

### SWITCHING

### N-CHANNEL POWER MOS FET/SCHOTTKY BARRIER DIODE

#### DESCRIPTION

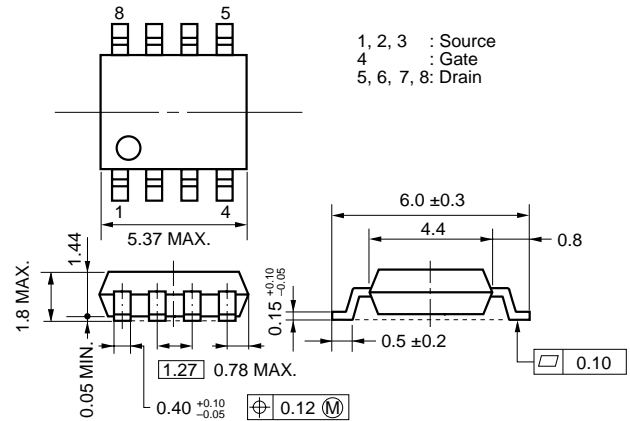
The  $\mu$ PA2781GR is N-channel Power MOSFET, which built a Schottky Barrier Diode inside.

This product is designed for synchronous DC/DC converter application.

#### FEATURES

- Built a Schottky Barrier Diode
- Low on-state resistance  
 $R_{DS(on)1} = 7.6 \text{ m}\Omega$  TYP. ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 7 \text{ A}$ )  
 $R_{DS(on)2} = 11.3 \text{ m}\Omega$  TYP. ( $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 7 \text{ A}$ )  
 $R_{DS(on)3} = 12.9 \text{ m}\Omega$  TYP. ( $V_{GS} = 4.0 \text{ V}$ ,  $I_D = 7 \text{ A}$ )
- Low  $C_{iss}$ :  $C_{iss} = 900 \text{ pF}$  TYP.
- Small and surface mount package (Power SOP8)

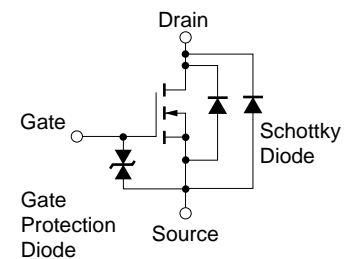
#### PACKAGE DRAWING (Unit: mm)



#### ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA2781GR	Power SOP8

#### EQUIVALENT CIRCUIT



#### 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) [MOSFET]	$I_{D(DC)}$	$\pm 13$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 52$	A
Average Forward Current <sup>Note2</sup> [SCHOTTKY]	$I_{F(AV)}$	2.5	A
Total Power Dissipation <sup>Note3</sup> [MOSFET]	$P_T$	2	W
Total Power Dissipation <sup>Note3</sup> [SCHOTTKY]	$P_T$	1	W
Channel & Junction Temperature	$T_{ch}, T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to + 150	$^\circ\text{C}$

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

**2.** Rectangle wave, 50% Duty Cycle

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

**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.

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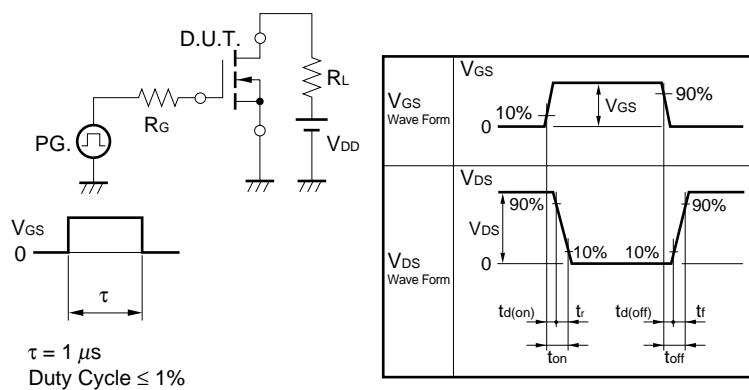
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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise noted. All terminals are connected.)**

