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.

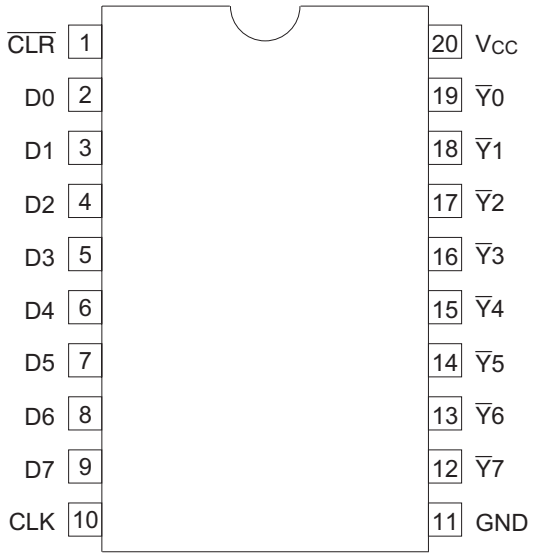
Features

- Application of amusement equipment.
- Output voltage : V_{DS} (max) = 15 V
- Output current : I_{DS} (max) = 200 mA (par pin)
- Supply voltage range : 3.0 to 5.5 V
- Operating temperature range : –20 to +85 °C
- Quiescent supply current : 5 µA max.
- Low input current : 1 µA 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)

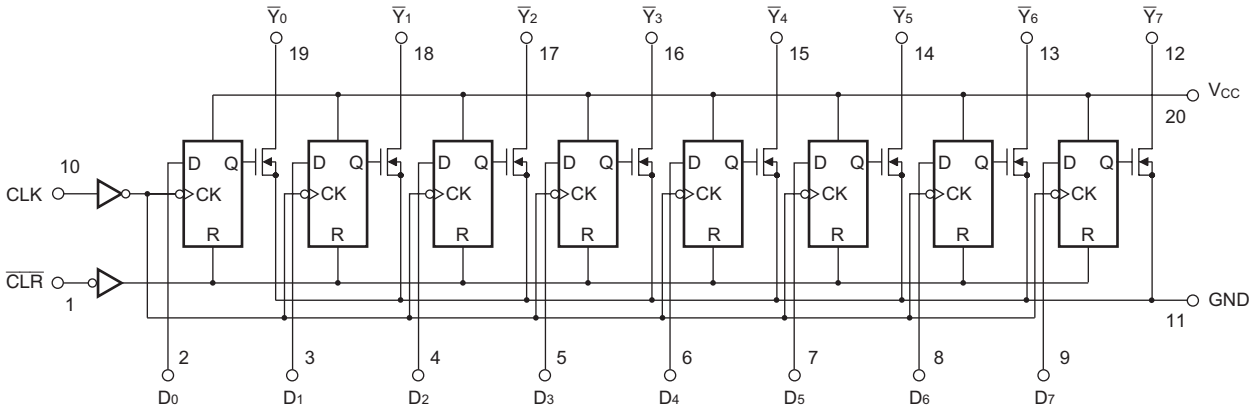
Note: Please consult the sales office for the above package availability.

Pin Arrangement



(Top view)

Logic Diagram



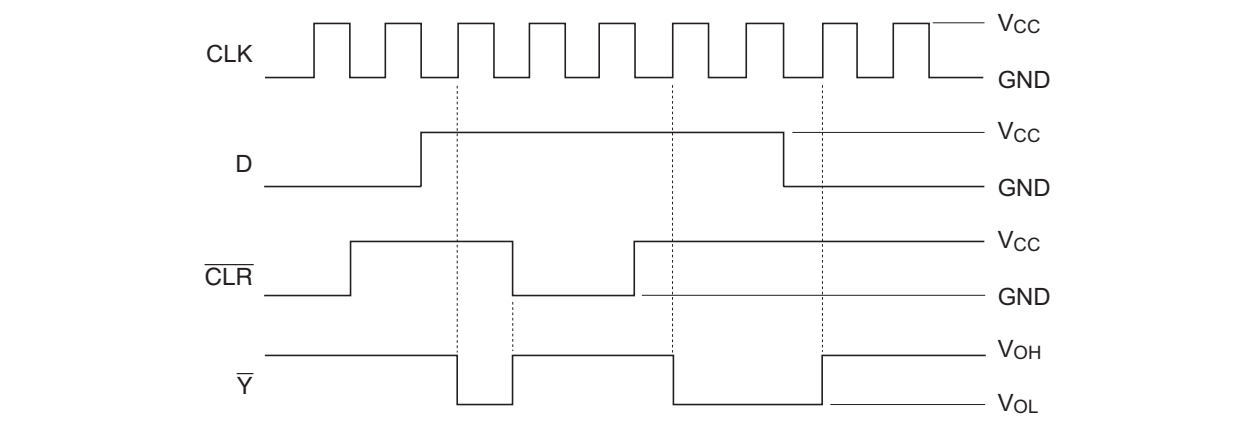
Note: Schmitt trigger circuit is added to all input. V_H = 1.5 V (TYP)

