

To our customers,

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Phase-out/Discontinued

**SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE**

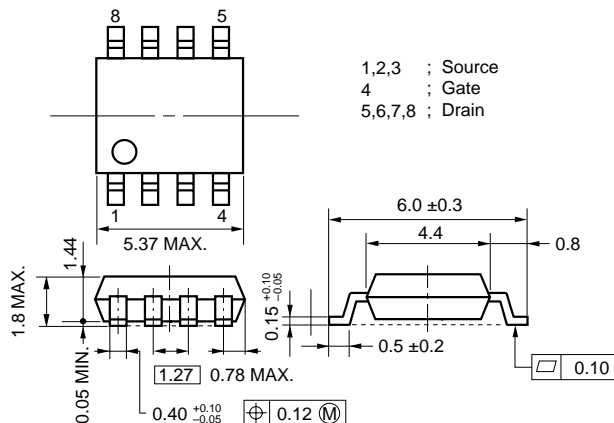
DESCRIPTION

This μ PA1704 is N-Channel MOS Field Effect Transistor designed for power management applications and Li-ion battery application.

FEATURES

- 2.5-V gate drive and low on-resistance
 $R_{DS(on)1} = 13 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 5.0 \text{ A)}$
 $R_{DS(on)2} = 16 \text{ m}\Omega \text{ MAX. (} V_{GS} = 2.5 \text{ V, } I_D = 5.0 \text{ A)}$
- Low C_{iss} : $C_{iss} = 2700 \text{ pF TYP.}$
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit : mm)



ORDERING INFORMATION

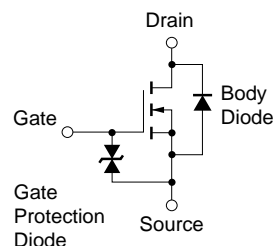
| PART NUMBER | PACKAGE |
|---------------|------------|
| μ PA1704G | Power SOP8 |

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, All terminals are connected.)

| | | | |
|---|----------------|--------------|------------------|
| Drain to Source Voltage ($V_{GS} = 0 \text{ V}$) | V_{DSS} | 30 | V |
| Gate to Source Voltage ($V_{DS} = 0 \text{ V}$) | V_{GSS} | ± 12 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ± 10 | A |
| Drain Current (pulse) ^{Note1} | $I_{D(pulse)}$ | ± 40 | A |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) ^{Note2} | P_T | 2.0 | 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. Mounted on ceramic substrate of $1200 \text{ mm}^2 \times 0.7 \text{ mm}$

