# NP179N055TUK

## 55 V – 180 A – N-channel Power MOS FET
## Application: Automotive

R07DS1249EJ0100
Rev.1.00
Mar 02, 2015

### Description

The NP179N055TUK is N-channel MOS Field Effect Transistors designed for high current switching applications.

### Features

- Super low on-state resistance
  $R_{DS(on)}$ = 1.75 mΩ MAX. ($V_{GS}$ = 10 V, $I_D$ = 90 A)
- Low Ciss
  Ciss = 9300 pF TYP. ($V_{DS}$ = 25 V)
- Designed for automotive application and AEC-Q101 qualified

### Ordering Information

| Part No. | Lead Plating | Packing | | Package |
|---|---|---|---|---|
| NP179N055TUK-E1-AY *1 | Pure Sn (Tin) | Tape 800 p/reel | Taping (E1 type) | TO-263-7pin |
| NP179N055TUK-E2-AY *1 | | | Taping (E2 type) | |

Note: *1 Pb-free (This product does not contain Pb in the external electrode)

### Absolute Maximum Ratings ($T_A$ = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to Source Voltage ($V_{GS}$ = 0 V) | $V_{DSS}$ | 55 | V |
| Gate to Source Voltage ($V_{DS}$ = 0 V) | $V_{GSS}$ | ±20 | V |
| Drain Current (DC) ($T_C$ = 25°C) | $I_{D(DC)}$ | ±180 | A |
| Drain Current (pulse) *1 | $I_{D(pulse)}$ | ±720 | A |
| Total Power Dissipation ($T_C$ = 25°C) | $P_{T1}$ | 288 | W |
| Total Power Dissipation ($T_A$ = 25°C) *2 | $P_{T2}$ | 1.8 | W |
| Channel Temperature | $T_{ch}$ | 175 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +175 | °C |
| Repetitive Avalanche Current *3 | $I_{AR}$ | 59 | A |
| Repetitive Avalanche Energy *3 | $E_{AR}$ | 348 | mJ |

Notes: *1 $T_C$ = 25°C, $P_W$ ≤ 10 μs, Duty Cycle ≤ 1%
*2 Mounted on glass epoxy substrate of 40 mm × 40 mm × 1.6 mmt with 4% Copper area (35 μm)
*3 $R_G$ = 25 Ω, $V_{GS}$ = 20 V → 0 V

### Thermal Resistance

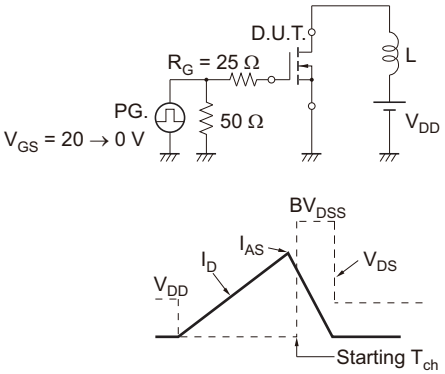
| | | | |
|---|---|---|---|
| Channel to Case Thermal Resistance | $R_{th(ch-C)}$ | 0.52 | °C/W |
| Channel to Ambient Thermal Resistance | $R_{th(ch-A)}$ | 83.3 | °C/W |