Function Table

Inputs			Output
$\overline{CLR}$	CLK	D	$\overline{Y}$
L	X	X	Z
H	↑	L	Z
H	↑	H	L
H	L	X	Y_0
H	↓	X	Y_0

H : High level
L : Low level
X : Immaterial
Z : High Impedance
↑ : Low to High transition
↓ : High to Low transition
Y_0 : Level of $\overline{Y}$ 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 [*1]	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 V, 4.5 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)

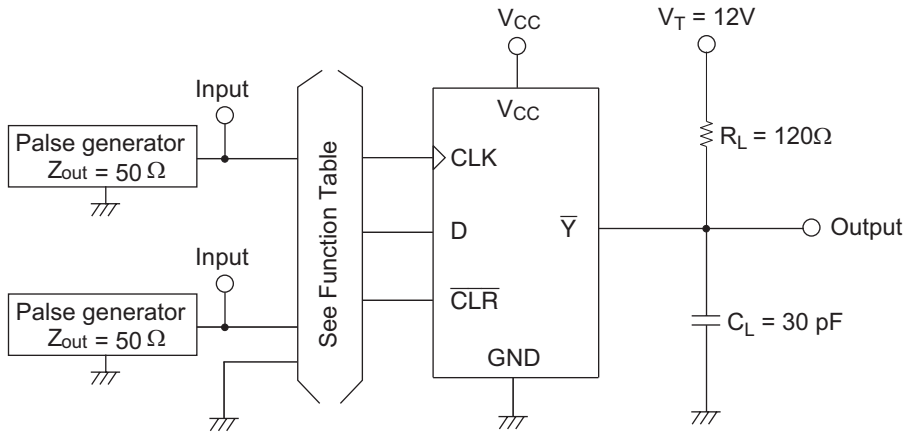
Item	Symbol	VCC (V)	Ratings			Unit	Conditions
			Min	Typ	Max		
Input voltage	V_{IH}	3.0 to 3.6	V_{CC}×0.84	—	—	V	
		4.5 to 5.5	V_{CC}×0.76	—	—		
	V_{IL}	3.0 to 3.6	—	—	V_{CC}×0.16	V	
		4.5 to 5.5	—	—	V_{CC}×0.24		
Output voltage	V_{DS}	3.0 to 3.6	—	0.30	0.45	V	I_{DS} = 100 mA
		4.5 to 5.5	—	0.25	0.38		
		3.0 to 3.6	—	0.60	0.90		I_{DS} = 200 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 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 V
Output on resister	R_{DS}	4.5	—	2.5	3.8	Ω	I_{DS} = 100 mA

Switching Characteristics

(Ta = –20 to +85°C, CL = 30 pF, tr = tf =6 ns)

