

# HD74LS47

## BCD-to-Seven-Segment Decoder / Driver (with 15 V Outputs)

REJ03D0410-0301

Rev.3.01

May 10, 2006

HD74LS47 features active-low outputs designed for driving incandescent indicators directly. This device has full ripple-blanking input / output controls and a lamp test. Display patterns for BCD input counts above 9 are unique symbols to authenticate input conditions. This circuit incorporates automatic leading and / or trailing-edge zero-blanking control (RBI and RBO). Lamp test (LT) of these types may be performed at any time when the BI / RBO node is at a high level. It contains an overriding blanking input (BI) which can be used to control the lamp intensity of pulsing or to inhibit the outputs. Inputs and outputs are entirely compatible for use with TTL or DTL logic outputs.

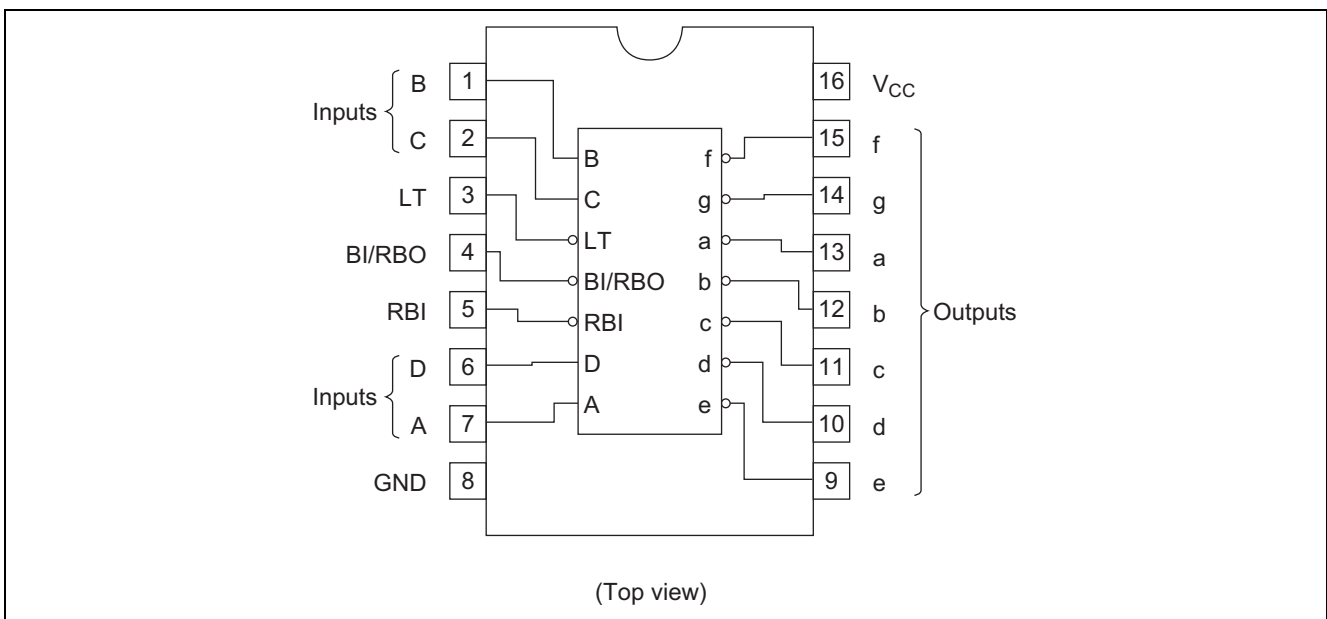
### Features

- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LS47P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74LS47FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)