## Electrical Characteristics ($T_A$ = 25°C)

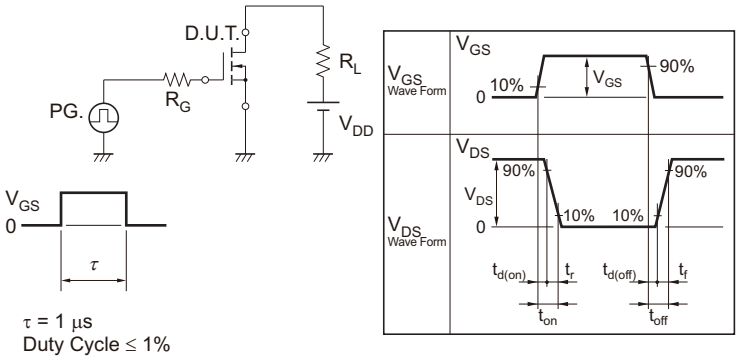
| Item | Symbol | MIN. | TYP. | MAX. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | μA | $V_{DS}$ = 55 V, $V_{GS}$ = 0 V |
| Gate Leakage Current | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V |
| Gate to Source Threshold Voltage | $V_{GS(th)}$ | 2.0 | 3.0 | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA |
| Forward Transfer Admittance *1 | $\|y_{fs}\|$ | 65 | 150 | — | S | $V_{DS}$ = 5 V, $I_D$ = 90 A |
| Drain to Source On-state Resistance *1 | $R_{DS(on)}$ | — | 1.45 | 1.75 | mΩ | $V_{GS}$ = 10 V, $I_D$ = 90 A |
| Input Capacitance | $C_{iss}$ | — | 9300 | 13950 | pF | $V_{DS}$ = 25 V<br>$V_{GS}$ = 0 V<br>f = 1 MHz |
| Output Capacitance | $C_{oss}$ | — | 920 | 1380 | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 310 | 560 | pF | |
| Turn-on Delay Time | $t_{d(on)}$ | — | 35 | 80 | ns | $V_{DD}$ = 28 V, $I_D$ = 90 A<br>$V_{GS}$ = 10 V<br>$R_G$ = 0 Ω |
| Rise Time | $t_r$ | — | 12 | 30 | ns | |
| Turn-off Delay Time | $t_{d(off)}$ | — | 110 | 220 | ns | |
| Fall Time | $t_f$ | — | 13 | 40 | ns | |
| Total Gate Charge | $Q_G$ | — | 160 | 240 | nC | $V_{DD}$ = 44 V<br>$V_{GS}$ = 10 V<br>$I_D$ = 180 A |
| Gate to Source Charge | $Q_{GS}$ | — | 42 | — | nC | |
| Gate to Drain Charge | $Q_{GD}$ | — | 42 | — | nC | |
| Body Diode Forward Voltage *1 | $V_{F(S-D)}$ | — | 0.9 | 1.5 | V | $I_F$ = 180 A, $V_{GS}$ = 0 V |
| Reverse Recovery Time | $t_{rr}$ | — | 63 | — | ns | $I_F$ = 180 A, $V_{GS}$ = 0 V<br>di/dt = 100 A/μs |
| Reverse Recovery Charge | $Q_{rr}$ | — | 120 | — | nC | |

Note: *1 Pulsed test

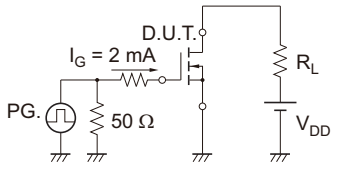
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**




