

# RD30LDT3595

## 24-bit Serial-in Parallel-out LED Driver IC

REJ03D0896-0200  
Rev.2.00  
Feb 22, 2008

### Description

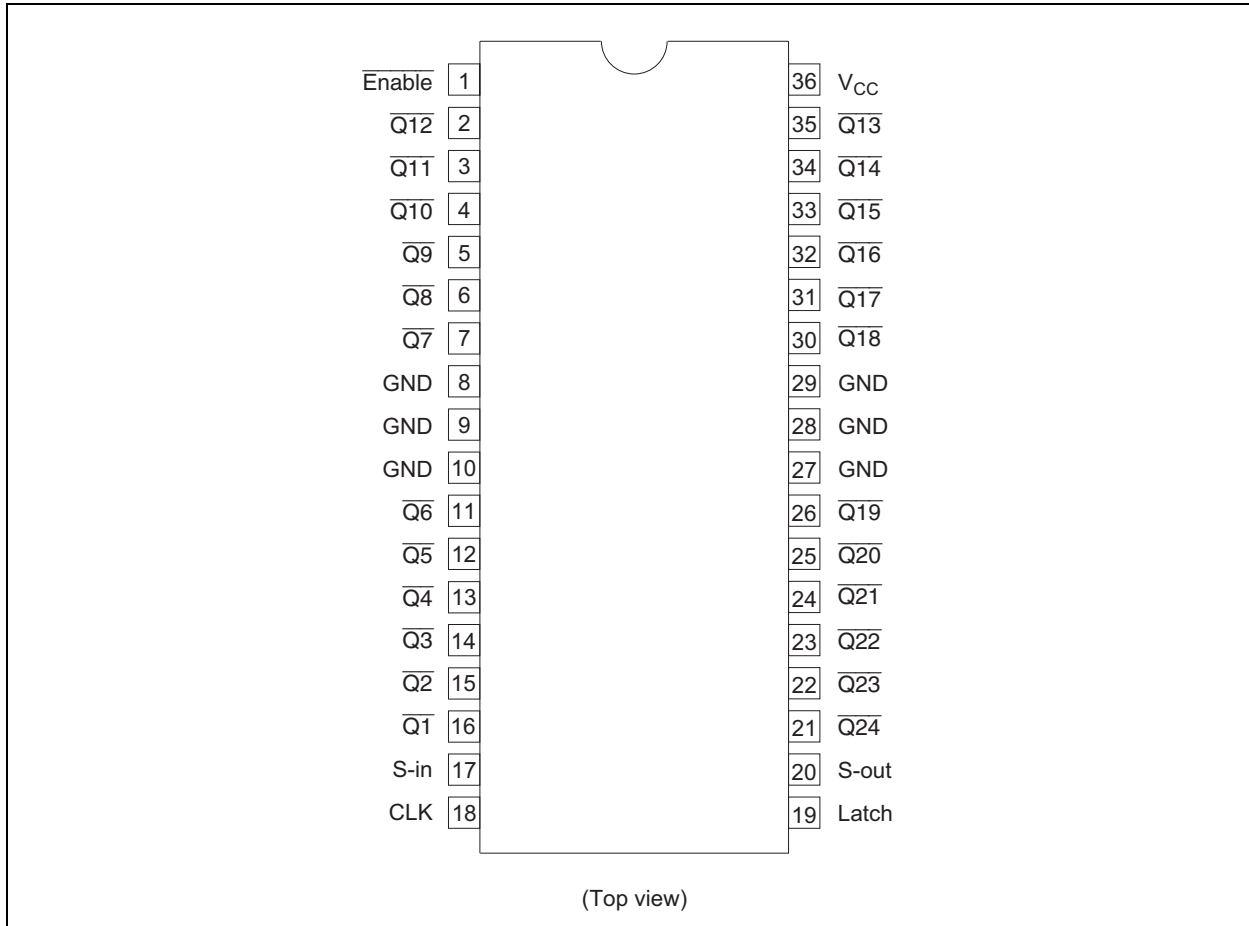
The RD30LDT3595 has twenty-four edge trigger D-type Flip-Flops with twenty-four latches in 36-pin package. Low-voltage and high-speed operation is suitable for battery-powered product (e.g., notebook computers), and the low-power consumption extends the battery life.

