

# MOS FIELD EFFECT TRANSISTOR $\mu$ PA1872B

## N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

### DESCRIPTION

The  $\mu$  PA1872B is a switching device, which can be driven directly by a 2.5 V power source.

The  $\mu$  PA1872B features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

### FEATURES

- 2.5 V drive available
- Low on-state resistance
  - $R_{DS(on)1} = 13.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 5.0 \text{ A}$ )
  - $R_{DS(on)2} = 13.5 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 4.0 \text{ V}$ ,  $I_D = 5.0 \text{ A}$ )
  - $R_{DS(on)3} = 15.5 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 3.1 \text{ V}$ ,  $I_D = 5.0 \text{ A}$ )
  - $R_{DS(on)4} = 18.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 2.5 \text{ V}$ ,  $I_D = 5.0 \text{ A}$ )
- Built-in G-S protection diode against ESD

### ORDERING INFORMATION

| PART NUMBER         | PACKAGE      |
|---------------------|--------------|
| $\mu$ PA1872BGR-9JG | Power TSSOP8 |

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

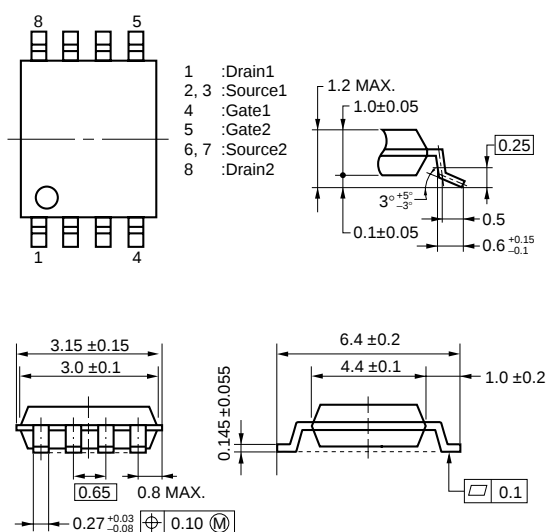
|                                                    |                |                        |                  |
|----------------------------------------------------|----------------|------------------------|------------------|
| Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ ) | $V_{DSS}$      | 20.0                   | V                |
| Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )  | $V_{GSS}$      | $\pm 12.0$             | V                |
| Drain Current (DC) <sup>Note 1</sup>               | $I_{D(DC)}$    | $\pm 10.0$             | A                |
| Drain Current (pulse) <sup>Note 2</sup>            | $I_{D(pulse)}$ | $\pm 80.0$             | A                |
| Total Power Dissipation <sup>Note 1</sup>          | $P_T$          | 2.0                    | W                |
| Channel Temperature                                | $T_{ch}$       | 150                    | $^\circ\text{C}$ |
| Storage Temperature                                | $T_{stg}$      | $-55 \text{ to } +150$ | $^\circ\text{C}$ |

**Notes 1.** Mounted on ceramic board of  $50 \text{ cm}^2 \times 1.1 \text{ mm}$

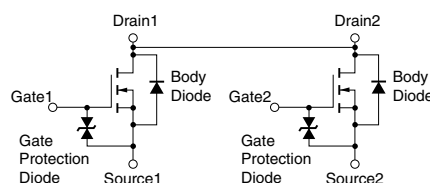
**2.**  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

**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.

### PACKAGE DRAWING (Unit: mm)



### EQUIVALENT CIRCUIT



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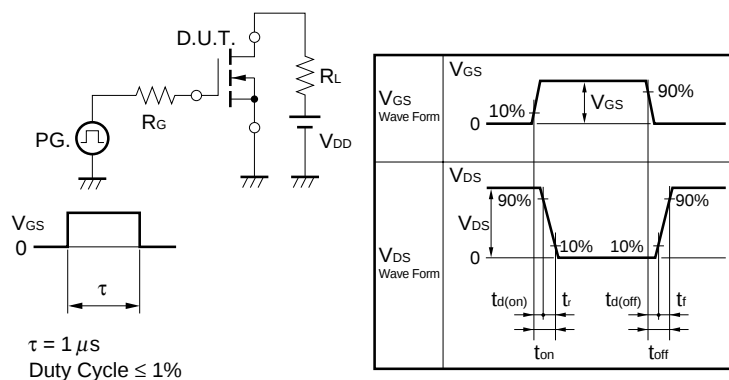
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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

