

SWITCHING  
P-CHANNEL POWER MOS FET

## DESCRIPTION

The  $\mu$ PA2710GR is P-Channel MOS Field Effect Transistor designed for power management applications of notebook computers and Li-ion battery protection circuit.

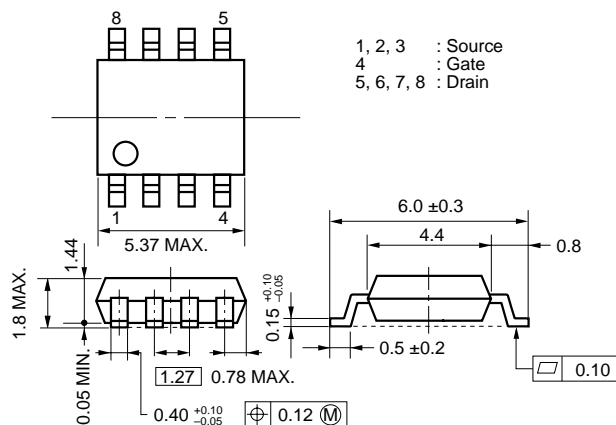
## FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 5.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -7.5 \text{ A)}$   
 $R_{DS(on)2} = 9.0 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -7.5 \text{ A)}$   
 $R_{DS(on)3} = 11 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.0 \text{ V, } I_D = -7.5 \text{ A)}$
- ★ • Low  $C_{iss}$ :  $C_{iss} = 4300 \text{ pF TYP.}$
- Small and surface mount package (Power SOP8)

## ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA2710GR	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)	$I_{D(DC)}$	$\pm 15$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 100$	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>	$I_{AS}$	-15	A
Single Avalanche Energy <sup>Note4</sup>	$E_{AS}$	22.5	mJ

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

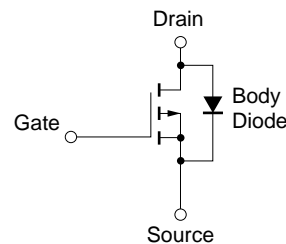
2. Mounted on ceramic substrate of  $1200 \text{ mm}^2 \times 2.2 \text{ mm}$

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.

## EQUIVALENT CIRCUIT



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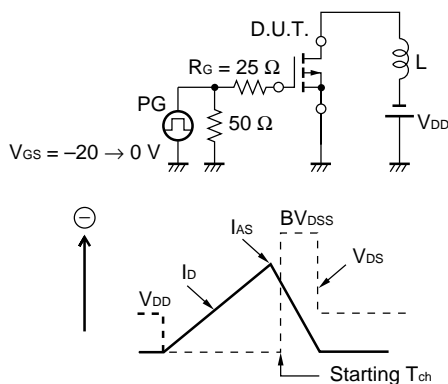
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★ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, All terminals are connected.)

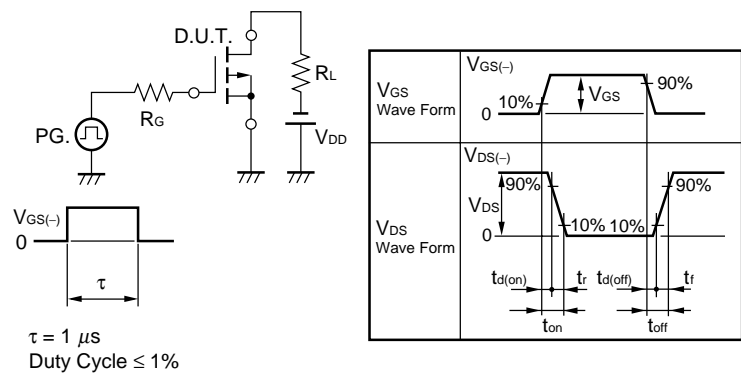
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V			-1	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±100	nA
Gate Cut-off Voltage <sup>Note</sup>	V <sub>GS(off)</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA	-1.0		-2.5	V
Forward Transfer Admittance <sup>Note</sup>	y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -7.5 A	14	31		S
Drain to Source On-state Resistance <sup>Note</sup>	R <sub>DS(on)1</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -7.5 A		4.7	5.5	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -7.5 A		6.4	9.0	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = -4.0 V, I <sub>D</sub> = -7.5 A		7.2	11	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10 V		4300		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		1200		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		690		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -15 V, I <sub>D</sub> = -7.5 A		11		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = -10 V		22		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		420		ns
Fall Time	t <sub>f</sub>			240		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = -24 V		97		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = -10 V		12		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = -15 A		29		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 15 A, V <sub>GS</sub> = 0 V		0.79		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 15 A, V <sub>GS</sub> = 0 V		119		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 50 A/μs		84		nC

