

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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EOL announced Product

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# MOS FIELD EFFECT TRANSISTOR

## 2SK2415,2415-Z

### SWITCHING N-CHANNEL POWER MOS FET

#### Description

The 2SK2415 is N-Channel MOS Field Effect Transistor designed for high voltage switching applications.

#### Features

- Low on-state resistance  
 $R_{DS(on)1} = 0.10 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 4.0 \text{ A)}$   
 $R_{DS(on)2} = 0.15 \Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 4.0 \text{ A)}$
- Low  $C_{iss}$ :  $C_{iss} = 570 \text{ pF TYP.}$

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

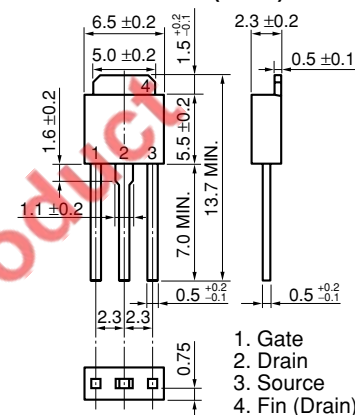
|                                                      |                |                        |                  |
|------------------------------------------------------|----------------|------------------------|------------------|
| Drain to Source Voltage                              | $V_{DSS}$      | 60                     | V                |
| Gate to Source Voltage                               | $V_{GSS}$      | $\pm 20$               | V                |
| Drain Current (DC)                                   | $I_{D(DC)}$    | $\pm 8.0$              | A                |
| Drain Current (pulse) <b>Note 1</b>                  | $I_{D(pulse)}$ | $\pm 32$               | A                |
| Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_{T1}$       | 20                     | W                |
| Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) | $P_{T2}$       | 1.0                    | W                |
| Channel Temperature                                  | $T_{ch}$       | 150                    | $^\circ\text{C}$ |
| Storage Temperature                                  | $T_{stg}$      | $-55 \text{ to } +150$ | $^\circ\text{C}$ |
| Single Avalanche Current <b>Note 2</b>               | $I_{AS}$       | 8.0                    | A                |
| Single Avalanche Energy <b>Note 2</b>                | $E_{AS}$       | 6.4                    | mJ               |

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

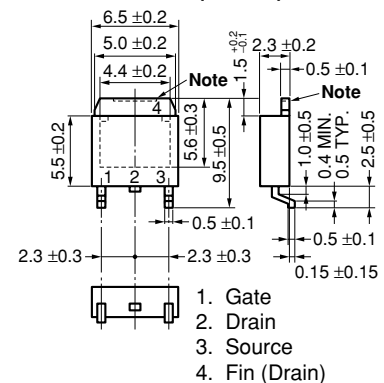
**2** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$

#### PACKAGE DRAWINGS (Unit: mm)

##### TO-251 (MP-3)

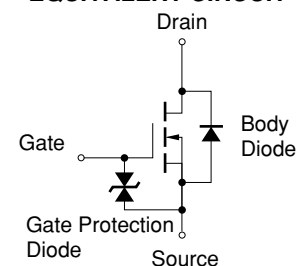


##### TO-252 (MP-3Z)



**Note** The depth of notch at the top of the fin is from 0 to 0.2 mm.

#### EQUIVALENT CIRCUIT



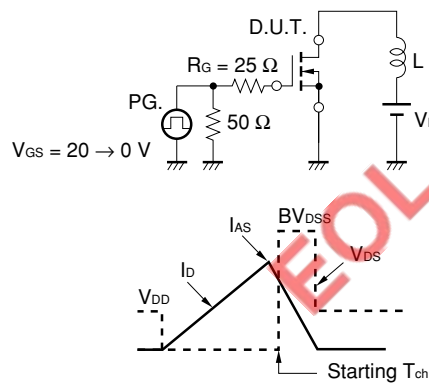
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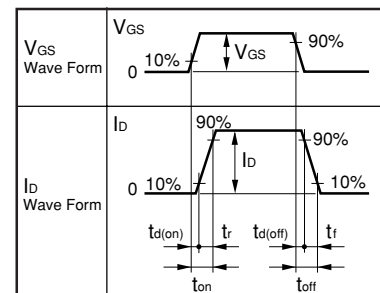
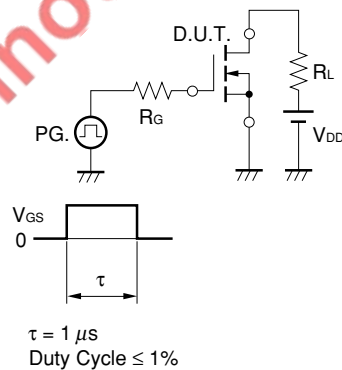
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

