

# MOS FIELD EFFECT TRANSISTOR

# $\mu$ PA2746UT1A

## SWITCHING

## N-CHANNEL POWER MOSFET

### DESCRIPTION

The  $\mu$ PA2746UT1A is N-channel MOS Field Effect Transistor designed for DC/DC converter applications.

### FEATURES

- Low on-state resistance
- $R_{DS(on)1} = 3.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 45 \text{ A}$ )
- $R_{DS(on)2} = 4.5 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 23 \text{ A}$ )
- Low  $Q_G$
- Thin type surface mount package with heat spreader (8-pin HVSON)
- RoHS Compliant
- Halogen Free

### 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) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 45$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 190$	A
Total Power Dissipation <sup>Note2</sup>	$P_{T1}$	1.5	W
Total Power Dissipation ( $PW = 10 \text{ sec}$ ) <sup>Note2</sup>	$P_{T2}$	4.6	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T3}$	83	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	$-55 \text{ to } +150$	$^\circ\text{C}$
Single Avalanche Current <sup>Note3</sup>	$I_{AS}$	40	A
Single Avalanche Energy <sup>Note3</sup>	$E_{AS}$	160	mJ

### THERMAL RESISTANCE

Channel to Ambient Thermal Resistance <sup>Note2</sup>	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$
Channel to Case (Drain) Thermal Resistance	$R_{th(ch-C)}$	1.5	$^\circ\text{C/W}$

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

2. Mounted on a glass epoxy board of 25.4 mm x 25.4 mm x 0.8 mm

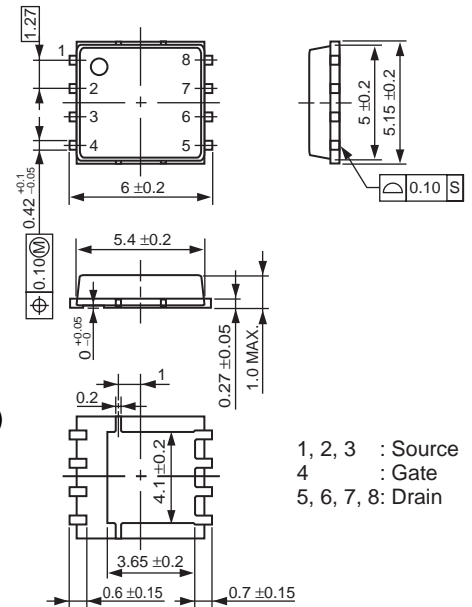
3. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 15 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$ ,  $L = 100 \mu\text{H}$

**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.

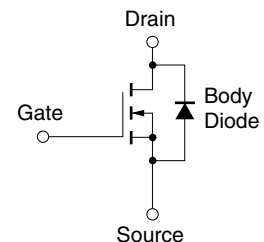
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### PACKAGE DRAWING (Unit: mm)