### Features

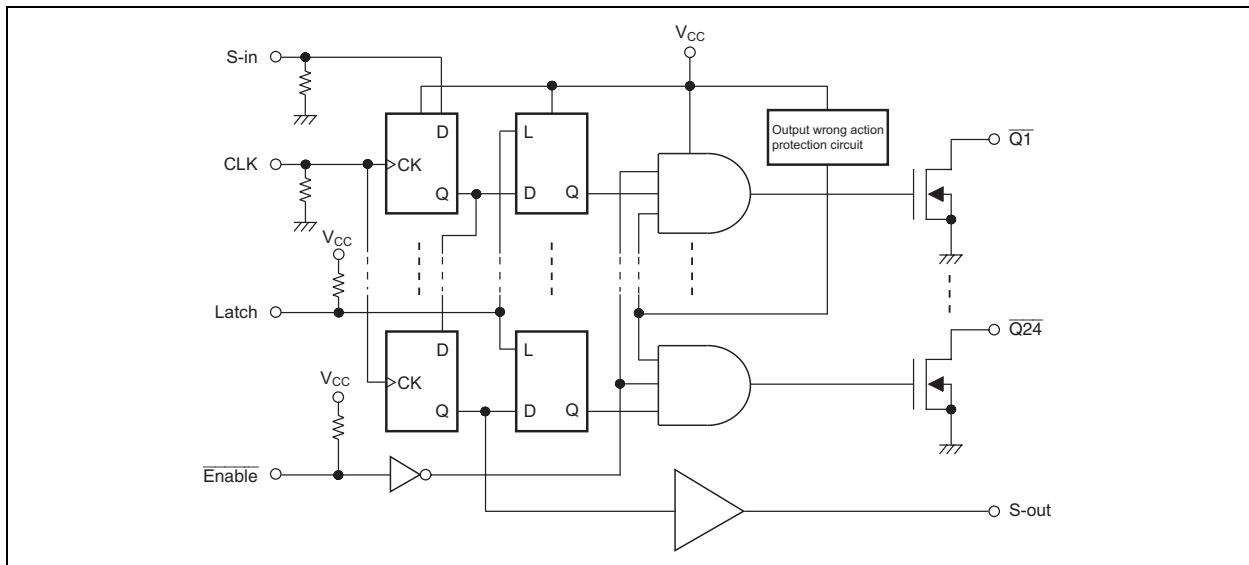
- Supply voltage range : 4.5 to 5.5 V,  $V_O = 30$  V
- Output current :  $I_O = 100$  mA (@ $V_{CC} = 5$  V)
- All the logical input has hysteresis voltage for the slow transition.
- Input with pull-up resistance. (Enable, Latch terminal)
- Input with pull-down resistance. (CLK, S-in terminal)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)	Surface Treatment
RD30LDT3595FPH0	SSOP-36 pin	PRSP0036GA-A (36P2R-A)	FP	H (1,000 pcs/reel)	0 (Sn-Cu)

Pin Arrangement



Logic Diagram



## Function Table

Inputs				Outputs	
S-in	CLK <sup>*1</sup>	Latch	Enable	$\overline{Q1}$ to $\overline{Q24}$	S-out
L	IN	L	L	t - 1	L
L	IN	H	L	Z	L
H	IN	L	L	t - 1	H
H	IN	H	L	L	H
H	IN	H	H	Z	H

<sup>\*1</sup> IN : Input the following signal in CLK



H : High level

L : Low level

Z : High impedance

t - 1 : Output level before the indicated steady state input conditions were established.

## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	$V_{CC}$	-0.5 to 7	V	
Input voltage range	$V_I$	-0.5 to $V_{CC} + 0.5$	V	
Output voltage range <sup>*1</sup> .	$V_O$	-0.5 to 30	V	Output : Z (OFF)
		-0.5 to $V_{CC} + 0.5$	V	S-out
Continuous output current	$I_O$	100	mA	$V_O = 0$ to $V_{CC}$
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) <sup>*2</sup>	$P_d$	1.9	W	
Storage temperature	$T_{stg}$	-65 to 150	$^\circ\text{C}$	

Notes: 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. This value is limited to 30 V maximum.

