RJE0616JSP

-60V, -4A Silicon P Channel Thermal FET Power Switching

R07DS1234EJ0200
(Previous: REJ03G1944-0100)
Rev.2.00
Oct 27, 2014

Description

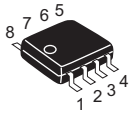
This FET has the over temperature shut-down capability sensing to the junction temperature. This FET has the built-in over temperature shut-down circuit in the gate area. And this circuit operation to shut-down the gate voltage in case of high junction temperature like applying over power consumption, over current etc..

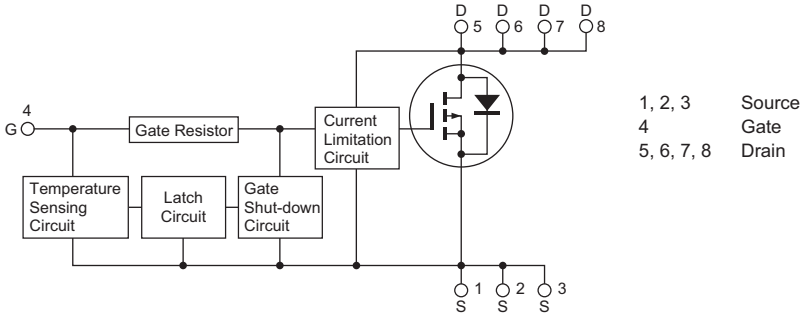
Features

- For Automotive applications
- Built-in the over temperature shut-down circuit.
- High endurance capability against to the short circuit.
- Latch type shut down operation (need 0 voltage recovery).
- Built-in the current limitation circuit.
- Low on-resistance $R_{DS(on)}$: 77 mΩ Typ, 90 mΩ Max (V_{GS} = –10 V)
- High density mounting
- AEC-Q101 compliant

Outline

RENESAS Package code: PRSP0008DD-D
(Package name: SOP-8)





Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	–60	V
Gate to source voltage	V_{GSS}	–16	V
	V_{GSS}	2.5	V
Drain current	I_D Note3	–4	A
Body-drain diode reverse drain current	I_{DR}	–4	A
Avalanche current	I_{AP} Note 2	–4	A
Avalanche energy	E_{AR} Note 2	68.6	mJ
Channel dissipation	Pch Note 1	2.5	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Notes: 1. When using the glass epoxy board (FR4 40 × 40 × 1.6 mm), PW ≤ 10 s
2. Tch = 25°C, Rg ≥ 50 Ω
3. It provides by the current limitation lower bound value.

Typical Operation Characteristics

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage	V_{IH}	–3.5	—	—	V	
	V_{IL}	—	—	–1.2	V	
Input current (Gate non shut down)	I_{IH1}	—	—	–100	µA	Vi = –8 V, V_{DS} = 0
	I_{IH2}	—	—	–50	µA	Vi = –3.5 V, V_{DS} = 0
	I_{IL}	—	—	–1	µA	Vi = –1.2 V, V_{DS} = 0
Input current (Gate shut down)	$I_{IH(sd)1}$	—	–0.8	—	mA	Vi = –8 V, V_{DS} = 0
	$I_{IH(sd)2}$	—	–0.35	—	mA	Vi = –3.5 V, V_{DS} = 0
Shut down temperature	Tsd	—	175	—	°C	Channel temperature (dv/dt V_{GS} ≥ 500 V/ms)
Gate operation voltage	Vop	–3.5	—	–12	V	
Drain current (Current limitation value)	$I_{D\ limt}$	–4	—	—	A	V_{GS} = –12 V, V_{DS} = –10 V Note 4

Notes; 4. Pulse test

Electrical Characteristics

(Ta = 25°C)