EQUIVALENT CIRCUIT



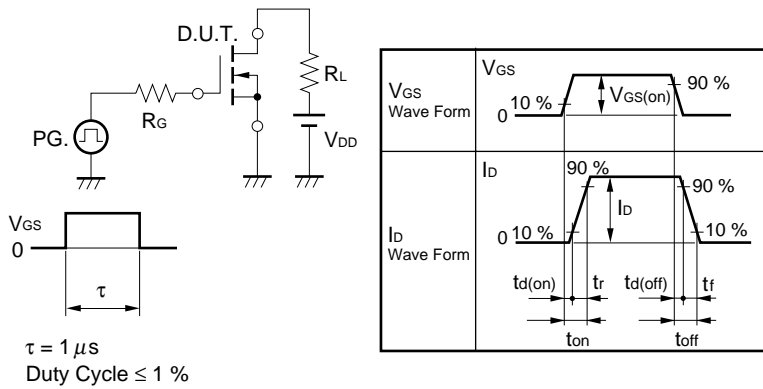
Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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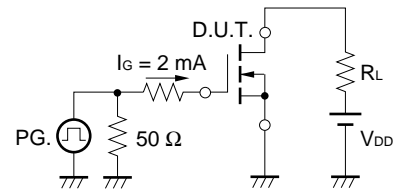
ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|---|------|------|------|------|
| Drain to Source On-state Resistance | R _{DS(on)1} | V _{GS} = 4.0 V, I _D = 5.0 A | | 9.8 | 13 | mΩ |
| | R _{DS(on)2} | V _{GS} = 2.5 V, I _D = 5.0 A | | 12 | 16 | mΩ |
| Gate to Source Cut-off Voltage | V _{GS(off)} | V _{DS} = 10 V, I _D = 1 mA | 0.5 | 0.8 | 1.5 | V |
| Forward Transfer Admittance | y _{fs} | V _{DS} = 10 V, I _D = 5.0 A | 10 | 25 | | S |
| Drain Leakage Current | I _{DSS} | V _{DS} = 30 V, V _{GS} = 0 V | | | 10 | μA |
| Gate to Source Leakage Current | I _{GSS} | V _{GS} = ±12 V, V _{DS} = 0 V | | | ±10 | μA |
| Input Capacitance | C _{iss} | V _{DS} = 10 V | | 2700 | | pF |
| Output Capacitance | C _{oss} | V _{GS} = 0 V | | 880 | | pF |
| Reverse Transfer Capacitance | C _{rss} | f = 1 MHz | | 400 | | pF |
| Turn-on Delay Time | t _{d(on)} | I _D = 5.0 A | | 25 | | ns |
| Rise Time | t _r | V _{GS(on)} = 4.0 V | | 95 | | ns |
| Turn-off Delay Time | t _{d(off)} | V _{DD} = 15 V | | 235 | | ns |
| Fall Time | t _f | R _G = 10 Ω | | 200 | | ns |
| Total Gate Charge | Q _G | I _D = 10 A | | 38 | | nC |
| Gate to Source Charge | Q _{GS} | V _{DD} = 24 V | | 3.3 | | nC |
| Gate to Drain Charge | Q _{GD} | V _{GS} = 4.0 V | | 15 | | nC |
| Body Diode Forward Voltage | V _{F(S-D)} | I _F = 10 A, V _{GS} = 0 V | | 0.8 | | V |
| Reverse Recovery Time | t _{rr} | I _F = 10 A, V _{GS} = 0 V | | 48 | | ns |
| Reverse Recovery Charge | Q _{rr} | di/dt = 100 A/μs | | 53 | | nC |

