

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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

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

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MOS FIELD EFFECT TRANSISTOR  
 $\mu$ PA2712GR

SWITCHING  
 P-CHANNEL MOS FET

DESCRIPTION

The  $\mu$ PA2712GR is P-Channel MOS Field Effect Transistor designed for power management applications of notebook computers and Li-ion battery protection circuit.

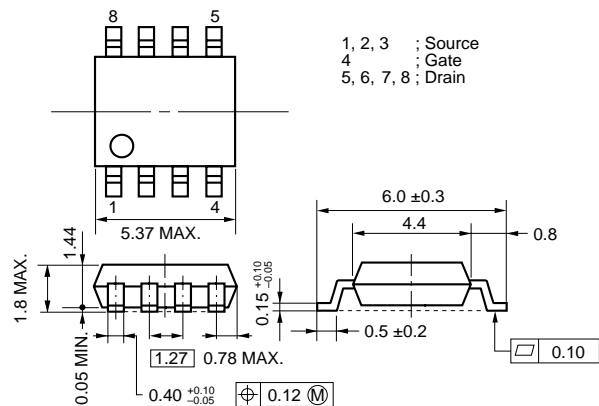
FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 13 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -5.0 \text{ A)}$   
 $R_{DS(on)2} = 21 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -5.0 \text{ A)}$   
 $R_{DS(on)3} = 26 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.0 \text{ V, } I_D = -5.0 \text{ A)}$
- Low  $C_{iss}$ :  $C_{iss} = 2000 \text{ pF TYP.}$
- Small and surface mount package (Power SOP8)

ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA2712GR	Power SOP8

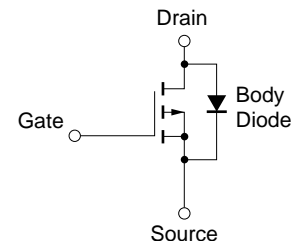
PACKAGE DRAWING (Unit: mm)



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 ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 10$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 40$	A
Total Power Dissipation <sup>Note2</sup>	$P_{T1}$	2	W
Total Power Dissipation <sup>Note3</sup>	$P_{T2}$	2	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note4</sup>	$I_{AS}$	-10	A
Single Avalanche Energy <sup>Note4</sup>	$E_{AS}$	10	mJ

EQUIVALENT CIRCUIT



- Notes
1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$
  2. Mounted on ceramic substrate of  $1200 \text{ mm}^2 \times 2.2 \text{ mm}$
  3. Mounted on a glass epoxy board (1 inch x 1 inch x 0.8 mm),  $PW = 10 \text{ sec}$
  4. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = -15 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $L = 100 \mu\text{H}$ ,  $V_{GS} = -20 \rightarrow 0 \text{ V}$

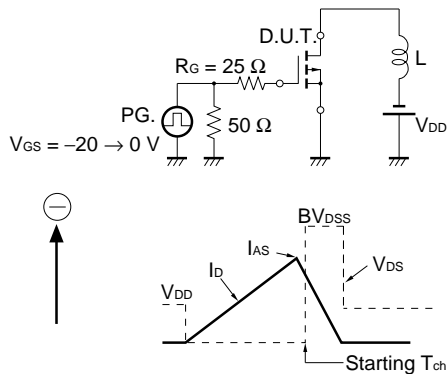
**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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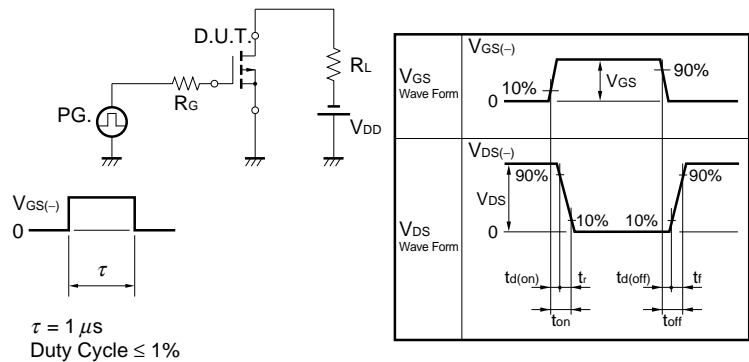
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, All terminals are connected.)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V			-1	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±100	nA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA	-1.0		-2.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -5.0 A	7	15		S
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -5.0 A		10	13	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5.0 A		15	21	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = -4.0 V, I <sub>D</sub> = -5.0 A		19	26	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10 V		2000		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		550		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		340		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -15 V, I <sub>D</sub> = -5.0 A		10		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = -10 V		16		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		92		ns
Fall Time	t <sub>f</sub>			51		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = -24 V		42		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = -10 V		6		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 10 A		12		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0 V		0.82		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0 V		46		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		33		nC