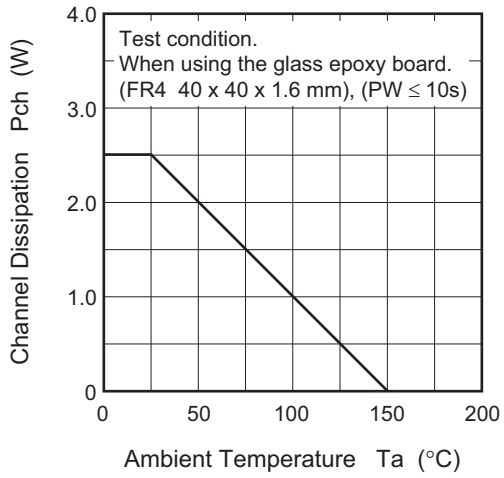
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	—	—	–4	A	V_{GS} = –3.5 V, V_{DS} = –10 V
	I_{D2}	—	—	–10	mA	V_{GS} = –1.2 V, V_{DS} = –10 V
	I_{D3}	–4	—	—	A	V_{GS} = –12 V, V_{DS} = –10 V Note 5
Drain to source breakdown voltage	$V_{(BR)DSS}$	–60	—	—	V	I_D = –10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	–16	—	—	V	I_G = –800 µA, V_{DS} = 0
	$V_{(BR)GSS}$	2.5	—	—	V	I_G = 100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS1}	—	—	–100	µA	V_{GS} = –8 V, V_{DS} = 0
	I_{GSS2}	—	—	–50	µA	V_{GS} = –3.5 V, V_{DS} = 0
	I_{GSS3}	—	—	–1	µA	V_{GS} = –1.2 V, V_{DS} = 0
	I_{GSS4}	—	—	100	µA	V_{GS} = 2.4 V, V_{DS} = 0
Input current (shut down)	$I_{GS(OP)1}$	—	–0.8	—	mA	V_{GS} = –8 V, V_{DS} = 0
	$I_{GS(OP)2}$	—	–0.35	—	mA	V_{GS} = –3.5 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS1}	—	—	–10	µA	V_{DS} = –60 V, V_{GS} = 0
Zero gate voltage drain current	I_{DSS2}	—	—	–10	µA	V_{DS} = –48 V, V_{GS} = 0, Ta = 125°C
Gate to source cutoff voltage	$V_{GS(off)}$	–2.2	—	–3.4	V	V_{DS} = –10 V, I_D = –1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	102	150	mΩ	I_D = –2 A, V_{GS} = –6 V Note 5
	$R_{DS(on)}$	—	77	90	mΩ	I_D = –2 A, V_{GS} = –10 V Note 5
Output capacitance	Coss	—	290	—	pF	V_{DS} = –10 V, V_{GS} = 0, f = 1MHz
Turn-on delay time	$t_{d(on)}$	—	3.20	—	µs	V_{GS} = –10 V, I_D= –2 A, R_L = 15 Ω
Rise time	t_r	—	2.80	—	µs	
Turn-off delay time	$t_{d(off)}$	—	1.55	—	µs	
Fall time	t_f	—	1.05	—	µs	
Body-drain diode forward voltage	V_{DF}	—	–0.84	—	V	I_F = –4 A, V_{GS} = 0
Body-drain diode reverse recovery time	t_{rr}	—	84	—	ns	I_F = –4 A, V_{GS} = 0, di_F/dt = 50 A/µs
Over load shut down operation time Note 6	t_{os1}	—	6.34	—	ms	V_{GS} = –5 V, V_{DD} = –16 V

Notes: 5. Pulse test

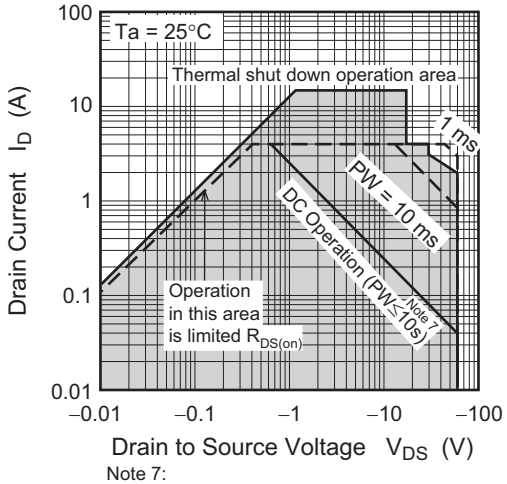
6. Including the junction temperature rise of the over loaded condition.

