DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

μPA1850

P-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

DESCRIPTION

The μPA1850 is a switching device which can be driven directly by a 2.5-V power source.

The μPA1850 features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

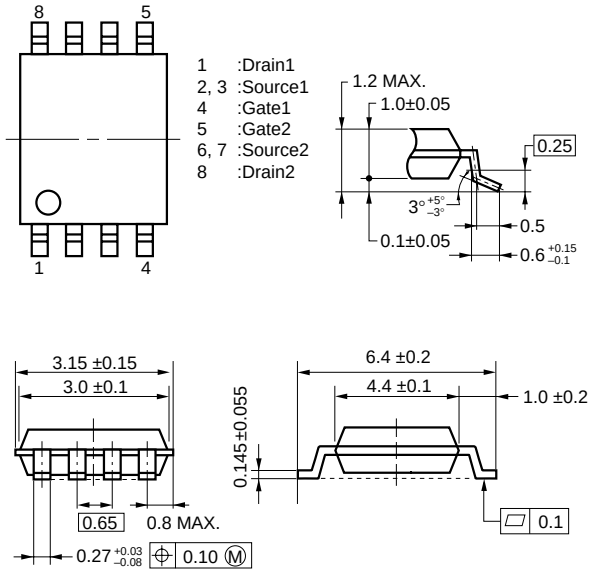
FEATURES

- Can be driven by a 2.5-V power source
- Low on-state resistance
  $R_{DS(on)1}$ = 115 mΩ MAX. (V_{GS} = –4.5 V, I_D = –1.5 A)
  $R_{DS(on)2}$ = 130 mΩ MAX. (V_{GS} = –4.0 V, I_D = –1.5 A)
  $R_{DS(on)3}$ = 200 mΩ MAX. (V_{GS} = –2.5 V, I_D = –1.5 A)
- Built-in G-S protection diode against ESD

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1850GR-9JG	Power TSSOP8

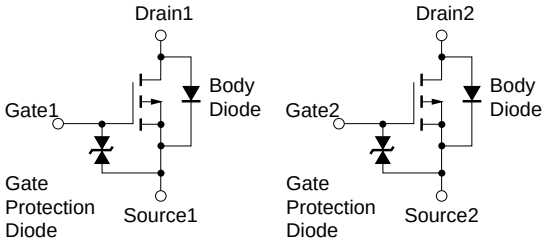
PACKAGE DRAWING (Unit : mm)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage	V_{DSS}	–12	V
Gate to Source Voltage	V_{GSS}	–10/+5	V
Drain Current (DC)	$I_{D(DC)}$	∓2.5	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	∓10	A
Total Power Dissipation Note2	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

2. Mounted on ceramic substrate of 5000 mm^2 x 1.1 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.

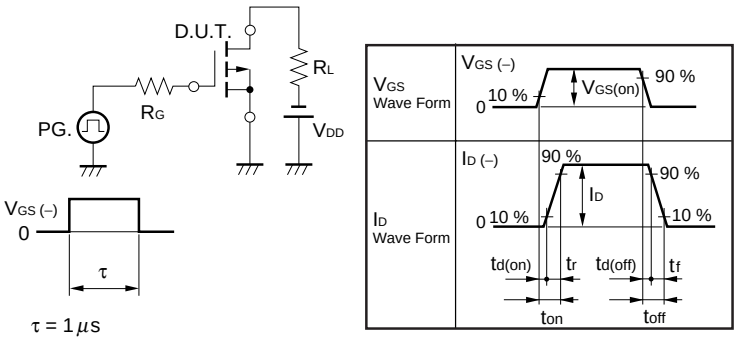
Document No. D11818EJ2V0DS00 (2nd edition)
Date Published January 2000 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

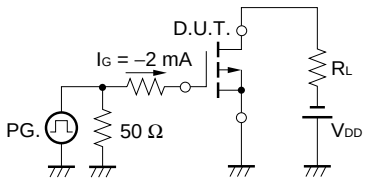
	CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
	Drain Cut-off Current	I_{DSS}	V_{DS} = –12 V, V_{GS} = 0 V			–10	μA
	Gate Leakage Current	I_{GSS}	V_{GS} = ∓ 10 V, V_{DS} = 0 V			∓ 10	μA
★	Gate to Source Cut-off Voltage	$V_{GS(off)}$	V_{DS} = –10 V, I_D = –1 mA	–0.5	–1.0	–1.5	V
★	Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = –10 V, I_D = –1.5 A	2.0	5.0		S
	Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = –4.5 V, I_D = –1.5 A		80	115	mΩ
		$R_{DS(on)2}$	V_{GS} = –4.0 V, I_D = –1.5 A		85	130	mΩ
		$R_{DS(on)3}$	V_{GS} = –2.5 V, I_D = –1.5 A		127	200	mΩ
	Input Capacitance	C_{iss}	V_{DS} = –10 V		260		pF
	Output Capacitance	C_{oss}	V_{GS} = 0 V		300		pF
	Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		45		pF
	Turn-on Delay Time	$t_{d(on)}$	V_{DD} = –10 V		120		ns
	Rise Time	t_r	I_D = –1.5 A		420		ns
	Turn-off Delay Time	$t_{d(off)}$	$V_{GS(on)}$ = –4.0 V		520		ns
	Fall Time	t_f	R_G = 10 Ω		430		ns
	Total Gate Charge	Q_G	V_{DD} = –10 V		12		nC
	Gate to Source Charge	Q_{GS}	I_D = –2.5 A		2		nC
	Gate to Drain Charge	Q_{GD}	V_{GS} = –4.0 V		5		nC
	Diode Forward Voltage	$V_{F(S-D)}$	I_F = 2.5 A, V_{GS} = 0 V		0.80		V
★	Reverse Recovery Time	t_{rr}	I_F = 2.5 A, V_{GS} = 0 V		750		ns
★	Reverse Recovery Charge	Q_{rr}	di/dt = 10 A/μs		950		nC