TEST CIRCUIT 1 SWITCHING TIME

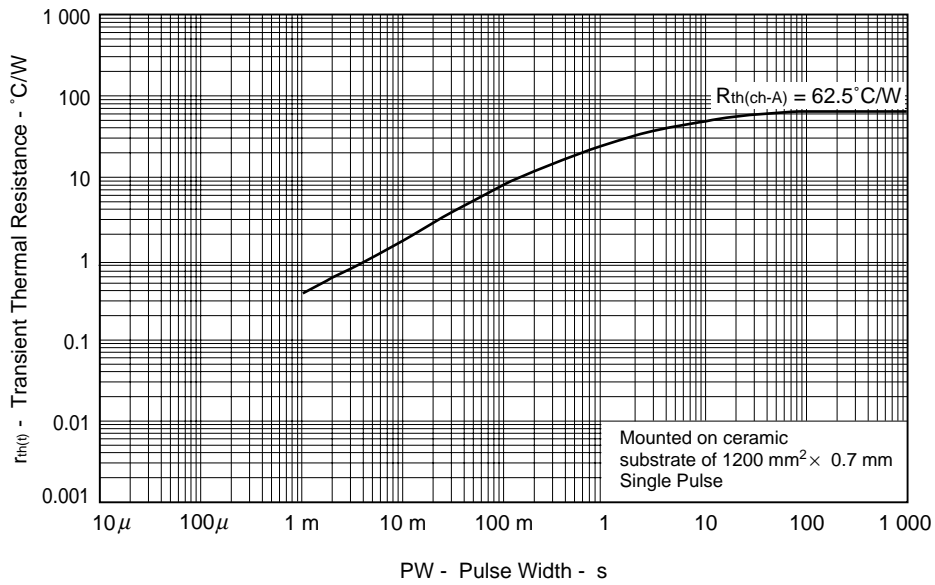


TEST CIRCUIT 2 GATE CHARGE

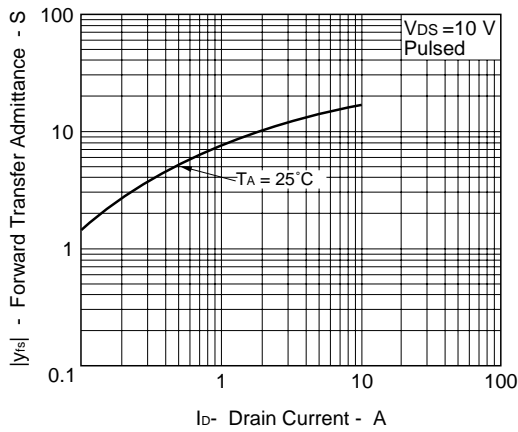


TYPICAL CHARACTERISTICS (T_A = 25°C)

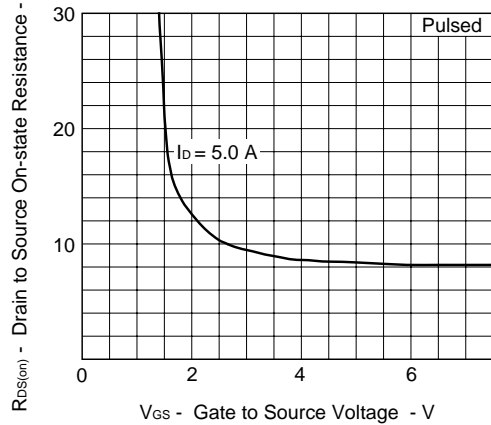
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



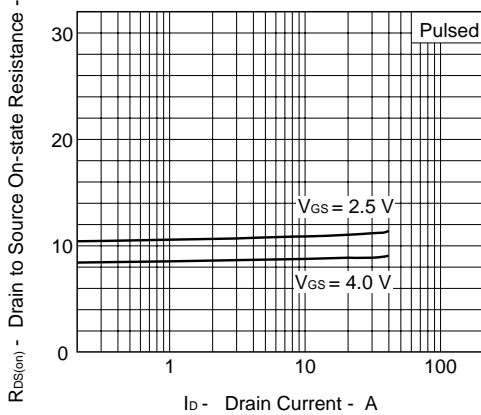
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



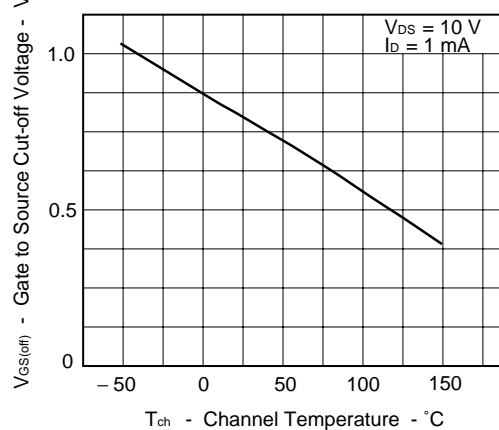
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



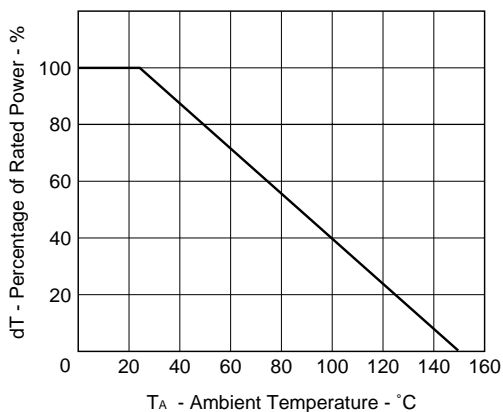
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



