

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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# HAT2165N

## Silicon N Channel Power MOS FET Power Switching

REJ03G1680-0300

Rev.3.00

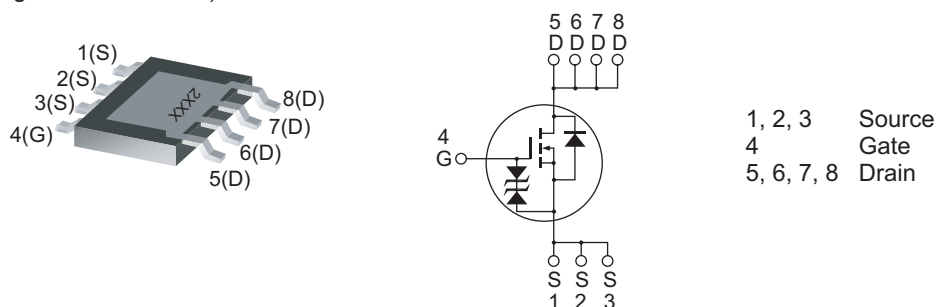
May 27, 2008

### Features

- High speed switching
- Capable of 4.5 V gate drive
- Low drive current
- High density mounting
- Low on-resistance  
 $R_{DS(on)} = 2.8 \text{ m}\Omega$  typ. (at  $V_{GS} = 10 \text{ V}$ )

### Outline

RENESAS Package code: PTSP0008DC-A  
(Package name: LFPAK-i)



### Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	30	V
Gate to source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	$I_D$	55	A
Drain peak current	$I_{D(pulse)}$ <sup>Note 1</sup>	220	A
Body-drain diode reverse drain current	$I_{DR}$	55	A
Avalanche current	$I_{AP}$ <sup>Note 2</sup>	30	A
Avalanche energy	$E_{AR}$ <sup>Note 2</sup>	90	mJ
Channel dissipation	$P_{ch}$ <sup>Note 3</sup>	30	W
Channel to case thermal resistance	$\theta_{ch-C}$	4.17	$^\circ\text{C/W}$
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

- Notes: 1.  $PW \leq 10 \mu\text{s}$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_{ch} = 25^\circ\text{C}$ ,  $R_g \geq 50 \Omega$   
 3.  $T_c = 25^\circ\text{C}$