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

### Pin Arrangement

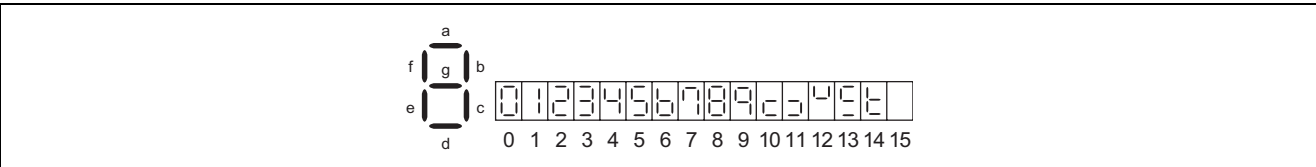


Function Table

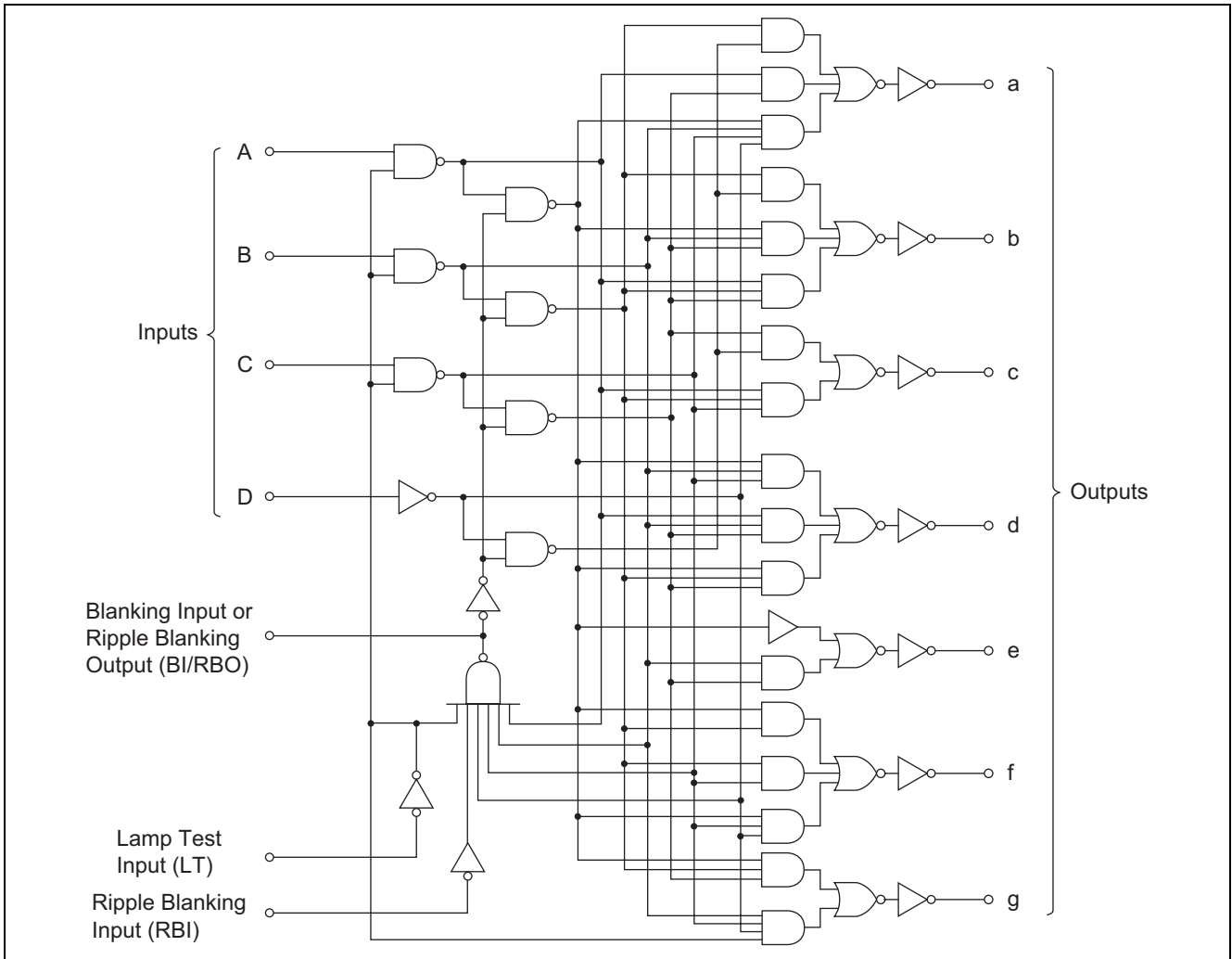
Decimal or Function	Inputs						BI/ RBO	Outputs							Note
	LT	RBI	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	ON	ON	ON	ON	ON	ON	OFF	1
1	H	X	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	X	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	X	L	L	H	H	H	ON	ON	ON	ON	OFF	OFF	ON	
4	H	X	L	H	L	L	H	OFF	ON	ON	OFF	OFF	ON	ON	
5	H	X	L	H	L	H	H	ON	OFF	ON	ON	OFF	ON	ON	
6	H	X	L	H	H	L	H	OFF	OFF	ON	ON	ON	ON	ON	
7	H	X	L	H	H	H	H	ON	ON	ON	OFF	OFF	OFF	OFF	
8	H	X	H	L	L	L	H	ON	ON	ON	ON	ON	ON	ON	
9	H	X	H	L	L	H	H	ON	ON	ON	OFF	OFF	ON	ON	
10	H	X	H	L	H	L	H	OFF	OFF	OFF	ON	ON	OFF	ON	
11	H	X	H	L	H	H	H	OFF	OFF	ON	ON	OFF	OFF	ON	
12	H	X	H	H	L	L	H	OFF	ON	OFF	OFF	OFF	ON	ON	
13	H	X	H	H	L	H	H	ON	OFF	OFF	ON	OFF	ON	ON	
14	H	X	H	H	H	L	H	OFF	OFF	OFF	ON	ON	ON	ON	
15	H	X	H	H	H	H	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
BI	X	X	X	X	X	X	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
RBI	H	L	L	L	L	L	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
LT	L	X	X	X	X	X	H	ON	ON	ON	ON	ON	ON	ON	4

