

**Phase-out/Discontinued**

### SWITCHING P-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

This product is P-Channel MOS Field Effect Transistor designed for DC/DC converter and power management applications of notebook computers.

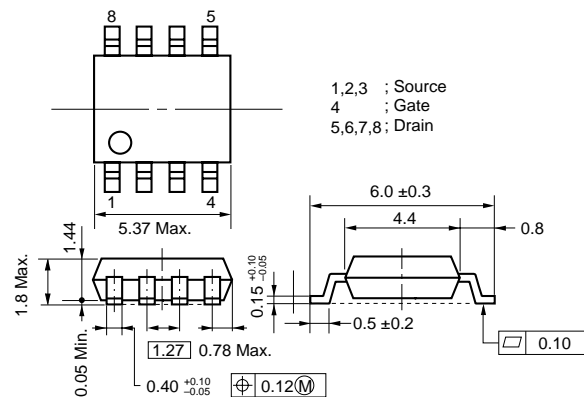
#### FEATURES

- Low on-resistance  
 $R_{DS(on)1} = 70 \text{ m}\Omega$  (MAX.) ( $V_{GS} = -10 \text{ V}$ ,  $I_D = -2.5 \text{ A}$ )  
 $R_{DS(on)2} = 160 \text{ m}\Omega$  (MAX.) ( $V_{GS} = -4 \text{ V}$ ,  $I_D = -2.0 \text{ A}$ )
- Low  $C_{iss}$  :  $C_{iss} = 840 \text{ pF}$  (TYP.)
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

#### ORDERING INFORMATION

| PART NUMBER | PACKAGE    |
|-------------|------------|
| μ PA1710AG  | Power SOP8 |

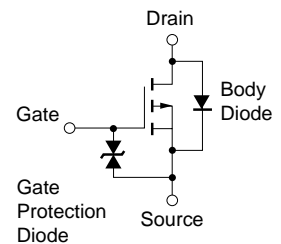
#### PACKAGE DRAWING (Unit : mm)



#### 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 ( $V_{DS} = 0 \text{ V}$ )                     | $V_{GSS}$      | ±20          | V  |
| Drain Current (DC)  | $I_{D(DC)}$    | ±5.0         | A  |
| Drain Current (pulse) <sup>Note1</sup>                                | $I_{D(pulse)}$ | ±20          | A  |
| Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>Note2</sup> | $P_T$          | 2.0          | W  |
| Channel Temperature   | $T_{ch}$       | 150          | °C |
| Storage Temperature   | $T_{stg}$      | -55 to + 150 | °C |

#### EQUIVALENT CIRCUIT



- Notes 1.**  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$   
**2.** Mounted on ceramic substrate of  $1200 \text{ mm}^2 \times 1.1 \text{ mm}$

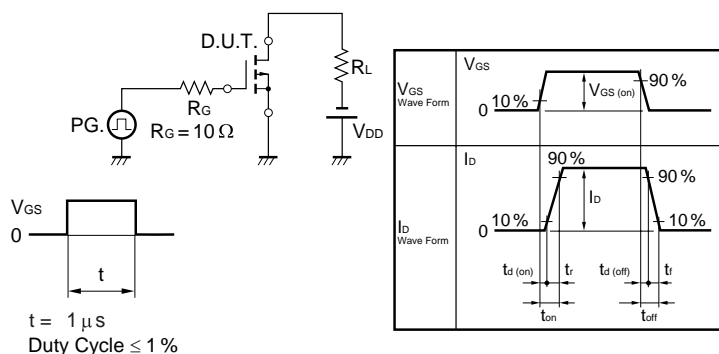
**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

The information in this document is subject to change without notice.

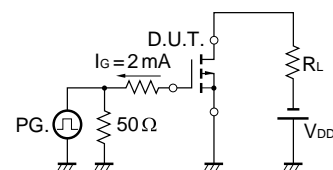
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, All terminals are connected.)**