**TEST CIRCUIT 2 SWITCHING TIME**

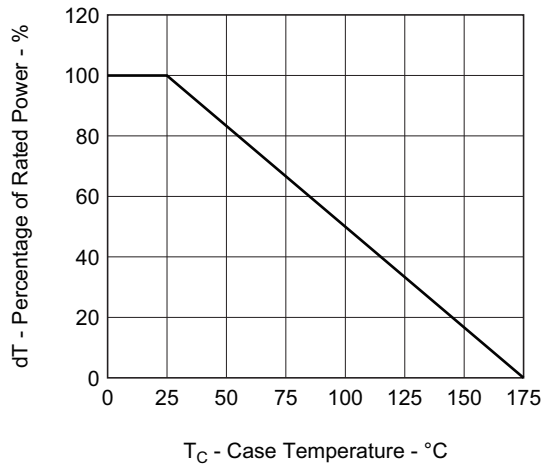



**TEST CIRCUIT 3 GATE CHARGE**

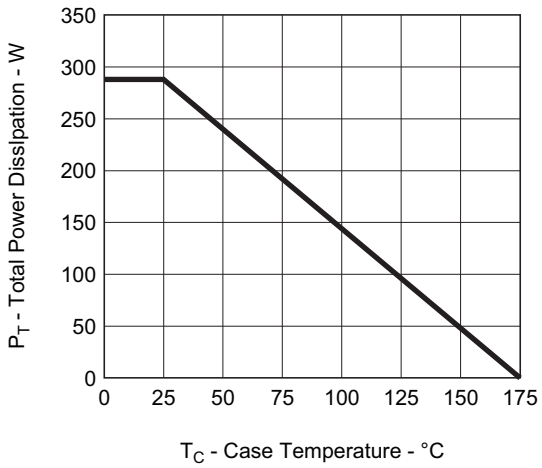


## Typical Characteristics ($T_A$ = 25°C)

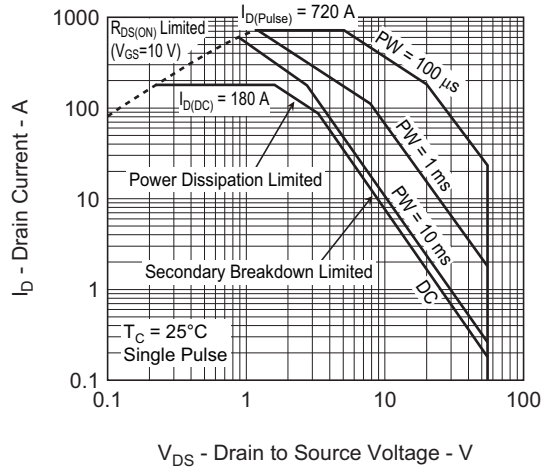
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