H; high level, L; low level, X, irrelevant

- Notes:
1. The blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBI) must be open or high if blanking of a decimal zero is not desired.
  2. When a low logic level is applied directly to the blanking input (BI), all segment outputs are off regardless of the level of any other input.
  3. When ripple-blanking input (RBI) and inputs A, B, C, and D are a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output (RBO) goes to a low level (response condition).
  4. When a blanking input / ripple blanking output (BI / RBO) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.



Block Diagram



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	$V_{CC}$	7	V
Input voltage	$V_{IN}$	7	V
Output current ( $t_w \leq 1\text{ms}$ , duty cycle $\leq 10\%$ )	$I_{O(\text{peak})}$	200	mA
Output current (off)	$I_{O(\text{off})}$	1	mA
Power dissipation	$P_T$	400	mW
Operating temperature	$T_{opr}$	-20 to +75	°C
Storage temperature	$T_{stg}$	-65 to +150	°C

Note: Voltage value, unless otherwise noted, are with respect to network ground terminal.

### Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{CC}$	4.75	5.00	5.25	V
Output voltage (off)	$V_{O(off)}$	—	—	15	V
Input current (on)	$I_{O(on)}$	—	—	24	mA
Output current	$I_{OH}$	—	—	-50	$\mu$ A
	$I_{OL}$	—	—	3.2	mA
Operating temperature	$T_{opr}$	-20	25	75	$^{\circ}$ C

### Electrical Characteristics

( $T_a = -20$  to  $+75$   $^{\circ}$ C)