| CHARACTERISTICS                     | SYMBOL               | TEST CONDITIONS                                  | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|--|------|------|------|------|
| Drain to Source On-state Resistance | R <sub>DS(on)1</sub> | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -2.5 A |      | 45   | 70   | mΩ   |
|                                     | R <sub>DS(on)2</sub> | V <sub>GS</sub> = -4 V, I <sub>D</sub> = -2.0 A  |      | 91   | 160  | mΩ   |
| Gate to Source Cut-off Voltage      | V <sub>GS(off)</sub> | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA  | -1.0 | -1.8 | -2.5 | V    |
| Forward Transfer Admittance         | y <sub>fs</sub>      | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -2.5 A | 3.0  | 5.6  |      | S    |
| Drain Leakage Current               | I <sub>DSS</sub>     | V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V   |      |      | -10  | μA   |
| Gate to Source Leakage Current      | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V   |      |      | ±10  | μA   |
| Input Capacitance                   | C <sub>iss</sub>     | V <sub>DS</sub> = -10 V                          |      | 840  |      | pF   |
| Output Capacitance                  | C <sub>oss</sub>     | V <sub>GS</sub> = 0 V                            |      | 570  |      | pF   |
| Reverse Transfer Capacitance        | C <sub>rss</sub>     | f = 1 MHz  |      | 190  |      | pF   |
| Turn-on Delay Time                  | t <sub>d(on)</sub>   | I <sub>D</sub> = -2.5 A                          |      | 13   |      | ns   |
| Rise Time                           | t <sub>r</sub>       | V <sub>GS(on)</sub> = -10 V                      |      | 66   |      | ns   |
| Turn-off Delay Time                 | t <sub>d(off)</sub>  | V <sub>DD</sub> = -15 V                          |      | 82   |      | ns   |
| Fall Time                           | t <sub>f</sub>       | R <sub>G</sub> = 10 Ω                            |      | 52   |      | ns   |
| Total Gate Charge                   | Q <sub>G</sub>       | I <sub>D</sub> = -5.0 A                          |      | 27.3 |      | nC   |
| Gate to Source Charge               | Q <sub>GS</sub>      | V <sub>DD</sub> = -24 V                          |      | 2.7  |      | nC   |
| Gate to Drain Charge                | Q <sub>GD</sub>      | V <sub>GS</sub> = -10 V                          |      | 8.2  |      | nC   |
| Body Diode Forward Voltage          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 5.0 A, V <sub>GS</sub> = 0 V    |      | 0.81 |      | V    |
| Reverse Recovery Time               | t <sub>rr</sub>      | I <sub>F</sub> = 5.0 A, V <sub>GS</sub> = 0 V    |      | 61   |      | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>      | di/dt = 50 A/μs                                  |      | 71   |      | nC   |

**TEST CIRCUIT 1 SWITCHING TIME**

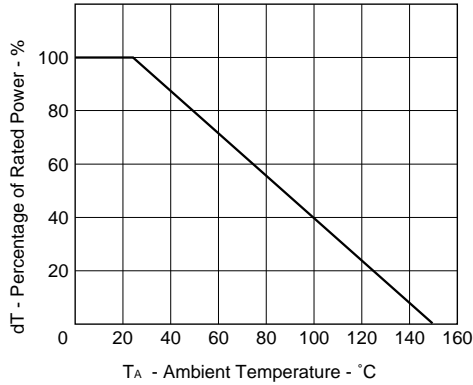


**TEST CIRCUIT 2 GATE CHARGE**

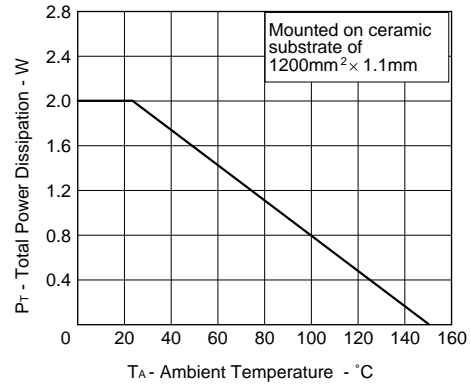


TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

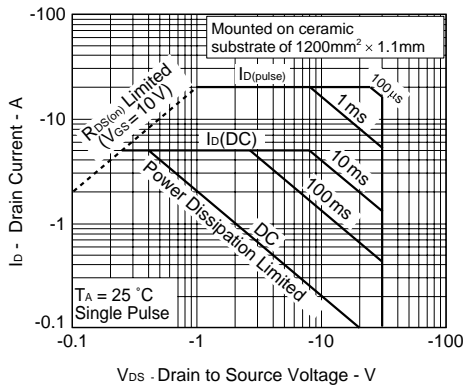
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



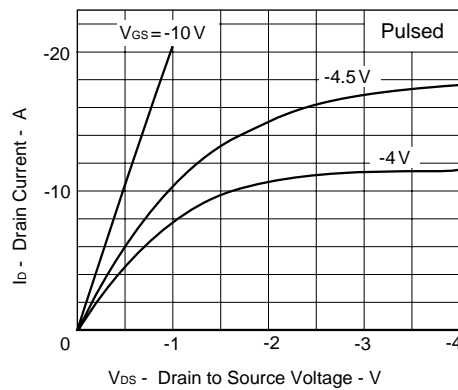
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



