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April 1st, 2010
Renesas Electronics Corporation

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HD74LS95B

4-bit Parallel Access Shift Register

REJ03D0424-0400
Rev.4.00
May 10, 2006

The 4-bit register features parallel and serial inputs, parallel outputs, mode control, and two clock inputs. The register has three mode operation:

- Parallel (broadside) load
- Shift right (the direction Q_A toward Q_D)
- Shift left (the direction Q_D toward Q_A)

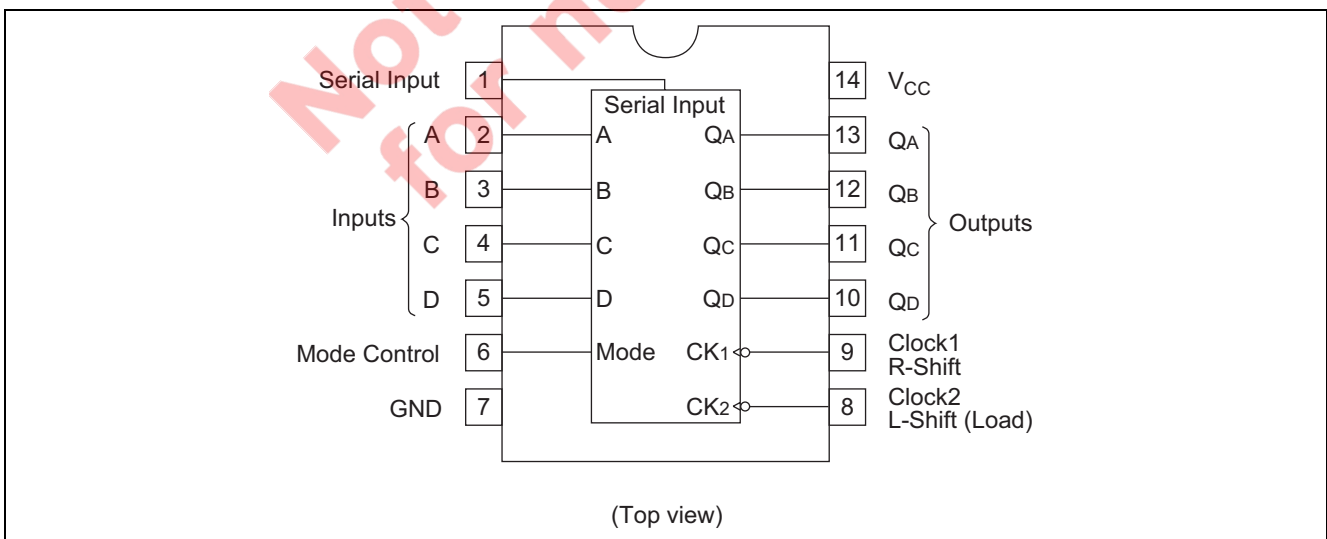
Parallel loading is accomplished by applying the four bits of data and taking the mode control input high. The data is loaded into the associated flip-flops and appears at the outputs after the high-to-low transition of the clock-2 input. During loading, the entry of serial data is inhibited. Shift right is accomplished on the high-to-low transition of clock-1 when the mode control is low; shift left is accomplished on the high-to-low transition of clock-2 when the mode control is high by connecting the output of each flip-flop to the parallel input of the previous flip-flop (Q_D to input C, etc.) and serial data is entered at input D. The clock input may be applied commonly to clock-1 and clock-2 if both modes can be clocked from the same source. Changes at the mode control inputs are low; however, conditions described in the last three lines of the function table will also ensure that register contents are protected.