### EQUIVALENT CIRCUIT

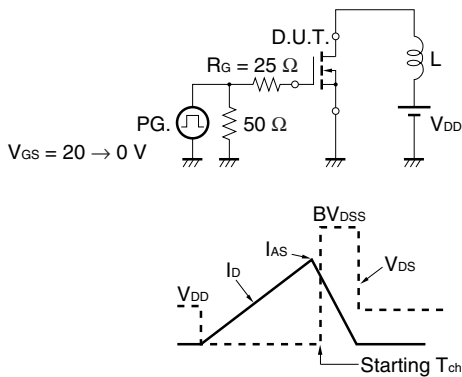


**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, All terminals are connected.)**

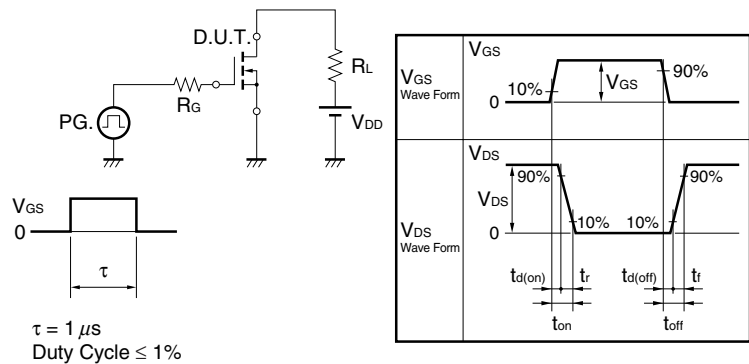
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V			±100	nA
Gate to Source Cut-off Voltage	V <sub>GS(off)</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> = 23 A	19			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> = 45 A		2.4	3.0	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 23 A		3.6	4.5	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V,		3190	4150	pF
Output Capacitance	C <sub>oss</sub>	f = 1 MHz		540	700	pF
Reverse Transfer Capacitance	C <sub>rss</sub>			245	370	pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 23 A,		26		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V,		14		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		85		ns
Fall Time	t <sub>f</sub>			15		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>GS</sub> = 10 V		52	78	nC
		V <sub>GS</sub> = 5 V		27	41	nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = 15 V		11		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 45 A		9.4		nC
Body Diode Forward Voltage <sup>Note</sup>	V <sub>F(S-D)</sub>	I <sub>F</sub> = 45 A, V <sub>GS</sub> = 0 V		0.83		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 45 A, V <sub>GS</sub> = 0 V,		37		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		35		nC
Gate Resistance	R <sub>G</sub>	f = 1 MHz		1.9	2.9	Ω

**Note** Pulsed

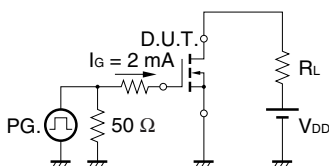
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



