

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# MOS FIELD EFFECT TRANSISTOR

## $\mu$ PA1764

# SWITCHING DUAL N-CHANNEL POWER MOS FET INDUSTRIAL USE

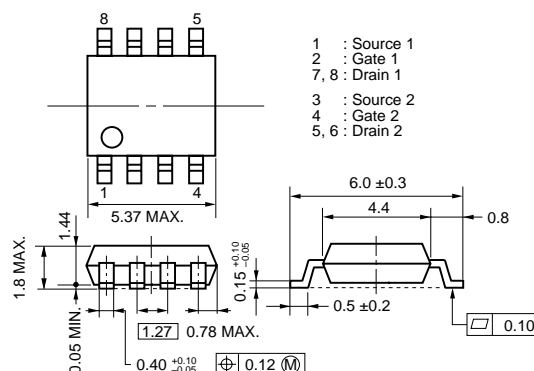
### DESCRIPTION

The  $\mu$  PA1764 is N-Channel MOS Field Effect Transistor designed for high current switching applications.

## FEATURES

- Dual chip type
- Low on-state resistance  
 $R_{DS(on)1} = 27 \text{ m}\Omega \text{ TYP. (} V_{GS} = 10 \text{ V, } I_D = 3.5 \text{ A)}$   
 $R_{DS(on)2} = 32 \text{ m}\Omega \text{ TYP. (} V_{GS} = 4.5 \text{ V, } I_D = 3.5 \text{ A)}$   
 $R_{DS(on)3} = 34 \text{ m}\Omega \text{ TYP. (} V_{GS} = 4.0 \text{ V, } I_D = 3.5 \text{ A)}$
- Low input capacitance  
 $C_{iss} = 1300 \text{ pF TYP.}$
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

**PACKAGE DRAWING (Unit : mm)**



## ORDERING INFORMATION

|             |            |
|-------------|------------|
| PART NUMBER | PACKAGE    |
| μPA1764G    | Power SOP8 |

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, All terminals are connected.)**

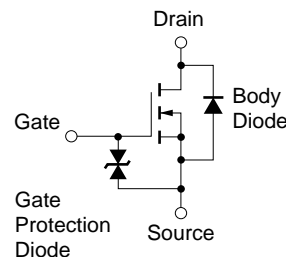
|   |                |                      |                  |
|---|----------------|----------------------|------------------|
| Drain to Source Voltage ( $V_{GS} = 0\text{ V}$ ) | $V_{DSS}$      | 60                   | V                |
| Gate to Source Voltage ( $V_{DS} = 0\text{ V}$ )  | $V_{GSS}$      | $\pm 20$             | V                |
| Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )   | $I_{D(DC)}$    | $\pm 7$              | A                |
| Drain Current (pulse) <sup>Note1</sup>            | $I_{D(pulse)}$ | $\pm 28$             | A                |
| Total Power Dissipation (1 unit) <sup>Note2</sup> | $P_T$          | 1.7                  | W                |
| Total Power Dissipation (2 unit) <sup>Note2</sup> | $P_T$          | 2.0                  | W                |
| Channel Temperature                               | $T_{ch}$       | 150                  | $^\circ\text{C}$ |
| Storage Temperature                               | $T_{stg}$      | $-55\text{ to }+150$ | $^\circ\text{C}$ |
| Single Avalanche Current <sup>Note3</sup>         | $I_{AS}$       | 7                    | A                |
| Single Avalanche Energy <sup>Note3</sup>          | $E_{AS}$       | 98                   | mJ               |

**Notes 1.**  $PW \leq 10 \mu s$ , Duty cycle  $\leq 1\%$

2.  $T_A = 25^\circ\text{C}$ , Mounted on ceramic substrate of  $1200\text{ mm}^2 \times 2.2\text{ mm}$
3. Starting  $T_{\text{ch}} = 25^\circ\text{C}$ ,  $V_{\text{DD}} = 30\text{ V}$ ,  $R_G = 25\ \Omega$ ,  $V_{\text{GS}} = 20 \rightarrow 0\text{ V}$