Note Pulsed PW≤350 μs, Duty Cycle≤2%

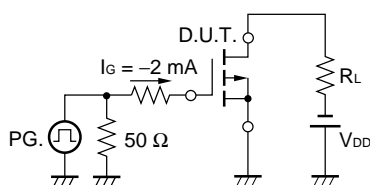
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

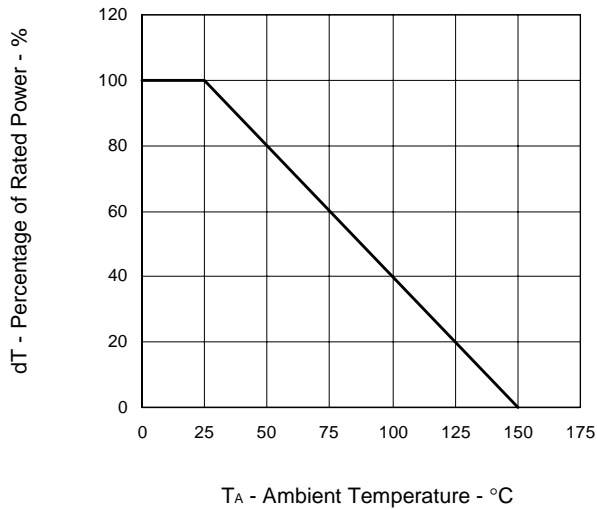


TEST CIRCUIT 3 GATE CHARGE

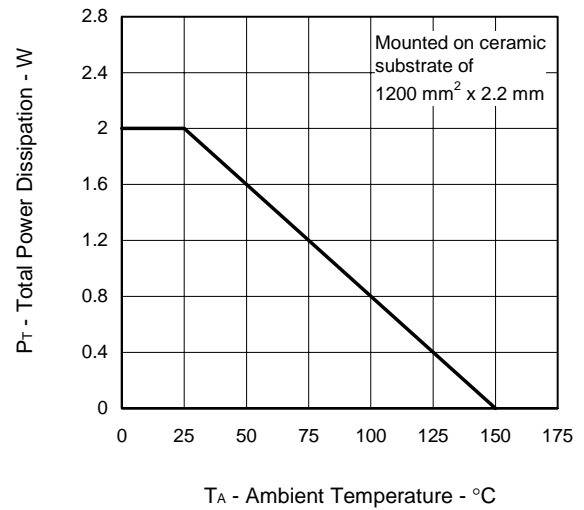


TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

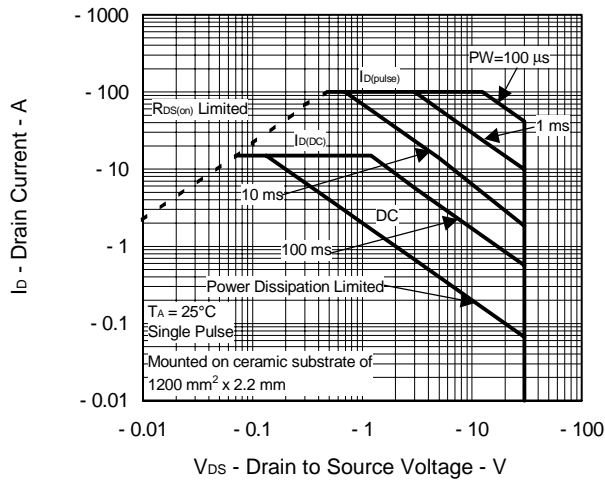
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



