

# MOS FIELD EFFECT TRANSISTOR

# $\mu$ PA2521

## N-CHANNEL MOS FET FOR SWITCHING

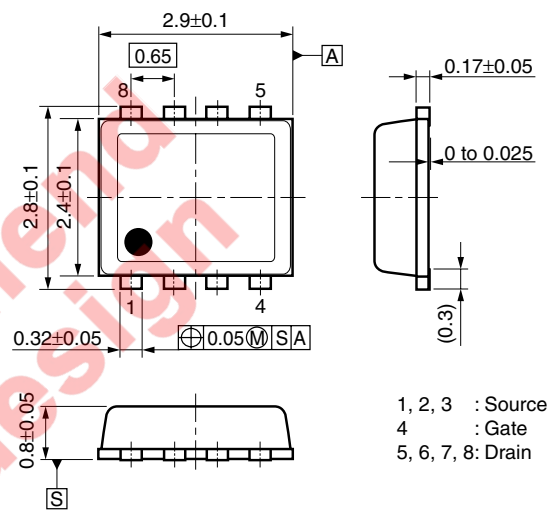
### DESCRIPTION

The  $\mu$ PA2521 is N-channel MOS Field Effect Transistor designed for DC/DC converter and power management applications of portable equipments.

### FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 16.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 8.0 \text{ A)}$   
 $R_{DS(on)2} = 25 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 4.0 \text{ A)}$
- Built-in gate protection diode
- Small and surface mount package (8-pin VSOFF (2429))
- Pb-free (This product does not contain Pb in external electrode and other parts.)

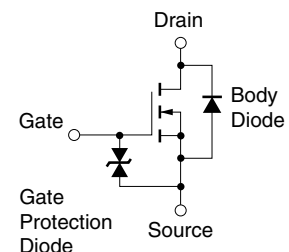
### PACKAGE DRAWING (Unit: mm)



### ABSOLUTE MAXIMUM RATINGS (TA = 25°C, All terminals are connected.)

Drain to Source Voltage (VGS = 0 V)	V <sub>DSS</sub>	30	V
Gate to Source Voltage (VDS = 0 V)	V <sub>GSS</sub>	±20	V
Drain Current (DC)	I <sub>D(DC)</sub>	±8	A
Drain Current (pulse) <sup>Note1</sup>	I <sub>D(pulse)</sub>	±32	A
Total Power Dissipation <sup>Note2</sup>	P <sub>T1</sub>	1.0	W
Total Power Dissipation (PW = 5 sec) <sup>Note2</sup>	P <sub>T2</sub>	2.2	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C
Single Avalanche Current <sup>Note3</sup>	I <sub>AS</sub>	8	A
Single Avalanche Energy <sup>Note3</sup>	E <sub>AS</sub>	6.4	mJ

### EQUIVALENT CIRCUIT



**Notes 1.** PW ≤ 10 μs, Duty Cycle ≤ 1%

**2.** Mounted on FR-4 board of 25.4 mm x 25.4 mm x 0.8 mm

**3.** Starting T<sub>ch</sub> = 25°C, V<sub>DD</sub> = 15 V, R<sub>G</sub> = 25 Ω, V<sub>GS</sub> = 20 → 0 V, L = 100 μH

**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.

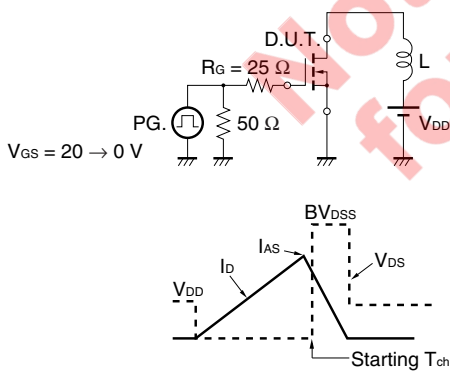
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**ELECTRICAL CHARACTERISTICS (TA = 25°C, All terminals are connected.)**