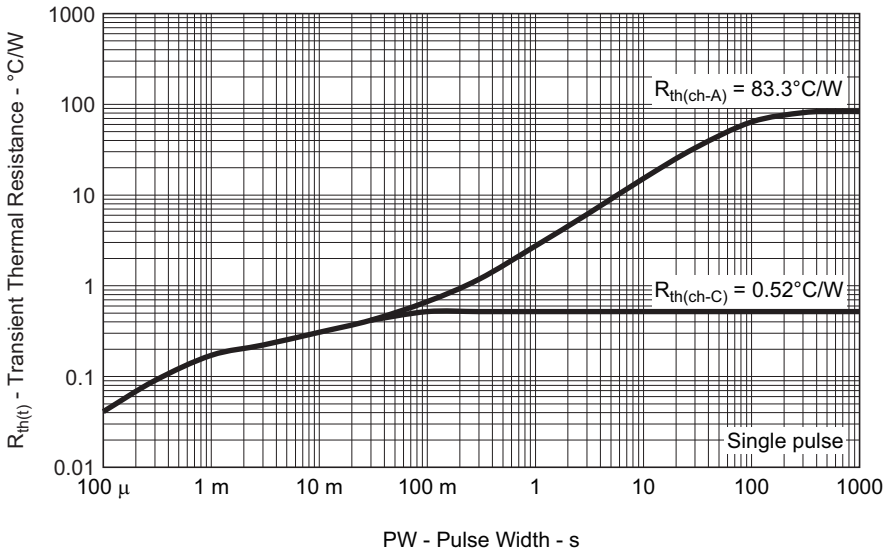

TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



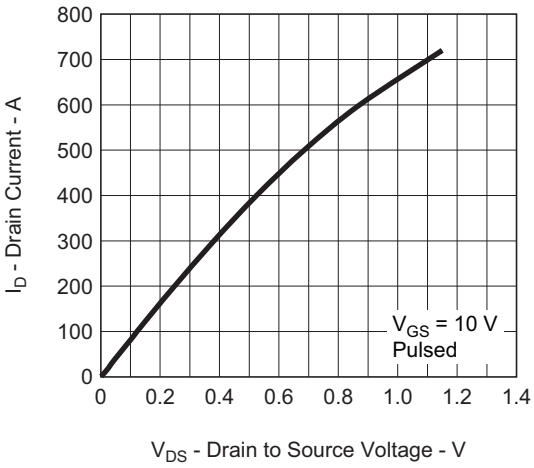

FORWARD BIAS SAFE OPERATING AREA



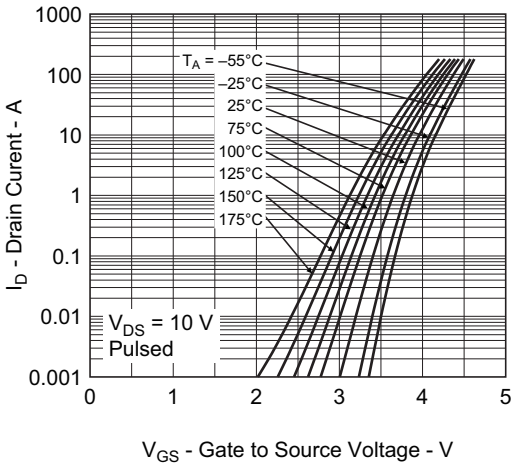

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



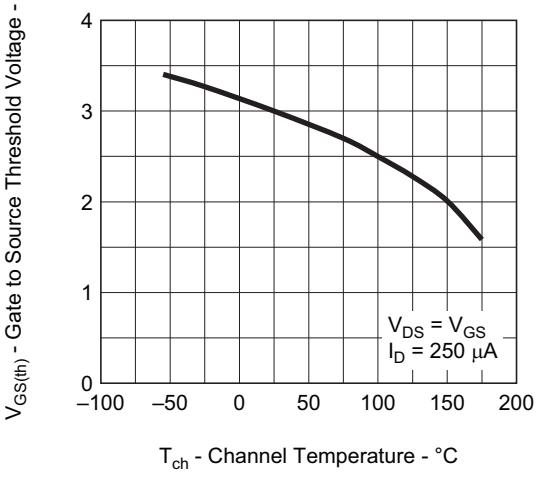
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