Features

- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LS95BFPEL	SOP-14 pin (JEITA)	PRSP0014DF-B (FP-14DAV)	FP	EL (2,000 pcs/reel)

Pin Arrangement

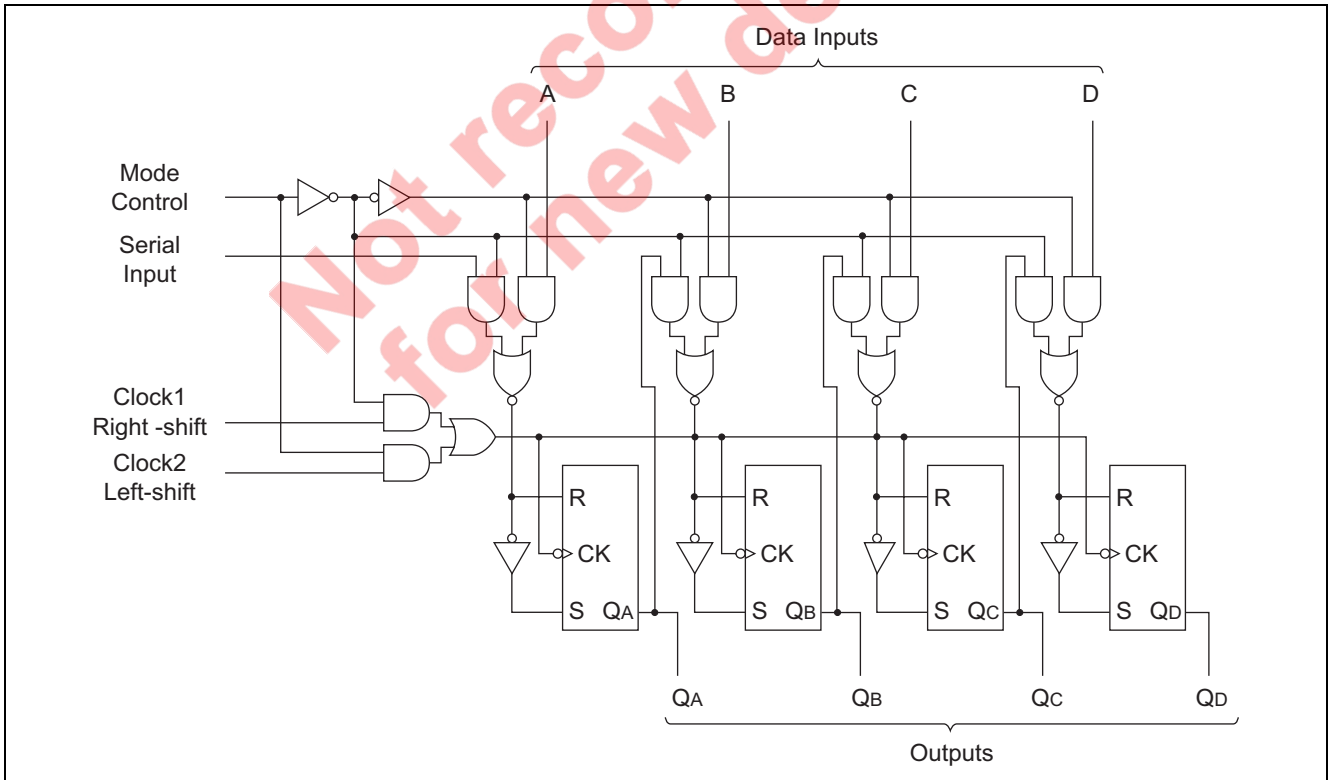


Function Table

Mode control	Inputs							Outputs			
	Clocks		Serial	Parallel				Q _A	Q _B	Q _C	Q _D
	2(L)	1(R)		A	B	C	D				
H	H	X	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}
H	↓	X	X	a	b	c	d	a	b	c	d
H	↓	X	X	Q _B *	Q _C *	Q _D *	d	Q _{Bn}	Q _{Cn}	Q _{Dn}	d
L	L	H	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}
L	X	↓	H	X	X	X	X	H	Q _{An}	Q _{Bn}	Q _{Cn}
L	X	↓	L	X	X	X	X	L	Q _{An}	Q _{Bn}	Q _{Cn}
↑	L	L	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}
↓	L	L	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}
↓	L	H	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}
↑	H	L	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}
↑	H	H	X	X	X	X	X	Q _{AO}	Q _{BO}	Q _{CO}	Q _{DO}