**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.

### EQUIVALENT CIRCUIT (1/2 Circuit)

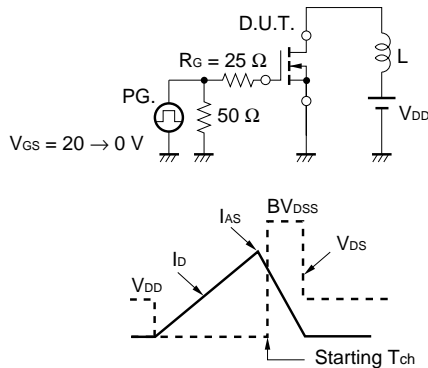


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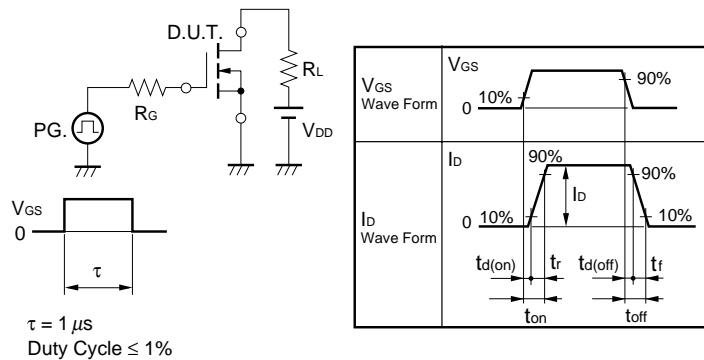
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, All terminals are connected.)**

| CHARACTERISTICS                     | SYMBOL               | TEST CONDITIONS                                 | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|---|------|------|------|------|
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>     | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V   |      |      | 10   | μA   |
| Gate Leakage Current                | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V  |      |      | ±10  | μA   |
| Gate Cut-off Voltage                | V <sub>GS(off)</sub> | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA   | 1.5  | 2.0  | 2.5  | V    |
| Forward Transfer Admittance         | y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3.5 A  | 5.0  | 9.0  |      | S    |
| Drain to Source On-state Resistance | R <sub>DS(on)1</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.5 A  |      | 27   | 35   | mΩ   |
|                                     | R <sub>DS(on)2</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3.5 A |      | 32   | 42   | mΩ   |
|                                     | R <sub>DS(on)3</sub> | V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 3.5 A |      | 34   | 46   | mΩ   |
| Input Capacitance                   | C <sub>iss</sub>     | V <sub>DS</sub> = 10 V                          |      | 1300 |      | pF   |
| Output Capacitance                  | C <sub>oss</sub>     | V <sub>GS</sub> = 0 V                           |      | 230  |      | pF   |
| Reverse Transfer Capacitance        | C <sub>rss</sub>     | f = 1 MHz                                       |      | 110  |      | pF   |
| Turn-on Delay Time                  | t <sub>d(on)</sub>   | V <sub>DD</sub> = 30 V, I <sub>D</sub> = 3.5 A  |      | 15   |      | ns   |
| Rise Time                           | t <sub>r</sub>       | V <sub>GS</sub> = 10 V                          |      | 69   |      | ns   |
| Turn-off Delay Time                 | t <sub>d(off)</sub>  | R <sub>G</sub> = 10 Ω                           |      | 65   |      | ns   |
| Fall Time                           | t <sub>f</sub>       |   |      | 27   |      | ns   |
| Total Gate Charge                   | Q <sub>G</sub>       | V <sub>DD</sub> = 48 V                          |      | 29   |      | nC   |
| Gate to Source Charge               | Q <sub>GS</sub>      | V <sub>GS</sub> = 10 V                          |      | 3.6  |      | nC   |
| Gate to Drain Charge                | Q <sub>GD</sub>      | I <sub>D</sub> = 7.0 A                          |      | 7.4  |      | nC   |
| Body Diode Forward Voltage          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V   |      | 0.84 |      | V    |
| Reverse Recovery Time               | t <sub>rr</sub>      | I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V   |      | 40   |      | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>      | di/dt = 100 A/μs                                |      | 66   |      | nC   |

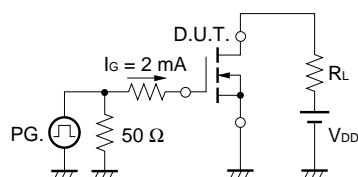
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