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

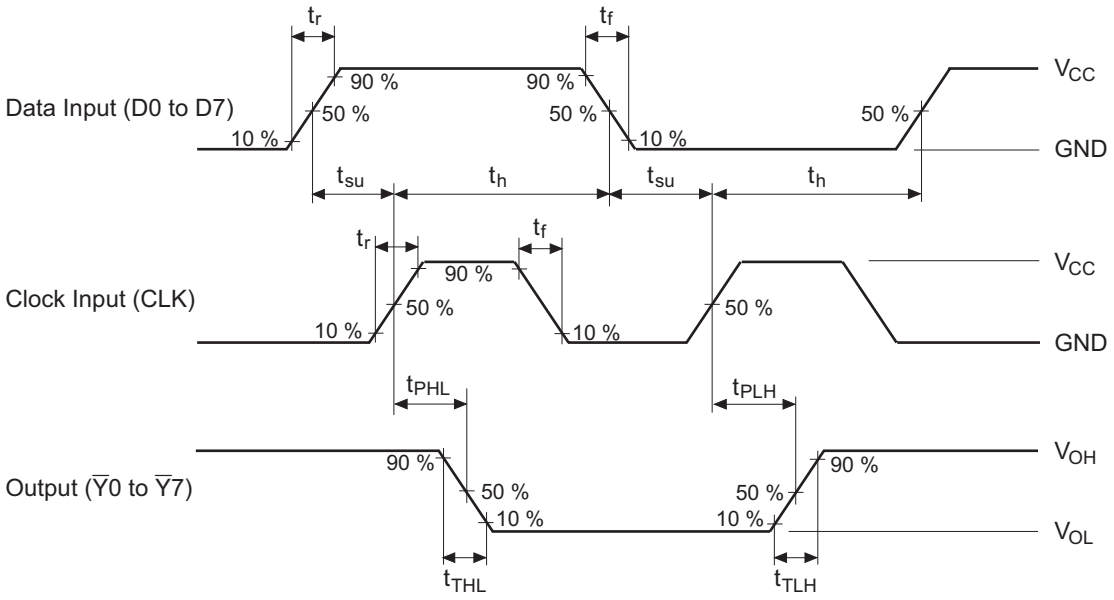
Test Circuit



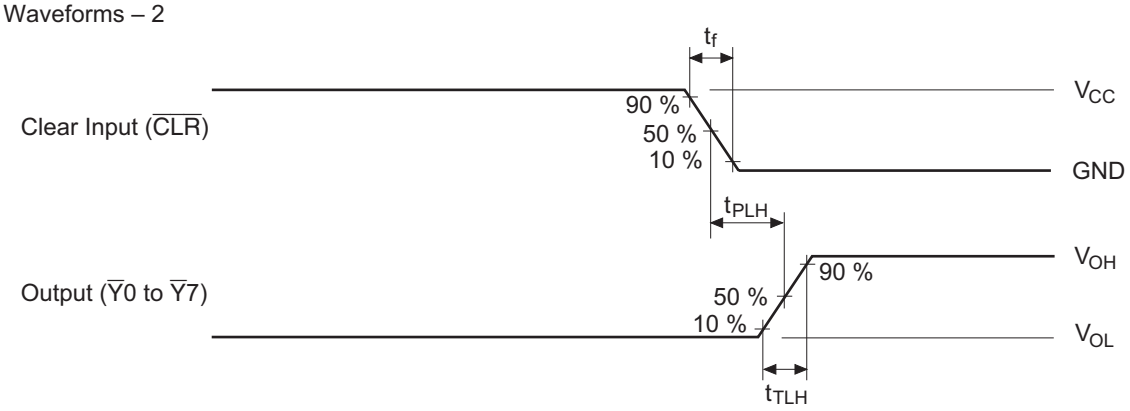
Note: 1. Input waveform : PRR = 1MHz, Duty Cycle = 50%, tr = 6ns, tf = 6ns
2. C_L includes probe and jig capacitance.

