

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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SWITCHING  
DUAL P-CHANNEL POWER MOS FET

DESCRIPTION

The  $\mu$ PA2770GR is Dual P-Channel MOS Field Effect Transistors designed for Motor Drive application.

FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 26 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -3.5 \text{ A)}$   
 $R_{DS(on)2} = 35 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -3.5 \text{ A)}$
- Low input capacitance  
 $C_{iss} = 2200 \text{ pF TYP.}$
- Built-in gate protection diode
- Small and surface mount package (Power SOP8)

ABSOLUTE MAXIMUM RATINGS

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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DS}$	-40	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 7$	A
Drain Current (pulse) <sup>Note 1</sup>	$I_{D(pulse)}$	$\pm 28$	A
Total Power Dissipation (1 unit) <sup>Note 2</sup>	$P_T$	1.7	W
Total Power Dissipation (2 units) <sup>Note 2</sup>	$P_T$	2.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note 3</sup>	$I_{AS}$	-7	A
Single Avalanche Energy <sup>Note 3</sup>	$E_{AS}$	4.9	mJ

- Notes**
1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$
  2. Mounted on ceramic substrate of  $2000 \text{ mm}^2 \times 1.6 \text{ mm}$
  3. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = -20 \text{ V} \times V_{DSS}$ ,  $R_G = 25 \Omega$ ,  $L = 100 \mu\text{H}$ ,  $V_{GS} = -20 \text{ V} \rightarrow 0 \text{ V}$

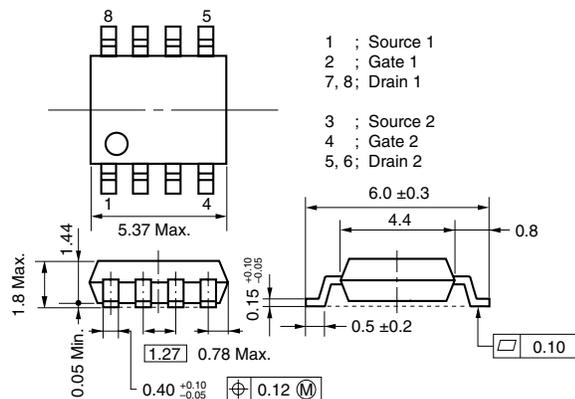
ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
$\mu$ PA2770GR-E1-AY <sup>Note</sup>	Pure Sn	Tape 2500 p/reel	Power SOP8
$\mu$ PA2770GR-E2-AY <sup>Note</sup>			

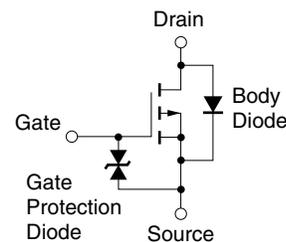
**Note** Pb-free (This product does not contain Pb in the external electrode.)

**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  
(1/2 circuit)



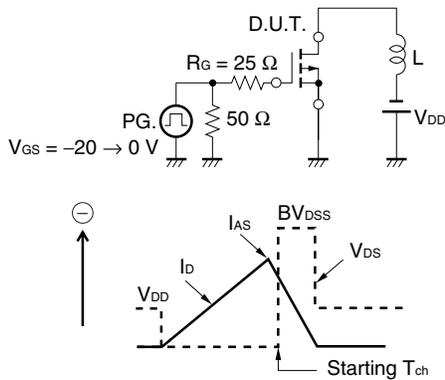
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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, All terminals are connected.)**