Item	Symbol	min.	typ.*	max.	Unit	Condition	
Input voltage	$V_{IH}$	2.0	—	—	V		
	$V_{IL}$	—	—	0.8	V		
Output voltage	BI / RBO	$V_{OH}$	2.4	—	—	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $I_{OH} = -50$ $\mu$ A
		$V_{OL}$	—	—	0.4	V	
	a to g	$V_{O(on)}$	—	—	0.4	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V
			—	—	0.5	V	
Output current	a to g	$I_{O(off)}$	—	—	250	$\mu$ A	$V_{CC} = 5.25$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $V_{O(off)} = 15$ V
Input current		$I_{IH}$	—	—	20	$\mu$ A	$V_{CC} = 5.25$ V, $V_I = 2.7$ V
	All input except BI / RBO	$I_{IL}$	—	—	-0.4	mA	$V_{CC} = 5.25$ V, $V_I = 0.4$ V
			—	—	-1.2	mA	
	BI / RBO	$I_i$	—	—	0.1	mA	$V_{CC} = 5.25$ V, $V_I = 7$ V
Short-circuit output current	BI / RBO	$I_{OS}$	-0.3	—	-2	mA	$V_{CC} = 5.25$ V
Supply current**		$I_{CC}$	—	7	13	mA	$V_{CC} = 5.25$ V
Input clamp voltage		$V_{IK}$	—	—	-1.5	V	$V_{CC} = 4.75$ V, $I_{IN} = -18$ mA

Notes: \*  $V_{CC} = 5$  V,  $T_a = 25$   $^{\circ}$ C

\*\*  $I_{CC}$  is measured with all outputs open and inputs at 4.5 V.

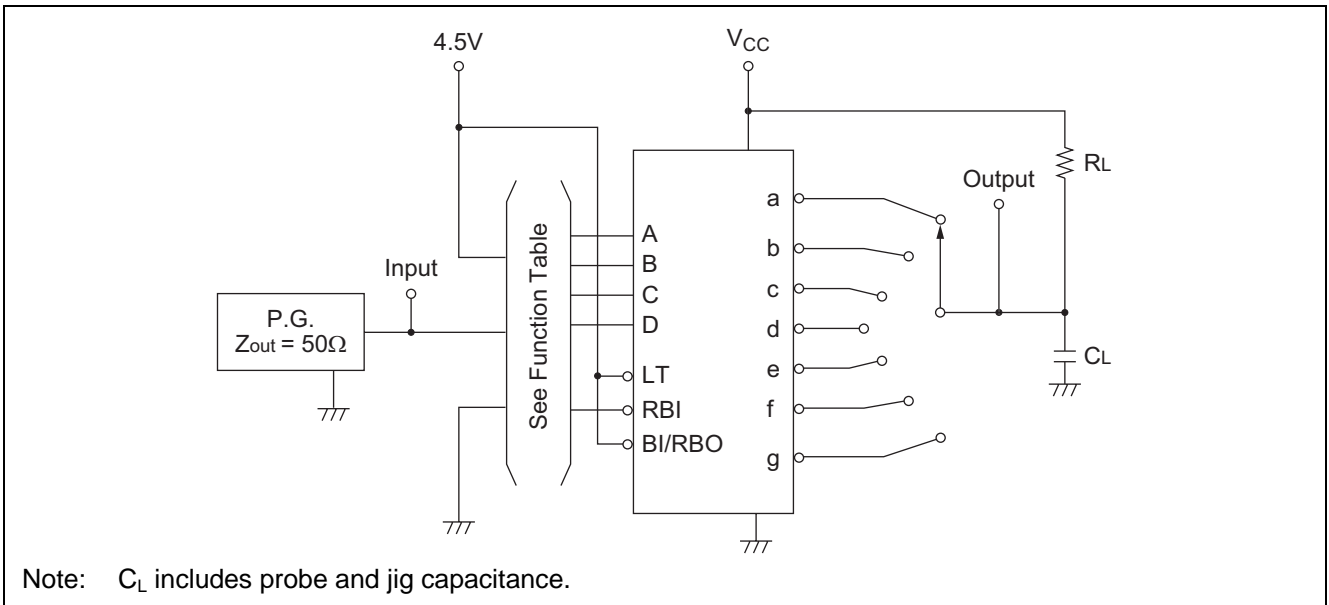
### Switching Characteristics

( $V_{CC} = 5$  V,  $T_a = 25$   $^{\circ}$ C)