2. The maximum package power dissipation was calculated using a junction temperature of  $150^\circ\text{C}$ .

## Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	$V_{CC}$	4.5	5.5	V	
Output voltage range	$V_O$	—	30	V	$\overline{Q1}$ to $\overline{Q24}$ : Z (OFF)
Output current (per pin)	$I_O$	—	100	mA	$\overline{Q1}$ to $\overline{Q24}$ : ON (duty cycle $\leq 50\%$ )
Operating free-air temperature	$T_a$	-40	85	$^\circ\text{C}$	

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

## Electrical Characteristic

Item	Symbol	V <sub>CC</sub> (V) *	Ta = 25°C			Ta = -40 to 85°C			Unit	Test condition
			Min	Typ	Max	Min	Typ	Max		
Input voltage	V <sub>IH</sub>	4.5 to 5.5	2.0	—	V <sub>CC</sub>	2.0	—	V <sub>CC</sub>	V	
	V <sub>IL</sub>	4.5 to 5.5	0	—	0.8	0	—	0.8	V	
Input current	I <sub>IH</sub>	5.5	—	—	25	—	—	30	μA	V <sub>IH</sub> = 5.5 V
	I <sub>IL</sub>	5.5	—	—	-25	—	—	-30	μA	V <sub>IL</sub> = 0 V
Output voltage (S-out)	V <sub>OH</sub>	5.0	4.9	—	—	4.9	—	—	V	I <sub>OH</sub> = -1 μA
	V <sub>OL</sub>	5.0	—	—	0.1	—	—	0.1	V	I <sub>OL</sub> = 1 μA
Output voltage (Q1 to Q24)	V <sub>OL</sub>	5.0	—	—	0.55	—	—	0.77	V	I <sub>OL</sub> = 100 mA
Output leakage current	I <sub>OLK</sub>	5.5	—	—	50	—	—	100	μA	V <sub>O</sub> = 30 V (Output : Z (OFF))
Quiescent supply current	I <sub>CC1</sub>	5.5	—	—	300	—	—	500	μA	Input : Open All driver output : OFF
	I <sub>CC2</sub>	5.5	—	—	300	—	—	500	μA	Driver output one circuit : ON
Driver output wrong action protection voltage	V <sub>T+</sub>	—	2.9	3.4	3.9	2.9	3.4	3.9	V	
	V <sub>T-</sub>	—	2.6	3.1	3.6	2.6	3.1	3.6	V	

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

## Timing Characteristics

(V<sub>CC</sub> = 5 V, C<sub>L</sub> = 15 pF, R<sub>L</sub> (S-out) = ∞, R<sub>L</sub> (Qn) = 100 Ω, t<sub>r</sub> = t<sub>f</sub> = 20 ns)