| CHARACTERISTIC                      | SYMBOL               | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS                                |
|-------------------------------------|----------------------|------|------|------|------|------------------------------------------------|
| Drain to Source On-state Resistance | R <sub>DS(on)1</sub> |      | 0.07 | 0.10 | Ω    | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.0 A |
|                                     | R <sub>DS(on)2</sub> |      | 0.10 | 0.15 | Ω    | V <sub>GS</sub> = 4 V, I <sub>D</sub> = 4.0 A  |
| Gate Cut-off Voltage                | V <sub>GS(off)</sub> | 1.0  | 1.6  | 2.0  | V    | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA  |
| Forward Transfer Admittance         | y <sub>fs</sub>      | 5.0  | 8.4  |      | S    | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.0 A |
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>     |      |      | 10   | μA   | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V  |
| Gate Leakage Current                | I <sub>GSS</sub>     |      |      | ±10  | μA   | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V |
| Input Capacitance                   | C <sub>iss</sub>     |      | 570  |      | pF   | V <sub>DS</sub> = 10 V                         |
| Output Capacitance                  | C <sub>oss</sub>     |      | 290  |      | pF   | V <sub>GS</sub> = 0 V                          |
| Reverse Transfer Capacitance        | C <sub>rss</sub>     |      | 75   |      | pF   | f = 1 MHz                                      |
| Turn-On Delay Time                  | t <sub>d(on)</sub>   |      | 5    |      | ns   | I <sub>D</sub> = 4.0 A                         |
| Rise Time                           | t <sub>r</sub>       |      | 60   |      | ns   | V <sub>GS</sub> = 10 V                         |
| Turn-Off Delay Time                 | t <sub>d(off)</sub>  |      | 75   |      | ns   | V <sub>DD</sub> = 30 V                         |
| Fall Time                           | t <sub>f</sub>       |      | 40   |      | ns   | R <sub>G</sub> = 10 Ω                          |
| Total Gate Charge                   | Q <sub>G</sub>       |      | 21   |      | nC   | I <sub>D</sub> = 8.0 A                         |
| Gate to Source Charge               | Q <sub>GS</sub>      |      | 2.0  |      | nC   | V <sub>DD</sub> = 48 V                         |
| Gate to Drain Charge                | Q <sub>GD</sub>      |      | 6.5  |      | nC   | V <sub>GS</sub> = 10 V                         |
| Body Diode Forward Voltage          | V <sub>F(S-D)</sub>  |      | 1.0  |      | V    | I <sub>F</sub> = 8.0 A, V <sub>GS</sub> = 0 V  |
| Reverse Recovery Time               | t <sub>rr</sub>      |      | 85   |      | ns   | I <sub>F</sub> = 8.0 A, V <sub>GS</sub> = 0 V  |
| Reverse Recovery Charge             | Q <sub>rr</sub>      |      | 200  |      | nC   | di/dt = 100 A/μs                               |