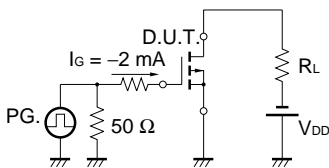
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



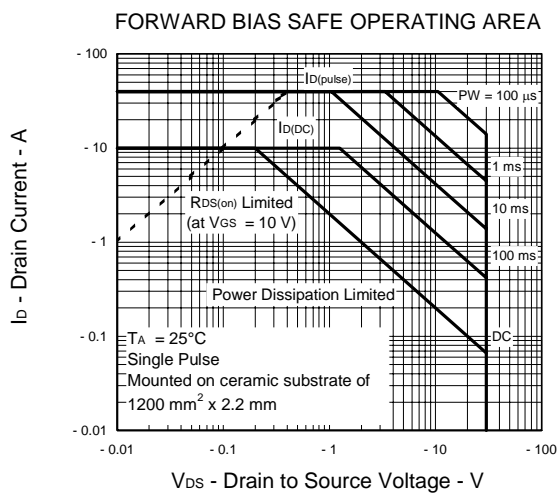
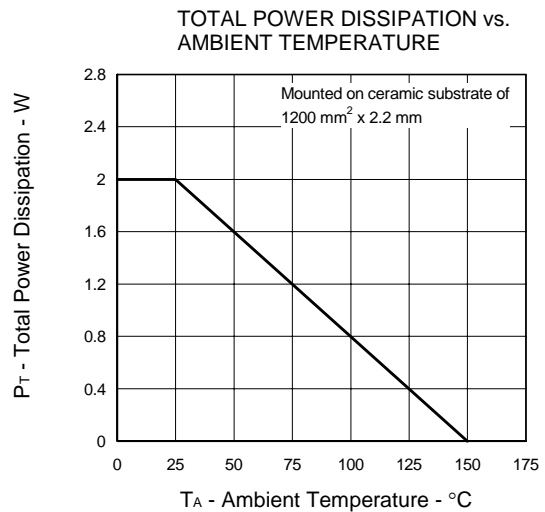
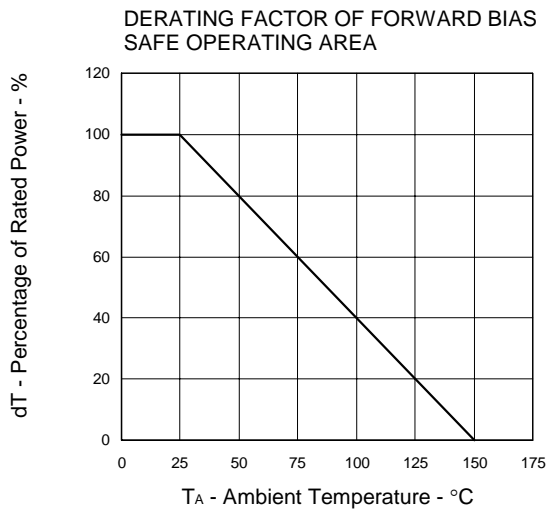
**TEST CIRCUIT 2 SWITCHING TIME**