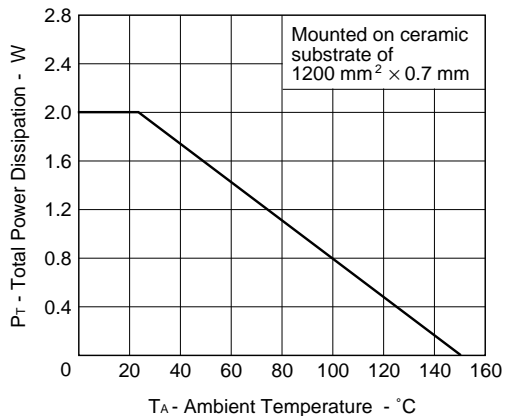
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



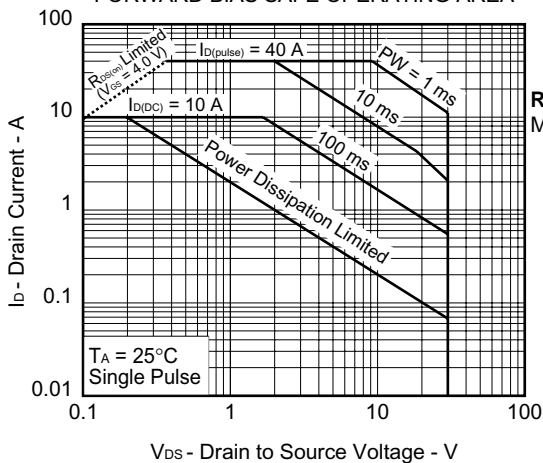
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