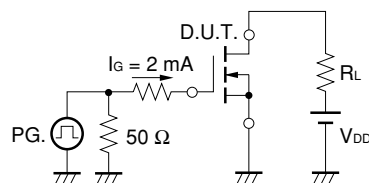
## TEST CIRCUIT 1 AVALANCHE CAPABILITY



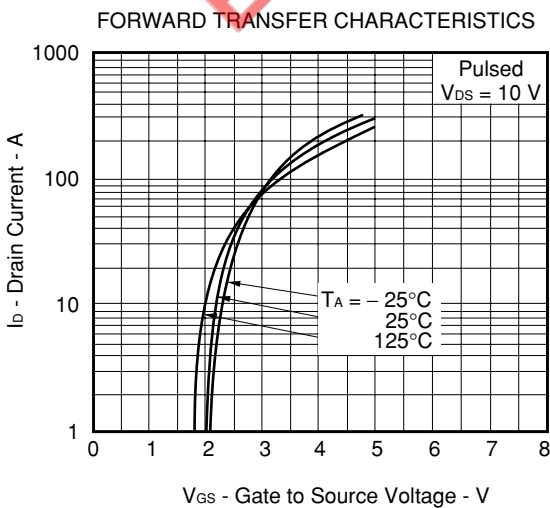
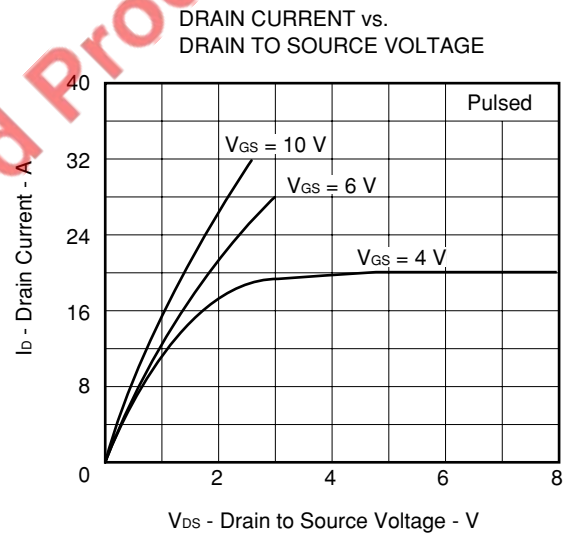
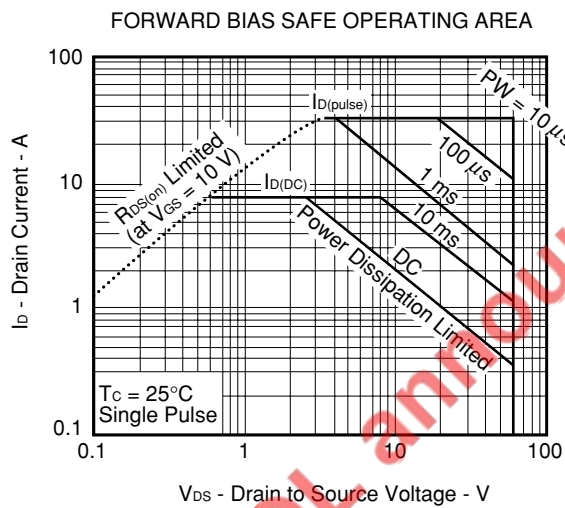
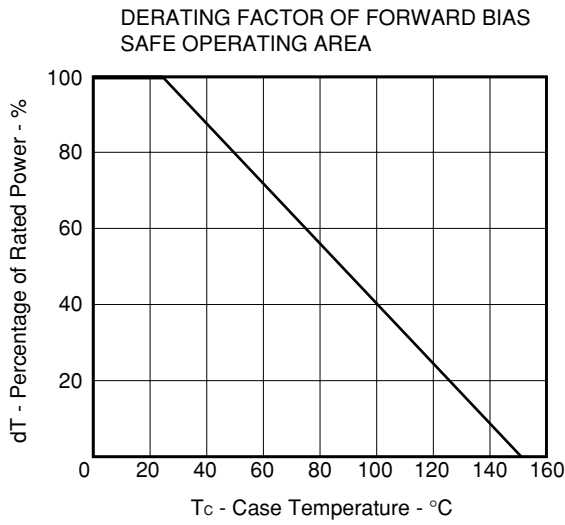
## TEST CIRCUIT 2 SWITCHING TIME