Waveforms

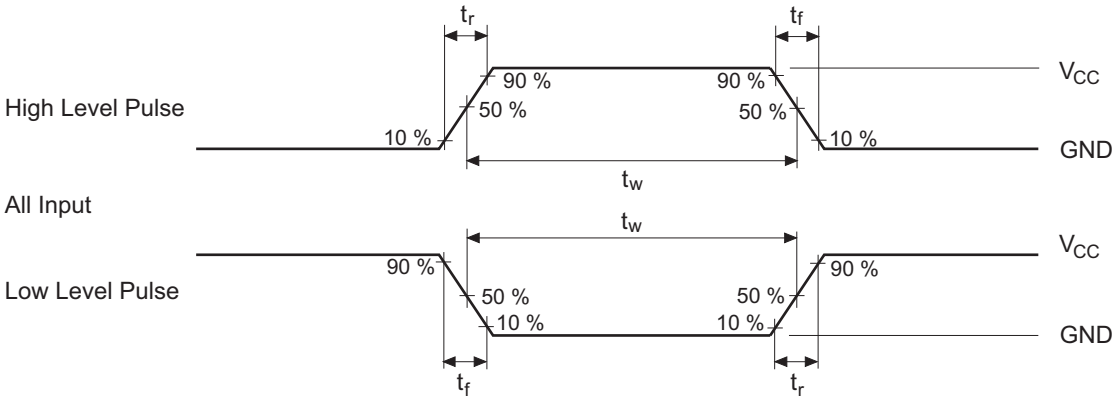
• Waveforms – 1



• Waveforms – 2



• Waveforms – 3

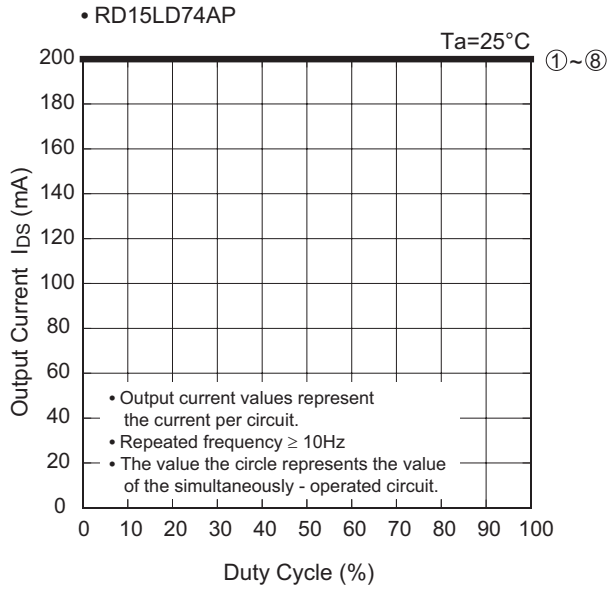


Notes: 1. Input waveform : PRR ≤ 1 MHz, Zo = 50 Ω, t_r ≤ 6 ns, t_f ≤ 6 ns
2. The input and output is measured one at a time with one transition per measurement.

Application Data

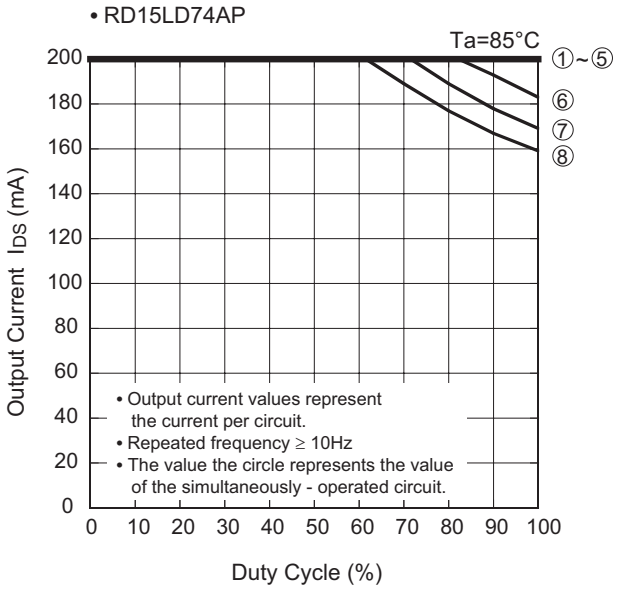
Duty Cycle – Output Current Characteristics

• RD15LD74AP



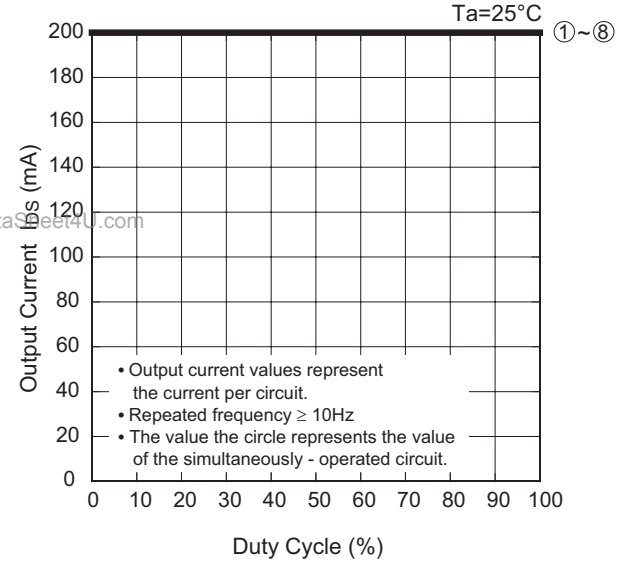
Duty Cycle – Output Current Characteristics