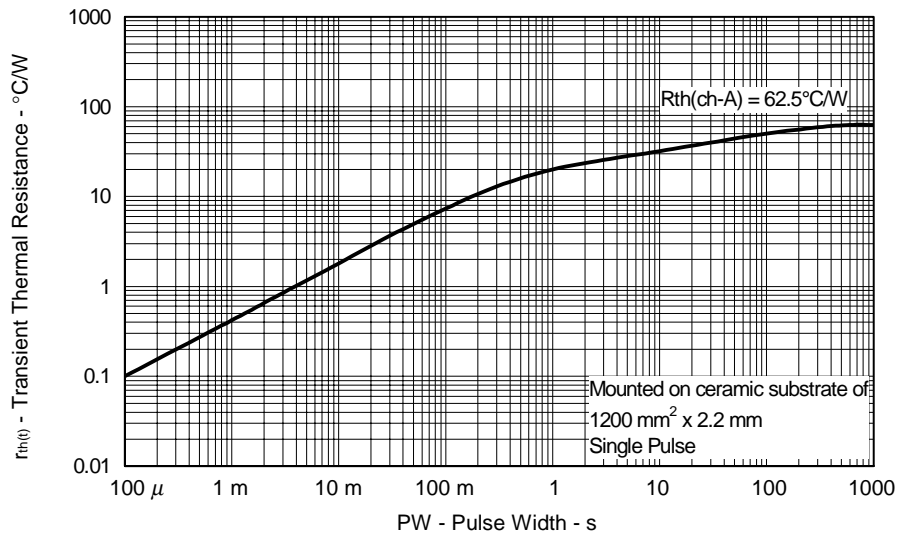
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



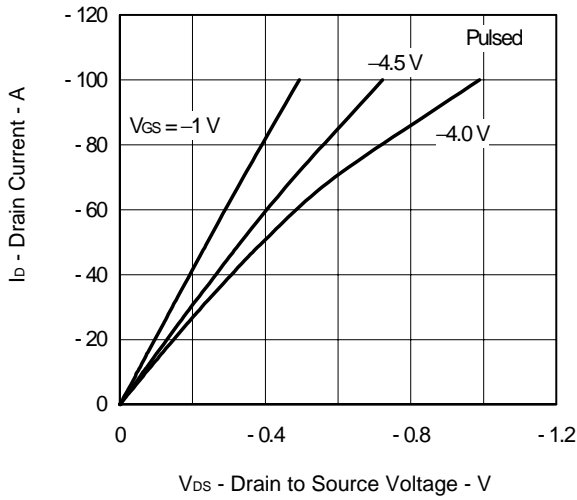
★ FORWARD BIAS SAFE OPERATING AREA



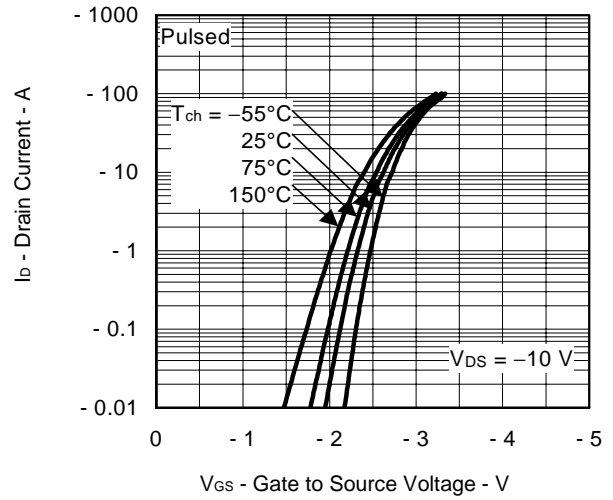
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