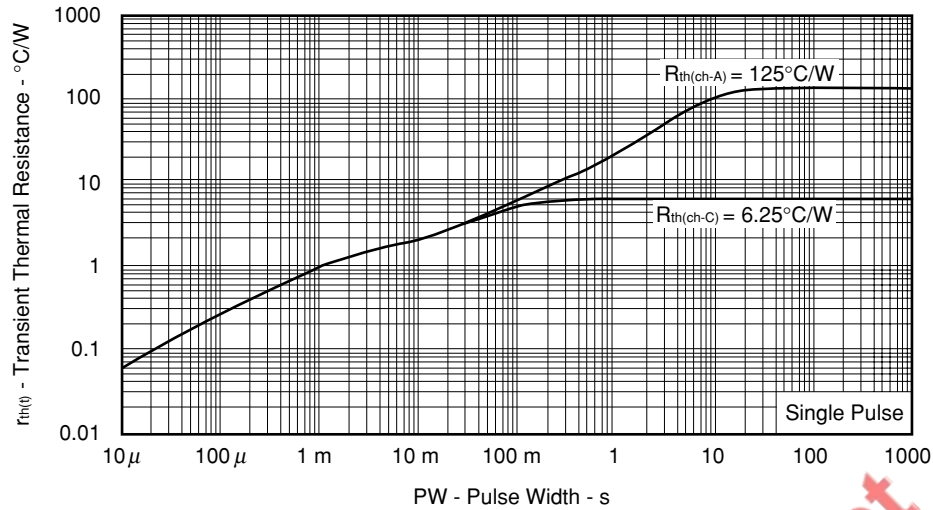
## TEST CIRCUIT 3 GATE CHARGE



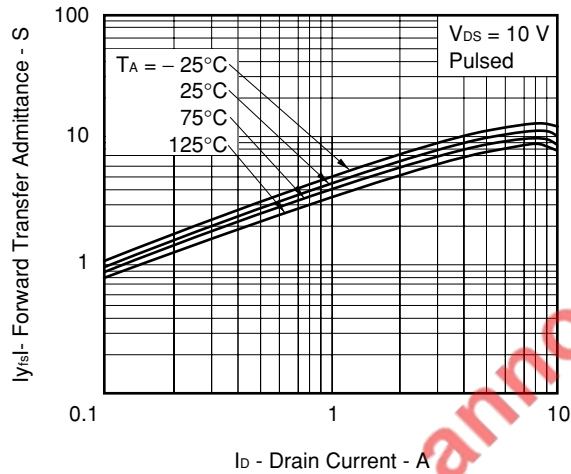
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



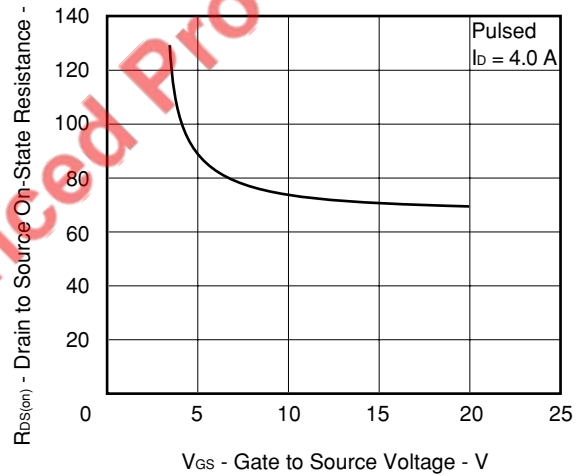
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



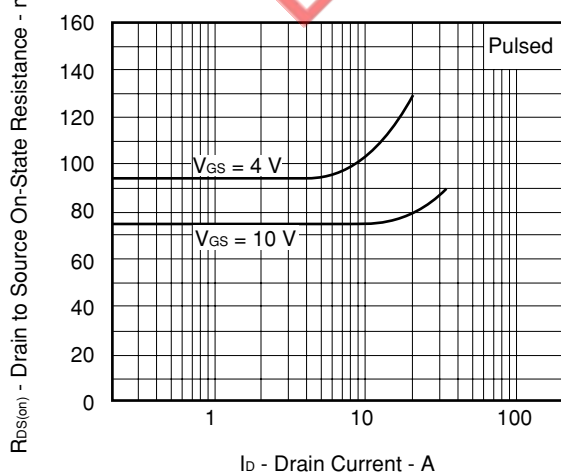
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



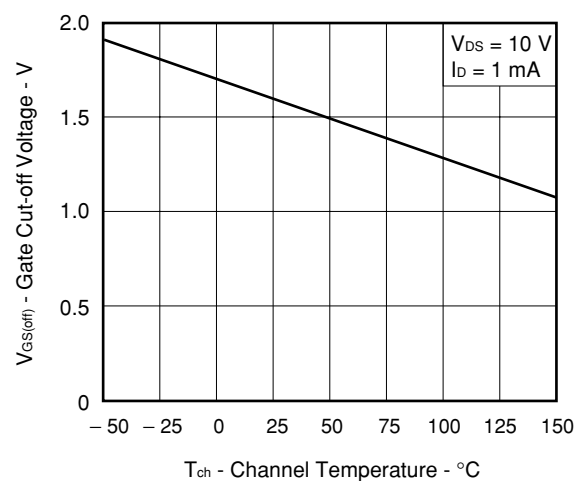
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