Main Characteristics

Power vs. Temperature Derating

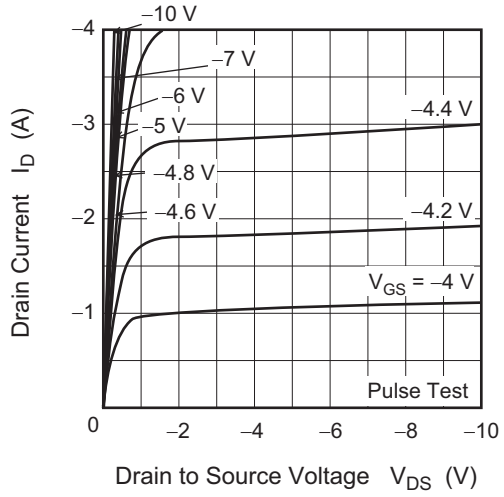


Maximum Safe Operation Area

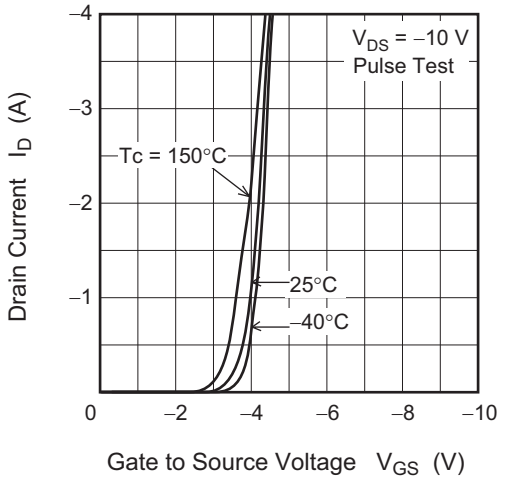


Note 7:
When using the glass epoxy board.
(FR4 40 x 40 x 1.6 mm)