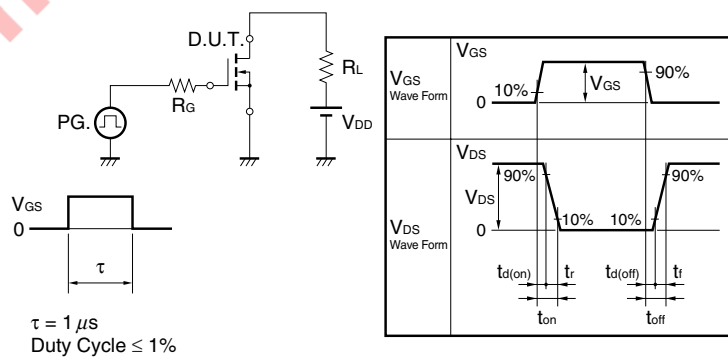
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5		2.5	V
Forward Transfer Admittance <sup>Note</sup>	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.0 A	3.2			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> = 8.0 A		12	16.5	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 4.0 A		17	25	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V,		780		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V,		170		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		61		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 4.0 A,		9.2		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V,		3.8		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		31		ns
Fall Time	t <sub>f</sub>			4.8		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 15 V,		7.6		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 5 V,		2.6		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 8 A		2.4		nC
Body Diode Forward Voltage <sup>Note</sup>	V <sub>F(S-D)</sub>	I <sub>F</sub> = 8 A, V <sub>GS</sub> = 0 V		0.82		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8 A, V <sub>GS</sub> = 0 V,		24		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		17		nC
Gate Resistance	R <sub>G</sub>	f = 1 MHz		1.6		Ω

**Note** Pulsed

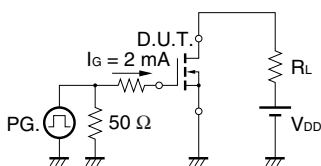
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



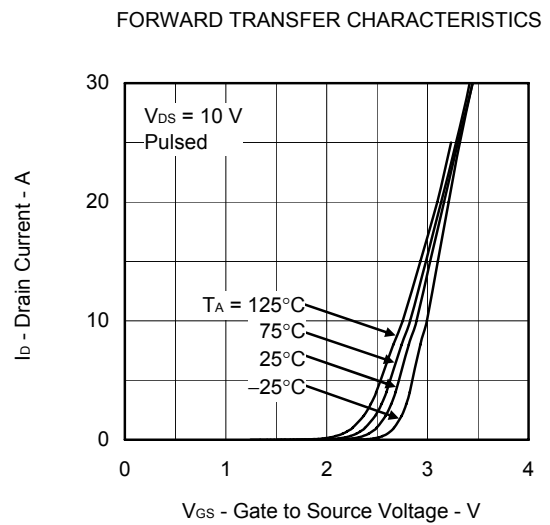
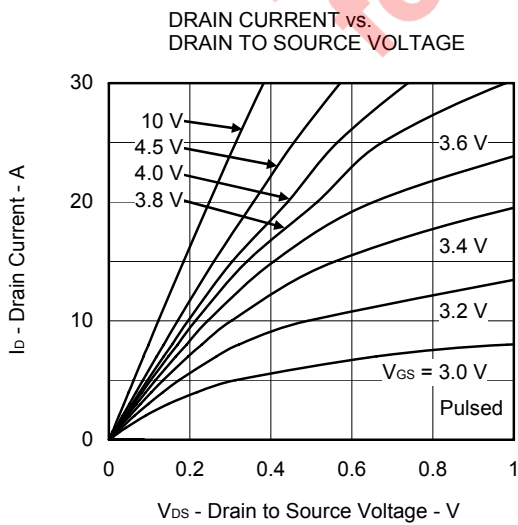
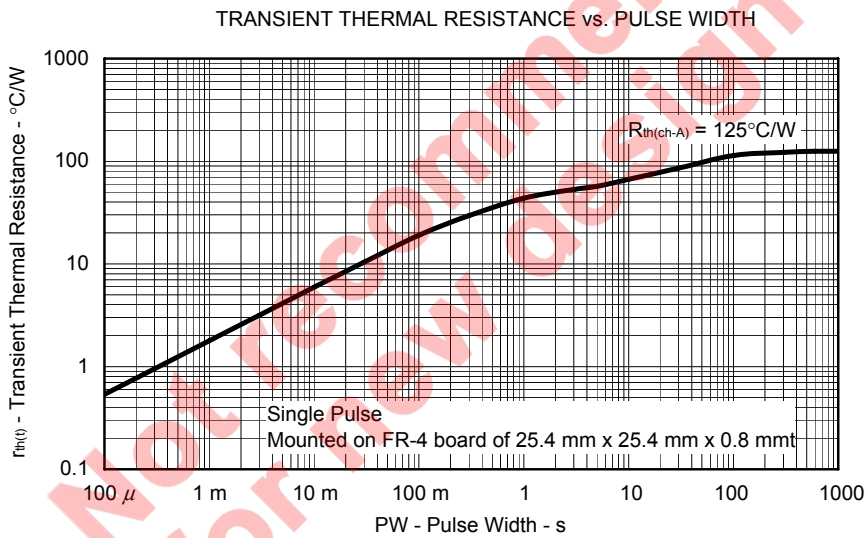
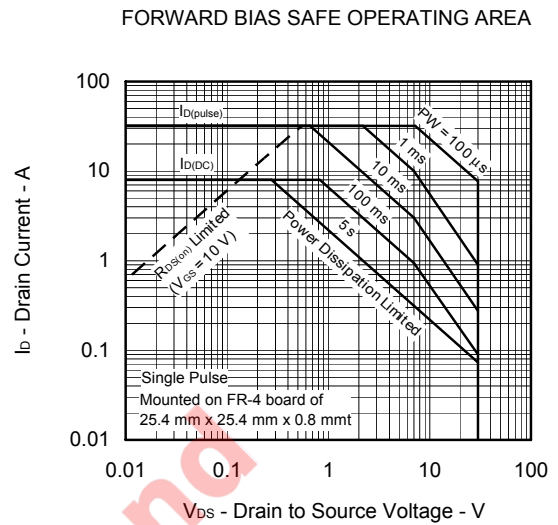
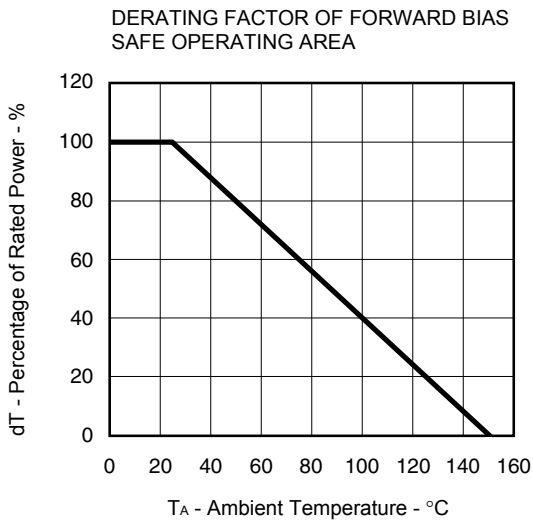
**TEST CIRCUIT 2 SWITCHING TIME**