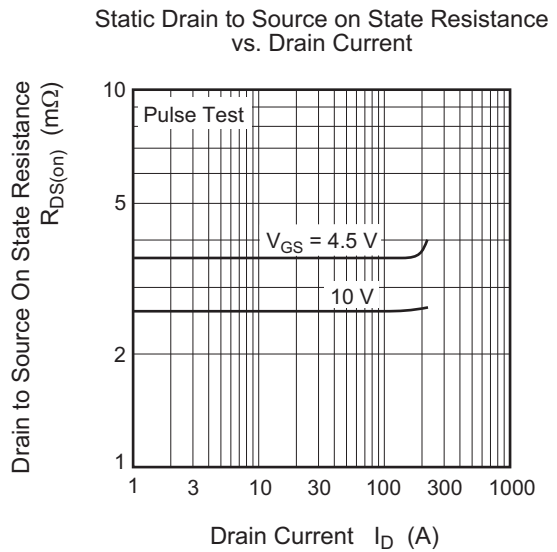
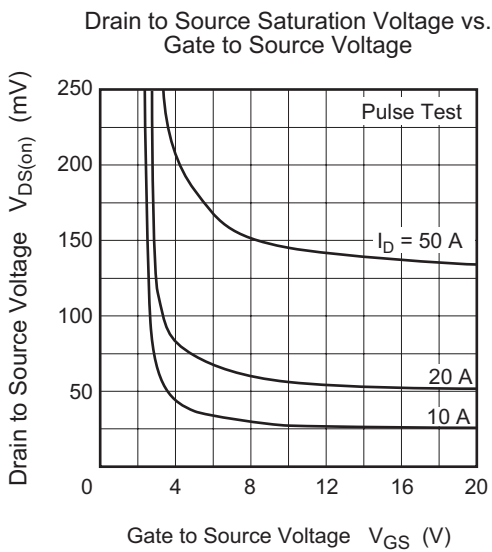
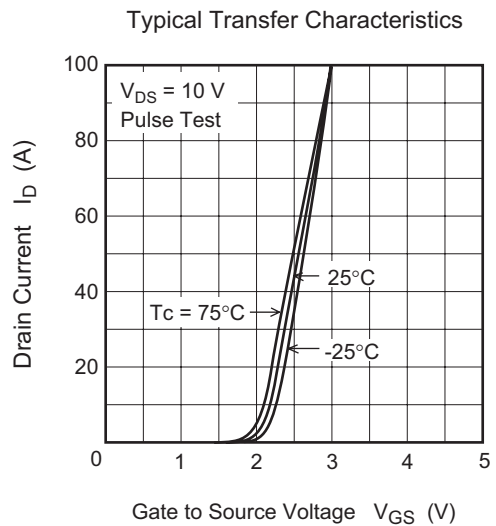
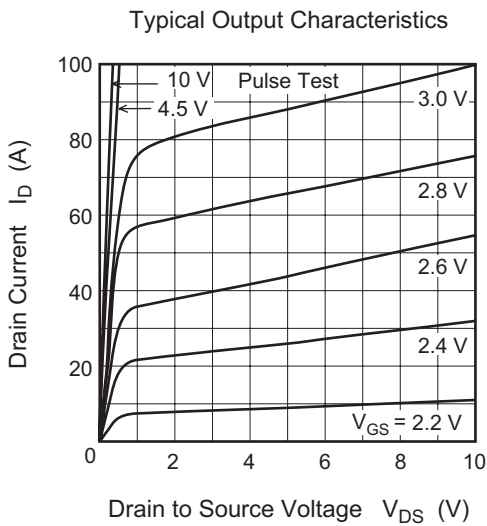
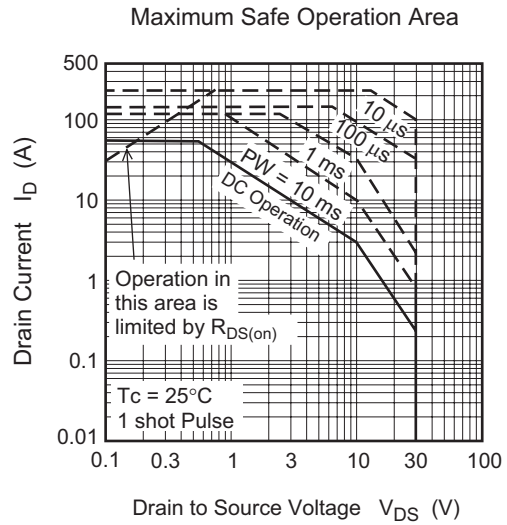
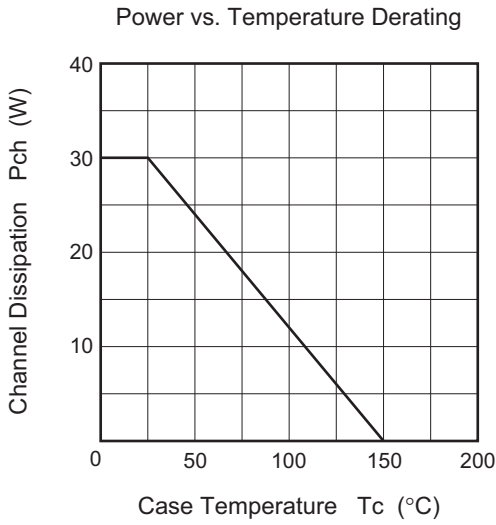
## Electrical Characteristics

(Ta = 25°C)