- Notes:
1. H; high level, L; low level, X; irrelevant
 2. ↑; transition from low to high level
 3. ↓; transition from high to low level
 4. a to d; the level of steady-state input at inputs A, B, C, or D, respectively.
 5. Q_{AO} to Q_{DO}; the level of Q_A, Q_B, Q_C, or Q_D, respectively, before the indicated steady-state input conditions were established.
 6. Q_{An} to Q_{Dn}; the level of Q_A, Q_B, Q_C, or Q_D, respectively, before the most-recent (↑) transition of the clock.
 7. *; Shifting left require external connection of Q_B to A, Q_C to B, and Q_D to C. Serial data is entered at input D.

Block Diagram



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	7	V
Input voltage	V_{IN}	7	V
Power dissipation	P_T	400	mW
Storage temperature	Tstg	-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 current	I_{OH}	—	—	-400	μ A
	I_{OL}	—	—	8	mA
Operating temperature	T_{opr}	-20	25	75	°C
Clock frequency	f_{clock}	0	—	25	MHz
Clock pulse width	$t_w(CK)$	20	—	—	ns
Setup time	t_{su}	20	—	—	ns
Hold time	t_h	10	—	—	ns
Enable time 1	$t_{enable 1}$	20	—	—	ns
Enable time 2	$t_{enable 2}$	20	—	—	ns
Inhibit time 1	$t_{inhibit 1}$	20	—	—	ns
Inhibit time 2	$t_{inhibit 2}$	20	—	—	ns

Electrical Characteristics

($T_a = -20$ to $+75$ °C)

Item	Symbol	min.	typ.*	max.	Unit	Condition
Input voltage	V_{IH}	2.0	—	—	V	
	V_{IL}	—	—	0.8	V	
Output voltage	V_{OH}	2.7	—	—	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $I_{OH} = -400$ μ A
	V_{OL}	—	—	0.4	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V
		—	—	0.5		
Input current	I_{IH}	—	—	20	μ A	$V_{CC} = 5.25$ V, $V_I = 2.7$ V
	I_{IL}	—	—	-0.4	mA	$V_{CC} = 5.25$ V, $V_I = 0.4$ V
	I_I	—	—	0.1	mA	$V_{CC} = 5.25$ V, $V_I = 7$ V
Short-circuit output current	I_{OS}	-20	—	-100	mA	$V_{CC} = 5.25$ V
Supply current**	I_{CC}	—	13	21	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, $T_a = 25$ °C