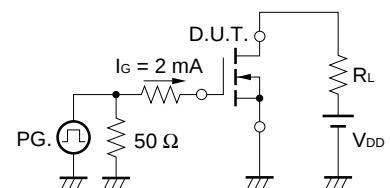
| CHARACTERISTICS                                 | SYMBOL               | TEST CONDITIONS                                   | MIN. | TYP. | MAX.  | UNIT |
|-------------------------------------------------|----------------------|---------------------------------------------------|------|------|-------|------|
| Zero Gate Voltage Drain Current                 | I <sub>DSS</sub>     | V <sub>DS</sub> = 20.0 V, V <sub>GS</sub> = 0 V   |      |      | 1.0   | μA   |
| Gate Leakage Current                            | I <sub>GSS</sub>     | V <sub>GS</sub> = ±12.0 V, V <sub>DS</sub> = 0 V  |      |      | ±10.0 | μA   |
| Gate Cut-off Voltage                            | V <sub>GS(off)</sub> | V <sub>DS</sub> = 10.0 V, I <sub>D</sub> = 1.0 mA | 0.50 | 1.00 | 1.50  | V    |
| Forward Transfer Admittance <b>Note</b>         | y <sub>fs</sub>      | V <sub>DS</sub> = 10.0 V, I <sub>D</sub> = 5.0 A  | 5    |      |       | S    |
| Drain to Source On-state Resistance <b>Note</b> | R <sub>DS(on)1</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5.0 A   | 8.0  | 10.0 | 13.0  | mΩ   |
|                                                 | R <sub>DS(on)2</sub> | V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 5.0 A   | 8.5  | 10.5 | 13.5  | mΩ   |
|                                                 | R <sub>DS(on)3</sub> | V <sub>GS</sub> = 3.1 V, I <sub>D</sub> = 5.0 A   | 9.0  | 11.0 | 15.5  | mΩ   |
|                                                 | R <sub>DS(on)4</sub> | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 5.0 A   | 10.0 | 13.0 | 18.0  | mΩ   |
| Input Capacitance                               | C <sub>iss</sub>     | V <sub>DS</sub> = 10.0 V                          |      | 945  |       | pF   |
| Output Capacitance                              | C <sub>oss</sub>     | V <sub>GS</sub> = 0 V                             |      | 220  |       | pF   |
| Reverse Transfer Capacitance                    | C <sub>rss</sub>     | f = 1.0 MHz                                       |      | 160  |       | pF   |
| Turn-on Delay Time                              | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10.0 V, I <sub>D</sub> = 5.0 A  |      | 47   |       | ns   |
| Rise Time                                       | t <sub>r</sub>       | V <sub>GS</sub> = 4.0 V                           |      | 315  |       | ns   |
| Turn-off Delay Time                             | t <sub>d(off)</sub>  | R <sub>G</sub> = 10 Ω                             |      | 255  |       | ns   |
| Fall Time                                       | t <sub>f</sub>       |                                                   |      | 330  |       | ns   |
| Total Gate Charge                               | Q <sub>G</sub>       | V <sub>DD</sub> = 16.0 V                          |      | 10.0 |       | nC   |
| Gate to Source Charge                           | Q <sub>GS</sub>      | V <sub>GS</sub> = 4.0 V                           |      | 2.5  |       | nC   |
| Gate to Drain Charge                            | Q <sub>GD</sub>      | I <sub>D</sub> = 10.0 A                           |      | 4.5  |       | nC   |
| Body Diode Forward Voltage <b>Note</b>          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 10.0 A, V <sub>GS</sub> = 0 V    |      | 0.83 |       | V    |
| Reverse Recovery Time                           | t <sub>rr</sub>      | I <sub>F</sub> = 10.0 A, V <sub>GS</sub> = 0 V    |      | 240  |       | ns   |
| Reverse Recovery Charge                         | Q <sub>rr</sub>      | di/dt = 50 A/μs                                   |      | 220  |       | nC   |