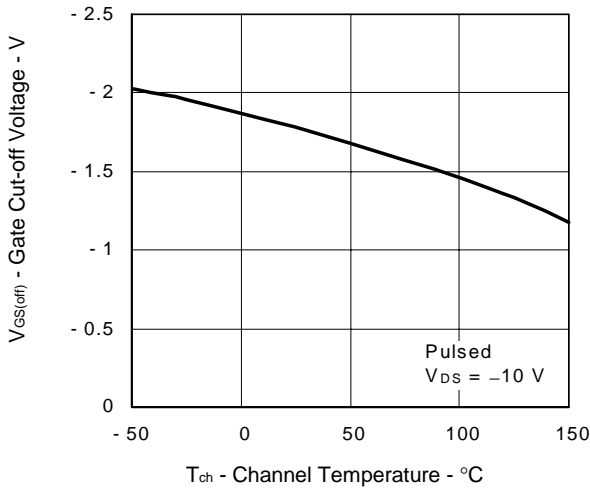
★ DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



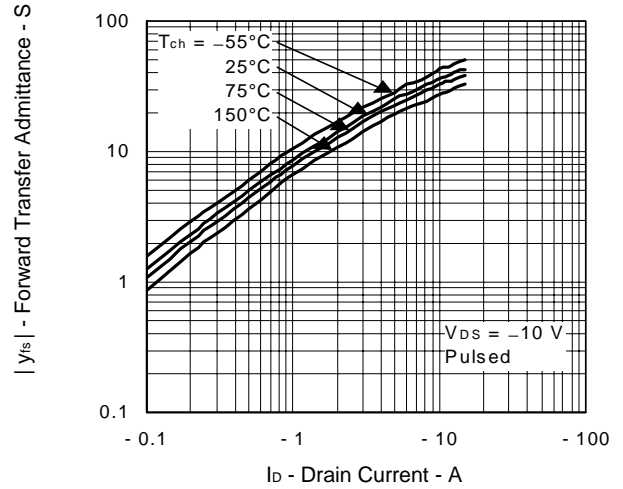
★ FORWARD TRANSFER CHARACTERISTICS



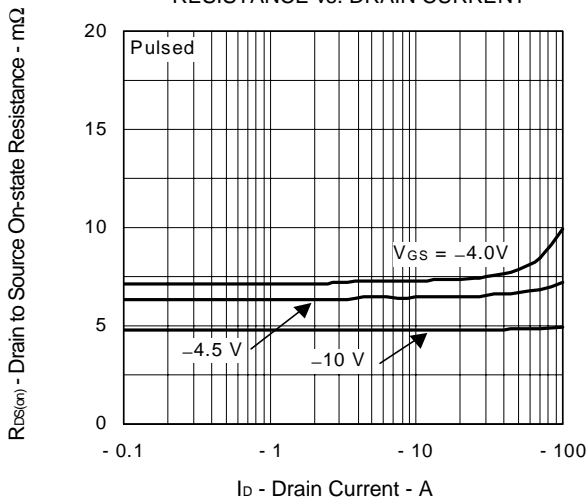
★ GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



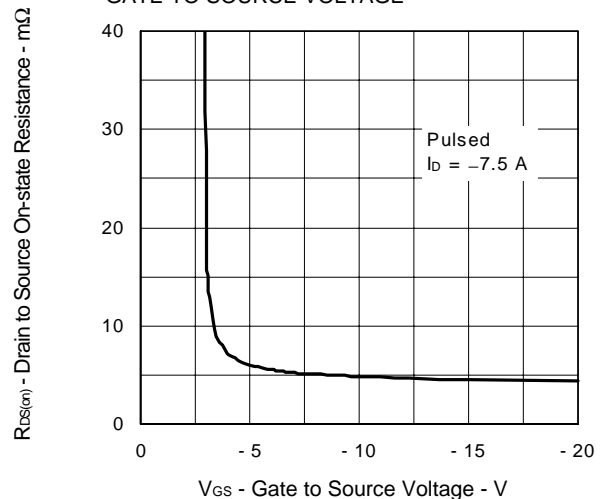
★ FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