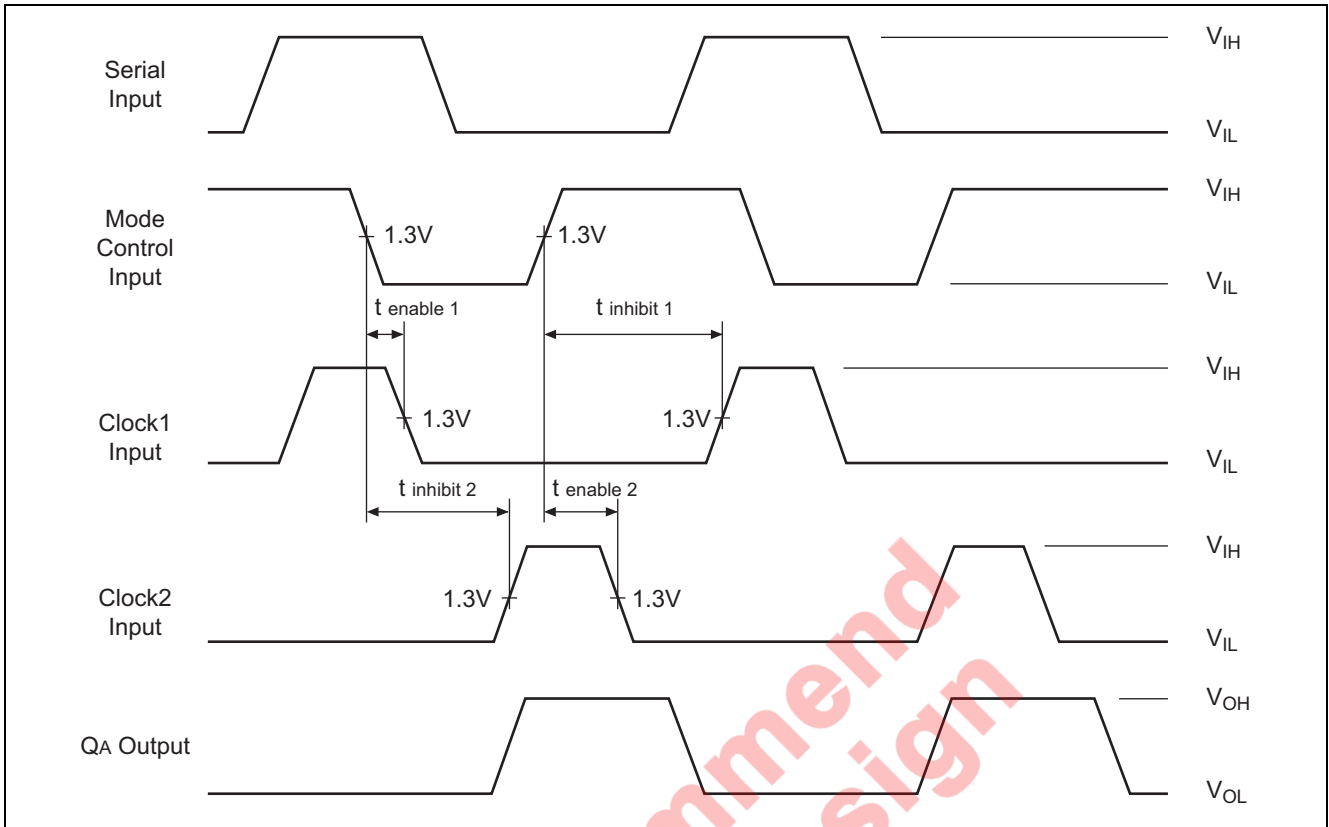
** I_{CC} is measured with all outputs and serial input open; A, B, C, and D inputs grounded; mode control at 4.5 V; and momentary 3 V, then ground, applied both clock inputs.

Switching Characteristics

($V_{CC} = 5$ V, $T_a = 25$ °C)