**Note** Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

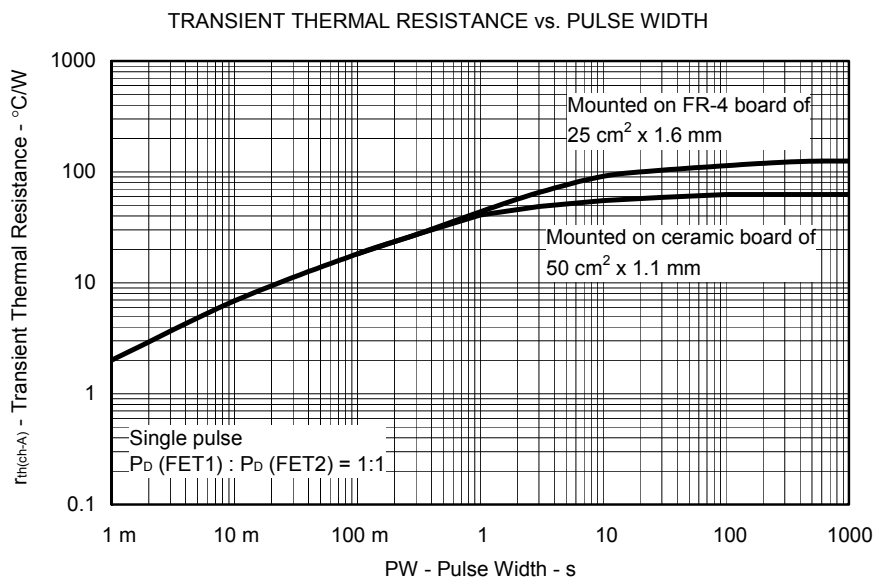
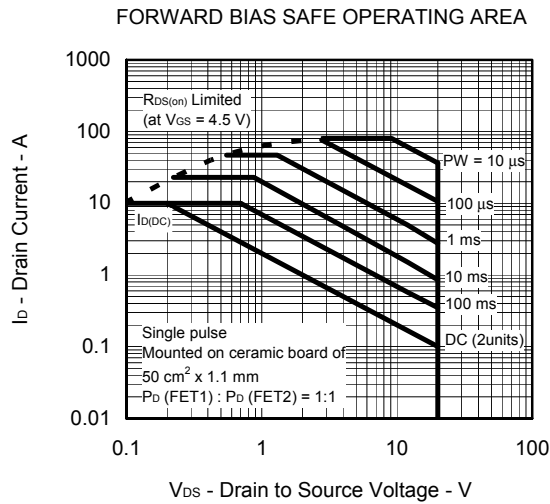
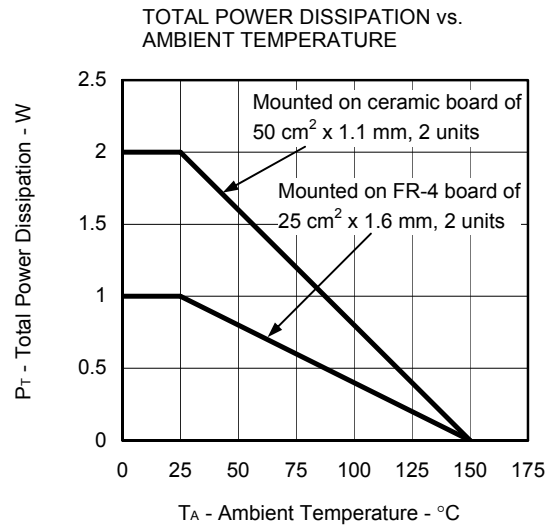
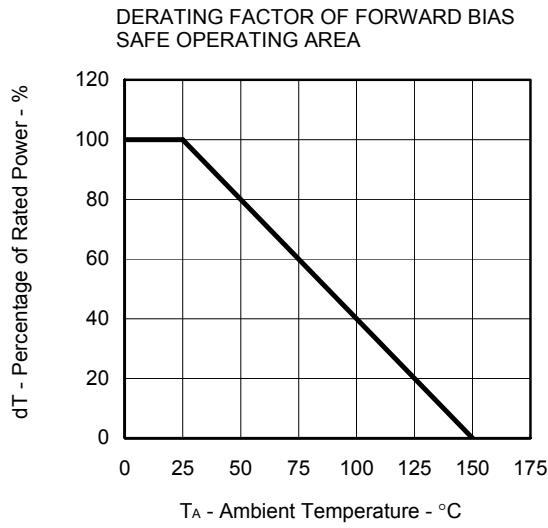
**TEST CIRCUIT 1 SWITCHING TIME**



