

### SWITCHING

### N-CHANNEL POWER MOSFET

#### DESCRIPTION

The  $\mu$ PA2721GR is N-channel MOS Field Effect Transistor designed for power management applications of notebook computers and Li-ion battery protection circuit.

#### FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 4.3 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 10 \text{ A)}$   
 $R_{DS(on)2} = 6.3 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 10 \text{ A)}$
- Low  $C_{iss}$ :  $C_{iss} = 5100 \text{ pF TYP. (} V_{DS} = 10 \text{ V, } V_{GS} = 0 \text{ V)}$
- Built-in gate protection diode
- Small and surface mount package (Power SOP8)

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA2721GR-E1	Power SOP8
$\mu$ PA2721GR-E1-A <sup>Note</sup>	Power SOP8
$\mu$ PA2721GR-E2	Power SOP8
$\mu$ PA2721GR-E2-A <sup>Note</sup>	Power SOP8

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

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , All terminals are connected.)

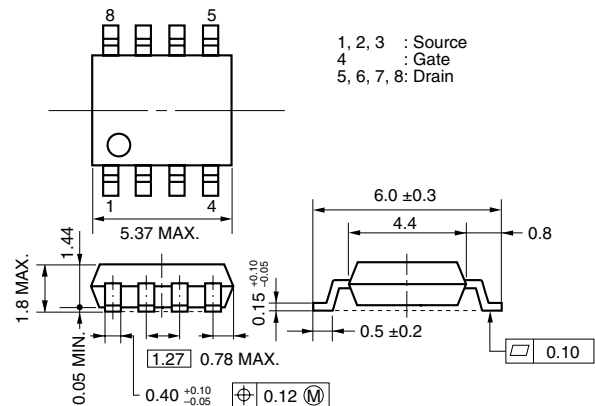
Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 19$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 150$	A
Total Power Dissipation <sup>Note2</sup>	$P_{T1}$	1.1	W
Total Power Dissipation (PW = 10 sec) <sup>Note2</sup>	$P_{T2}$	2.5	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

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

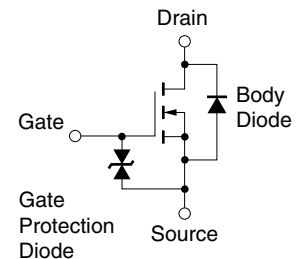
2. Mounted on glass epoxy board of 1 inch x 1 inch x 0.8 mm

**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.

#### PACKAGE DRAWING (Unit: mm)



#### EQUIVALENT CIRCUIT



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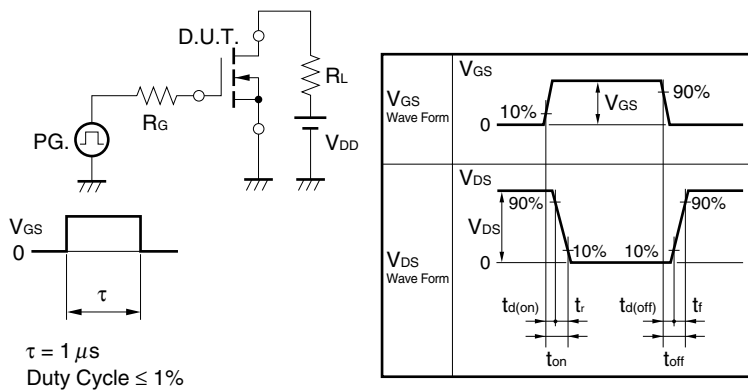
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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, All terminals are connected.)**

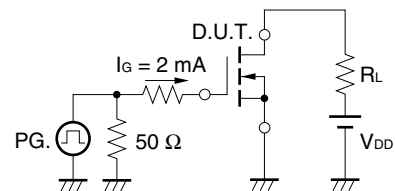
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.0		2.5	V
Forward Transfer Admittance <sup>Note</sup>	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 A	12			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> = 10 A		3.4	4.3	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		4.6	6.3	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		5100		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		1050		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> = 10 A		23		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		40		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		113		ns
Fall Time	t <sub>f</sub>			51		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 15 V		51		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 5 V		13		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 19 A		24		nC
Body Diode Forward Voltage <sup>Note</sup>	V <sub>F(S-D)</sub>	I <sub>F</sub> = 19 A, V <sub>GS</sub> = 0 V		0.8		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 19 A, V <sub>GS</sub> = 0 V		48		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		52		nC