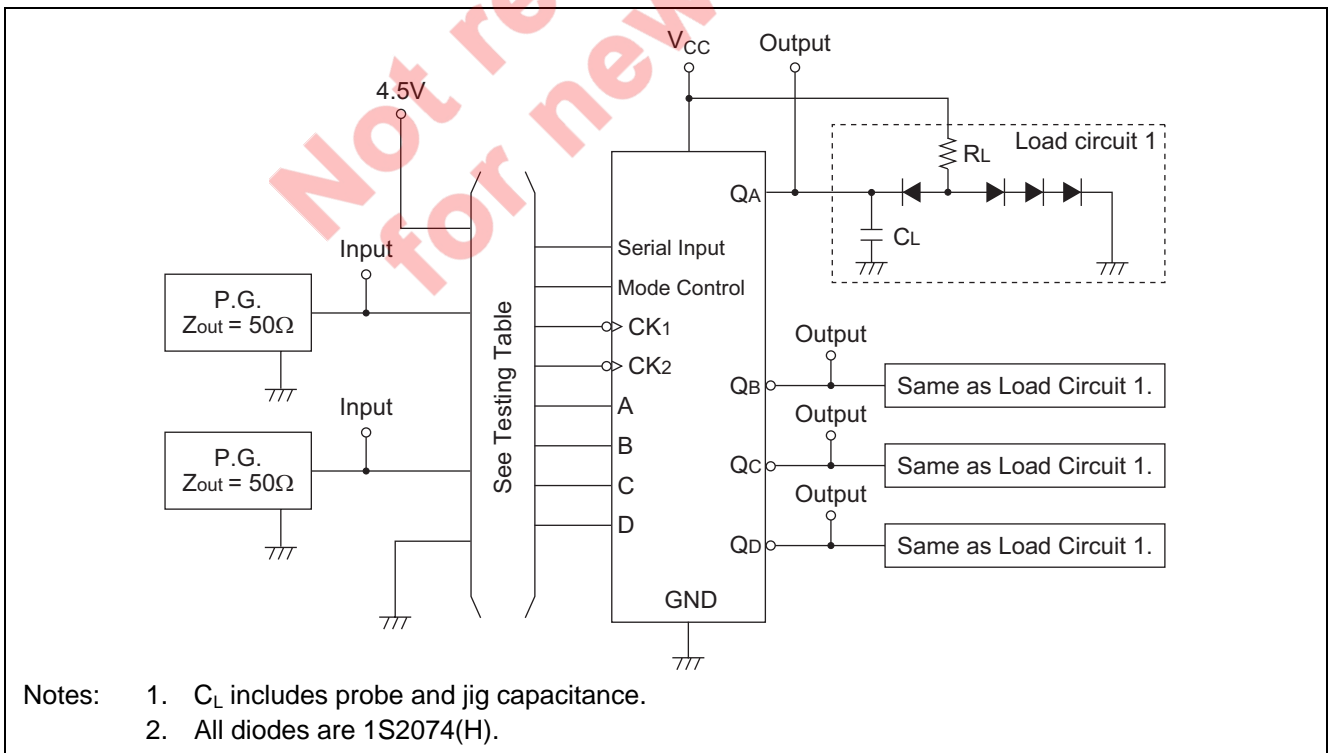
Item	Symbol	min.	typ.	max.	Unit	Condition
Maximum clock frequency	f_{max}	25	36	—	MHz	$C_L = 15$ pF, $R_L = 2$ k Ω
Propagation delay time	t_{PLH}	—	18	27	ns	
	t_{PHL}	—	21	32	ns	