• RD15LD74AP



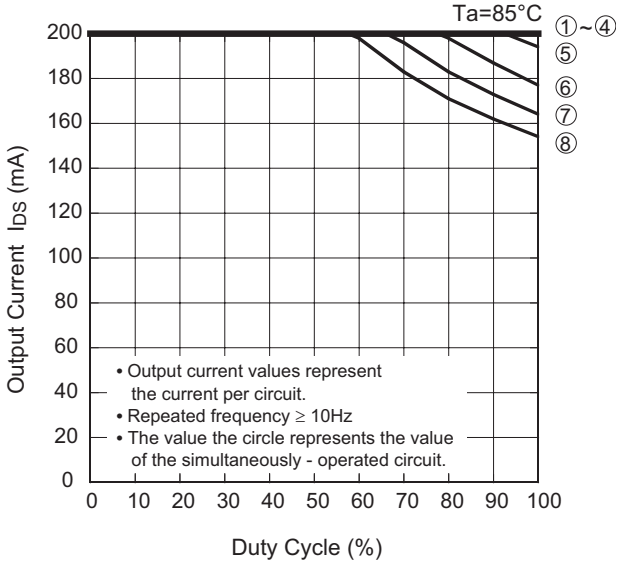
Duty Cycle – Output Current Characteristics

• RD15LD74ANP



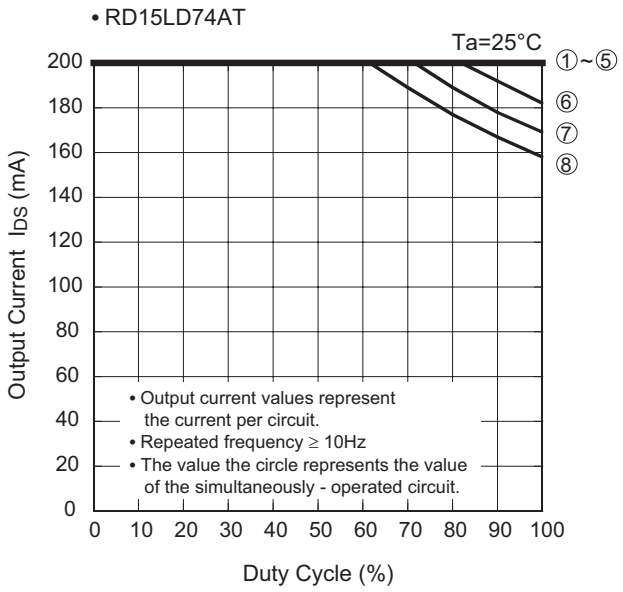
Duty Cycle – Output Current Characteristics