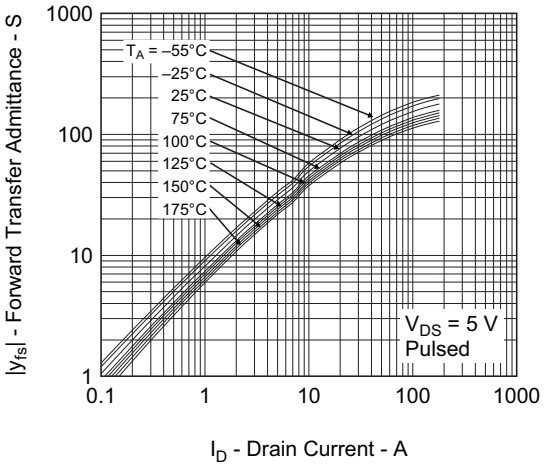

FORWARD TRANSFER CHARACTERISTICS



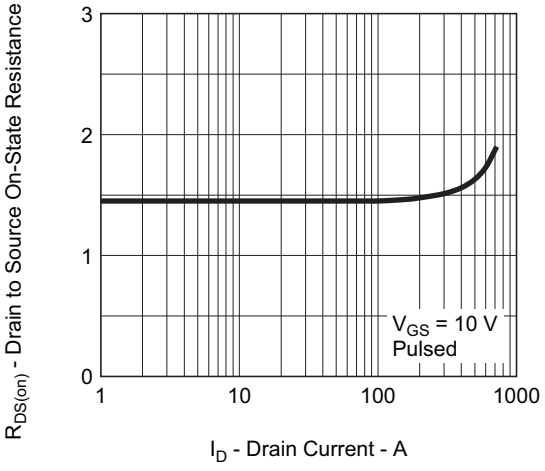

GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



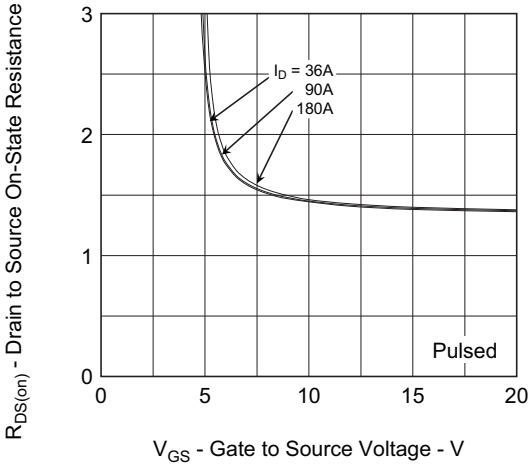

FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



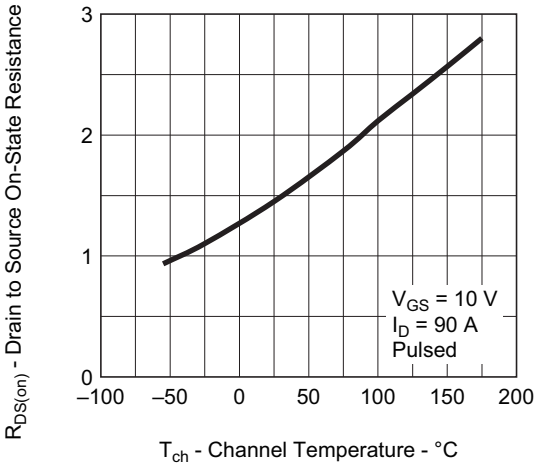

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



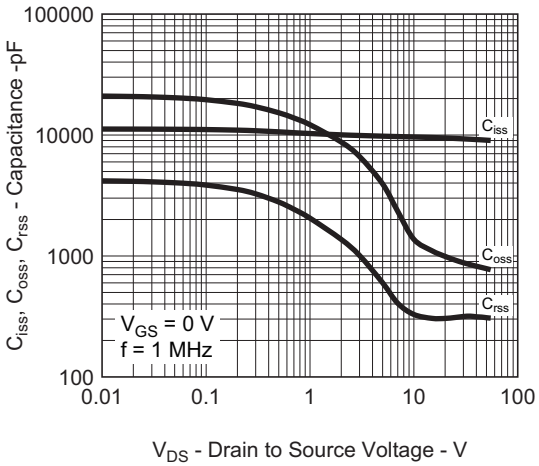

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



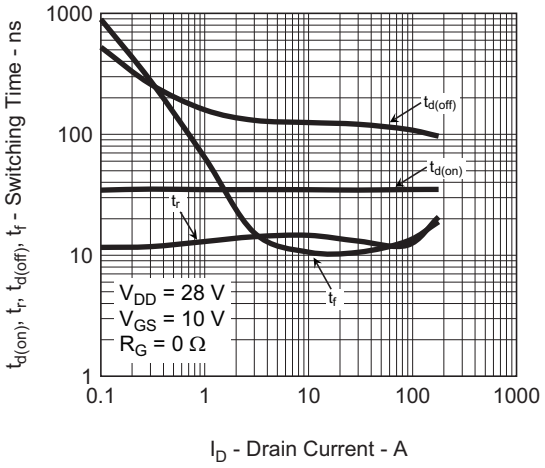
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