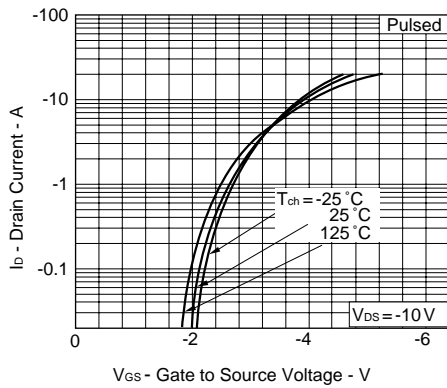
FORWARD BIAS SAFE OPERATING AREA



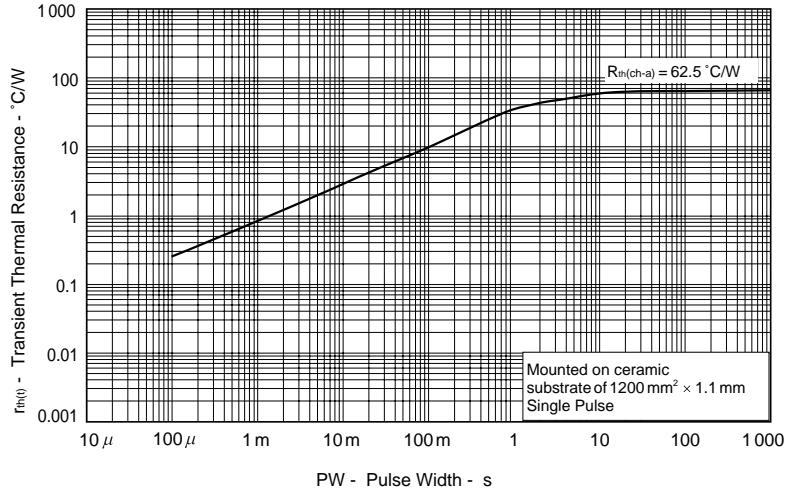
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



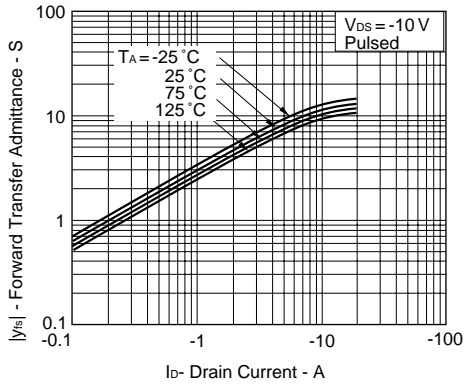
FORWARD TRANSFER CHARACTERISTICS



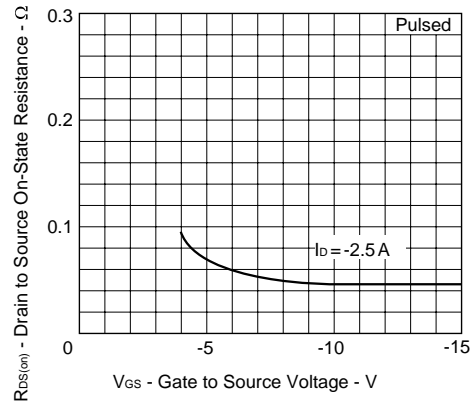
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



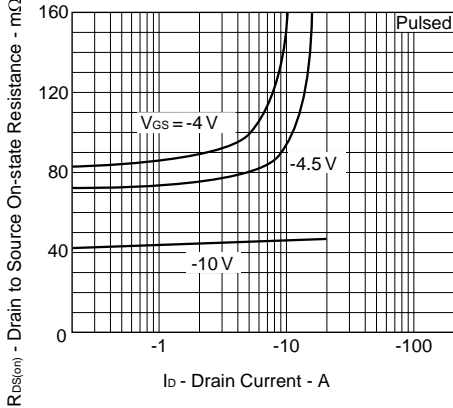
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



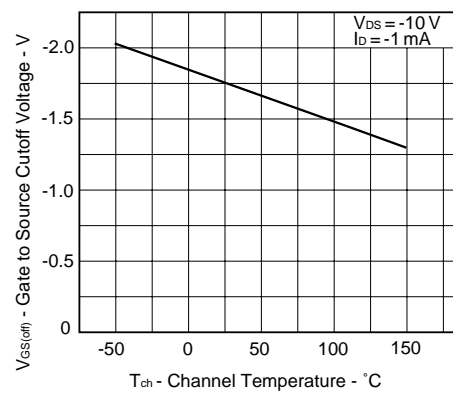
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