**TEST CIRCUIT 3 GATE CHARGE**

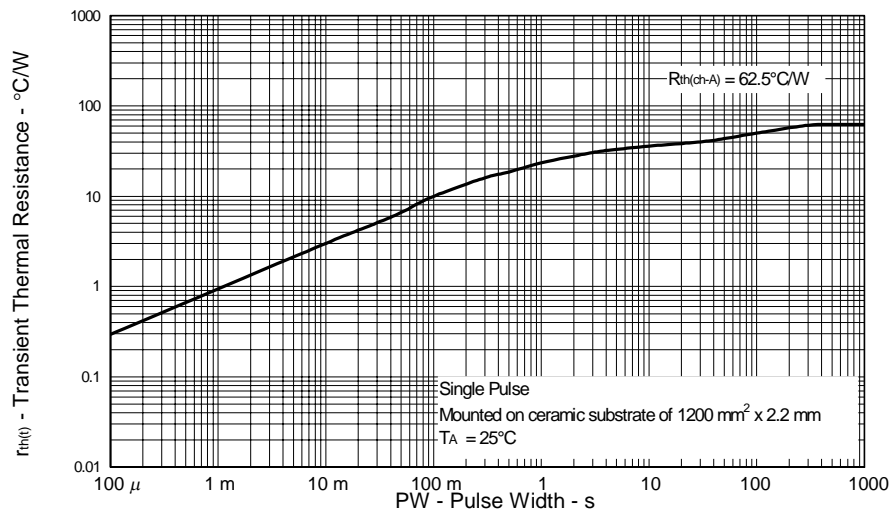


TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

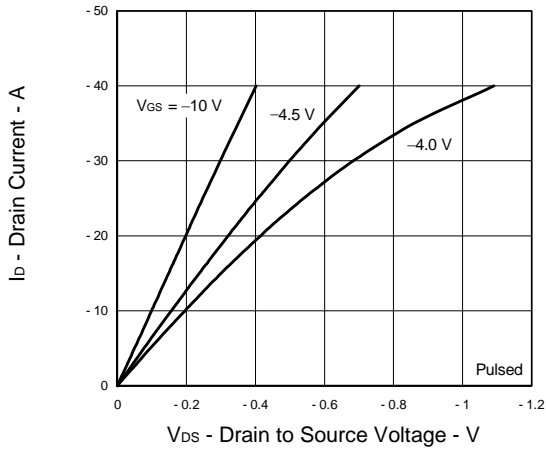


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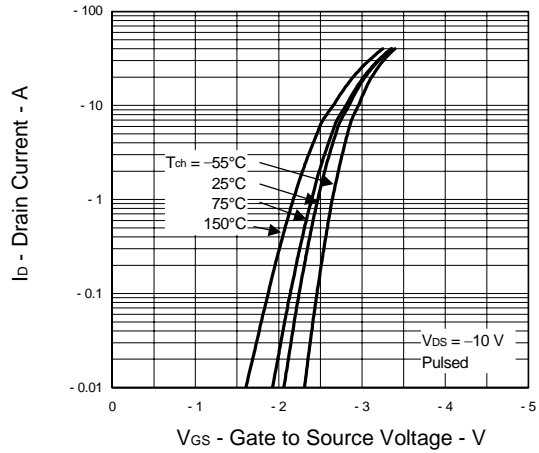
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



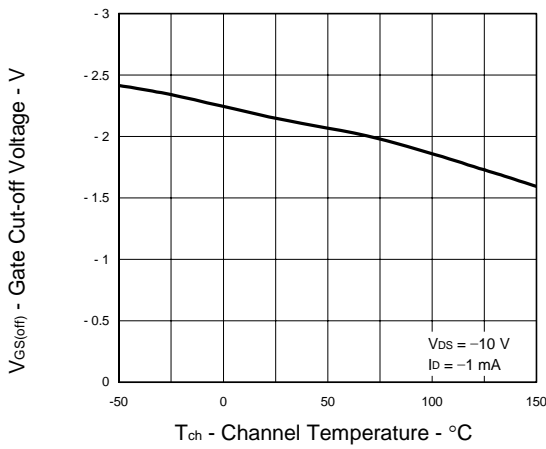
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