Clock Enable / Inhibit Times



Testing Method

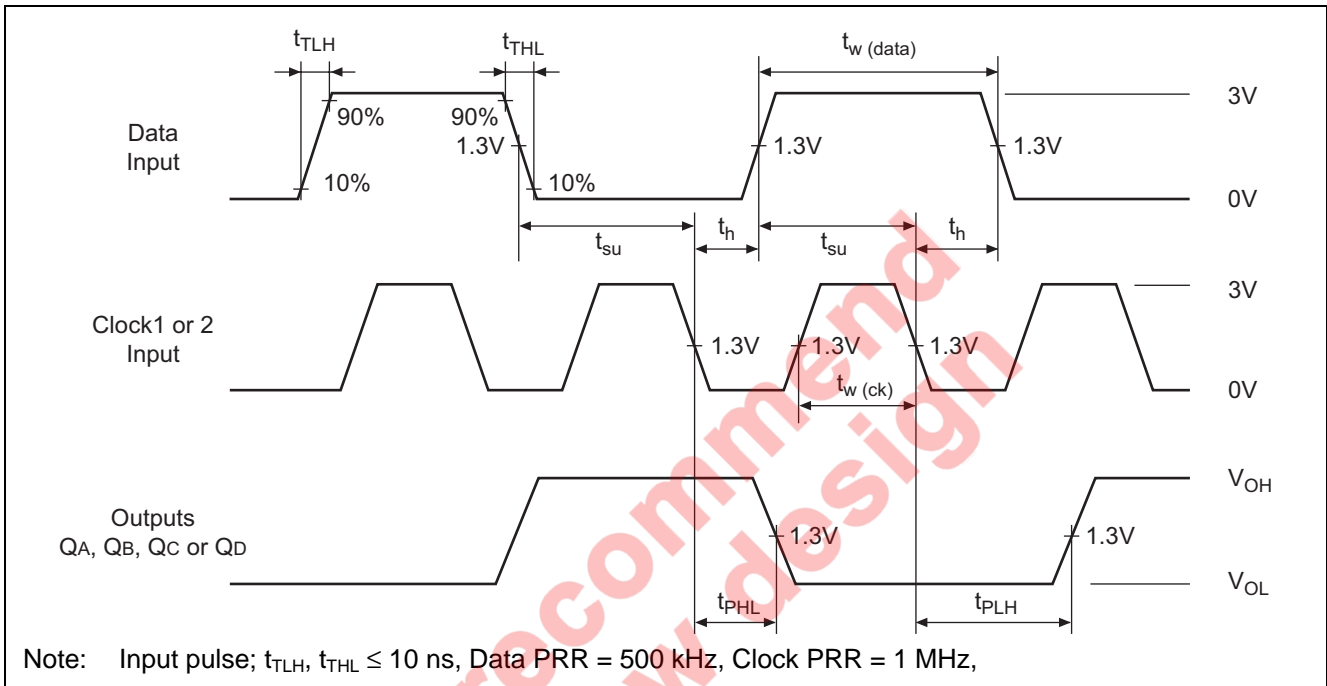
Test Circuit



Testing Table

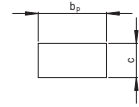
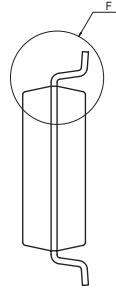
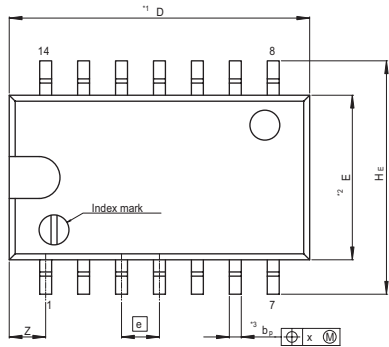
Item	From input to output	Inputs								Outputs			
		CK-1	CK-2	Mode control	Serial Inputs	A	B	C	D	Q _A	Q _B	Q _C	Q _D
f _{max}	CK-1 → Q	IN	4.5 V	0 V	IN	4.5 V	4.5 V	4.5 V	4.5 V	OUT	OUT	OUT	OUT
	CK-2 → Q	4.5 V	IN	4.5 V	4.5 V	IN	IN	IN	IN	OUT	OUT	OUT	OUT
t _{PLH}	CK-1 → Q	IN	4.5 V	0 V	IN	4.5 V	4.5 V	4.5 V	4.5 V	OUT	OUT	OUT	OUT
t _{PHL}	CK-2 → Q	4.5 V	IN	4.5 V	4.5 V	IN	IN	IN	IN	OUT	OUT	OUT	OUT

Waveform



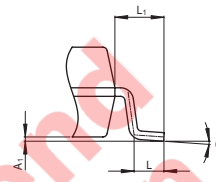
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-5.5x10.06-1.27	PRSP0014DF-B	FP-14DAV	0.23g



Terminal cross section
(Ni/Pd/Au plating)

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



Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A ₂	—	—	—
A ₁	0.00	0.10	0.20
A	—	—	2.20
b _p	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
H _E	7.50	7.80	8.00
Ⓜ	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	1.42
L	0.50	0.70	0.90
L ₁	—	1.15	—

Not recommended for new design

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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) 6887-7898

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.

10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

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, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510