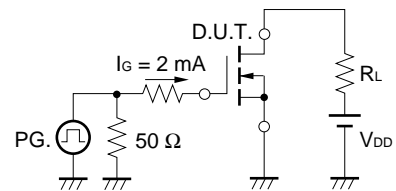
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current <sup>Note</sup>	I <sub>DSS</sub>	V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V			50	μA
		V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V, T <sub>A</sub> = 125°C			10	mA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</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		2.5	V
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 A		7.6	9.5	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 7 A		11.3	15.1	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 7 A		12.9	17.2	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		900		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		450		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		120		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 7 A		9		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		5		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		35		ns
Fall Time	t <sub>f</sub>			8		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 15 V		9		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 5 V		3		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 13 A		4		nC
Body Diode Forward Voltage <sup>Note</sup>	V <sub>F(S-D)</sub>	I <sub>F</sub> = 1 A, V <sub>GS</sub> = 0 V		0.45	0.5	V
		I <sub>F</sub> = 1 A, V <sub>GS</sub> = 0 V, T <sub>A</sub> = 125°C		0.37		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 7 A, V <sub>GS</sub> = 0 V		28		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		18		nC

**Note** Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

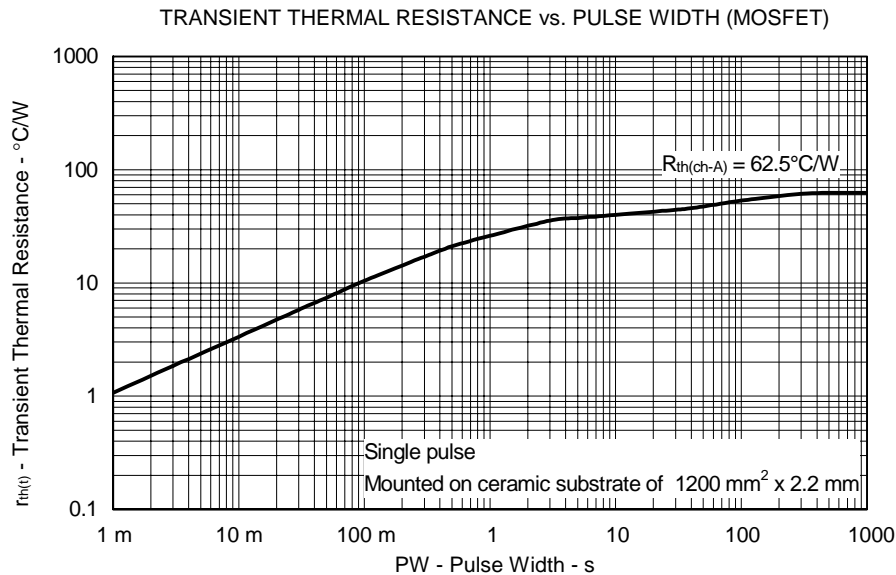
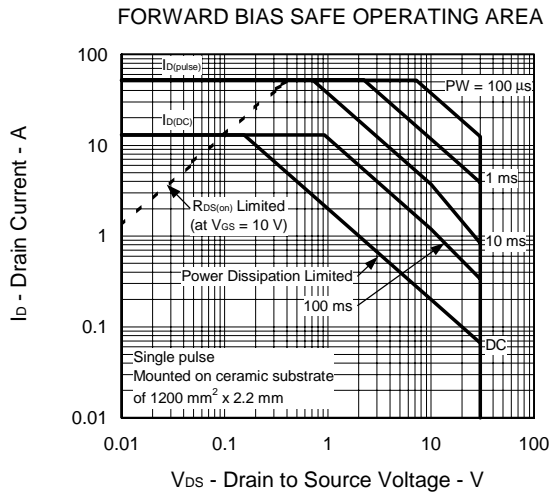
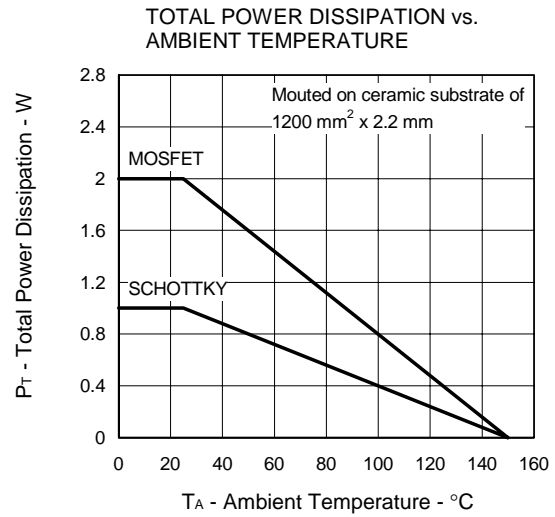
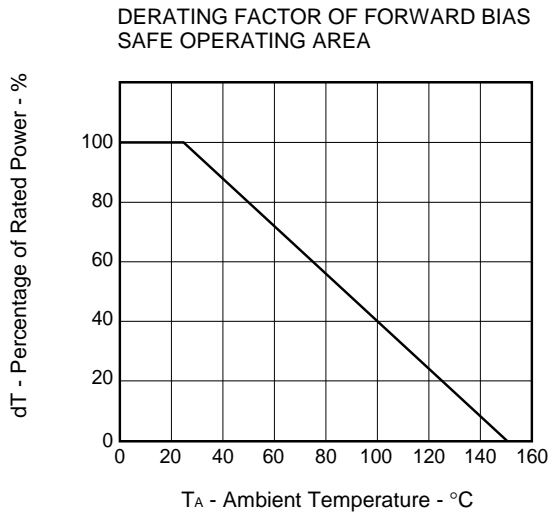
**TEST CIRCUIT 1 SWITCHING TIME**