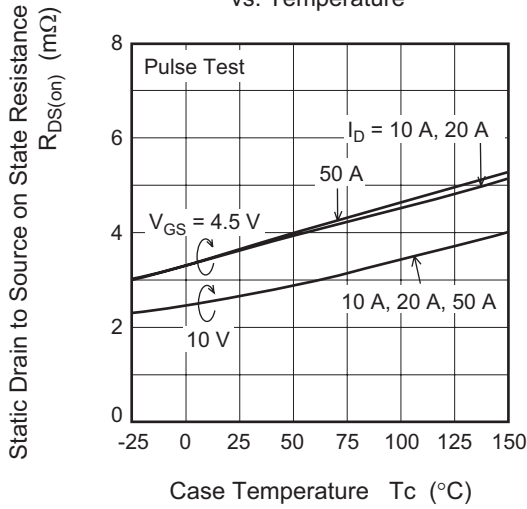
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	2.8	3.6	$\text{m}\Omega$	$I_D = 27.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	3.7	5.6	$\text{m}\Omega$	$I_D = 27.5 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note4</sup>
Forward transfer admittance	$ y_{fs} $	60	100	—	S	$I_D = 27.5 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note4</sup>
Input capacitance	$C_{iss}$	—	5180	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$	—	1200	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	380	—	pF	$f = 1 \text{ MHz}$
Gate resistance	$R_g$	—	0.5	—	$\Omega$	
Total gate charge	$Q_g$	—	33	—	nc	$V_{DD} = 10 \text{ V}$
Gate to source charge	$Q_{gs}$	—	15	—	nc	$V_{GS} = 4.5 \text{ V}$
Gate to drain charge	$Q_{gd}$	—	7.1	—	nc	$I_D = 55 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	13	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 27.5 \text{ A}$
Rise time	$t_r$	—	65	—	ns	$V_{DD} \cong 10 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	60	—	ns	$R_L = 0.36 \text{ }\Omega$
Fall time	$t_f$	—	9.5	—	ns	$R_g = 4.7 \text{ }\Omega$
Body-drain diode forward voltage	$V_{DF}$	—	0.81	1.06	V	$I_F = 55 \text{ A}$ , $V_{GS} = 0$ <sup>Note4</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	40	—	ns	$I_F = 55 \text{ A}$ , $V_{GS} = 0$ $di_F/dt = 100 \text{ A}/\mu\text{s}$

Notes: 4. Pulse test

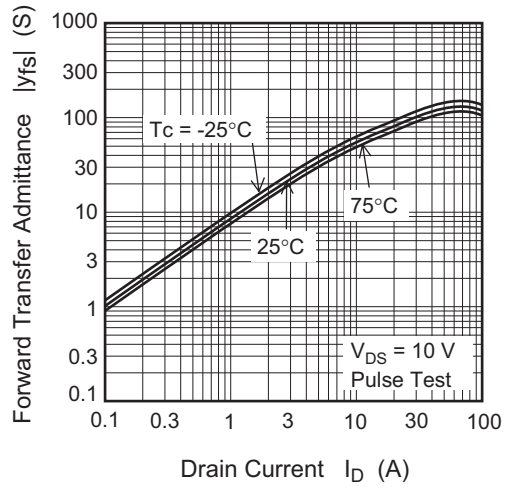
Main Characteristics



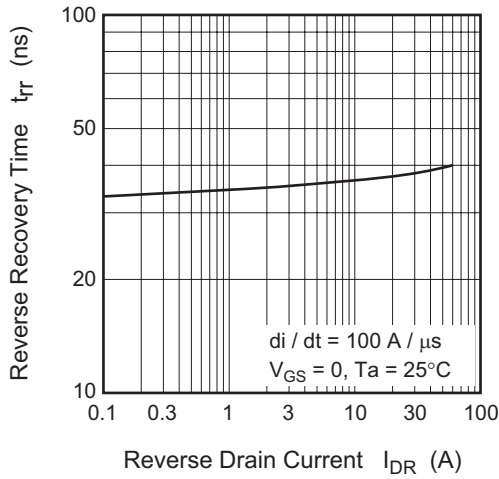
Static Drain to Source on State Resistance vs. Temperature



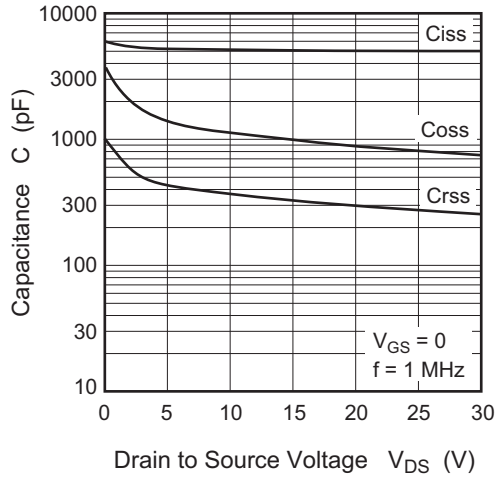
Forward Transfer Admittance vs. Drain Current