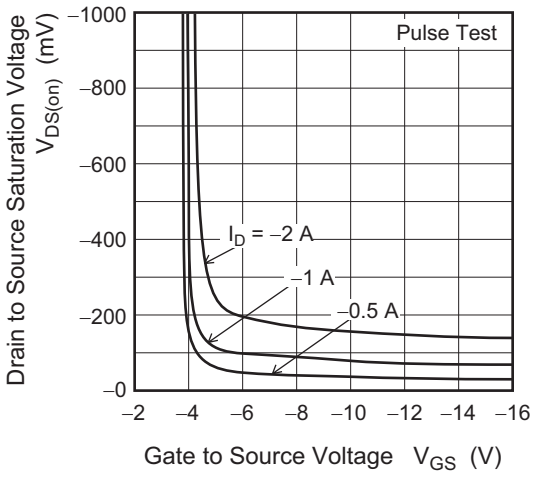
Typical Output Characteristics



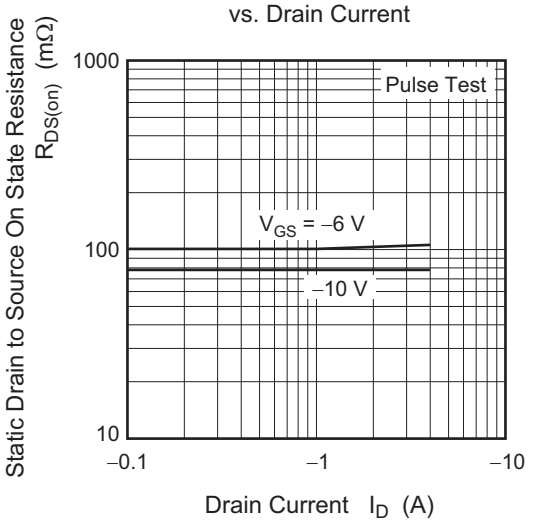
Typical Transfer Characteristics



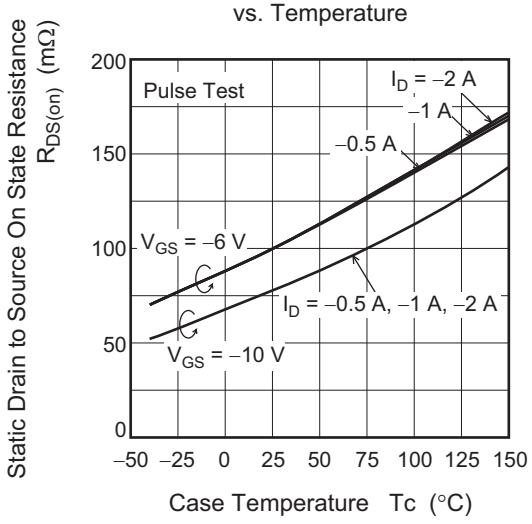
Drain Source Saturation Voltage vs. Gate to Source Voltage



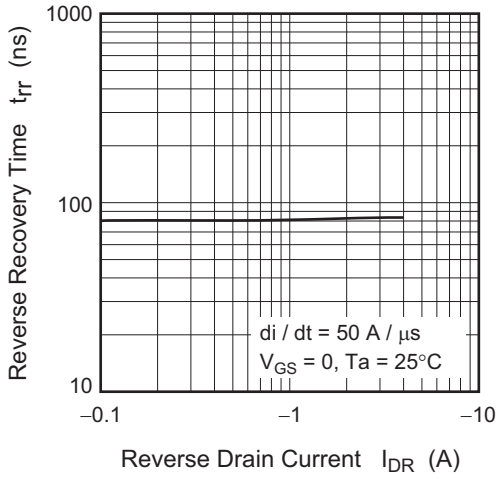
Static Drain to Source On State Resistance vs. Drain Current



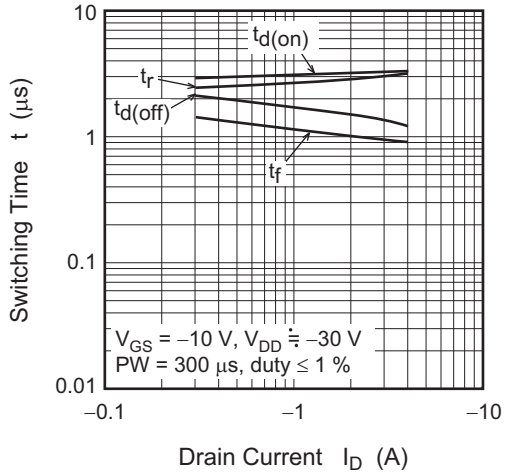
Static Drain to Source On State Resistance vs. Temperature