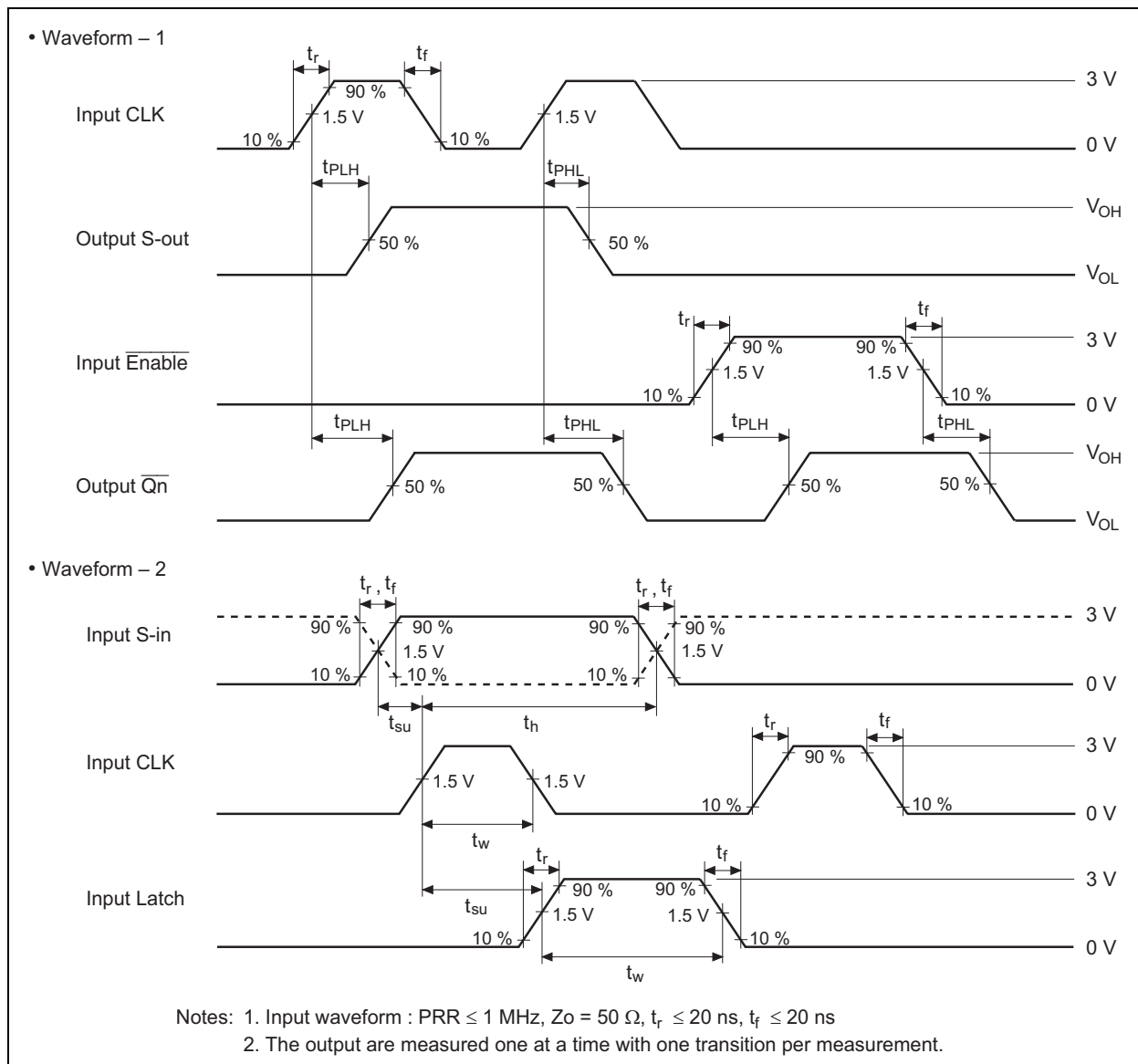
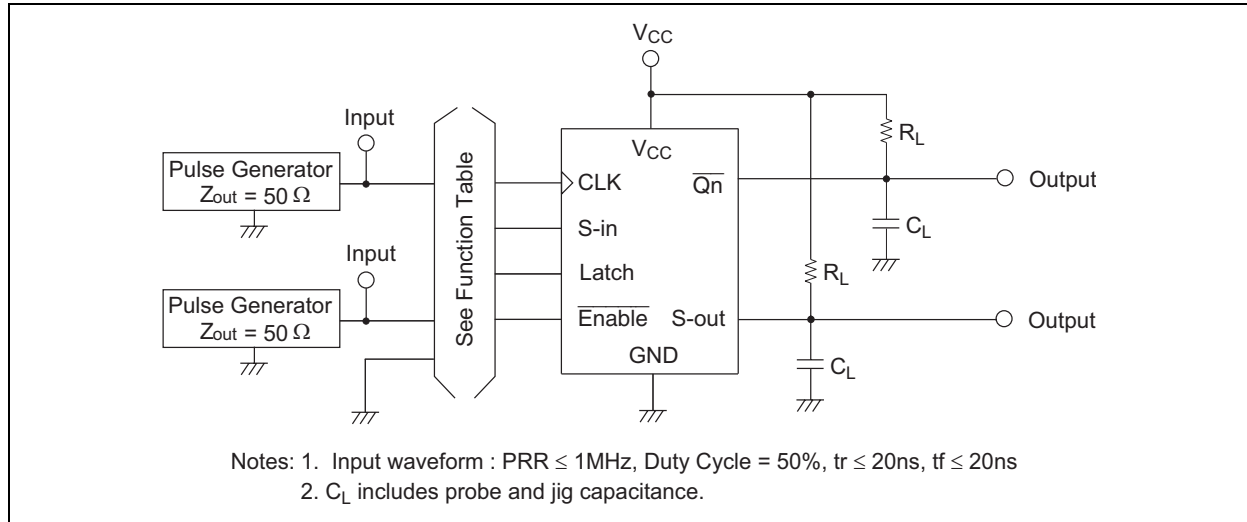
Item	Symbol	Ta = 25°C			Ta = -40 to 85°C			Unit	Test condition
		Min	Typ	Max	Min	Typ	Max		
Maximum clock frequency	f <sub>max</sub>	—	—	12.5	—	—	12.5	MHz	Duty cycle = 45 % to 55 %
Pulse width	t <sub>W</sub>	30	—	—	30	—	—	ns	CLK
Pulse width	t <sub>W</sub>	30	—	—	30	—	—	ns	Latch
Setup time	t <sub>SU</sub>	30	—	—	30	—	—	ns	S-in to CLK
Hold time	t <sub>H</sub>	20	—	—	20	—	—	ns	S-in to CLK
Setup time	t <sub>SU</sub>	60	—	—	60	—	—	ns	Latch to CLK
Clock pulse rise time	t <sub>r</sub>	—	—	500	—	—	500	ns	
Clock pulse fall time	t <sub>f</sub>	—	—	500	—	—	500	ns	