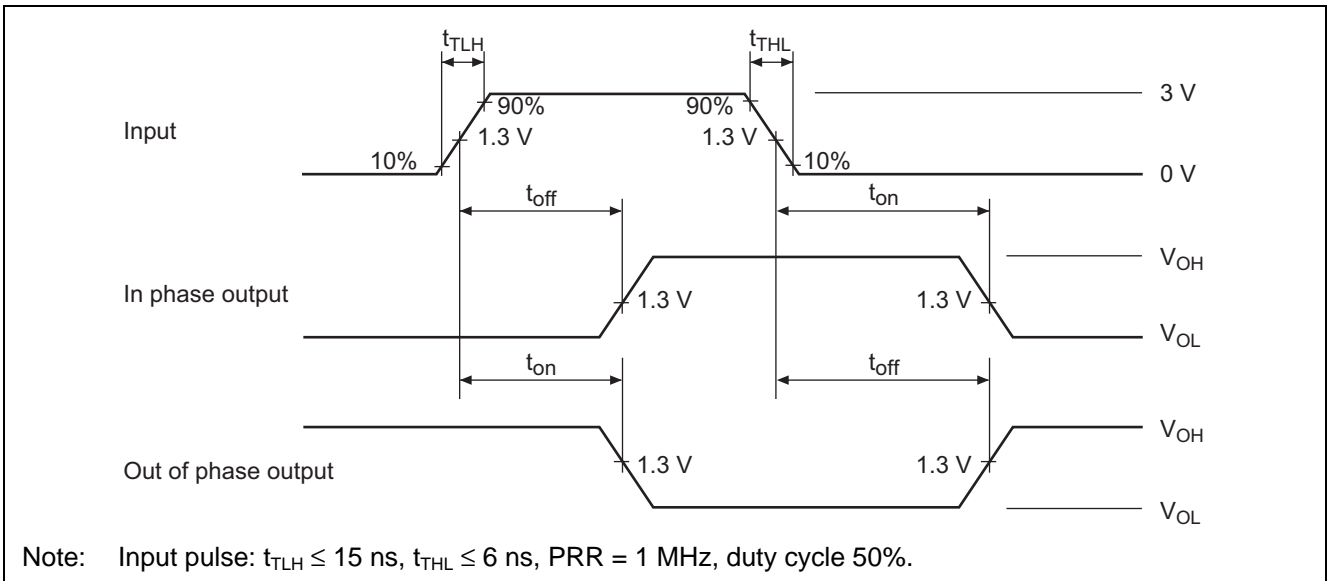
Item	Symbol	Input	min.	typ.	max.	Unit	Condition
Turn-on time	$t_{on}$	A	—	—	100	ns	$C_L = 15$ pF, $R_L = 665$ $\Omega$
		RBI	—	—	100		
Turn-off time	$t_{off}$	A	—	—	100	ns	
		RBI	—	—	100		