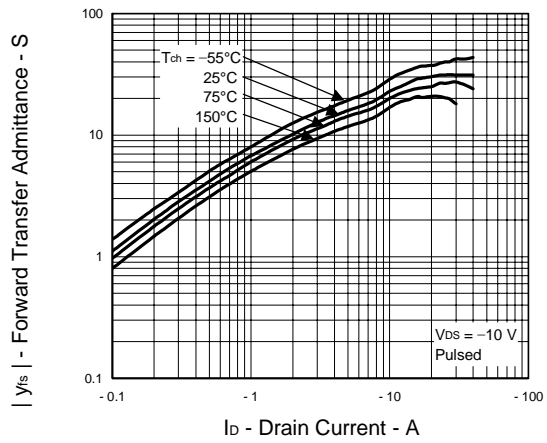
FORWARD TRANSFER CHARACTERISTICS



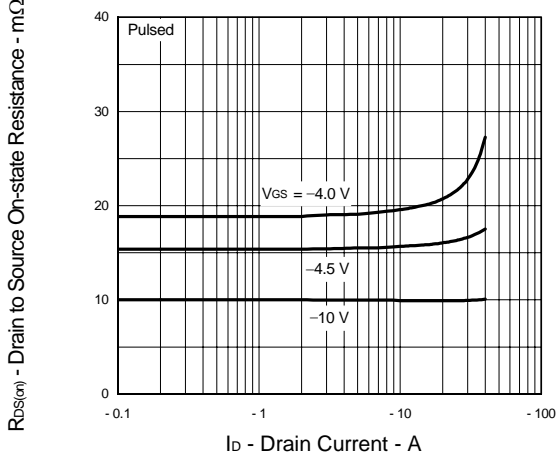
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



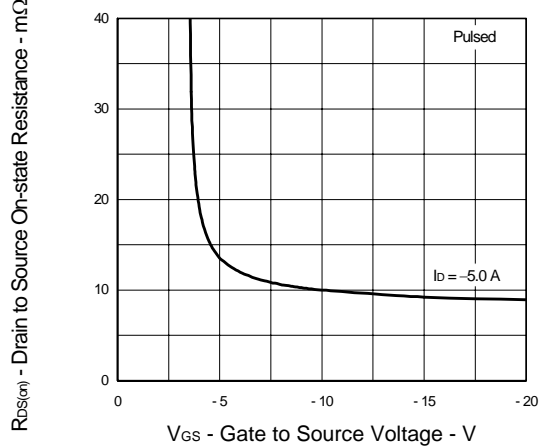
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



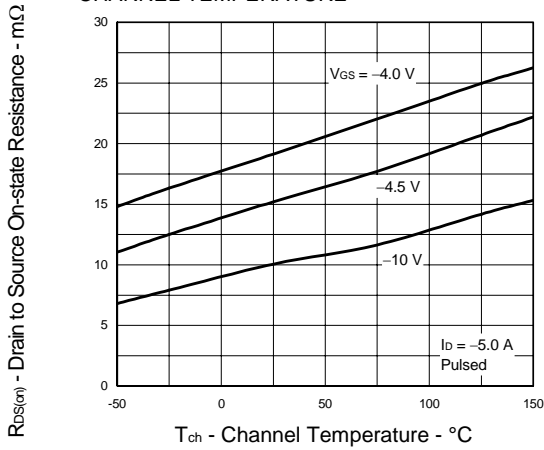
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



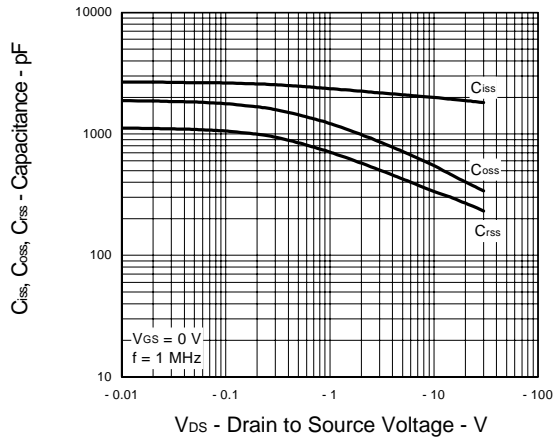
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



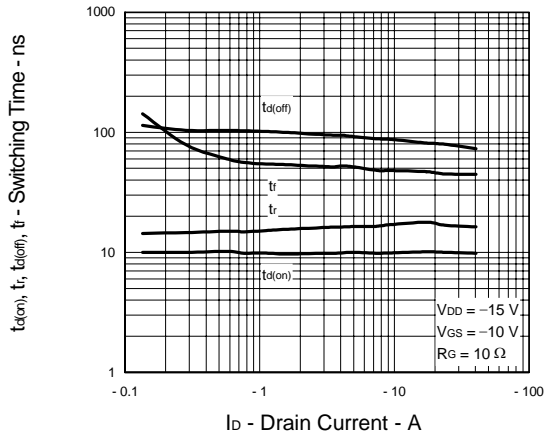
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