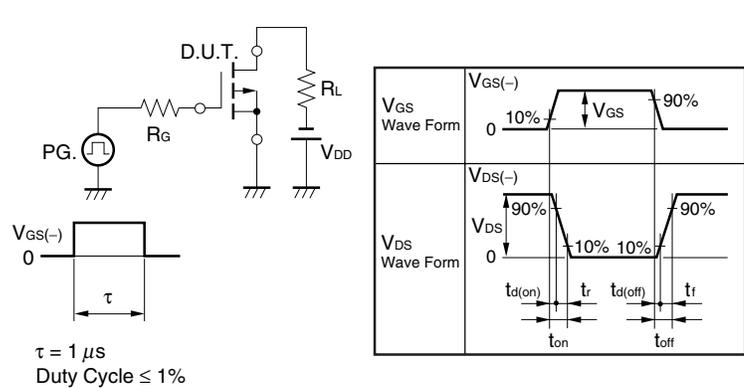
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V			-10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA	-1.0	-1.6	-2.5	V
Forward Transfer Admittance <sup>Note</sup>	y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -3.5 A	5	11		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> = -3.5 A		21	26	mΩ
Drain to Source On-state Resistance <sup>Note</sup>	R <sub>DS(on)2</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3.5 A		24	35	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10 V		2200		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		350		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		260		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -20 V, I <sub>D</sub> = -3.5 A		11		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = -10 V		27		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		160		ns
Fall Time	t <sub>f</sub>			88		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = -7 A		45		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = -32 V		5.2		nC
Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS</sub> = -10 V		12		nC
Body Diode Forward Voltage <sup>Note</sup>	V <sub>F(S-D)</sub>	I <sub>F</sub> = 7 A, V <sub>GS</sub> = 0 V		0.84	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = -7 A, V <sub>GS</sub> = 0 V		54		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = -50 A/μs		25		nC

**Note** Pulsed

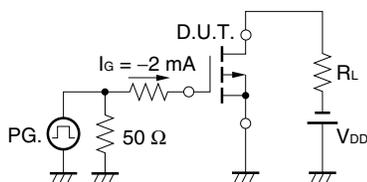
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