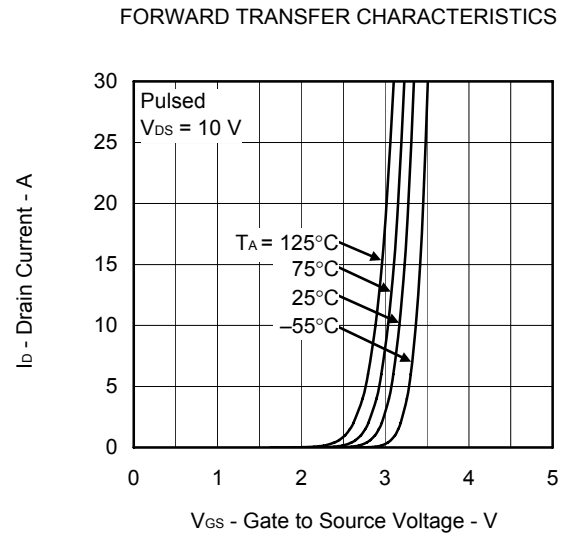
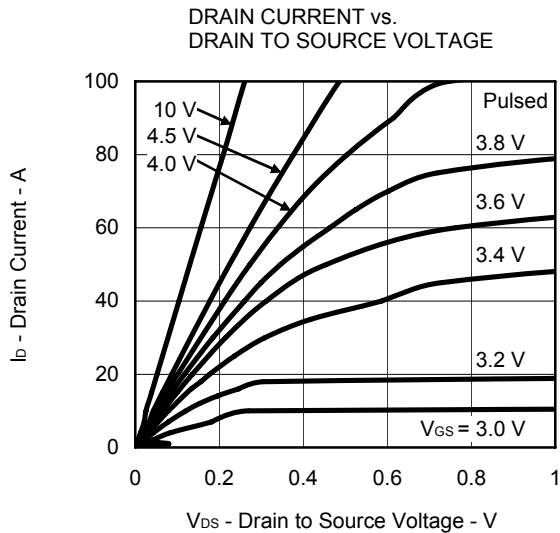
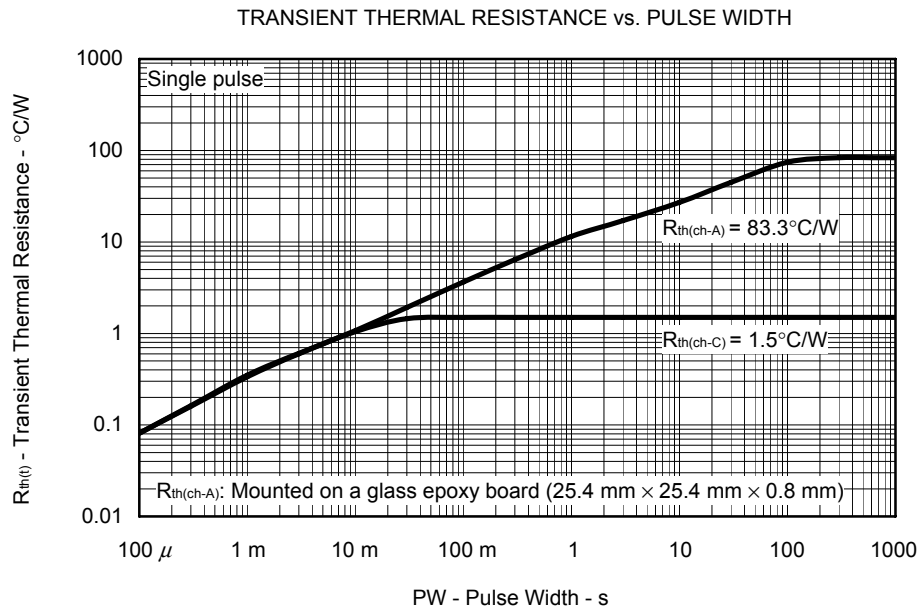
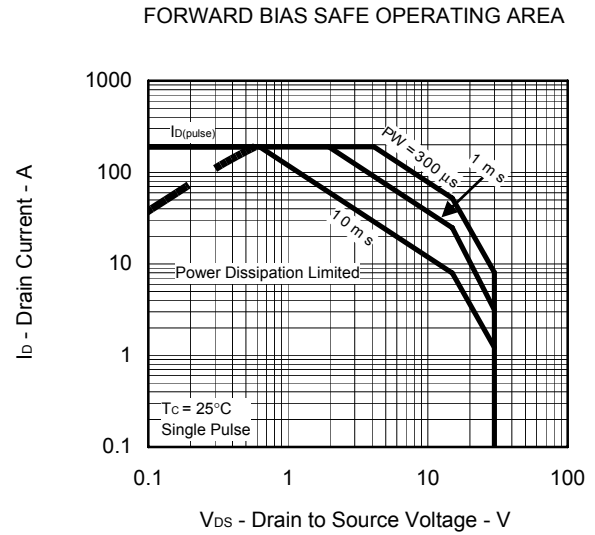
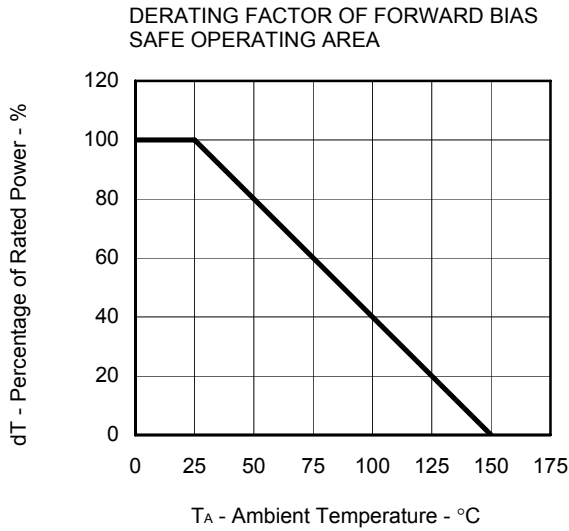
**TEST CIRCUIT 2 SWITCHING TIME**