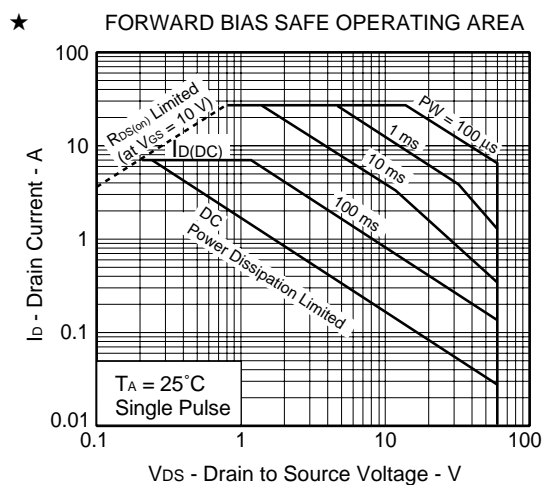
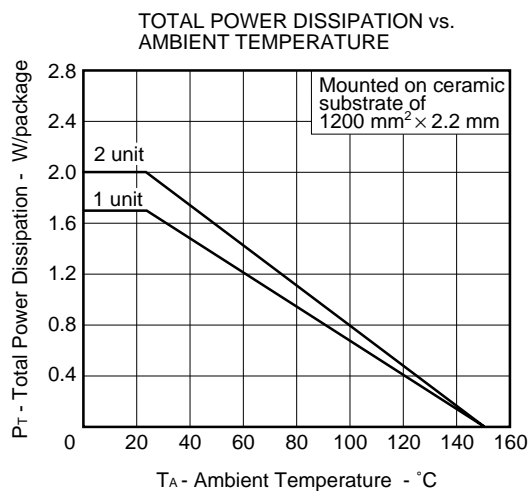
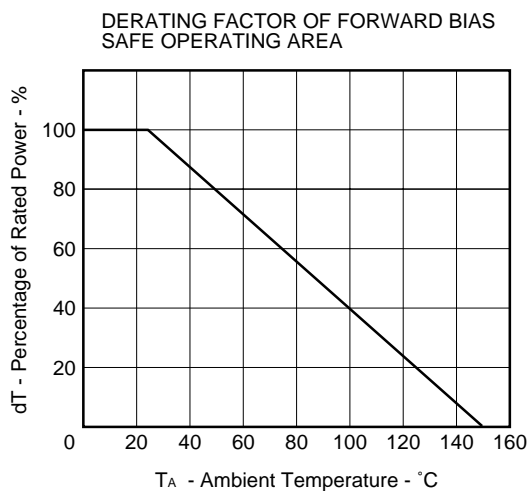
**TEST CIRCUIT 2 SWITCHING TIME**