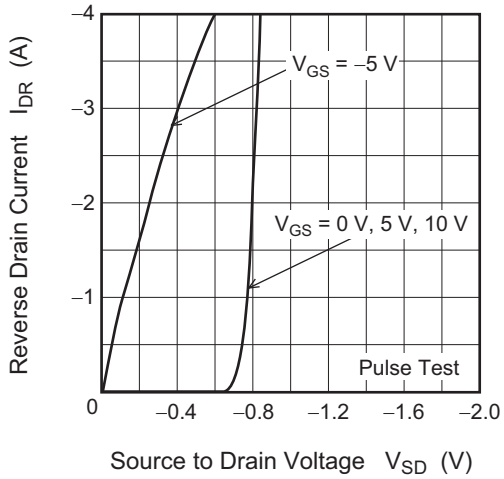
Body-Drain Diode Reverse Recovery Time



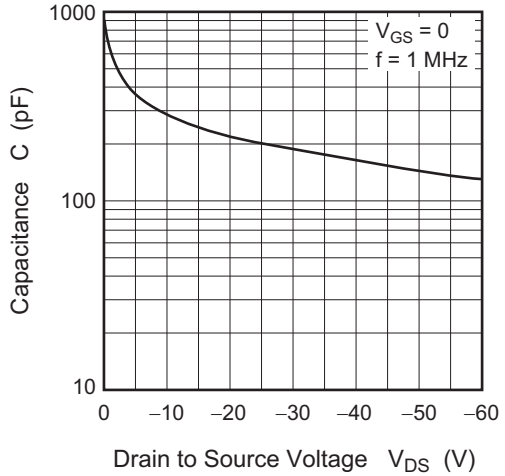
Switching Characteristics



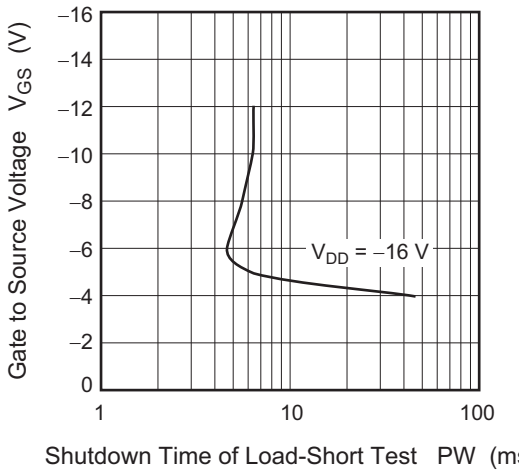
Reverse Drain Current vs. Source to Drain Voltage



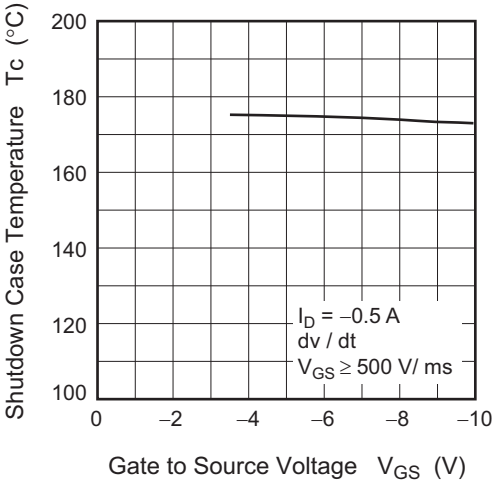
Typical Capacitance vs. Drain to Source Voltage



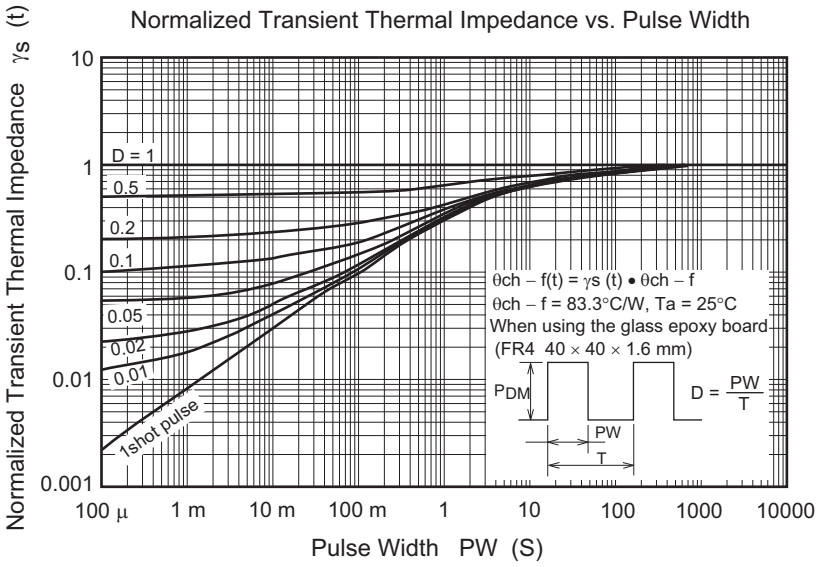
Gate to Source Voltage vs. Shutdown Time of Load-Short Test