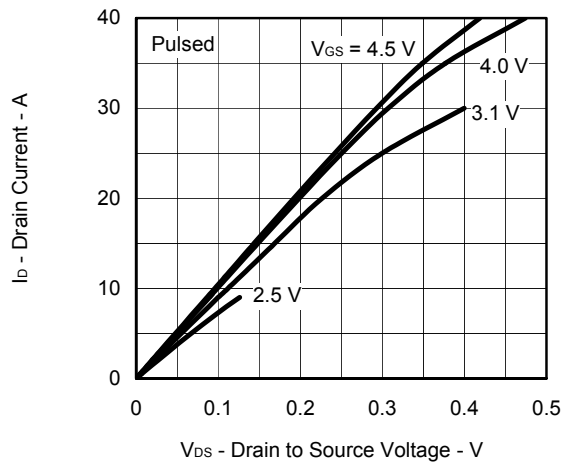
**TEST CIRCUIT 2 GATE CHARGE**



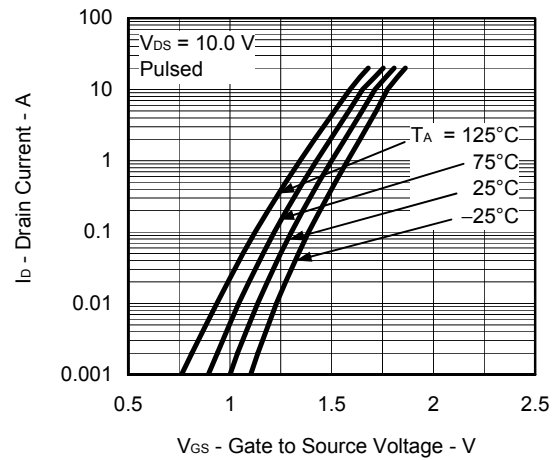
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



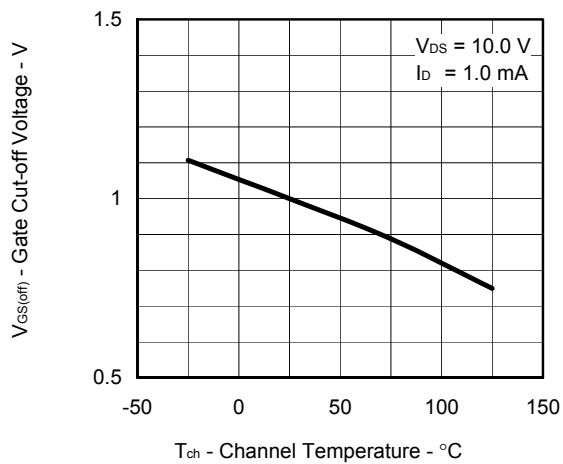
DRAIN CURRENT vs.  
DRAIN TO SOURCE VOLTAGE



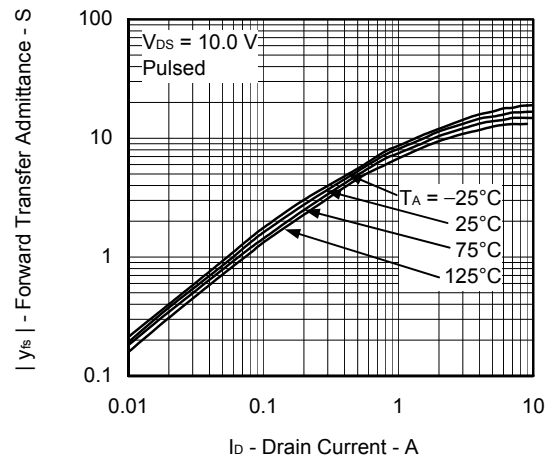
FORWARD TRANSFER CHARACTERISTICS



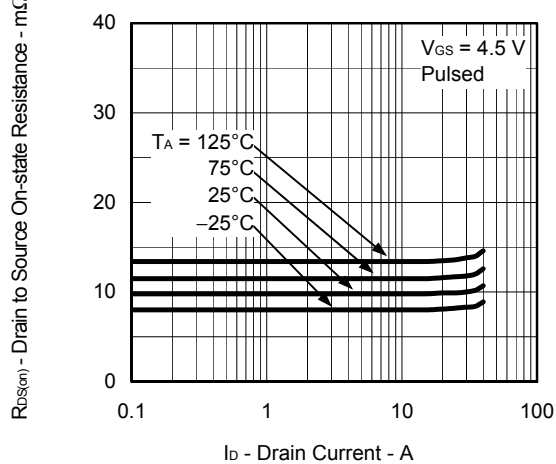
GATE CUT-OFF VOLTAGE vs.  
CHANNEL TEMPERATURE