**TEST CIRCUIT 3 GATE CHARGE**

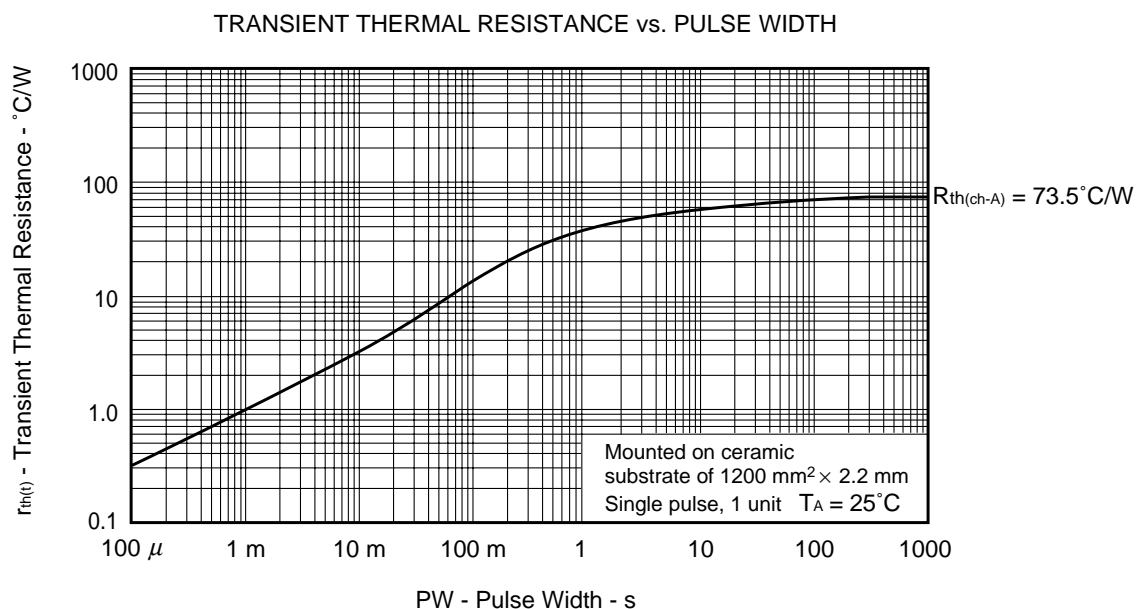


**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , All terminals are connected.)**

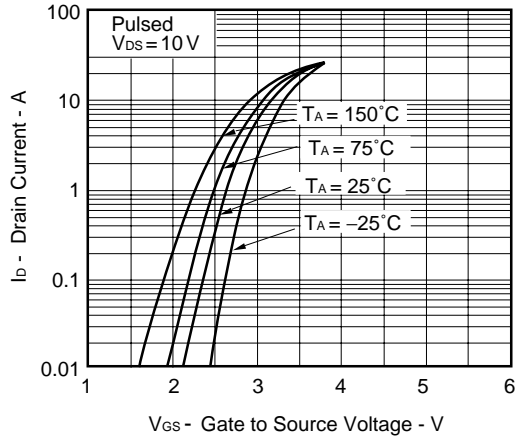


**Remark**

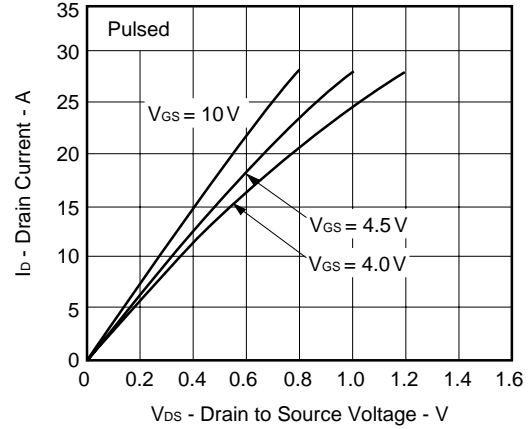
Mounted on ceramic substrate of  $1200\text{ mm}^2 \times 2.2\text{ mm}$



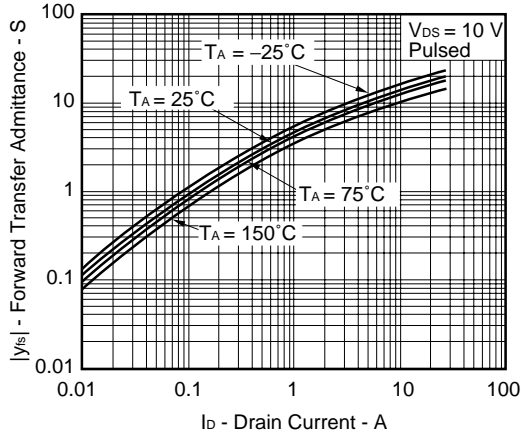
FORWARD TRANSFER CHARACTERISTICS



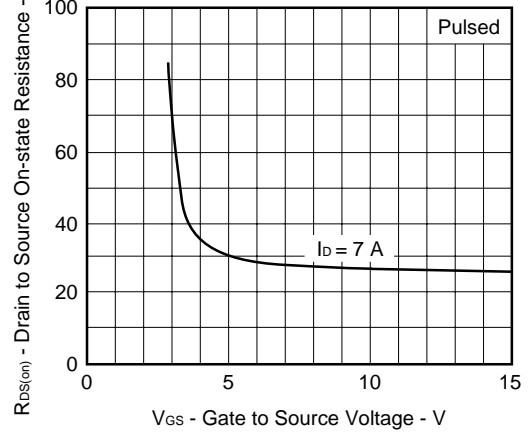
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



