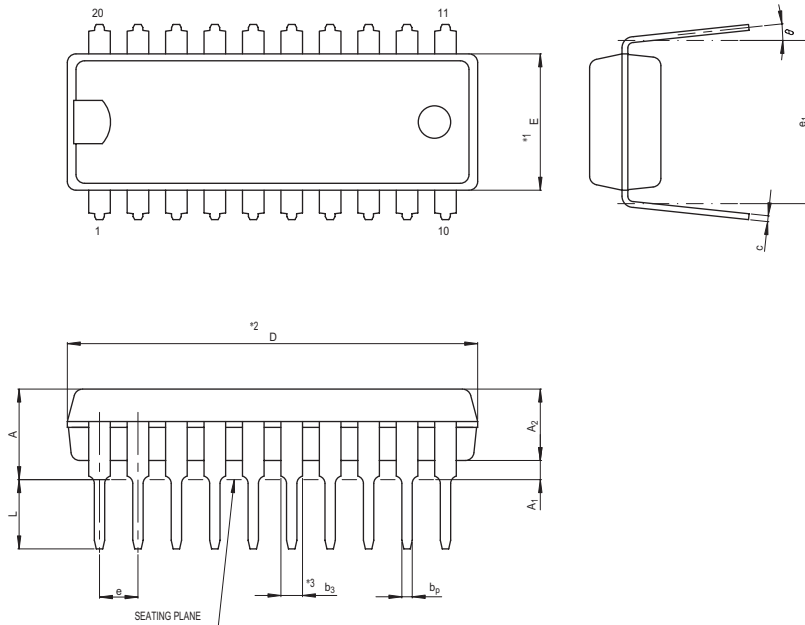


Switching Time – Output Current Characteristics



Package Dimensions

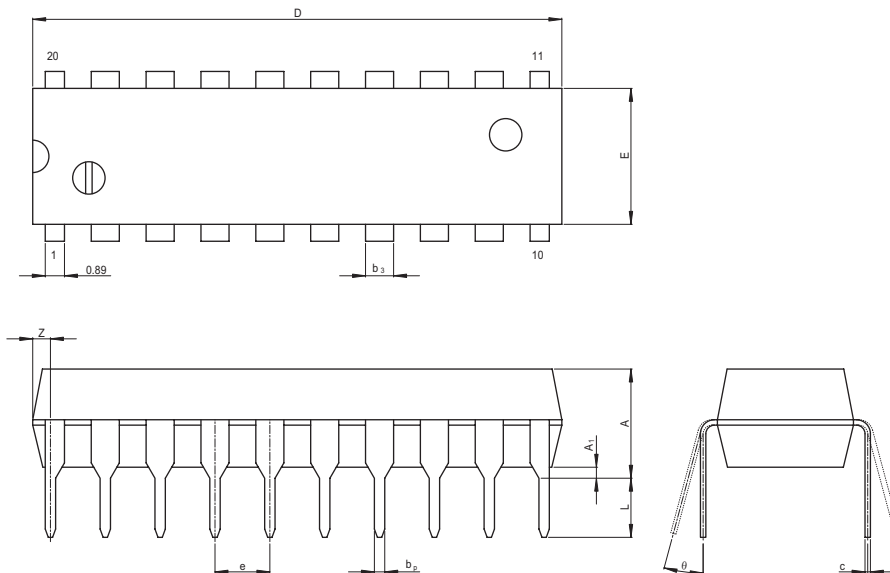
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SDIP20-6.3x19-1.78	PRDP0020BA-A	20P4B	1.0g



NOTE)  
 1. DIMENSIONS \*\*1\* AND \*\*2\* DO NOT INCLUDE MOLD FLASH.  
 2. DIMENSION \*\*3\* DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e <sub>1</sub>	7.32	7.62	7.92
D	18.8	19.0	19.2
E	6.15	6.3	6.45
A	—	—	4.5
A <sub>1</sub>	0.51	—	—
A <sub>2</sub>	—	3.3	—
b <sub>p</sub>	0.38	0.48	0.58
b <sub>3</sub>	0.9	1.0	1.3
c	0.22	0.27	0.34
θ	0°	—	15°
e	1.528	1.778	2.028
L	3.0	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP20-6.3x24.5-2.54	PRDP0020AC-B	DP-20NEV	1.26g

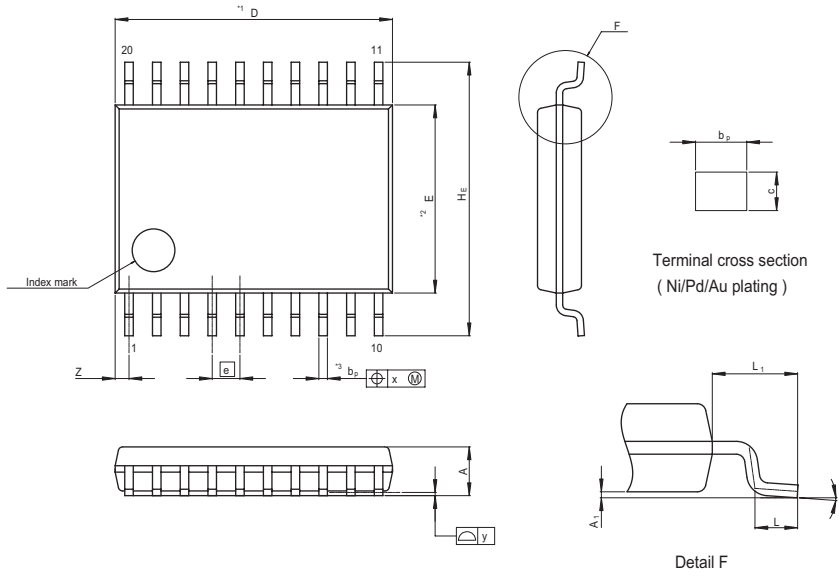


(Ni/Pd/Au plating)

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e <sub>1</sub>	—	7.62	—
D	—	24.50	25.40
E	—	6.30	7.00
A	—	—	5.08
A <sub>1</sub>	0.51	—	—
b <sub>p</sub>	0.40	0.48	0.56
b <sub>3</sub>	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	1.27
L	2.54	—	—

# RD15LD74AP, RD15LD74ANP, RD15LD74AT

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP20-4.4x6.5-0.65	PTSP0020JB-A	TTP-20DAV	0.07g



NOTE)  
 1. DIMENSIONS\*\*1 (Nom)\*\*AND\*\*2\*  
 DO NOT INCLUDE MOLD FLASH.  
 2. DIMENSION\*\*3\*DOES NOT  
 INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	6.50	6.80
E	—	4.40	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.03	0.07	0.10
A	—	—	1.10
b <sub>p</sub>	0.15	0.20	0.25
b <sub>1</sub>	—	—	—
c	0.10	0.15	0.20
c <sub>1</sub>	—	—	—
θ	0°	—	8°
HE	6.20	6.40	6.60
Ⓜ	—	0.65	—
x	—	—	0.13
y	—	—	0.10
Z	—	—	0.65
L	0.4	0.5	0.6
L <sub>1</sub>	—	1.0	—

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