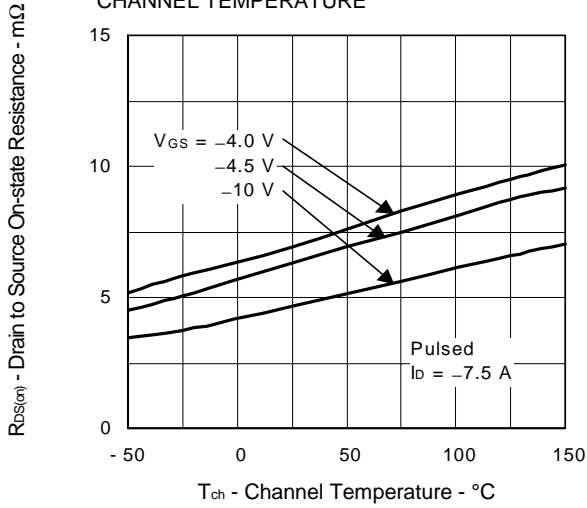
★ DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



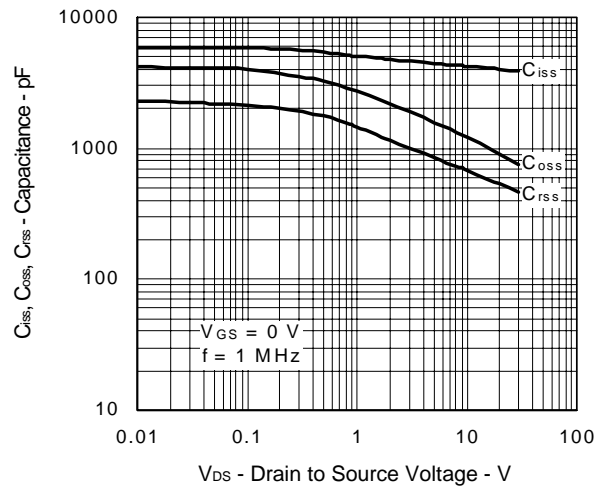
★ DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



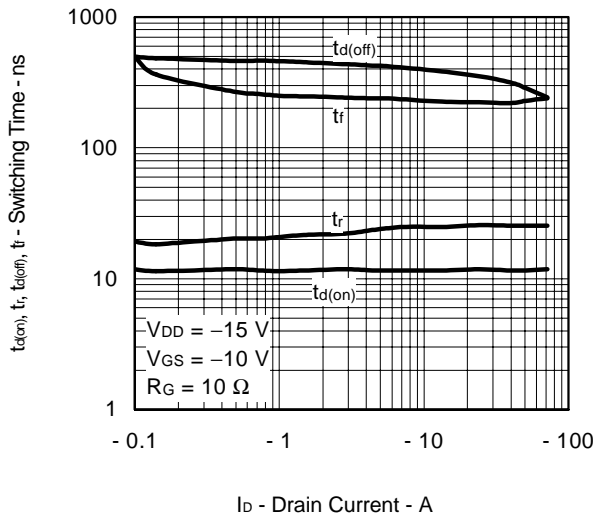
★ DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



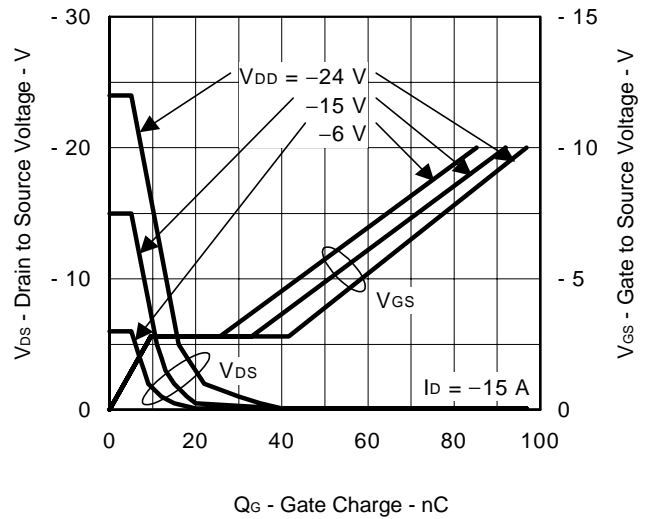
★ CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