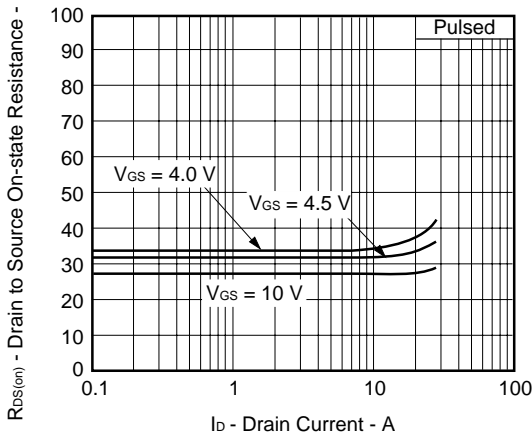
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



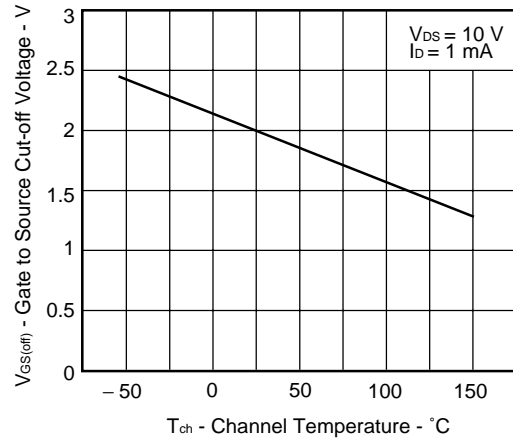
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

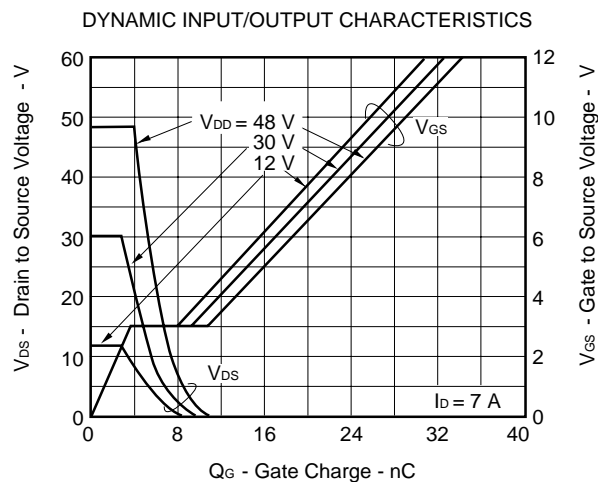
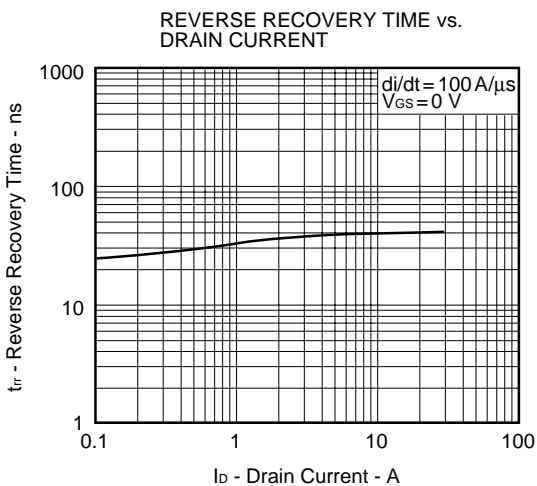
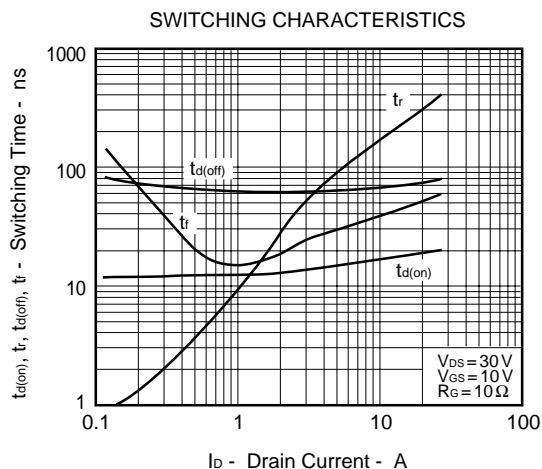
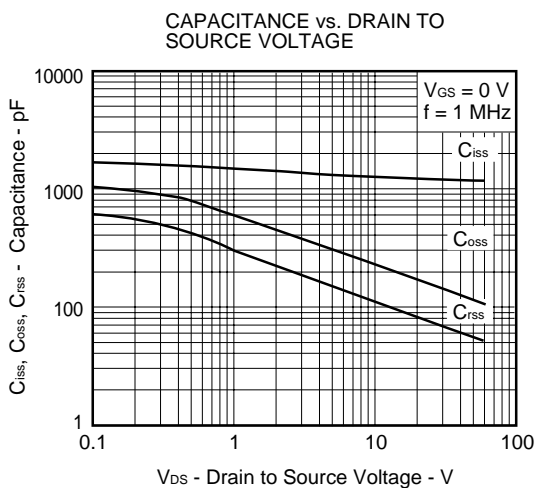
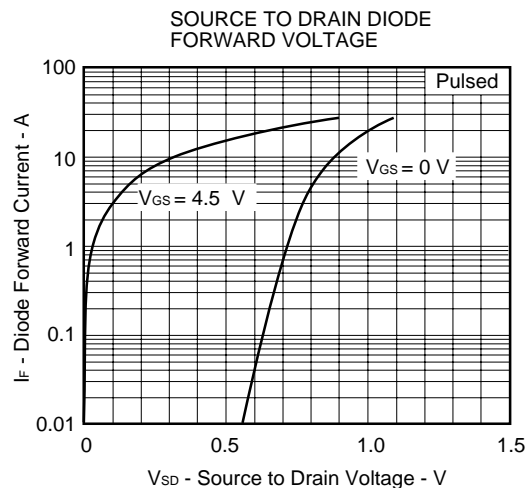
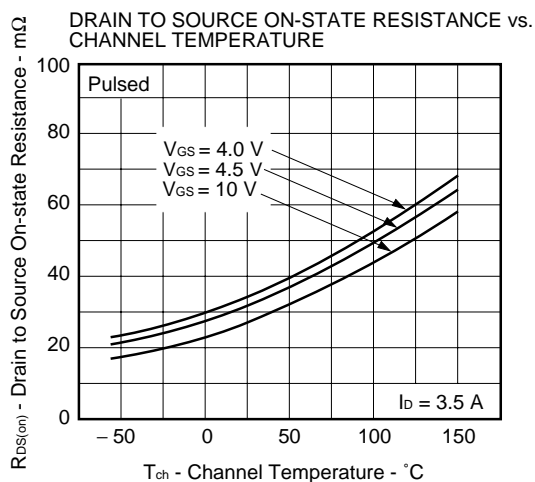