**Note** Pulsed

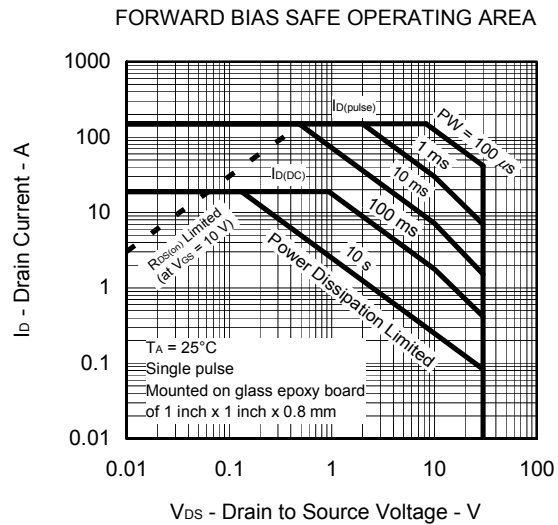
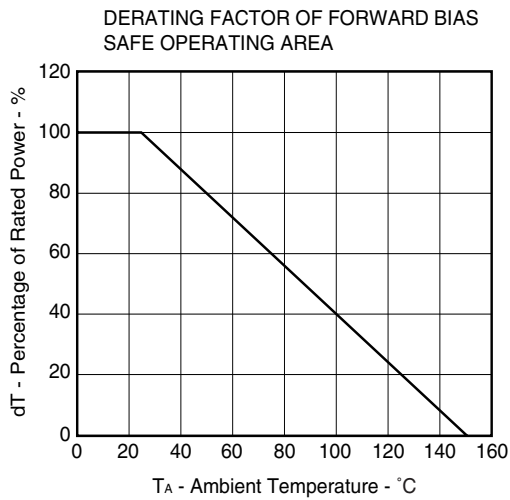
**TEST CIRCUIT 1 SWITCHING TIME**



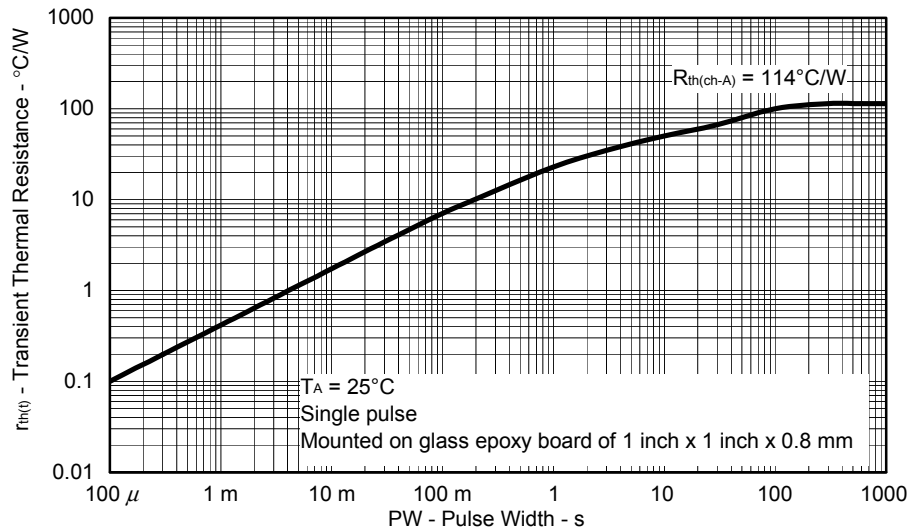
**TEST CIRCUIT 2 GATE CHARGE**



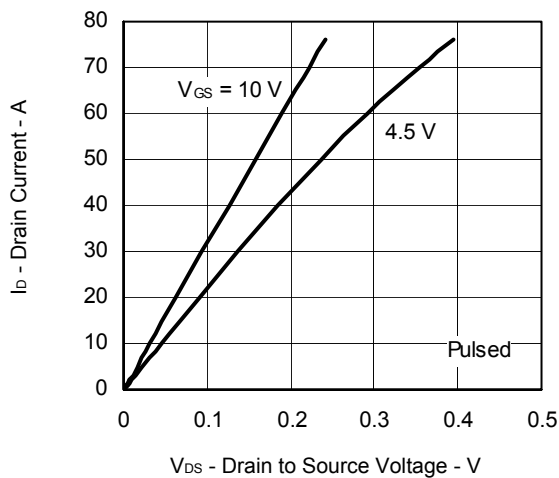
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



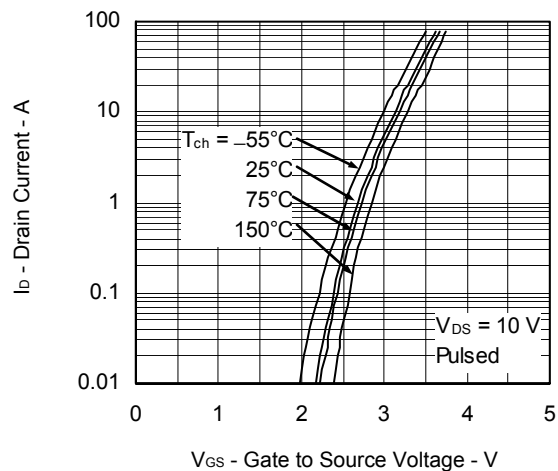
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