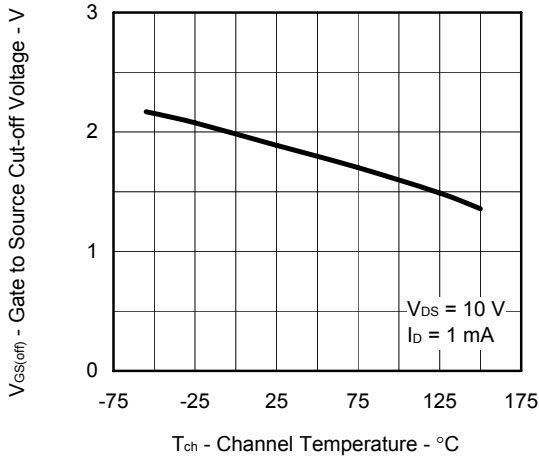
**TEST CIRCUIT 3 GATE CHARGE**



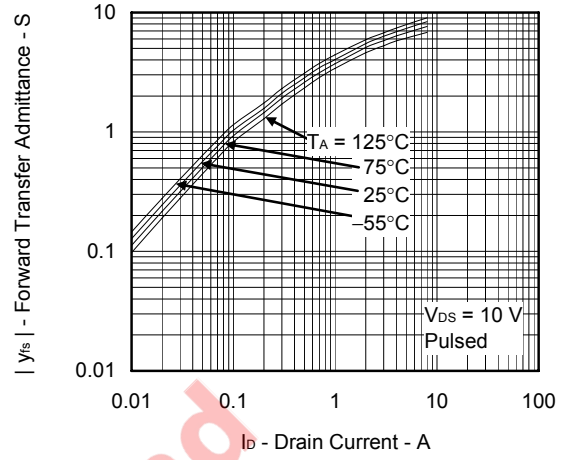
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



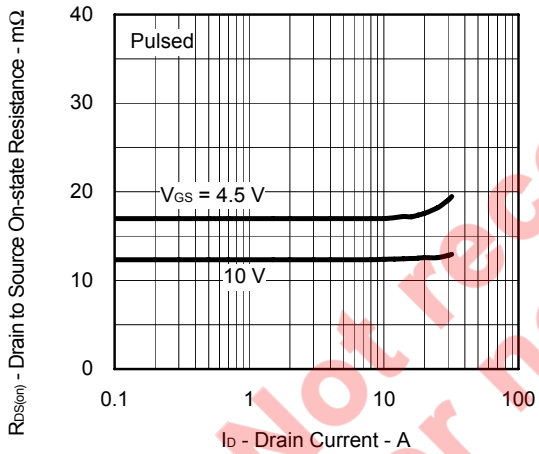
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