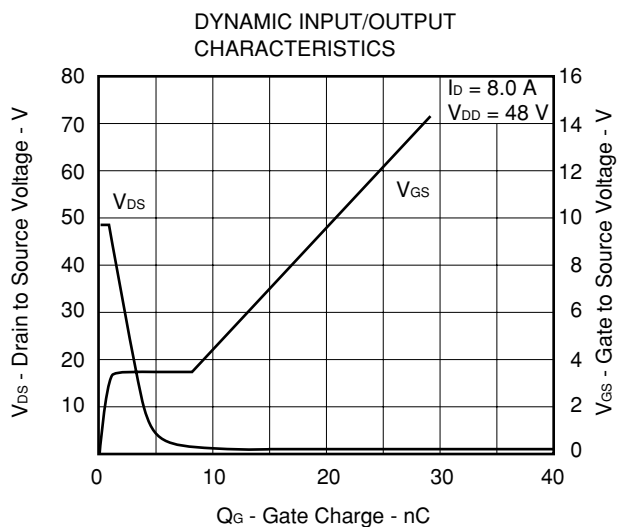
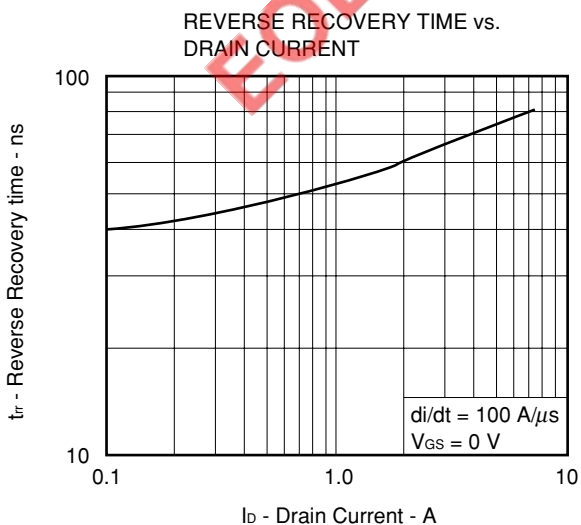
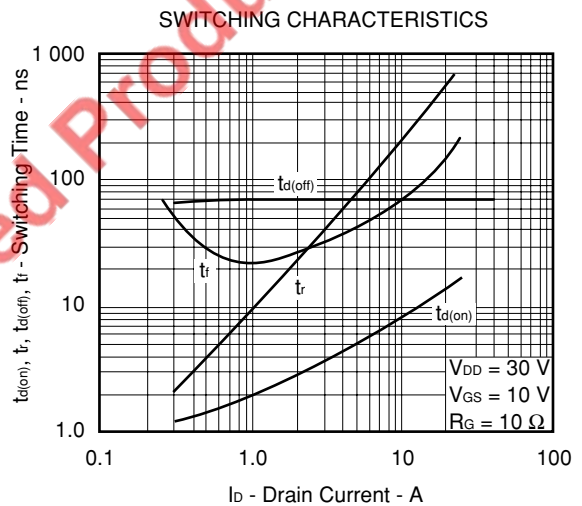
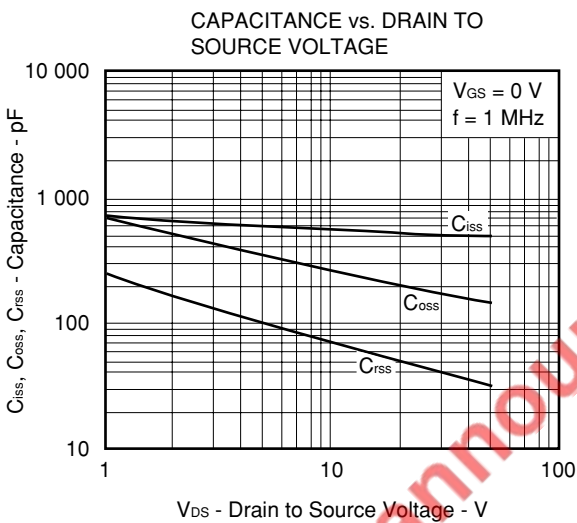
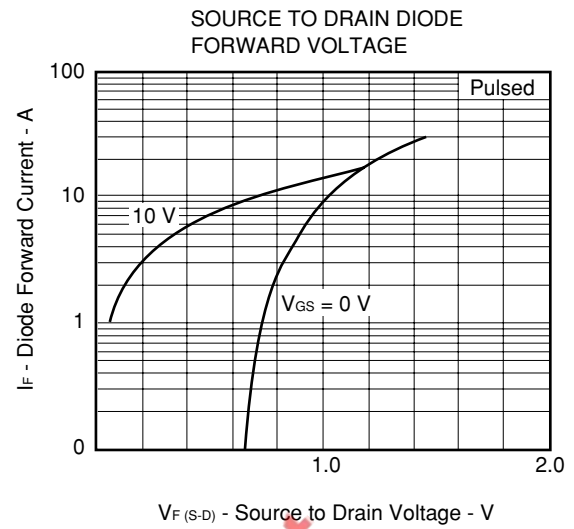
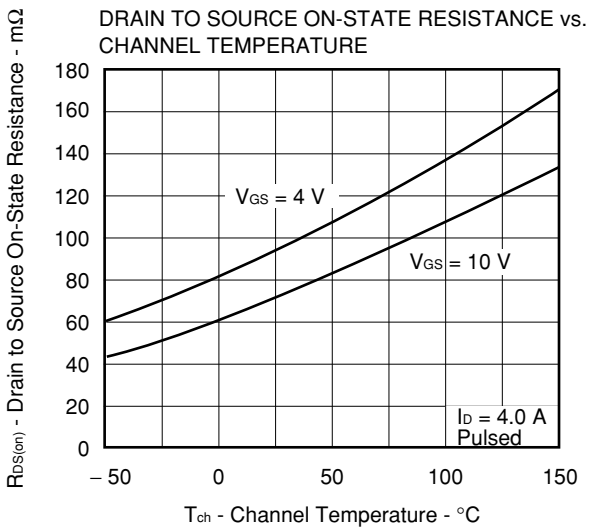