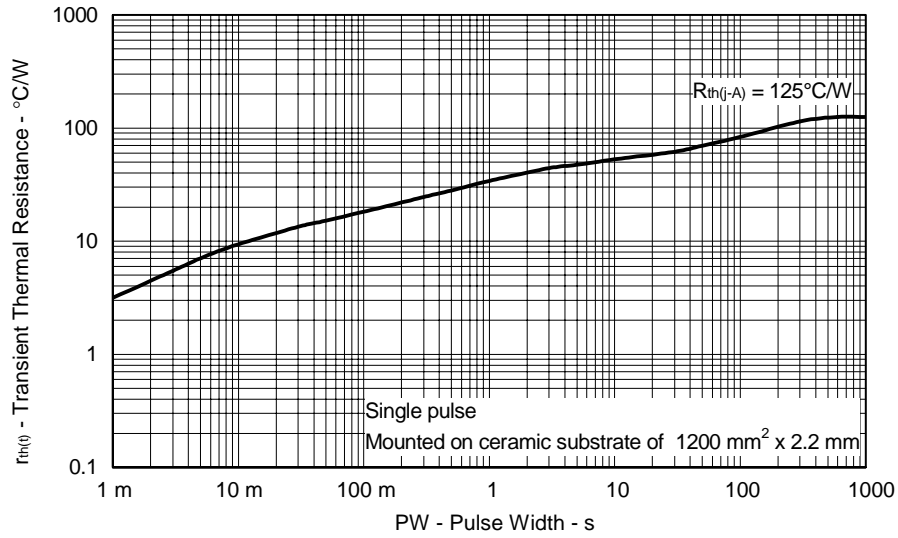
**TEST CIRCUIT 2 GATE CHARGE**



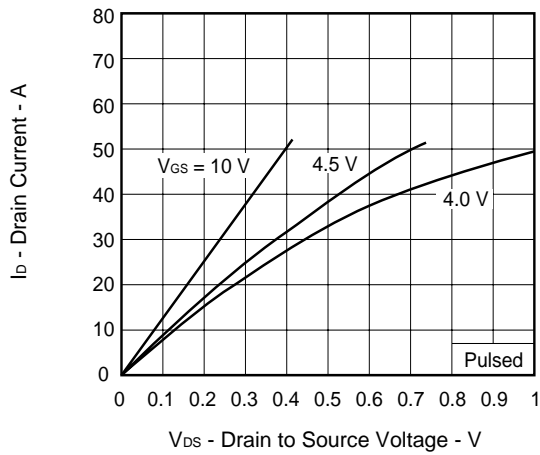
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ . All terminals are connected.)