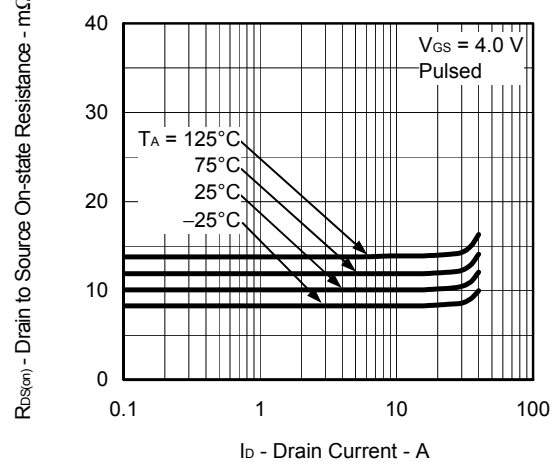
FORWARD TRANSFER ADMITTANCE vs.  
DRAIN CURRENT

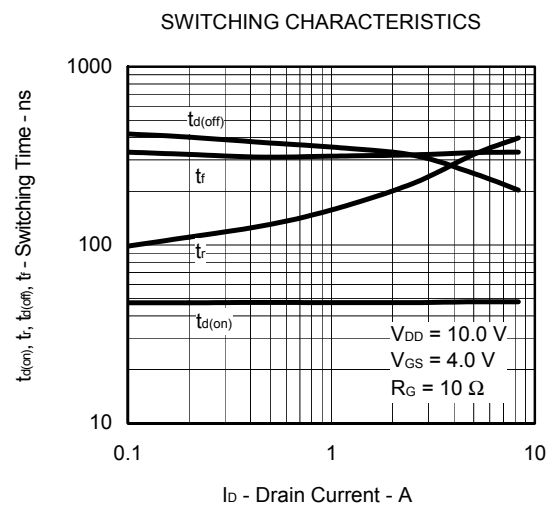
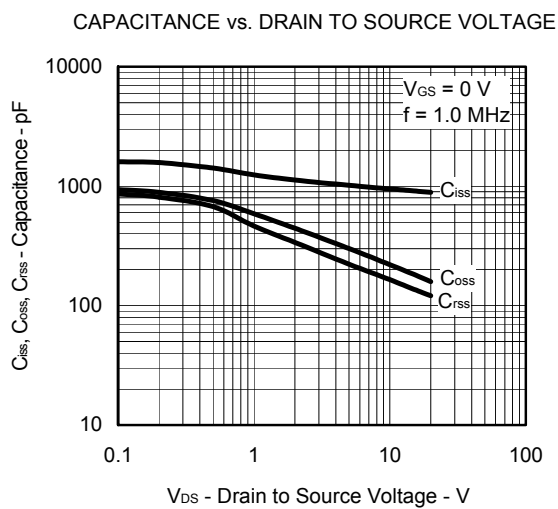
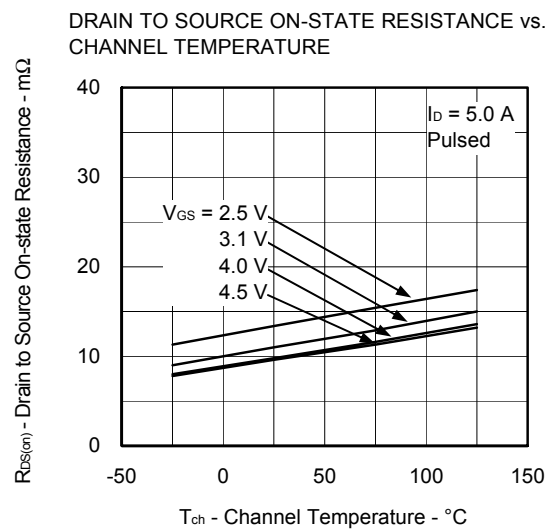
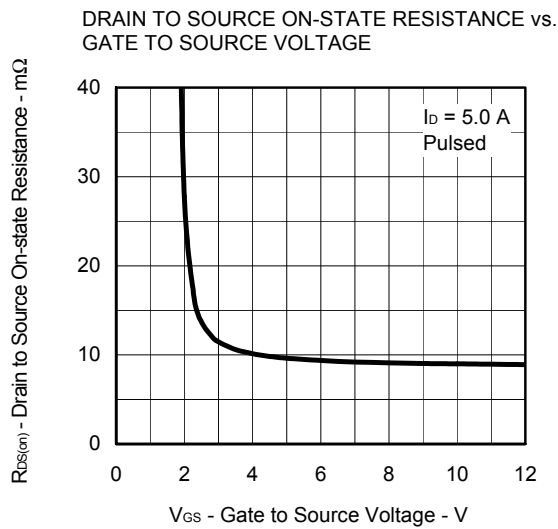
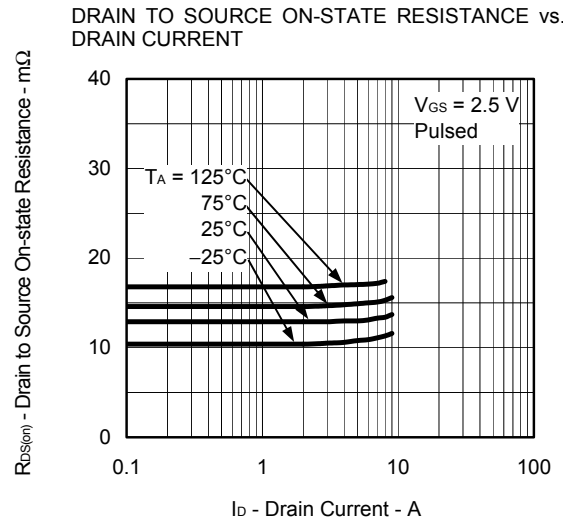
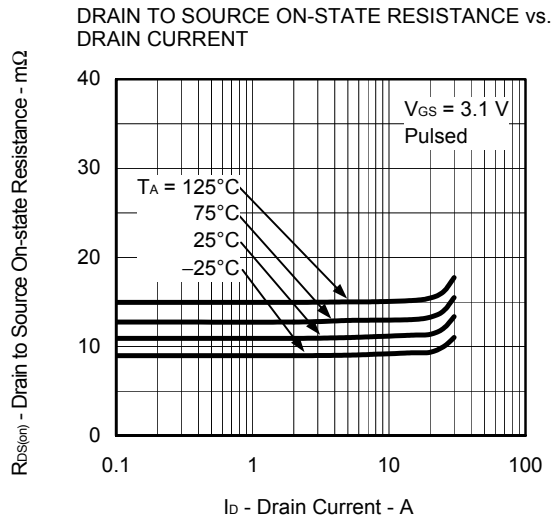