• RD15LD74ANP

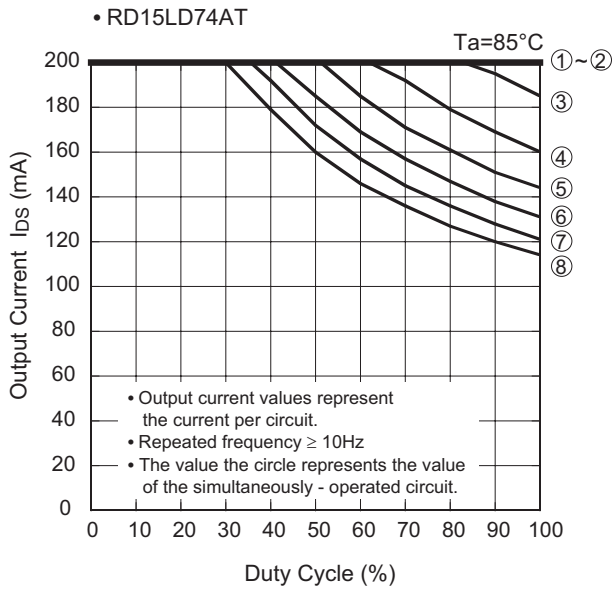


Application Data

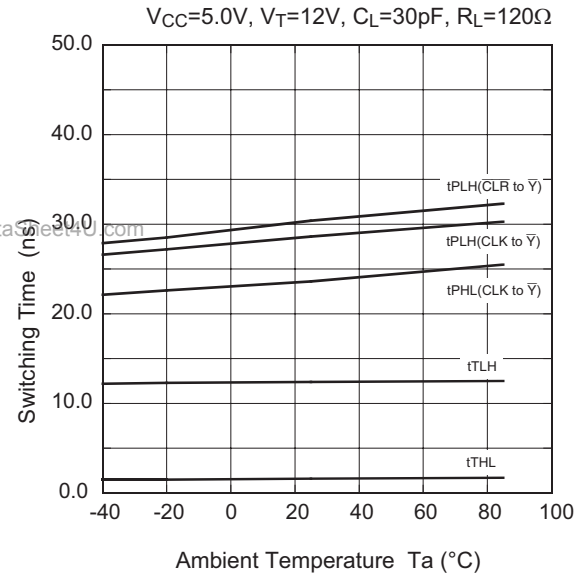
Duty Cycle – Output Current Characteristics



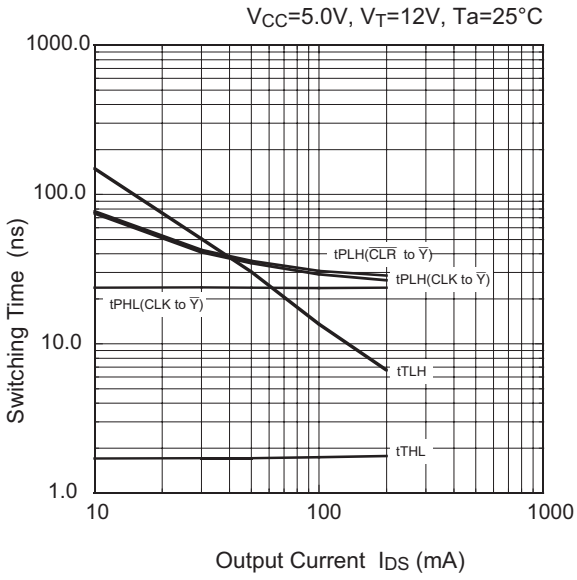
Duty Cycle – Output Current Characteristics