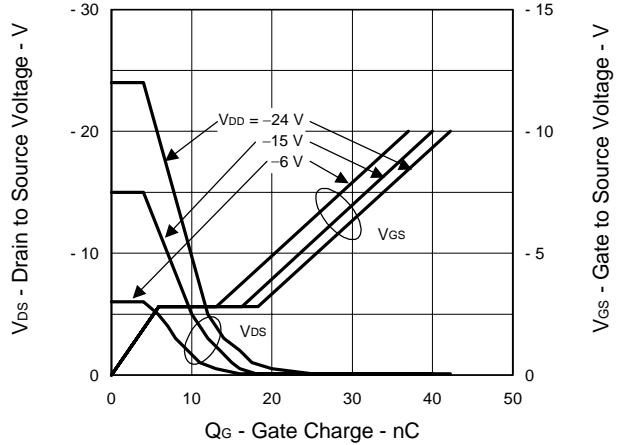
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



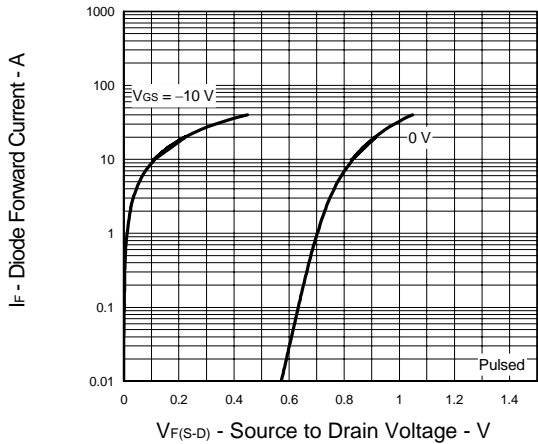
SWITCHING CHARACTERISTICS



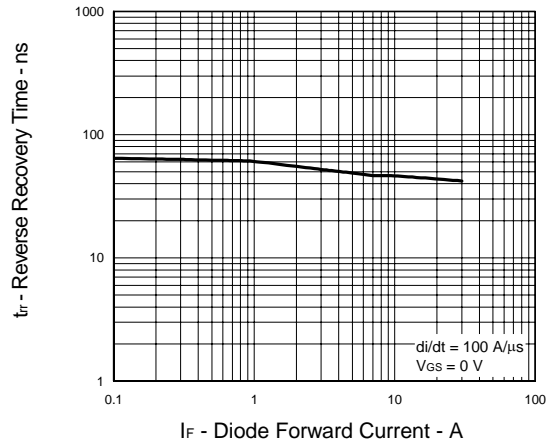
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



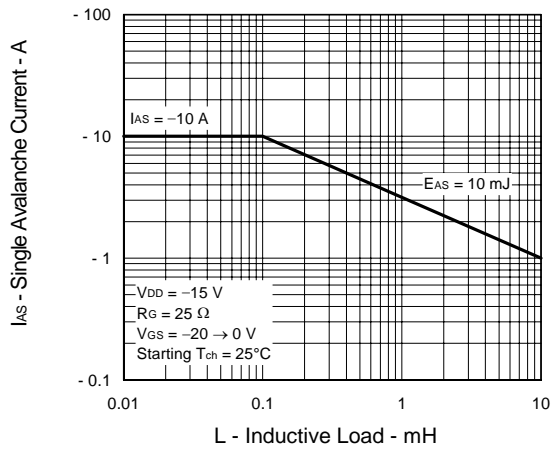
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



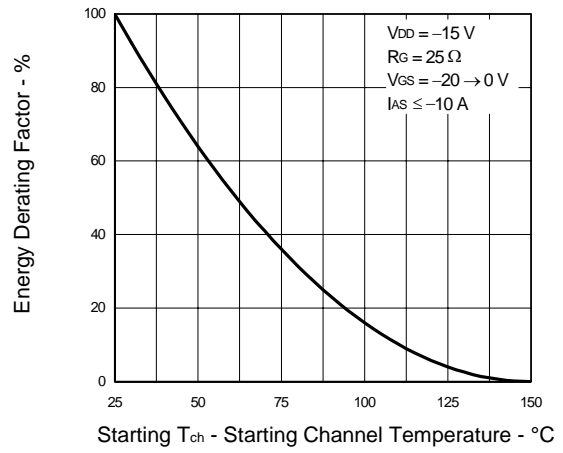
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY DERATING FACTOR





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