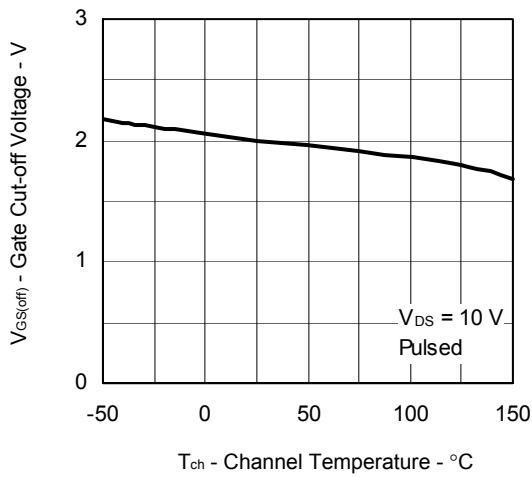
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



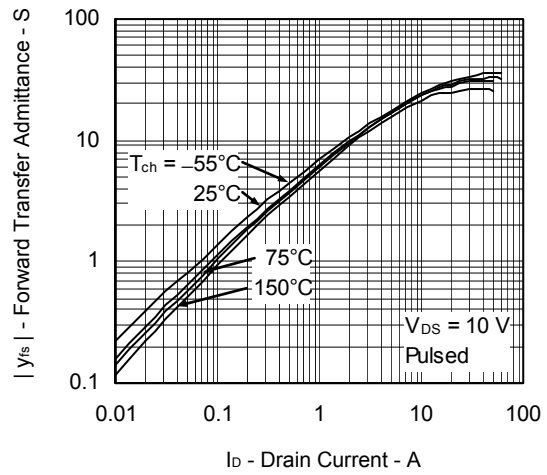
FORWARD TRANSFER CHARACTERISTICS



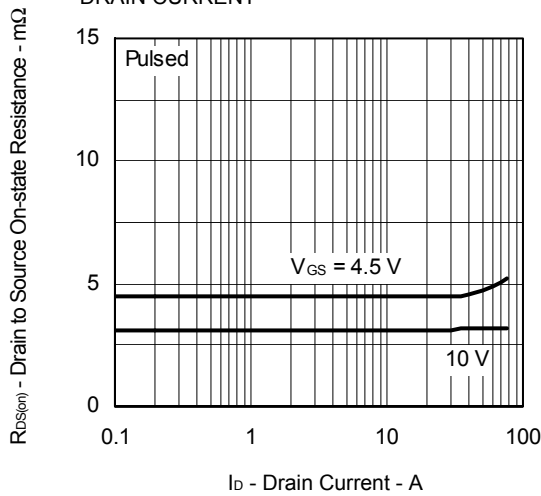
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



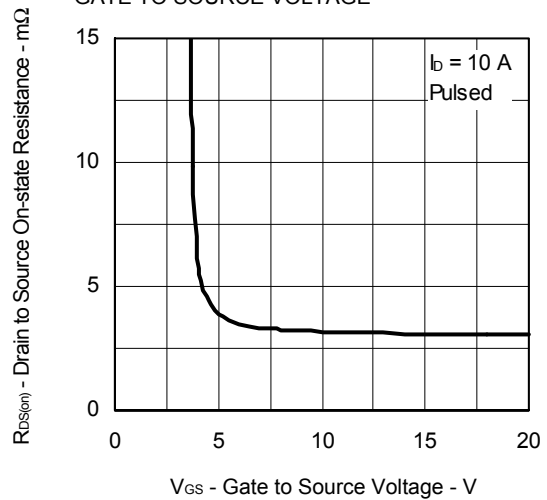
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



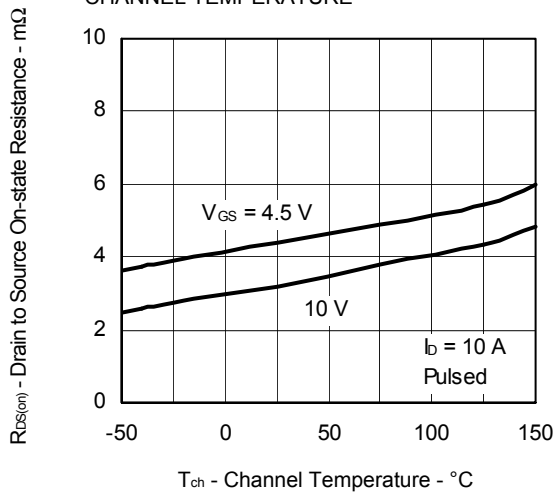
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