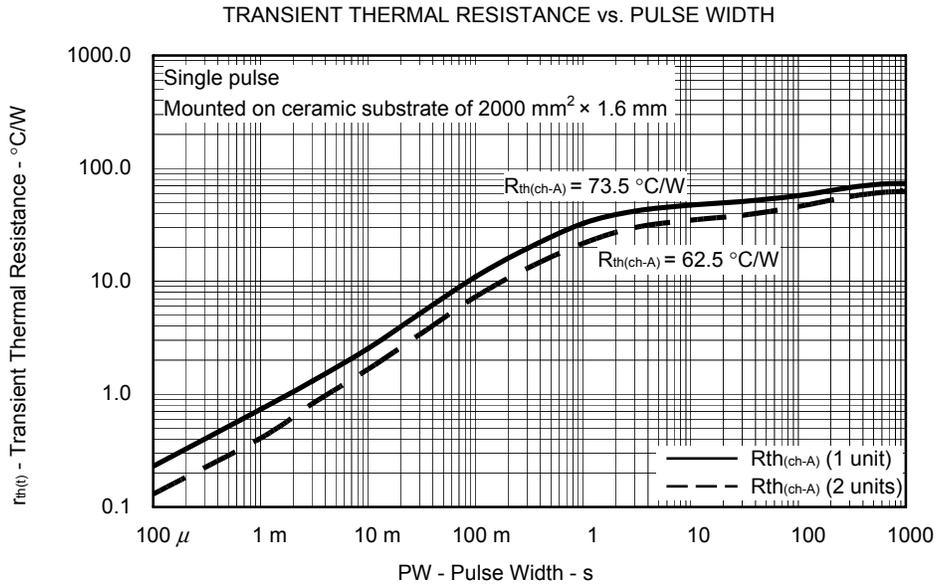
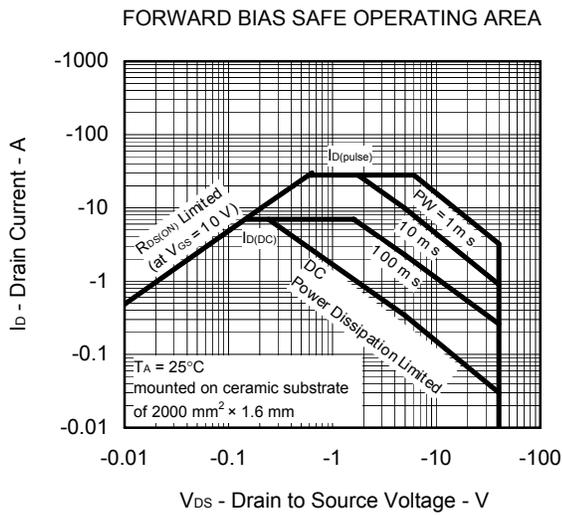
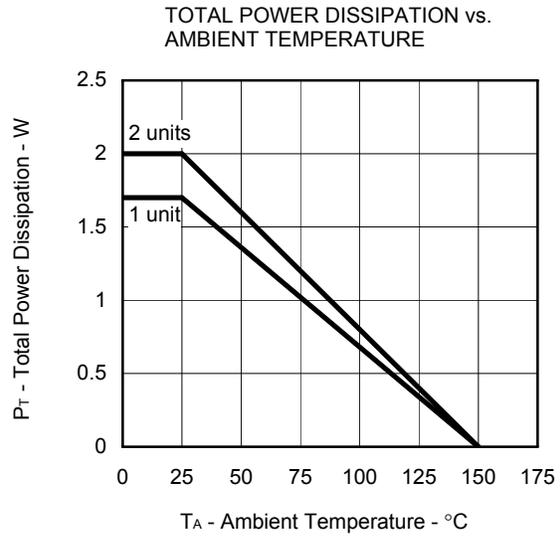
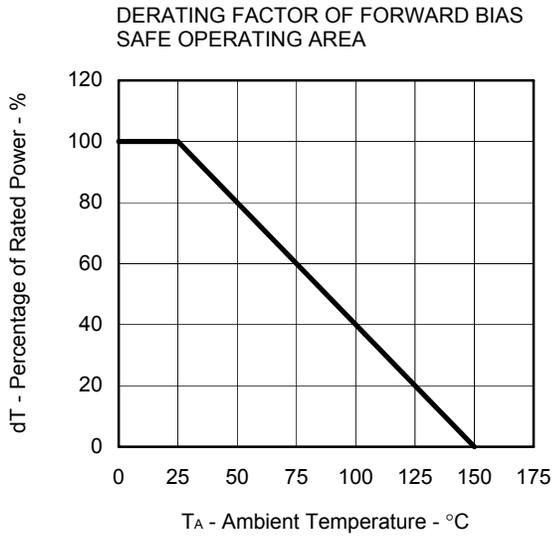
**TEST CIRCUIT 2 SWITCHING TIME**