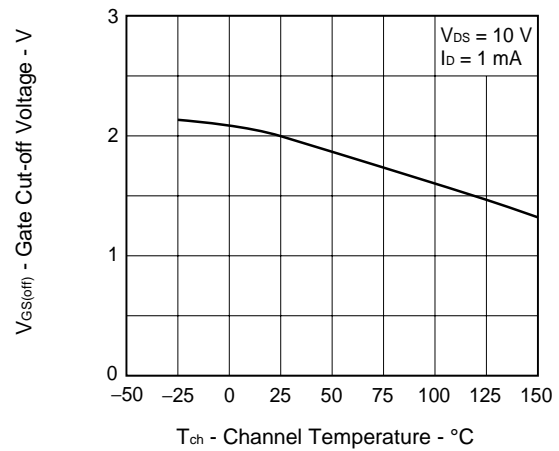
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH (SCHOTTKY)



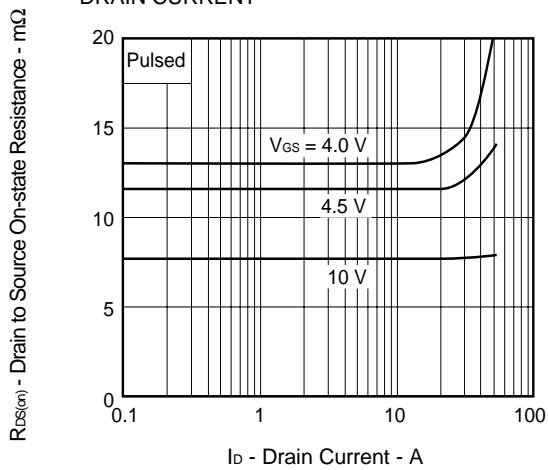
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



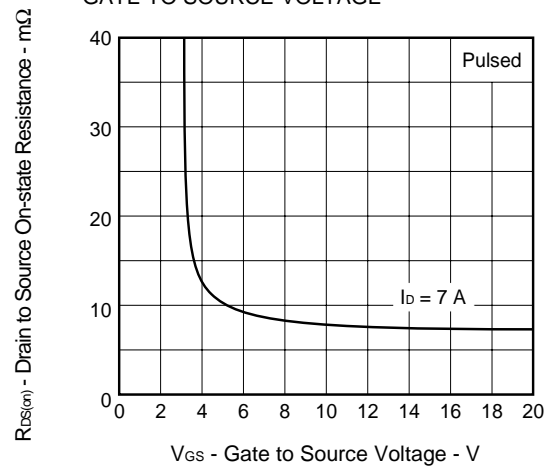
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



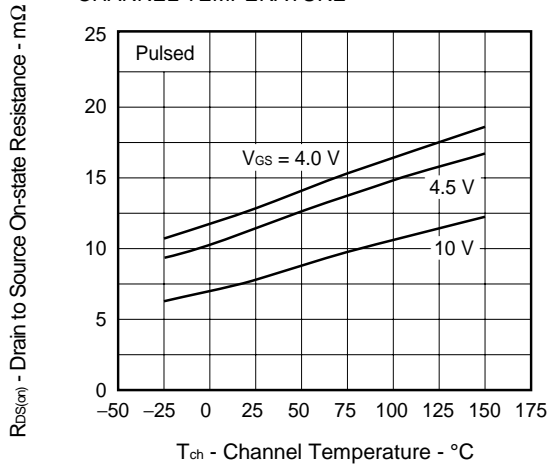
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