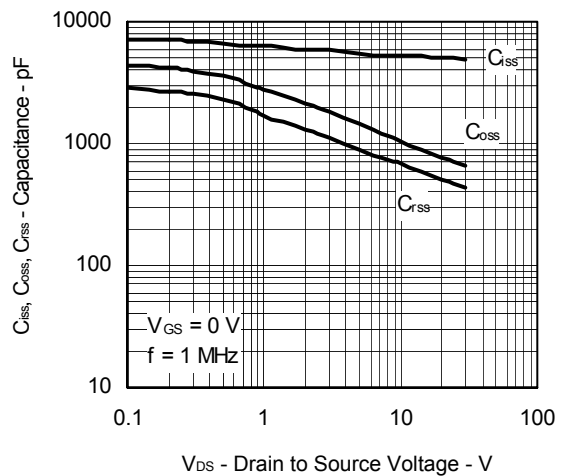
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



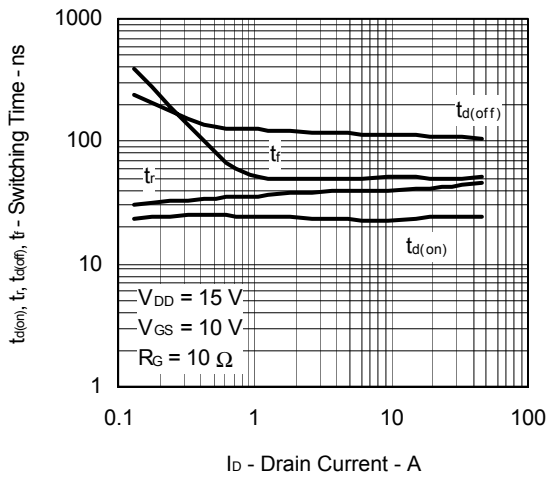
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



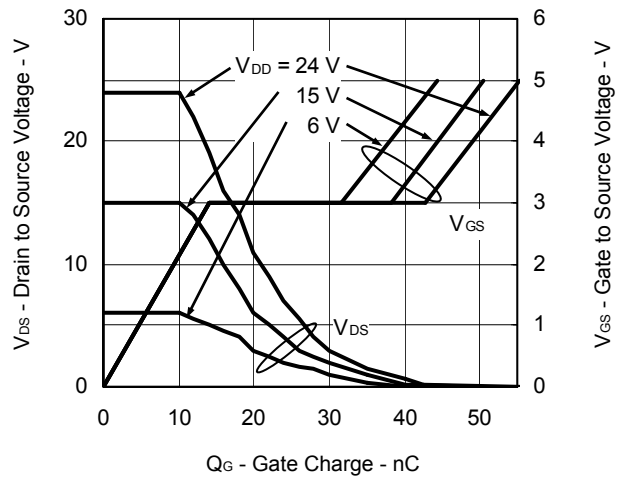
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



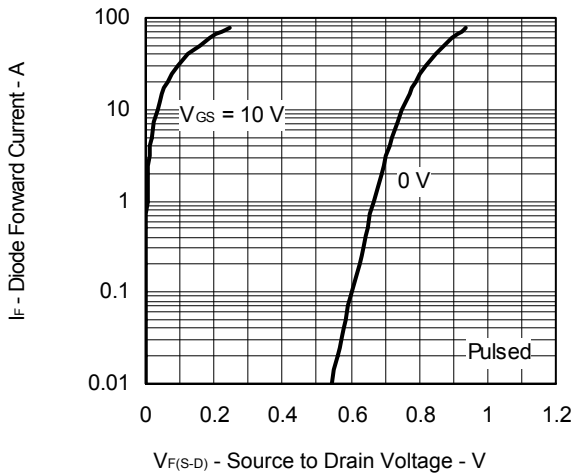
SWITCHING CHARACTERISTICS



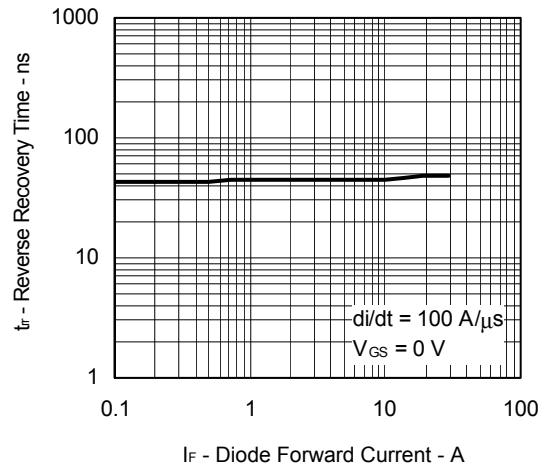
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



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