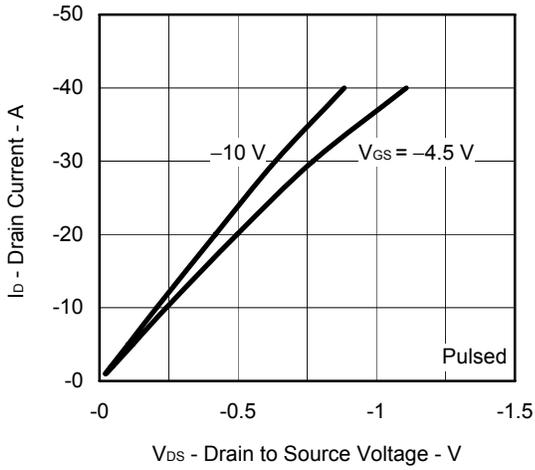
**TEST CIRCUIT 3 GATE CHARGE**



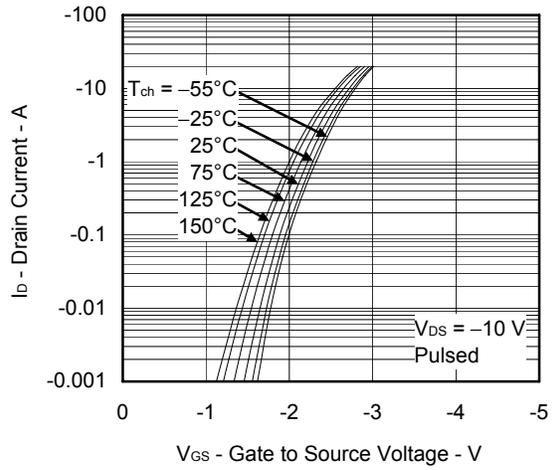
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



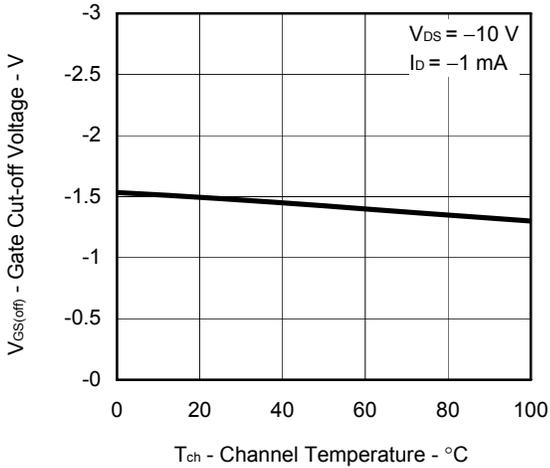
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



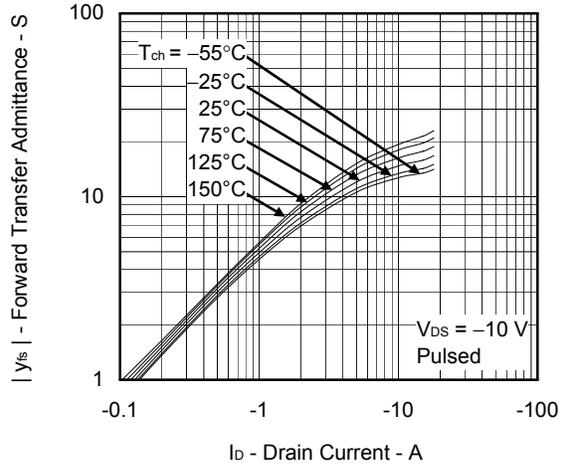
FORWARD TRANSFER CHARACTERISTICS



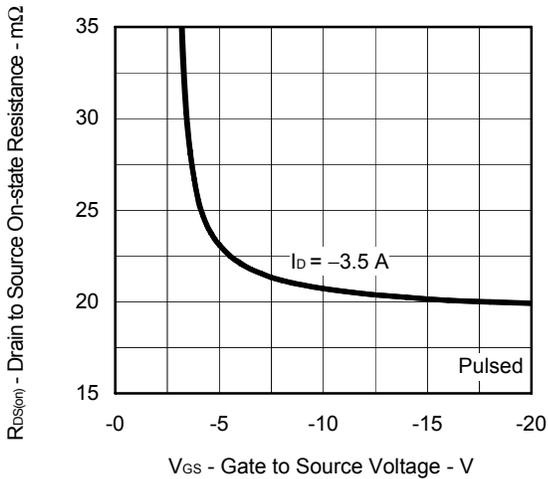
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



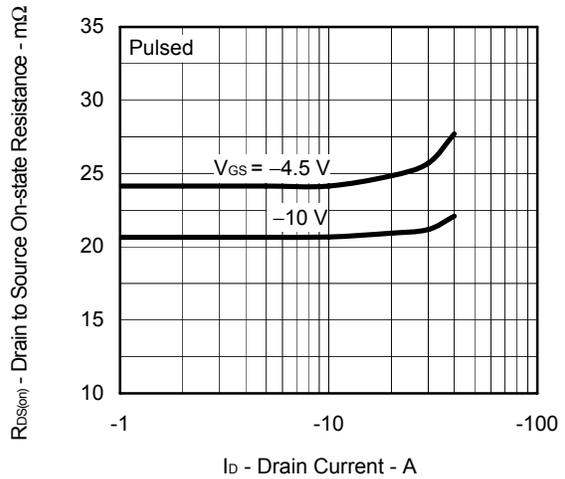
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