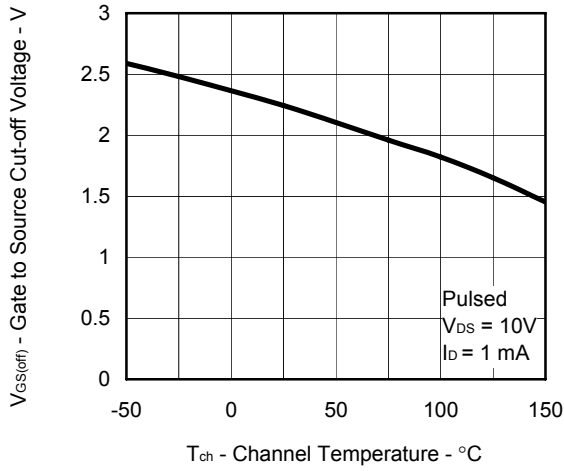
**TEST CIRCUIT 3 GATE CHARGE**



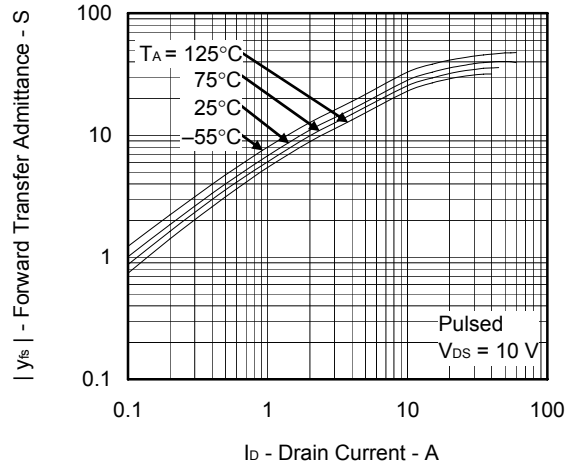
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



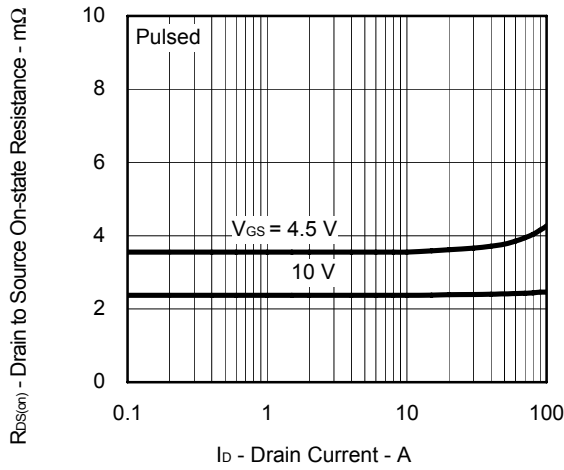
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



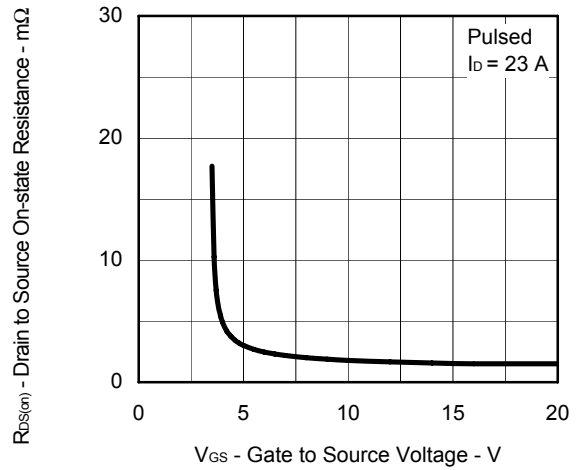
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



