

MOS FET WITH SCHOTTKY BARRIER DIODE $\mu PA507TE$

P-CHANNEL MOS FET WITH SCHOTTKY BARRIER DIODE FOR SWITCHING

DESCRIPTION

NEC

The μ PA507TE is a switching device, which can be driven directly by a 1.8 V power source.

This device incorporates a MOS FET, which features a low on-state resistance and excellent switching characteristics and a low forward voltage Schottky barrier diode, and is suitable for applications such as DC/DC converter of portable machine and so on.

FEATURES

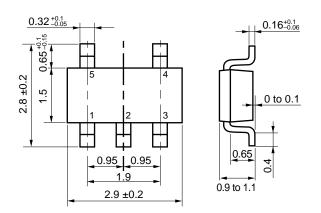
- 1.8 V drive available (MOS FET)
- Low on-state resistance (MOS FET) $R_{DS(on)1} = 68 \text{ m}\Omega \text{ TYP}. (V_{GS} = -4.5 \text{ V}, \text{ ID} = -1.0 \text{ A})$ $R_{DS(on)2} = 84 \text{ m}\Omega \text{ TYP}. (V_{GS} = -2.5 \text{ V}, \text{ ID} = -1.0 \text{ A})$ $R_{DS(on)3} = 109 \text{ m}\Omega \text{ TYP}. (V_{GS} = -1.8 \text{ V}, \text{ ID} = -1.0 \text{ A})$
- Low forward voltage (Schottky barrier diode) VF = 0.35 V TYP. (IF = 1.0 A)

ORDERING INFORMATION

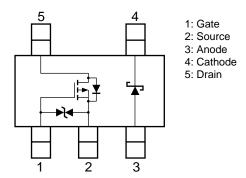
PART NUMBER	PACKAGE
μ PA507TE	SC-95_5p (Mini Mold Thin Type)

Marking: ZA

PACKAGE DRAWING (Unit: mm)



★ PIN CONNECTION (Top View)



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.

Caution This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.

VESD \pm 100 V TYP. (C = 200 pF, R = 0 Ω , Single pulse)

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MOS FET ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Drain to Source Voltage (Vgs = 0 V)	VDSS	-20	V
Gate to Source Voltage (VDS = 0 V)	Vgss	∓8	V
Drain Current (DC)	D(DC)	∓2	А
Drain Current (pulse) ^{Note1}	D(pulse)	∓8	А
Total Power Dissipation Note2	Рт	0.57	W
Channel Temperature	Tch	150	°C

Notes 1. PW \leq 10 μ s, Duty Cycle \leq 1%

2. Mounted on FR-4 board of 2500 mm² x 1.6 mm, t \leq 5 sec.

SCHOTTKY BARRIER DIODE ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Repetitive Peak Reverse Voltage	VRRM	30	V
Average Forward Current Note3	F(AV)	1	А
Surge Current Note4	IFSM	10	А
Junction Temperature	Tj	+125	°C
Storage Temperature	Tstg	–55 to +125	°C