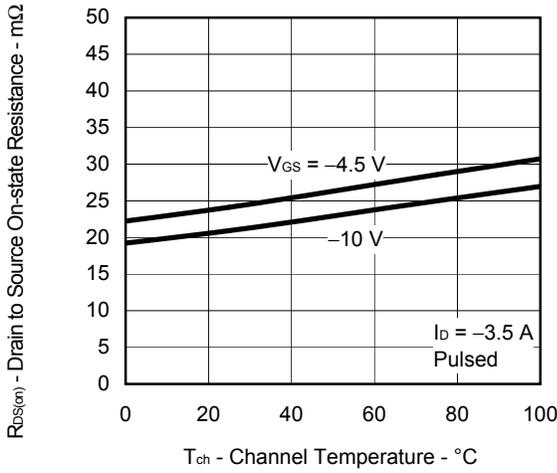
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



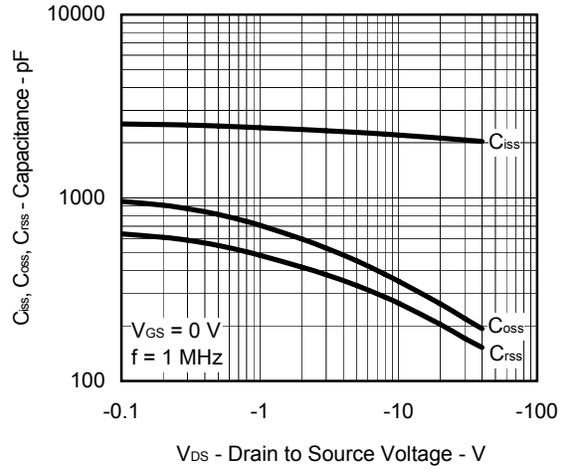
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



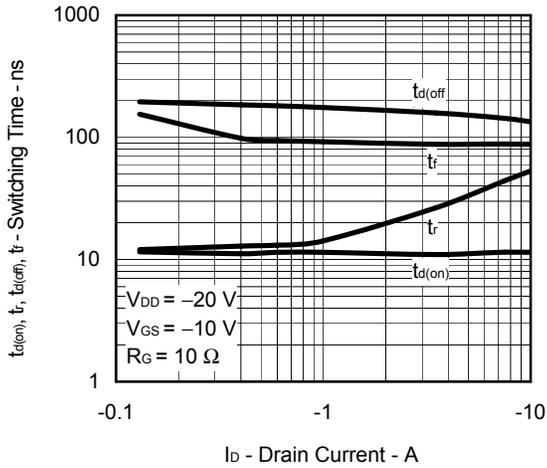
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



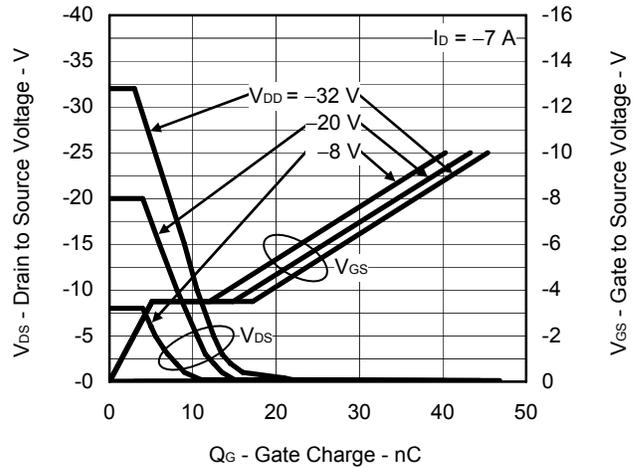
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