Switching Time – Ambient Temperature Characteristics

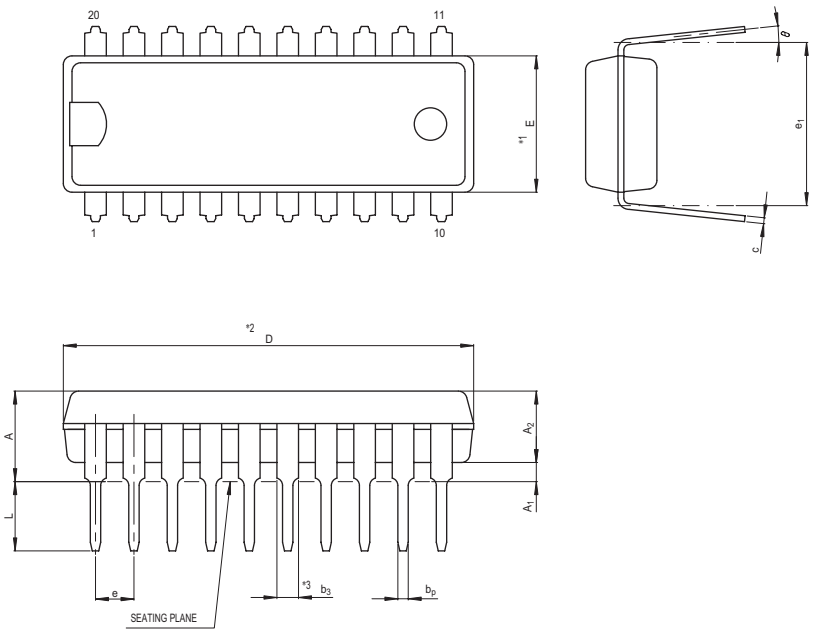


Switching Time – Output Current Characteristics



Package Dimensions

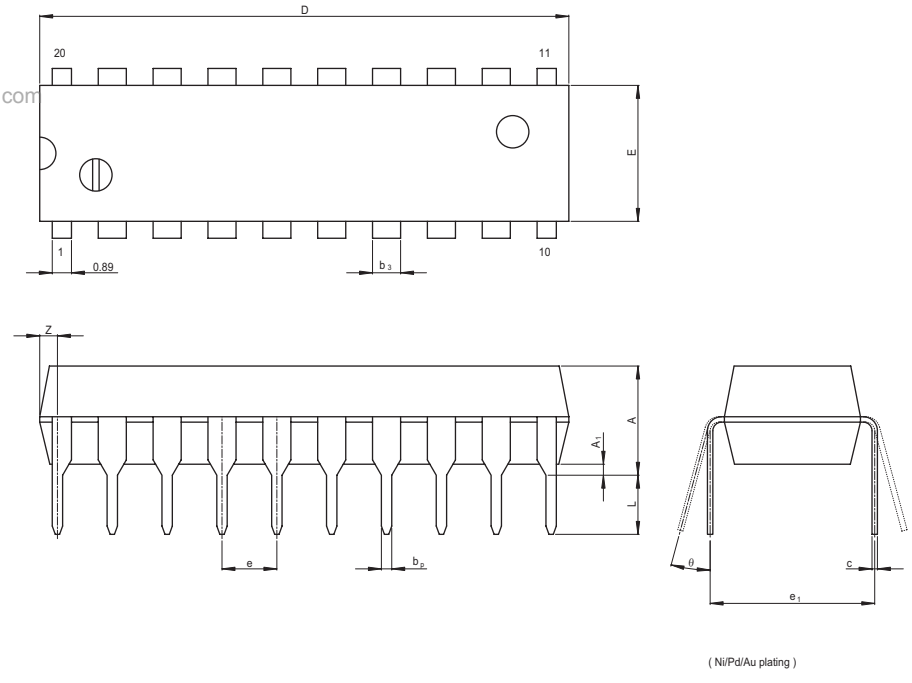
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SDIP20-6.3x19-1.78	PRDP0020BA-A	20P4B	1.0g



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

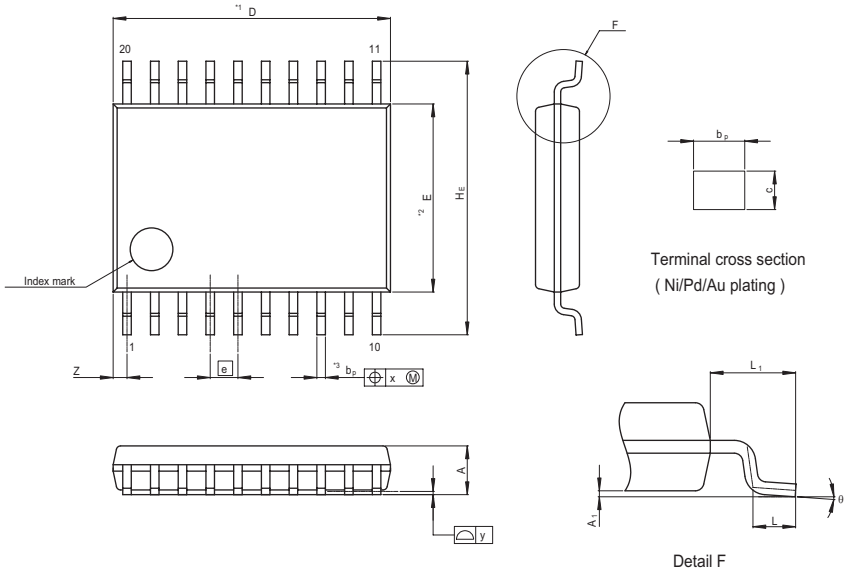
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	7.32	7.62	7.92
D	18.8	19.0	19.2
E	6.15	6.3	6.45
A	—	—	4.5
A_1	0.51	—	—
A_2	—	3.3	—
b_p	0.38	0.48	0.58
b_3	0.9	1.0	1.3
c	0.22	0.27	0.34
θ	0°	—	15°
e	1.528	1.778	2.028
L	3.0	—	—