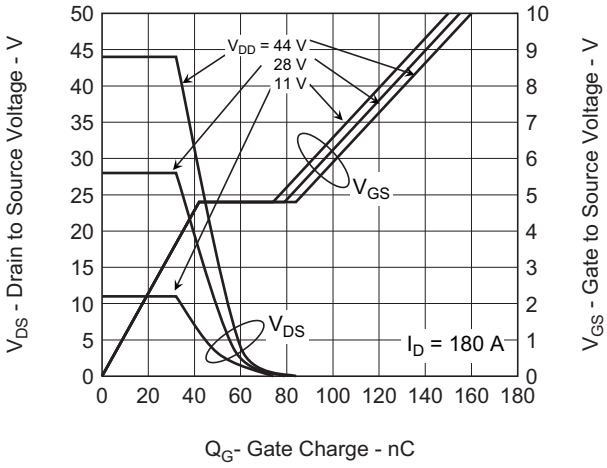

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



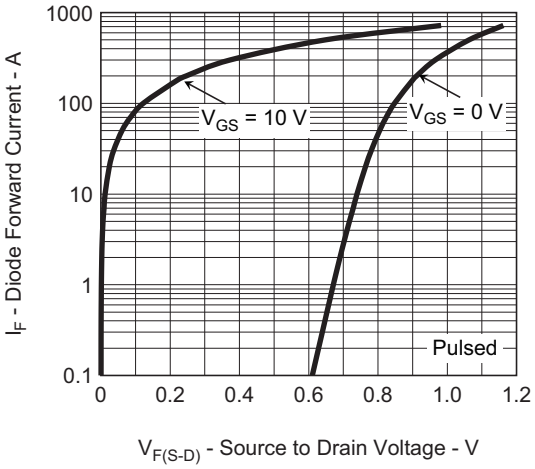

SWITCHING CHARACTERISTICS



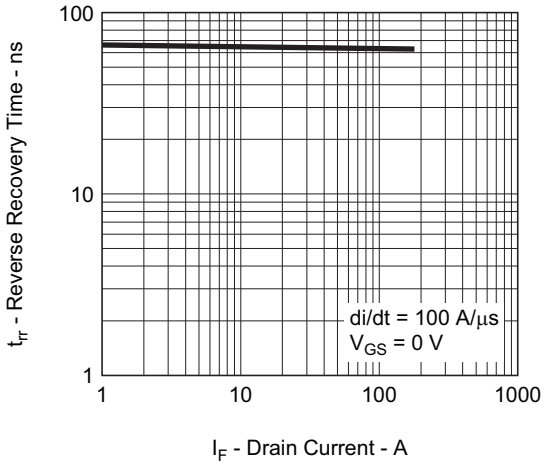

DYNAMIC INPUT/OUTPUT CHARACTERISTICS




SOURCE TO DRAIN DIODE FORWARD VOLTAGE



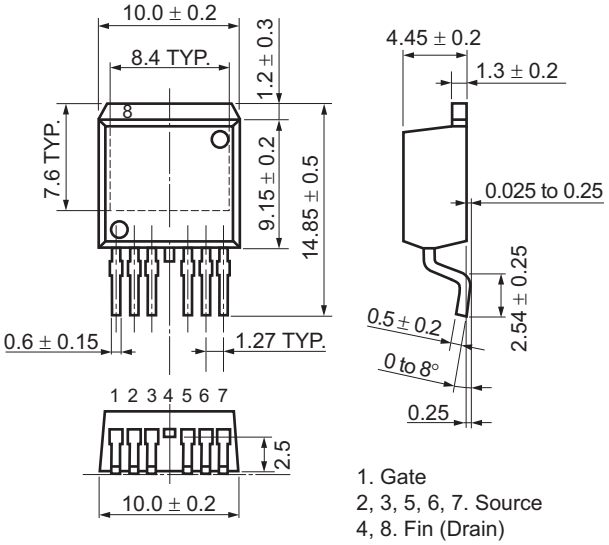

REVERSE RECOVERY TIME vs. DRAIN CURRENT



## Package Drawing (Unit: mm)

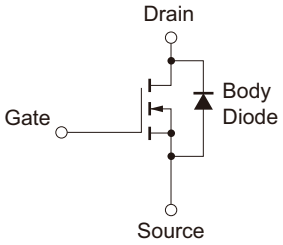
**TO-263-7pin (MP-25ZT) (Mass: 0.128 g TYP.)**

Renesas Code: PRSS0008DB-A




1. Gate
2, 3, 5, 6, 7. Source
4, 8. Fin (Drain)

## Equivalent Circuit




Remark: Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

| Revision History | NP179N055TUK Data Sheet |
|---|---|

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.00 | Mar 02, 2015 | — | First Edition Issued |

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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**
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

**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 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

**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 1207, 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 India Pvt. Ltd.**
No.777C, 100 Feet Road, HALII Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

**Renesas Electronics Korea Co., Ltd.**
12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141



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