## Testing Method

### Test Circuit



### Waveform

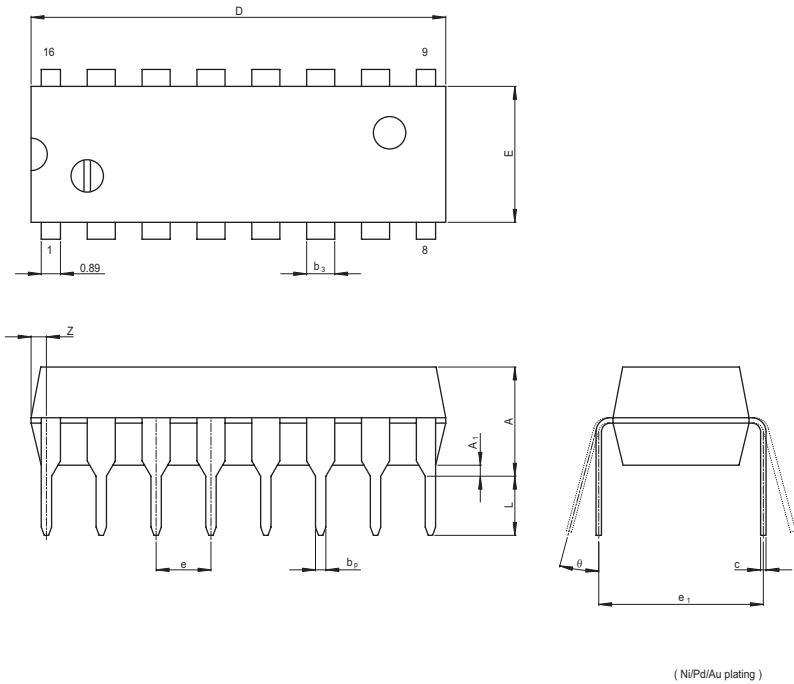


### Testing Table

Item	Inputs					Outputs						
	RBI	D	C	B	A	a	b	c	d	e	f	g
$t_{on}$ $t_{off}$	4.5 V	GND	GND	GND	IN	OUT	—	—	OUT	OUT	OUT	—
	4.5 V	GND	GND	4.5 V	IN	—	—	OUT	—	OUT	—	—
	4.5 V	GND	4.5 V	4.5 V	IN	OUT	OUT	—	OUT	OUT	OUT	OUT
	IN	GND	GND	GND	GND	OUT	OUT	OUT	OUT	OUT	OUT	—

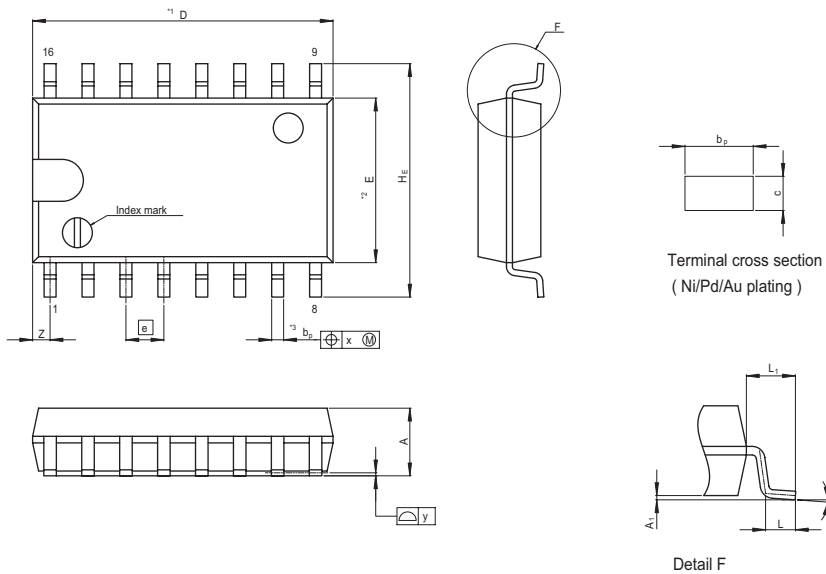
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP16-6.3x19.2-2.54	PRDP0016AE-B	DP-16FV	1.05g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e <sub>1</sub>	—	7.62	—
D	—	19.2	20.32
E	—	6.3	7.4
A	—	—	5.06
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	—	—	1.12
L	2.54	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g



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	—	10.06	10.5
E	—	5.50	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.00	0.10	0.20
A	—	—	2.20
b <sub>p</sub>	0.34	0.40	0.46
b <sub>1</sub>	—	—	—
c	0.15	0.20	0.25
c <sub>1</sub>	—	—	—
θ	0°	—	8°
HE	7.50	7.80	8.00
⊙	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.80
L	0.50	0.70	0.90
L <sub>1</sub>	—	1.15	—

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