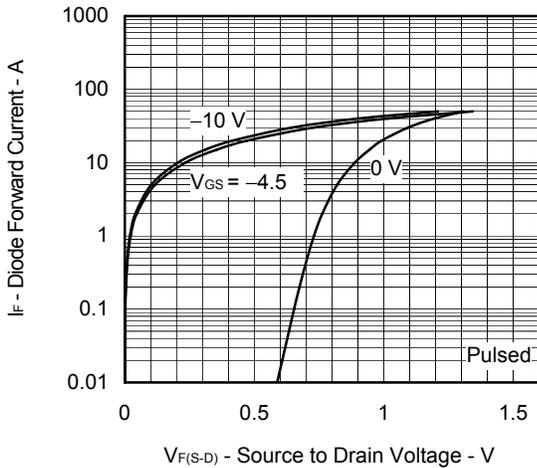
SWITCHING CHARACTERISTICS



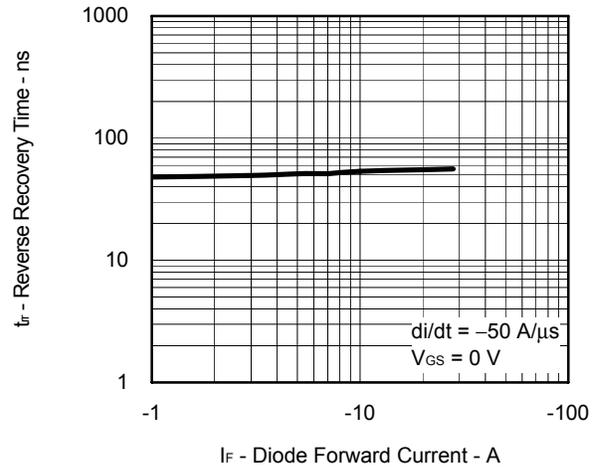
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



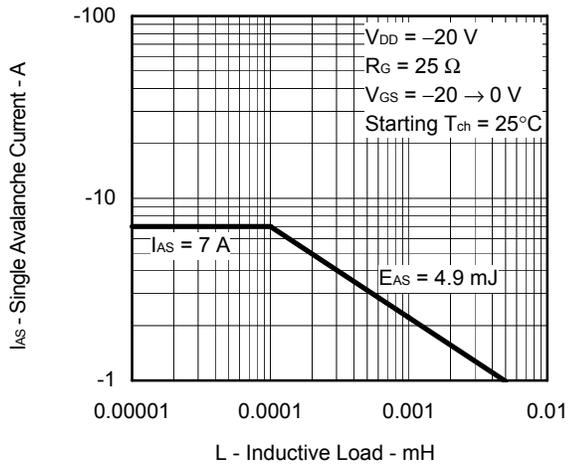
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



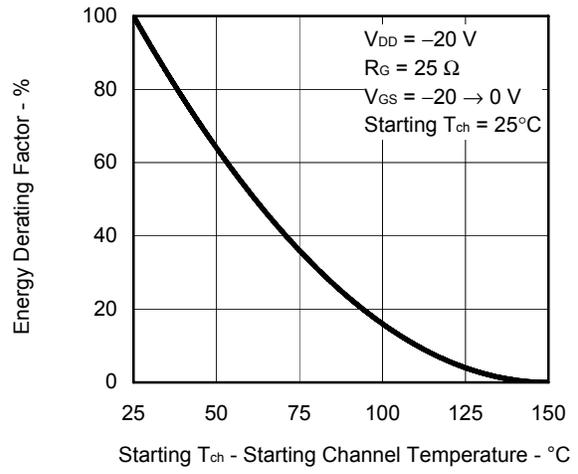
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY DERATING FACTOR



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