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



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	—	7.62	—
D	—	24.50	25.40
E	—	6.30	7.00
A	—	—	5.08
A_1	0.51	—	—
b_p	0.40	0.48	0.56
b_3	—	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	—	—

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_2	—	—	—
A_1	0.03	0.07	0.10
A	—	—	1.10
b_p	0.15	0.20	0.25
b_1	—	—	—
c	0.10	0.15	0.20
c_1	—	—	—
θ	0°	—	8°
H_E	6.20	6.40	6.60
e	—	0.65	—
x	—	—	0.13
y	—	—	0.10
Z	—	—	0.65
L	0.4	0.5	0.6
L_1	—	1.0	—

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Notes:
1. This document is provided for reference purposes only so that Renesas customers may select the appropriate Renesas products for their use. Renesas neither makes warranties or representations with respect to the accuracy or completeness of the information contained in this document nor grants any license to any intellectual property rights or any other rights of Renesas or any third party with respect to the information in this document.
2. Renesas shall have no liability for damages or infringement of any intellectual property or other rights arising out of the use of any information in this document, including, but not limited to, product data, diagrams, charts, programs, algorithms, and application circuit examples.
3. You should not use the products or the technology described in this document for the purpose of military applications such as the development of weapons of mass destruction or for the purpose of any other military use. When exporting the products or technology described herein, you should follow the applicable export control laws and regulations, and procedures required by such laws and regulations.
4. All information included in this document such as product data, diagrams, charts, programs, algorithms, and application circuit examples, is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas products listed in this document, please confirm the latest product information with a Renesas sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas such as that disclosed through our website. (http://www.renesas.com)
5. Renesas has used reasonable care in compiling the information included in this document, but Renesas assumes no liability whatsoever for any damages incurred as a result of errors or omissions in the information included in this document.
6. When using or otherwise relying on the information in this document, you should evaluate the information in light of the total system before deciding about the applicability of such information to the intended application. Renesas makes no representations, warranties or guaranties regarding the suitability of its products for any particular application and specifically disclaims any liability arising out of the application and use of the information in this document or Renesas products.
7. With the exception of products specified by Renesas as suitable for automobile applications, Renesas products are not designed, manufactured or tested for applications or otherwise in systems the failure or malfunction of which may cause a direct threat to human life or create a risk of human injury or which require especially high quality and reliability such as safety systems, or equipment or systems for transportation and traffic, healthcare, combustion control, aerospace and aeronautics, nuclear power, or undersea communication transmission. If you are considering the use of our products for such purposes, please contact a Renesas sales office beforehand. Renesas shall have no liability for damages arising out of the uses set forth above.
8. Notwithstanding the preceding paragraph, you should not use Renesas products for the purposes listed below:
   (1) artificial life support devices or systems
   (2) surgical implantations
   (3) healthcare intervention (e.g., excision, administration of medication, etc.)
   (4) any other purposes that pose a direct threat to human life
   Renesas shall have no liability for damages arising out of the uses set forth in the above and purchasers who elect to use Renesas products in any of the foregoing applications shall indemnify and hold harmless Renesas Technology Corp., its affiliated companies and their officers, directors, and employees against any and all damages arising out of such applications.
9. You should use the products described herein within the range specified by Renesas, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas shall have no liability for malfunctions or damages arising out of the use of Renesas products beyond such specified ranges.
10. Although Renesas endeavors to improve the quality and reliability of its products, IC products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other applicable measures. Among others, since the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
11. In case Renesas products listed in this document are detached from the products to which the Renesas products are attached or affixed, the risk of accident such as swallowing by infants and small children is very high. You should implement safety measures so that Renesas products may not be easily detached from your products. Renesas shall have no liability for damages arising out of such detachment.
12. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written approval from Renesas.
13. Please contact a Renesas sales office if you have any questions regarding the information contained in this document, Renesas semiconductor products, or if you have any other inquiries.

RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7858/7898

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2377-3473

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 3518-3399

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510