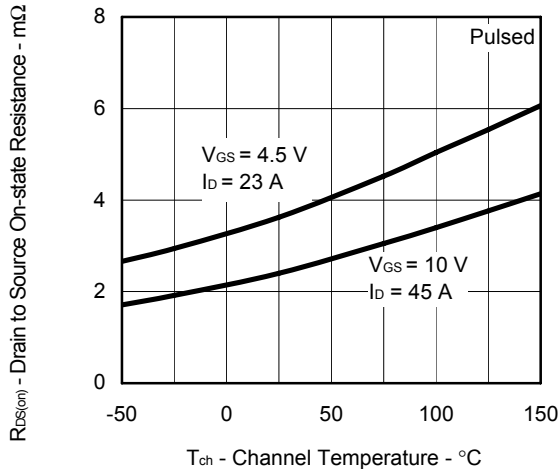
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



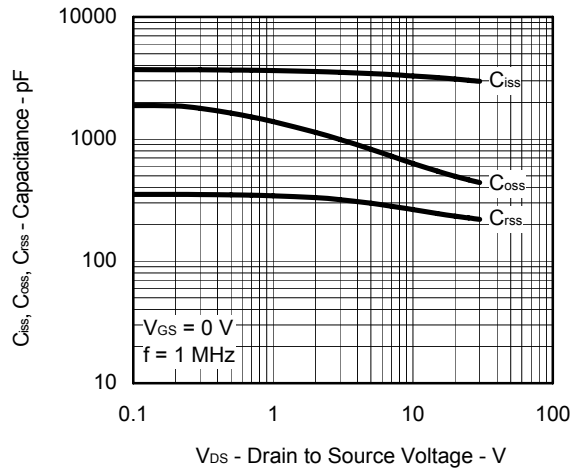
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



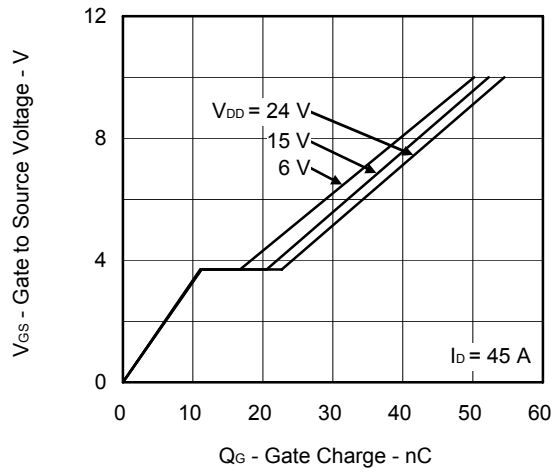
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



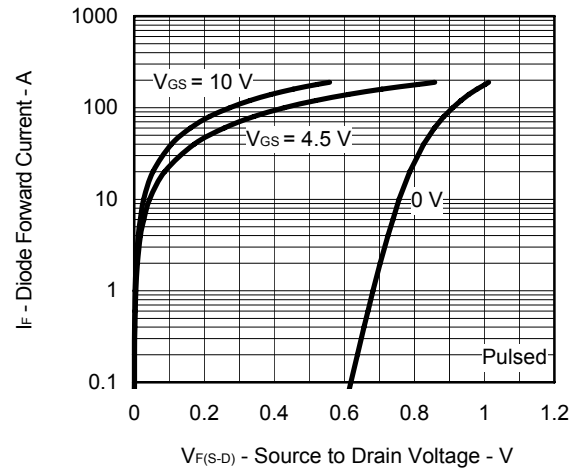
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



**ORDERING INFORMATION**

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
μPA2746UT1A-E1-AY <sup>Note</sup>	Pure Sn	Tape 3000 p/reel	8-pin HVSON (6051) 0.10 g TYP.
μPA2746UT1A-E2-AY <sup>Note</sup>			

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

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