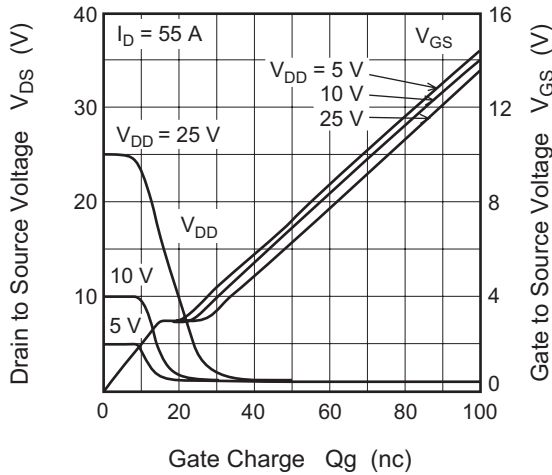
Body-Drain Diode Reverse Recovery Time



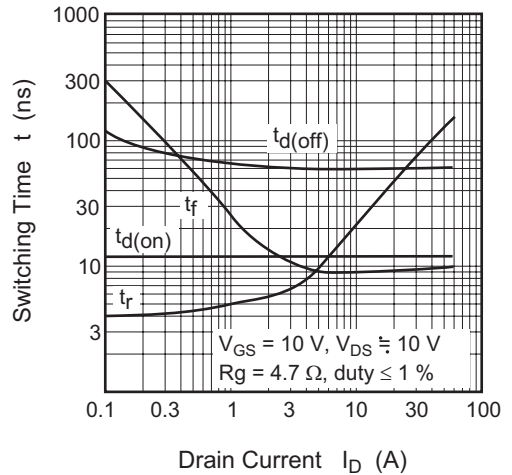
Typical Capacitance vs. Drain to Source Voltage



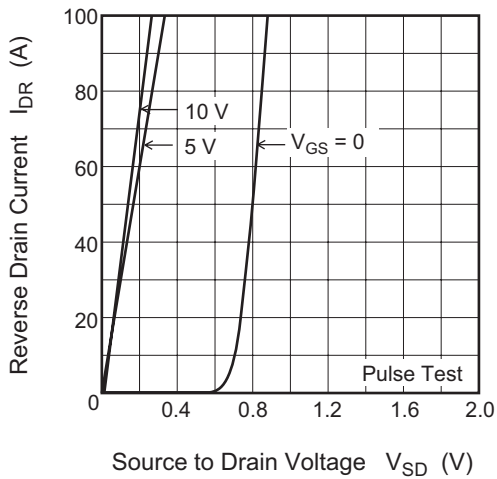
Dynamic Input Characteristics



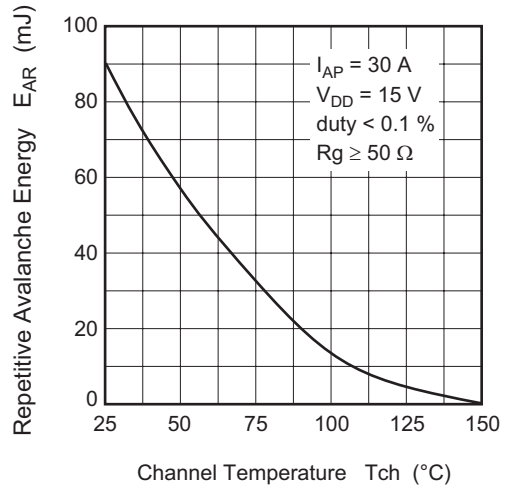
Switching Characteristics



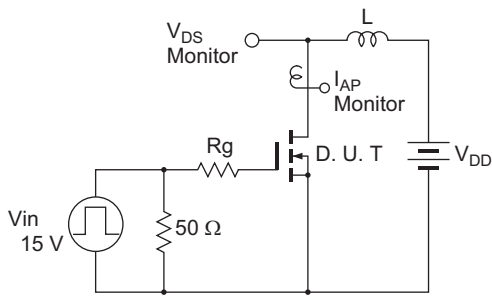
Reverse Drain Current vs. Source to Drain Voltage



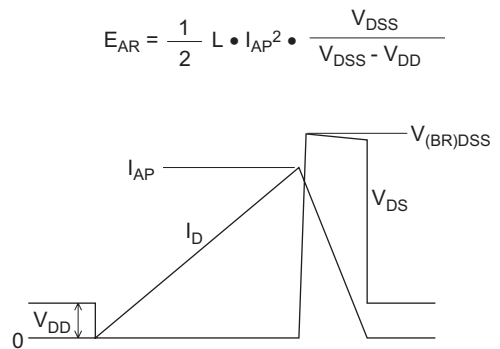
Maximum Avalanche Energy vs. Channel Temperature Derating