## Switching Characteristics

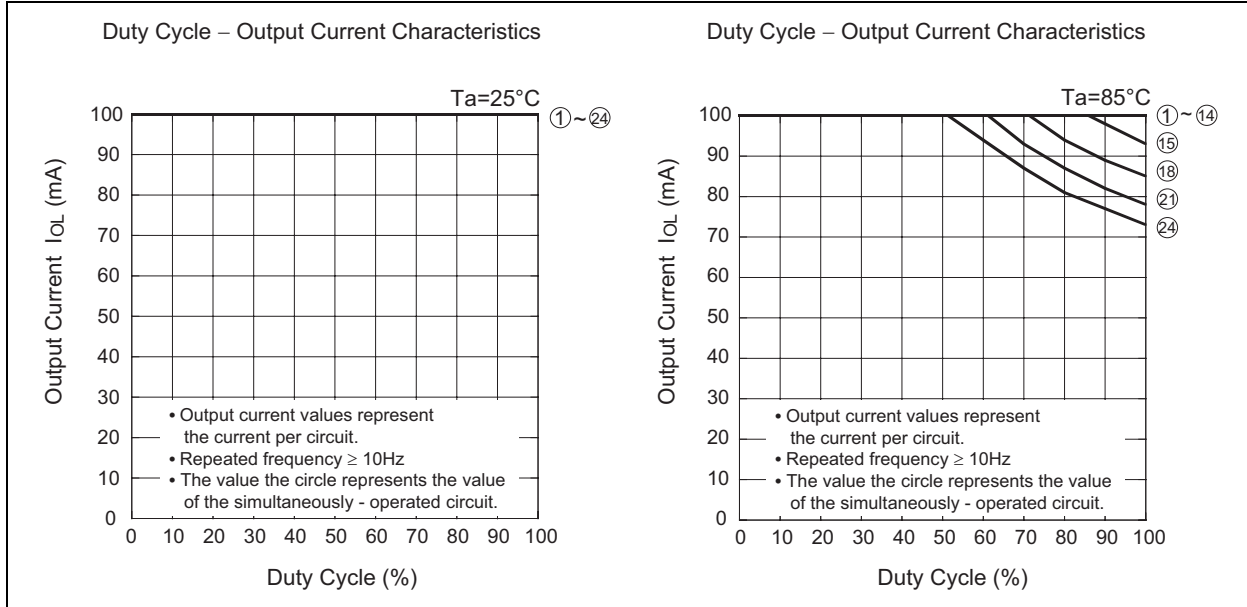
(V<sub>CC</sub> = 5 V, C<sub>L</sub> = 15 pF, R<sub>L</sub> (S-out) = ∞, R<sub>L</sub> (Qn) = 100 Ω, t<sub>r</sub> = t<sub>f</sub> = 20 ns)