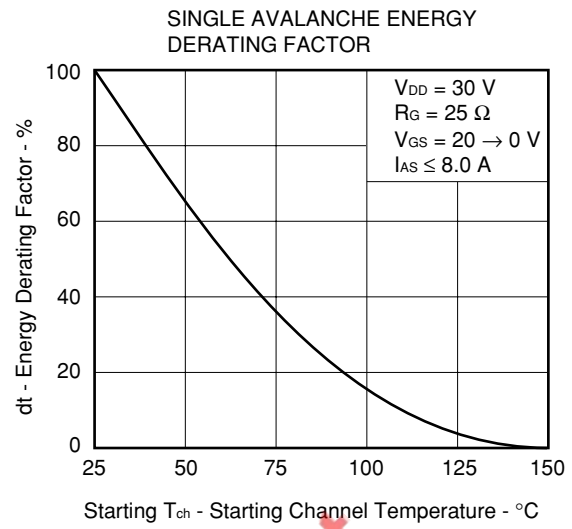
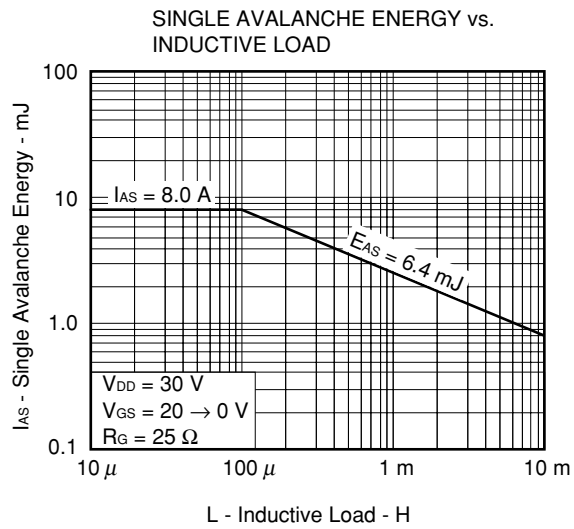
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE







EOL announced Product

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