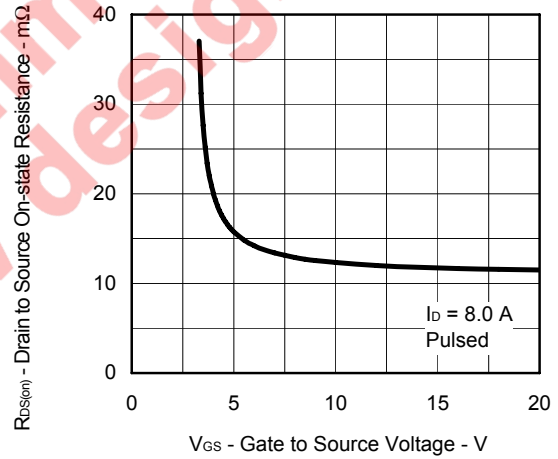
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



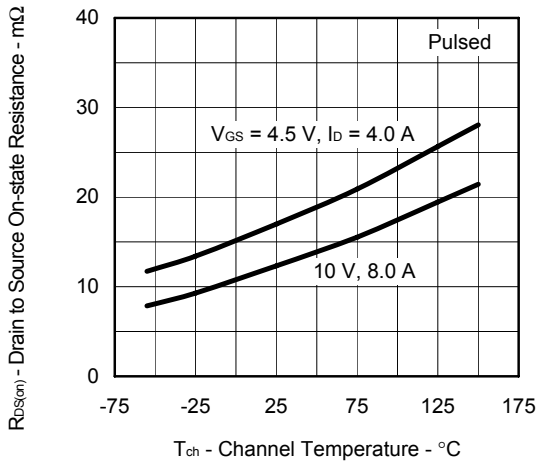
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



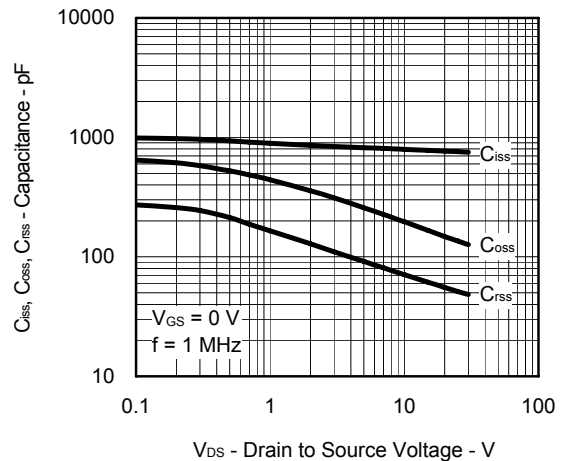
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



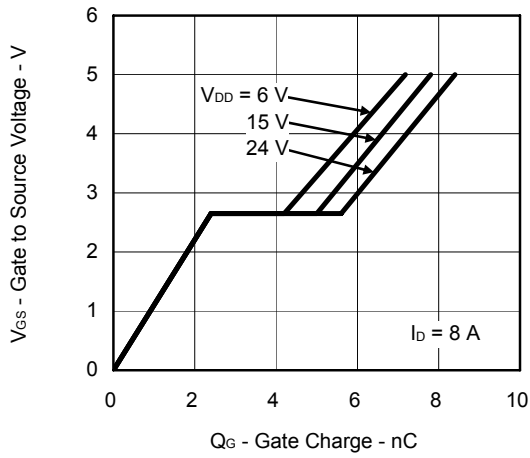
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



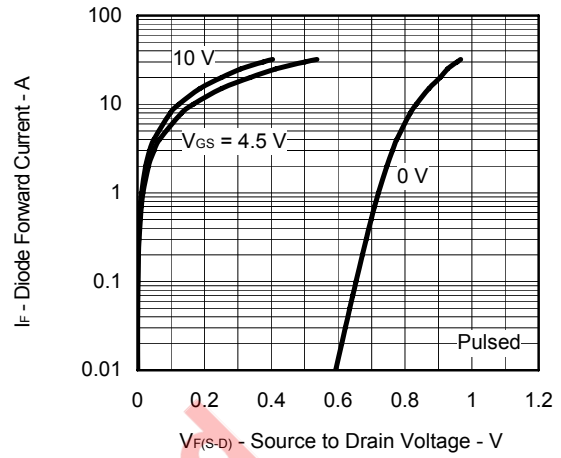
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
μPA2521T1H-T1-AT <sup>Note</sup>	Pure Sn	8 mm embossed taping	8-pin VSO (2429)
μPA2521T1H-T2-AT <sup>Note</sup>		3000 p/reel	

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

Not recommended for new design