Notes 3. Mounted on FR-4 board of 2500 mm² x 1.6 mm, t \leq 5 sec

4. 50 Hz sine wave, 1 cycle

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	IDSS	V _{DS} = -20 V, V _{GS} = 0 V			-1	μA
Gate Leakage Current	lgss	V_{GS} = \mp 8 V, V_{DS} = 0 V			∓10	μA
Gate Cut-off Voltage	V _{GS(off)}	V_{DS} = -10 V, I _D = -1.0 mA	-0.45	-0.75	-1.50	V
Forward Transfer Admittance Note	y _{fs}	Vds = -10 V, Id = -1.0 A	2.0	4.3		S
Drain to Source On-state Resistance Note	RDS(on)1	V_{GS} = -4.5 V, I_D = -1.0 A		68	85	mΩ
	RDS(on)2	V_{GS} = -2.5 V, I _D = -1.0 A		84	120	mΩ
	RDS(on)3	V_{GS} = -1.8 V, I _D = -1.0 A		109	180	mΩ
Input Capacitance	Ciss	V _{DS} = -10 V		380		pF
Output Capacitance	Coss	V _{GS} = 0 V		85		pF
Reverse Transfer Capacitance	Crss	f = 1.0 MHz		45		pF
Turn-on Delay Time	td(on)	$V_{DD} = -10 \text{ V}, \text{ I}_{D} = -1.0 \text{ A}$		10		ns
Rise Time	tr	V _{GS} = -4.0 V		5		ns
Turn-off Delay Time	td(off)	R _G = 10 Ω		47		ns
Fall Time	tr			28		ns
Total Gate Charge	QG	V _{DD} = -16 V		4.7		nC
Gate to Source Charge	Q _{GS}	V _{GS} = -4.0 V		0.9		nC
Gate to Drain Charge	Qgd	ID = -2.0 A		1.5		nC
Body Diode Forward Voltage Note	VF(S-D)	IF = 2.0 A, VGS = 0 V		0.84		V

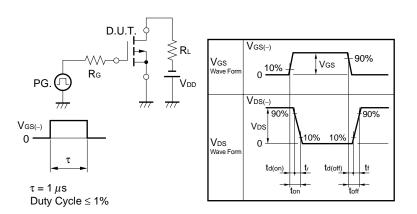
MOS FET	ELECTRICAL	CHARACTERISTICS ($(T_A = 25^{\circ}C)$
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Note Pulsed: PW \leq 350 μ s, Duty Cycle \leq 2%

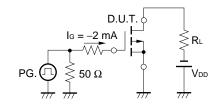
SCHOTTKY BARRIER DIODE ELECTRICAL CHARACTERISTICS (TA = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Forward Voltage	VF	I⊧ = 1.0 A		0.35	0.38	V
Reverse Current	IR	V _R = 10 V			200	μA
Terminal Capacitance	Ст	f = 1.0 MHz, V _R = 10 V		36		pF

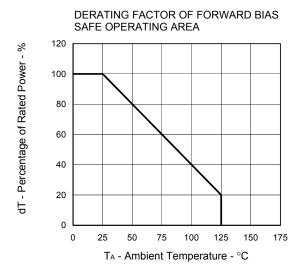
TEST CIRCUIT 1 SWITCHING TIME

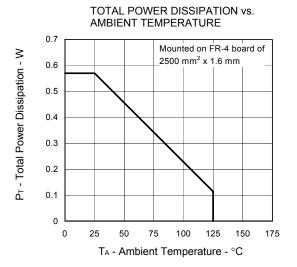


TEST CIRCUIT 2 GATE CHARGE

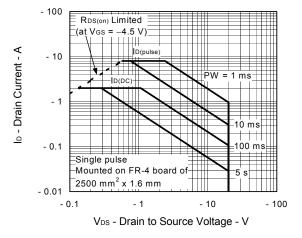


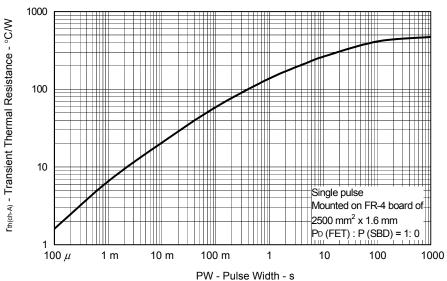
MOS FET TYPICAL CHARACTERISTICS (TA = 25°C)