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C			Unit	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Typ	Max			
Propagation delay time	t <sub>PLH</sub>	—	—	60	—	—	60	ns	CLK	S-out
	t <sub>PHL</sub>	—	—	60	—	—	60			
	t <sub>PLH</sub>	—	—	70	—	—	70	ns	CLK	Qn
	t <sub>PHL</sub>	—	—	70	—	—	70			
	t <sub>PLH</sub>	—	—	70	—	—	70	ns	Enable	Qn
	t <sub>PHL</sub>	—	—	70	—	—	70			

## Test Circuit

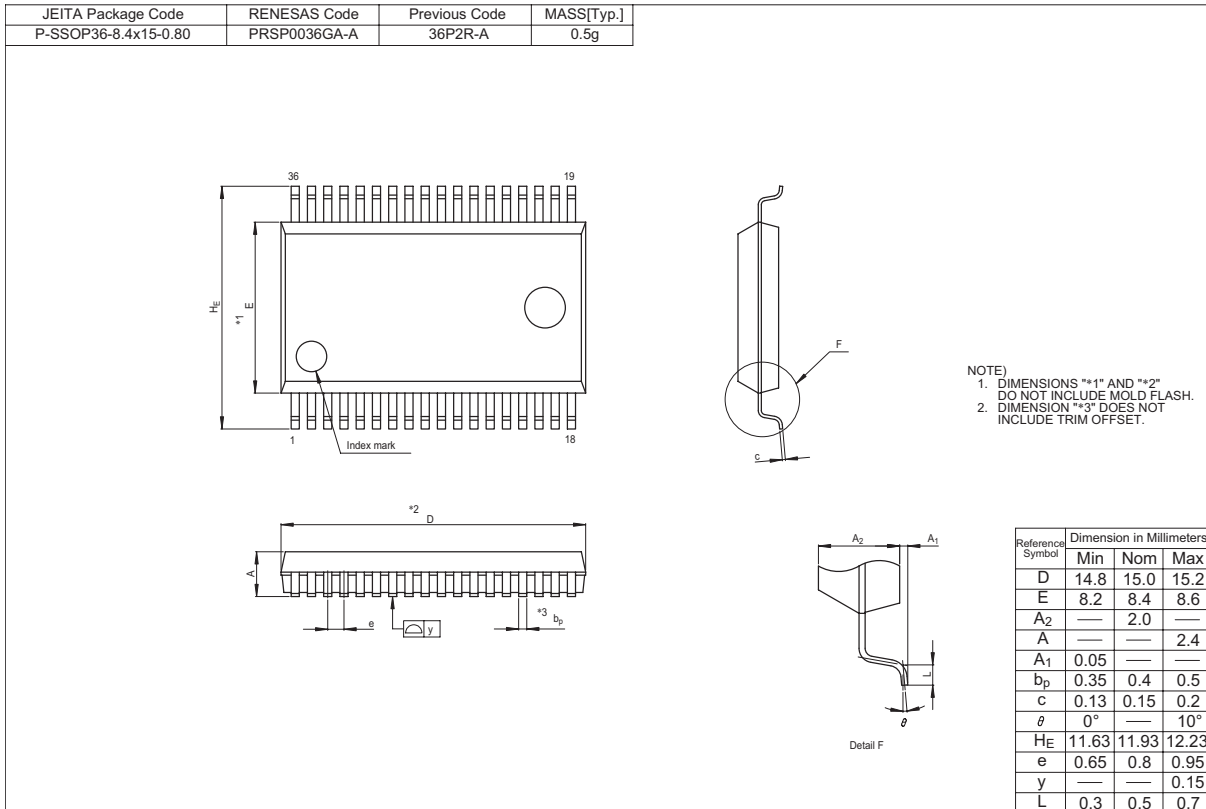


Application Data



Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SSOP36-8.4x15-0.80	PRSP0036GA-A	36P2R-A	0.5g



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