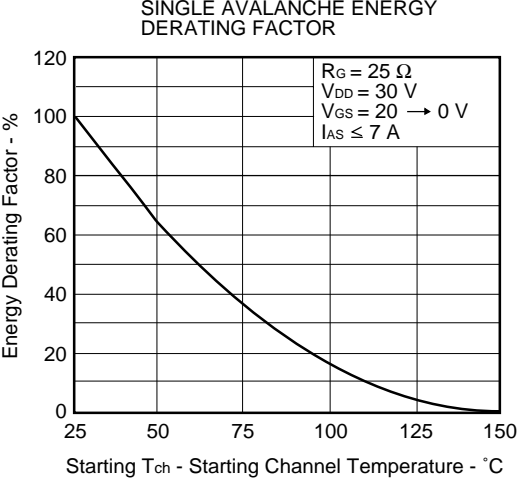
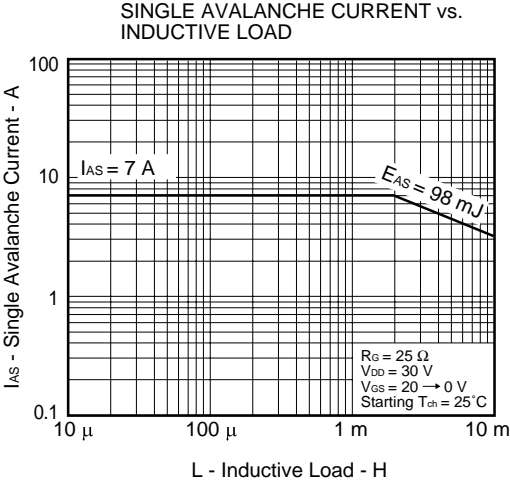
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE









[MEMO]

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