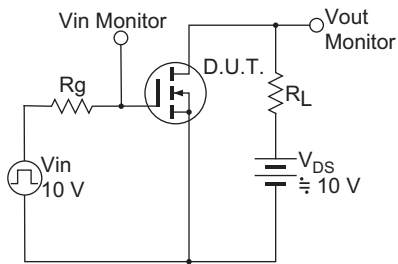
Avalanche Test Circuit



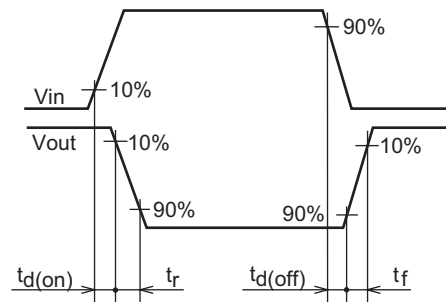
Avalanche Waveform



Switching Time Test Circuit

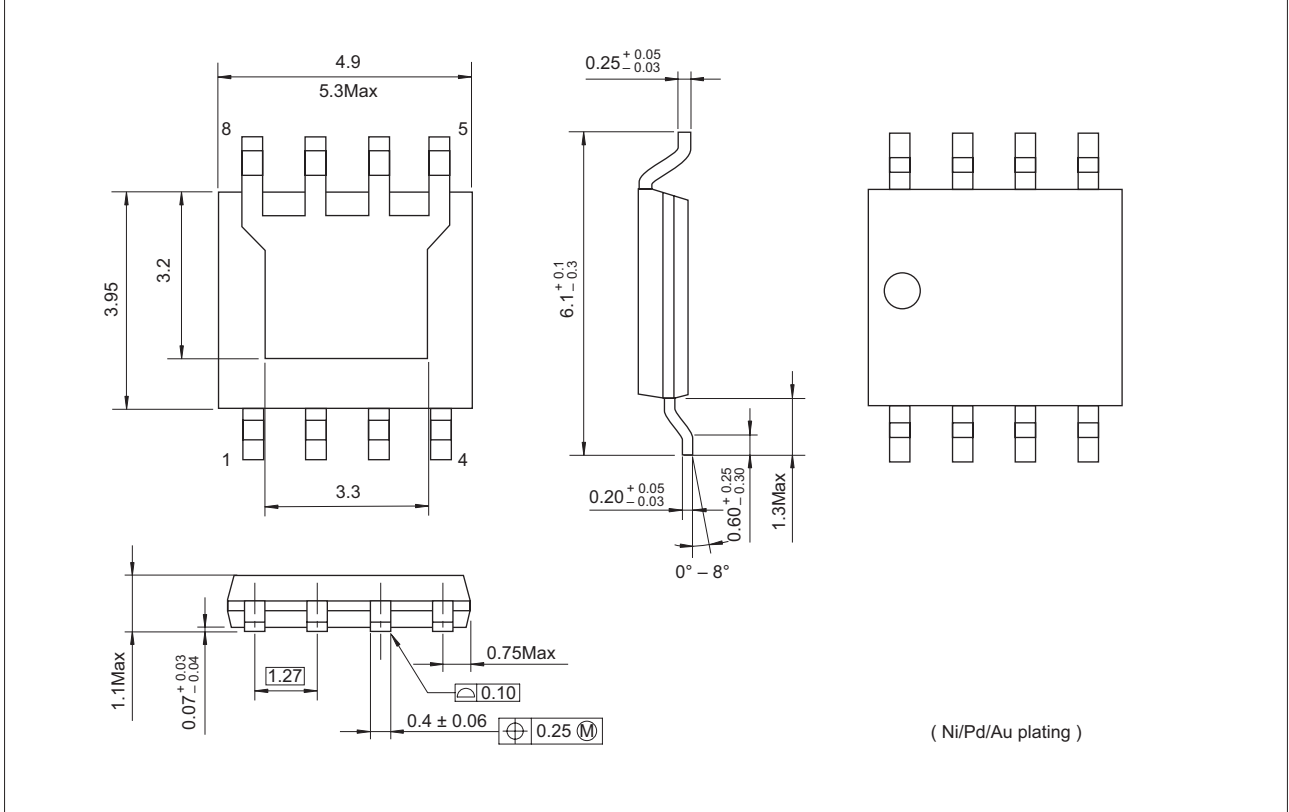


Switching Time Waveform



### Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
LFPAK-I	—	PTSP0008DC-A	LFPAK-IV	0.080g



### Ordering Information

Part No.	Quantity	Shipping Container
HAT2165N-EL-E	2500 pcs	Taping



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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

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Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7858/7898

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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