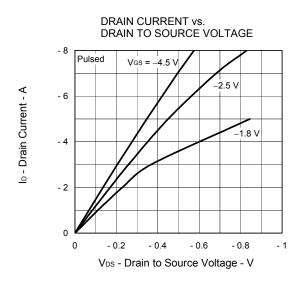


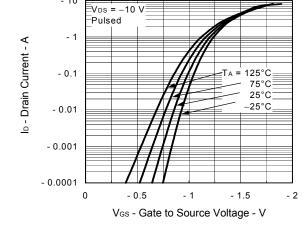
FORWARD BIAS SAFE OPERATING AREA





TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

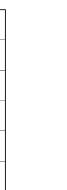




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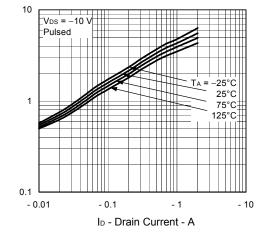
FORWARD TRANSFER CHARACTERISTICS

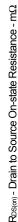
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE - 1 $V_{DS} = -10 V$ V_{GS(off)} - Gate Cut-off Voltage - V ID = -1.0 mA - 0.9 - 0.8 - 0.7 - 0.6 - 0.5 - 0.4 - 50 0 50 100 150 Tch - Channel Temperature - °C



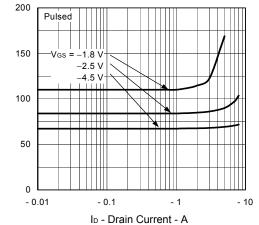
| y_{fs} | - Forward Transfer Admittance - S

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

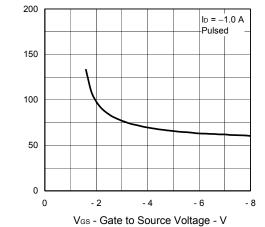




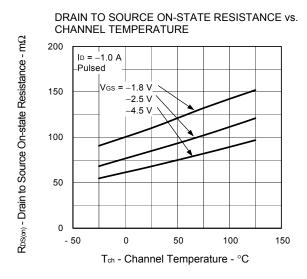
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



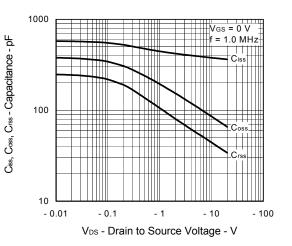
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



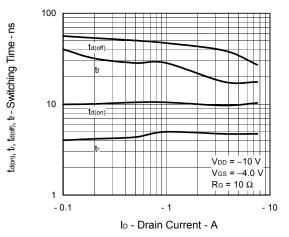
 $R_{DS(cn)}$ - Drain to Source On-state Resistance - $m\Omega$

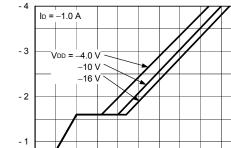


CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS





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QG - Gate Change - nC

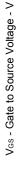
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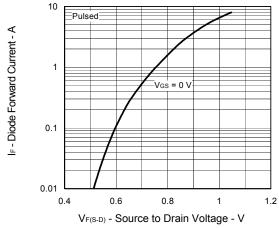
DYNAMIC INPUT CHARACTERISTICS



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SOURCE TO DRAIN DIODE FORWARD VOLTAGE

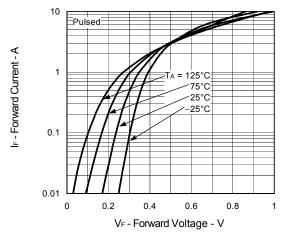


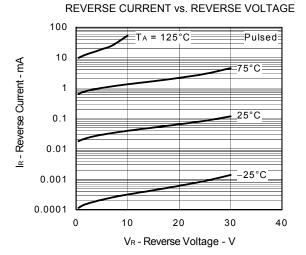
Data Sheet G16626EJ1V1DS

SCHOTTKY BARRIER DIODE TYPICAL CHARACTERISTICS (TA = 25°C)

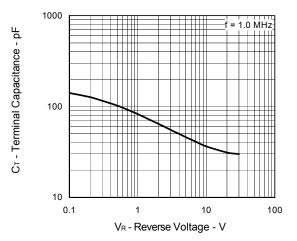
FORWARD CURRENT vs. FORWARD VOLTAGE

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TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



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