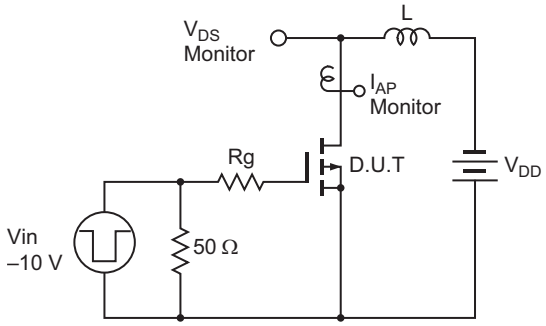
Shutdown Case Temperature vs.
Gate to Source Voltage



Normalized Transient Thermal Impedance vs. Pulse Width

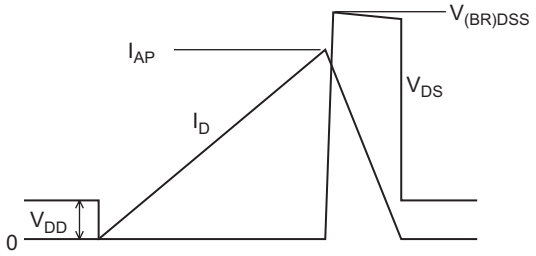


Avalanche Test Circuit

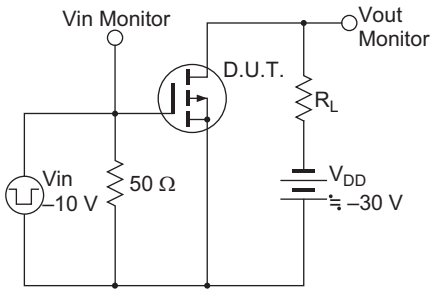


Avalanche Waveform

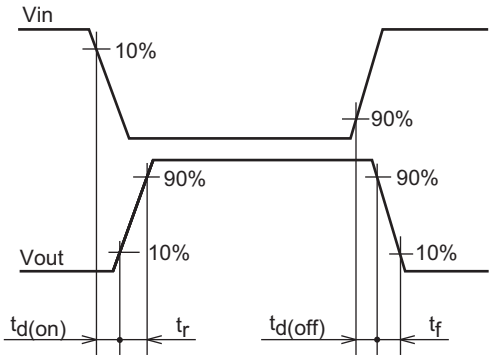
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

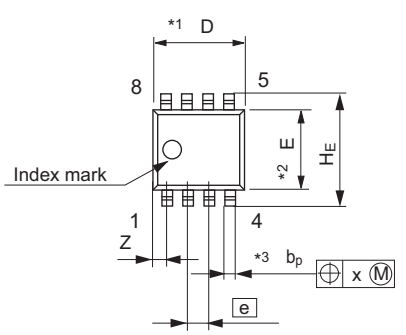


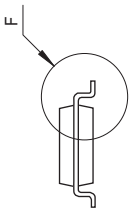
Switching Time Waveform

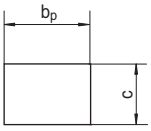


Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
SOP-8	P-SOP8-3.95 × 4.9-1.27	PRSP0008DD-D	FP-8DAV	0.085g

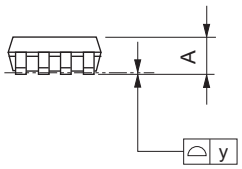


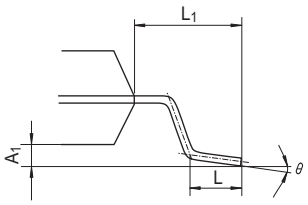




Terminal cross section
(Ni/Pd/Au plating)

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	—	4.90	5.3
E	—	3.95	—
A_2	—	—	—
A_1	0.10	0.14	0.25
A	—	—	1.75
b_p	0.34	0.40	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	5.80	6.10	6.20
e	—	1.27	—
x	—	—	0.25
y	—	—	0.1
Z	—	—	0.75
L	0.40	0.60	1.27
L_1	—	1.08	—

Ordering Information

Part No.	Quantity	Shipping Container
RJE0616JSP-00-J0	2500 pcs	Taping

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Renesas Electronics America Inc.
2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics 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: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Ku, Seoul, 135-920, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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