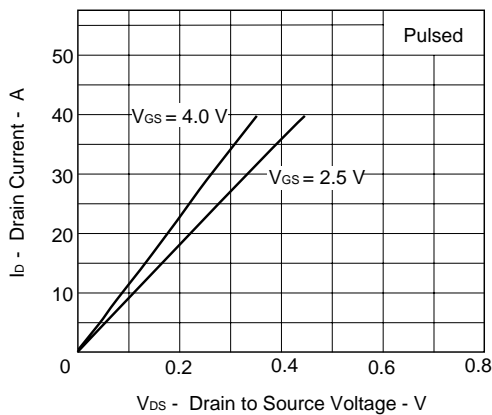


★ FORWARD BIAS SAFE OPERATING AREA

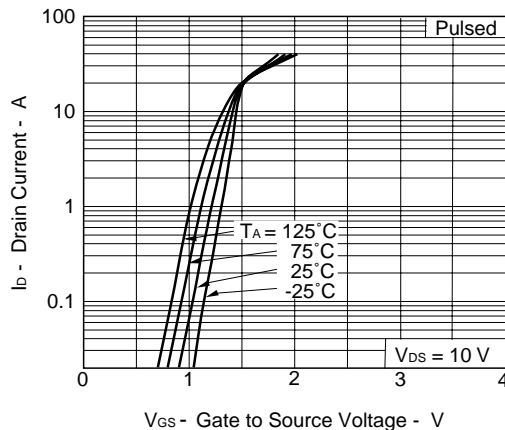


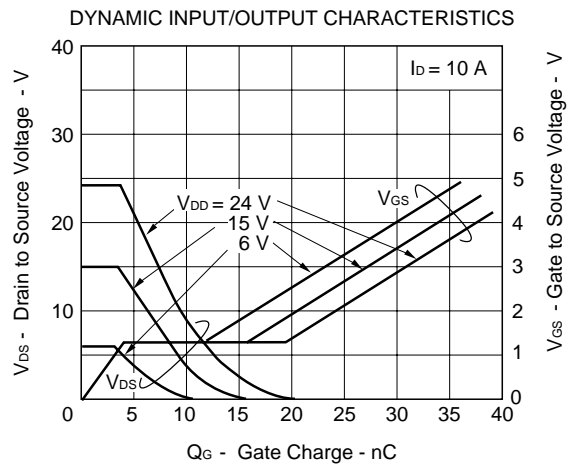
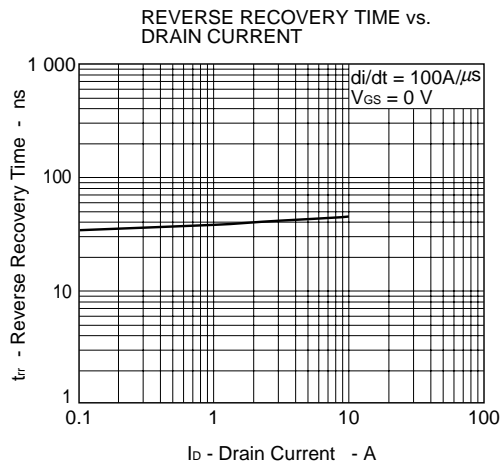
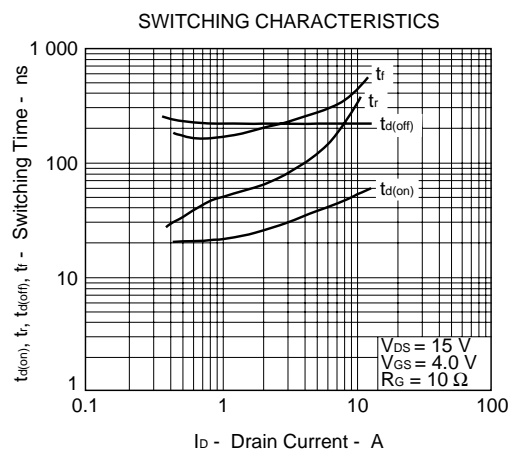
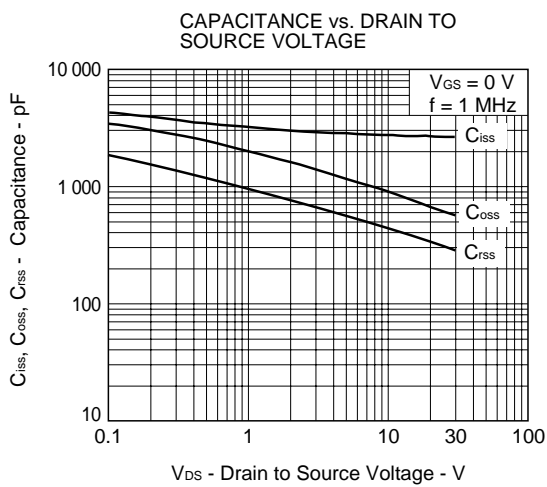
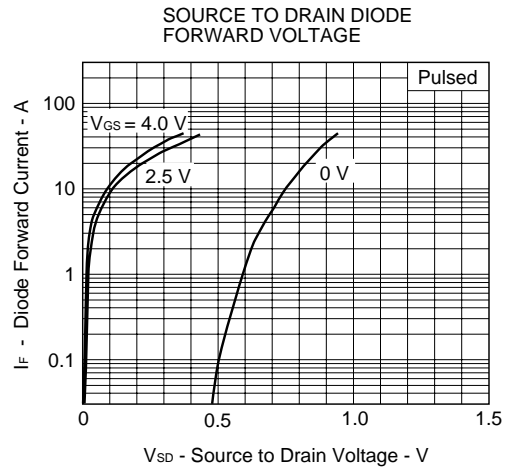
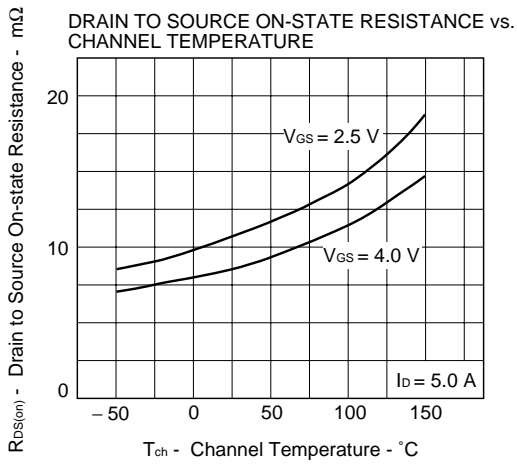
Remark
Mounted on ceramic substrate of 1200 mm² x 0.7 mm

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



FORWARD TRANSFER CHARACTERISTICS





[MEMO]

[MEMO]

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