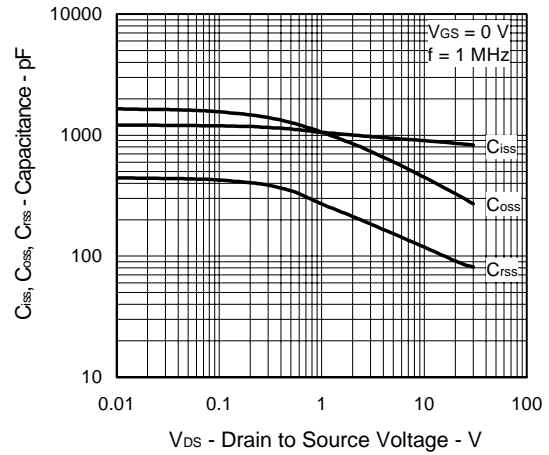
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



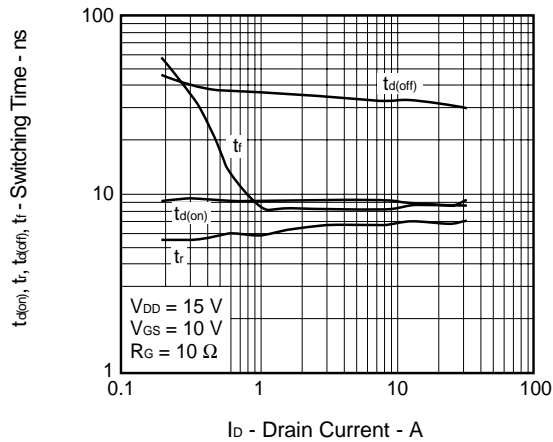
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



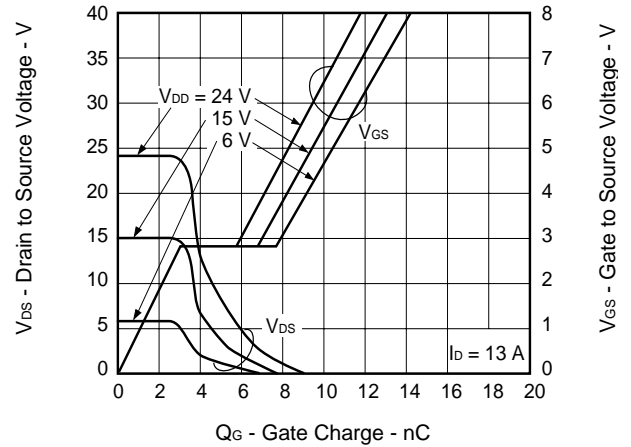
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



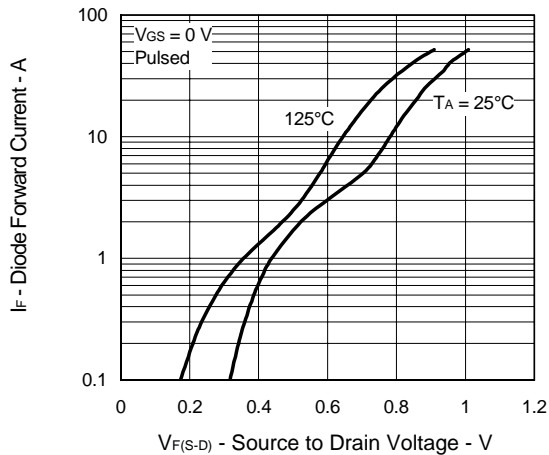
SWITCHING CHARACTERISTICS



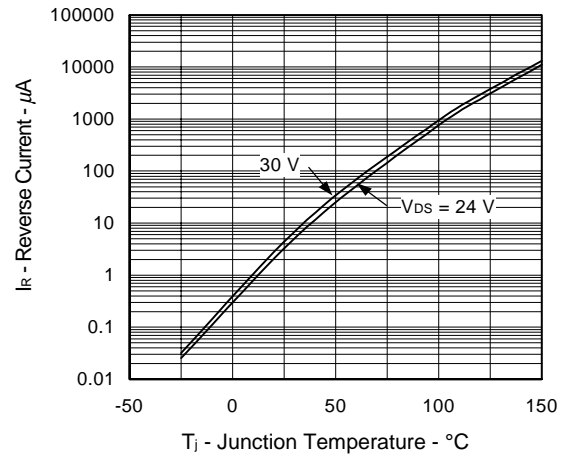
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



SOURCE TO DRAIN DIODE REVERSE CURRENT



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