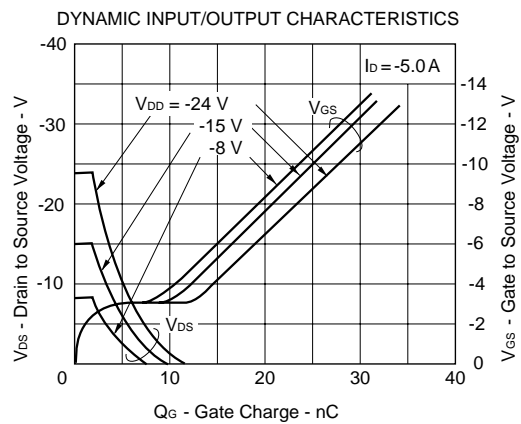
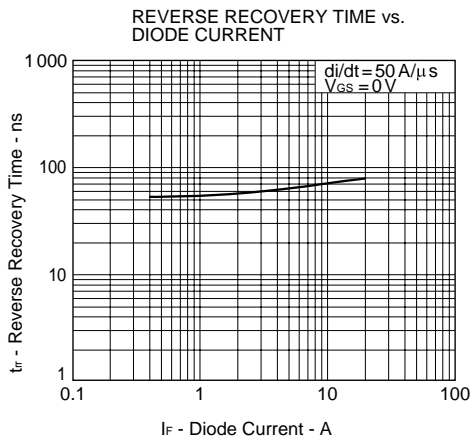
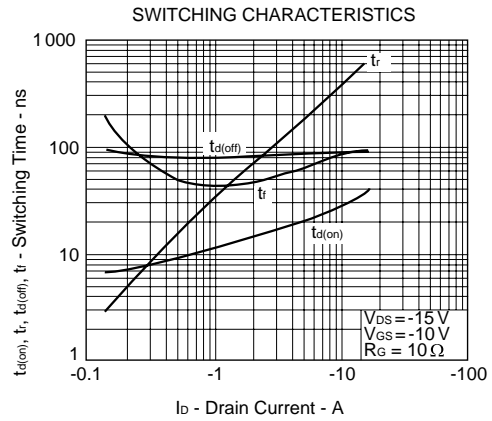
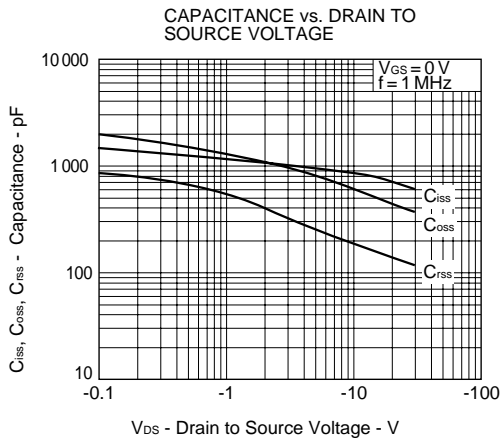
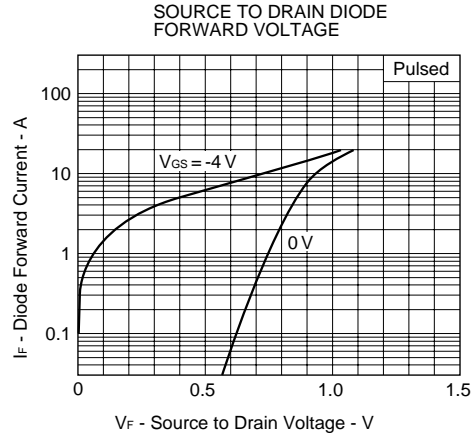
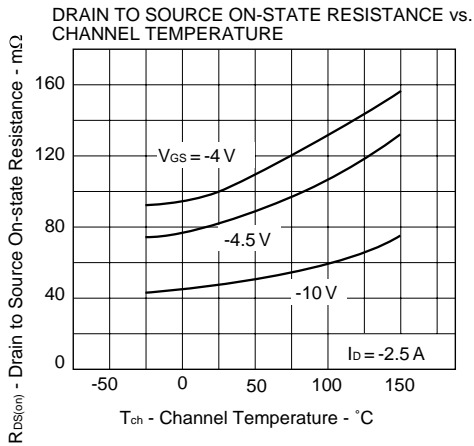


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE





[MEMO]

[MEMO]

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Anti-radioactive design is not implemented in this product.