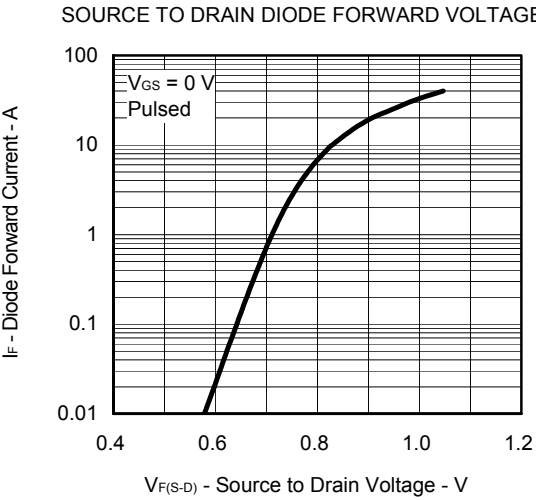
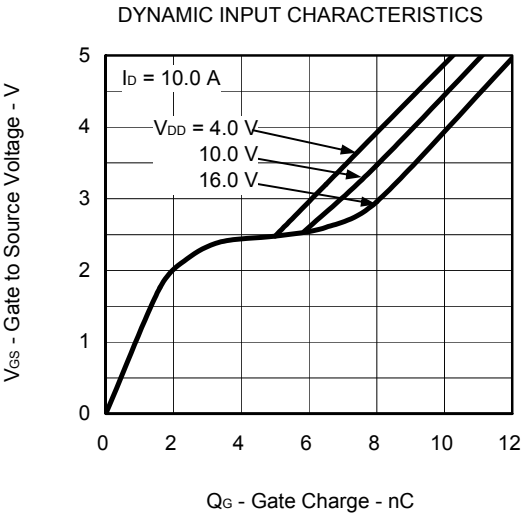
DRAIN TO SOURCE ON-STATE RESISTANCE vs.  
DRAIN CURRENT



DRAIN TO SOURCE ON-STATE RESISTANCE vs.  
DRAIN CURRENT







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