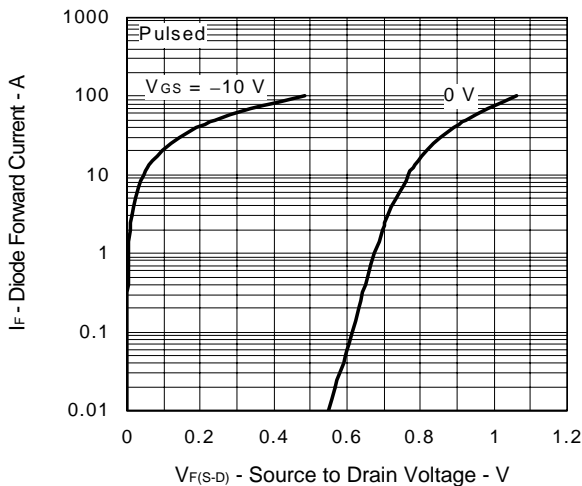
★ SWITCHING CHARACTERISTICS



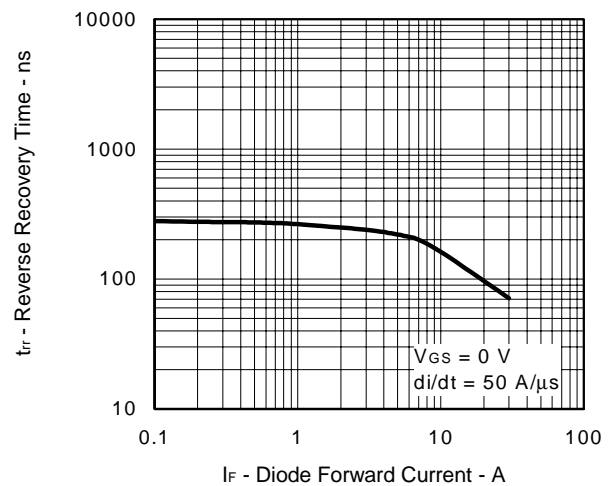
★ DYNAMIC INPUT/OUTPUT CHARACTERISTICS



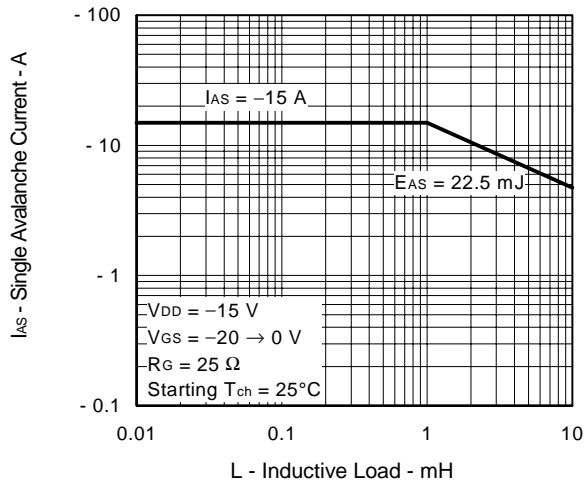
★ SOURCE TO DRAIN DIODE FORWARD VOLTAGE



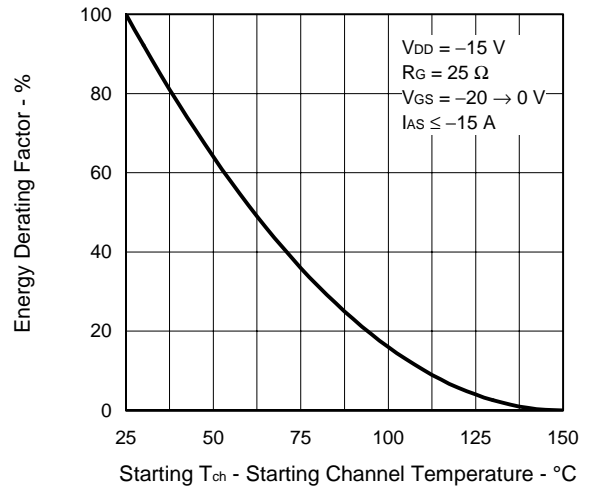
★ REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY DERATING FACTOR



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