TEST CIRCUIT 1 SWITCHING TIME



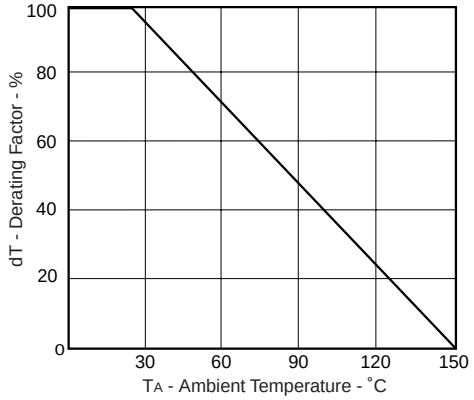
τ = 1 μs
Duty Cycle ≤ 1 %

TEST CIRCUIT 2 GATE CHARGE

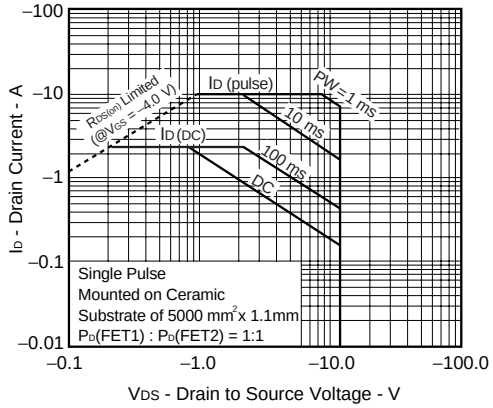


★ TYPICAL CHARACTERISTICS (T_A = 25°C)

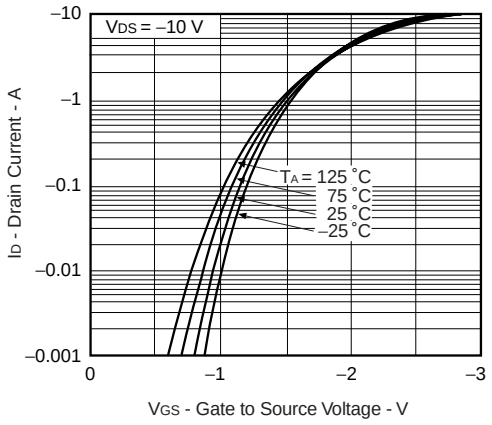
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



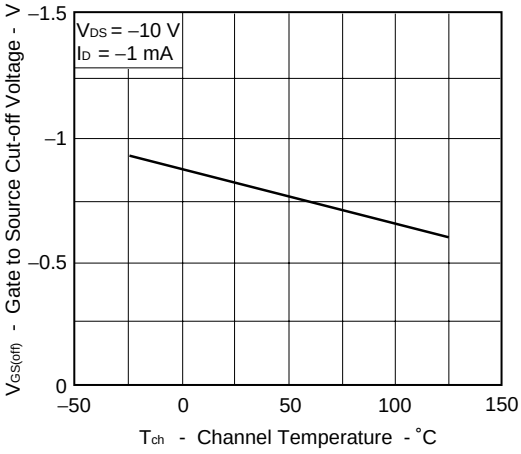
FORWARD BIAS SAFE OPERATING AREA



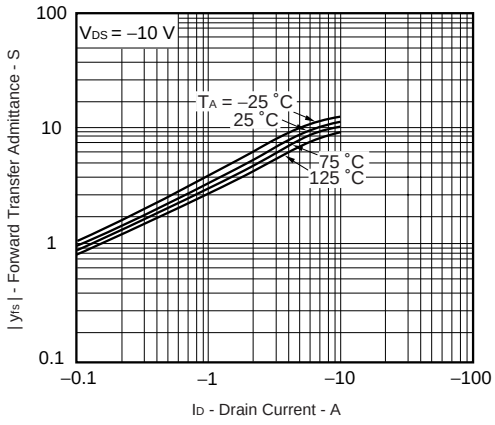
TRANSFER CHARACTERISTICS



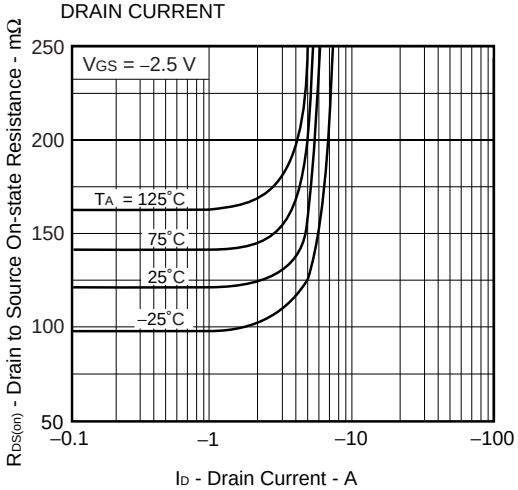
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



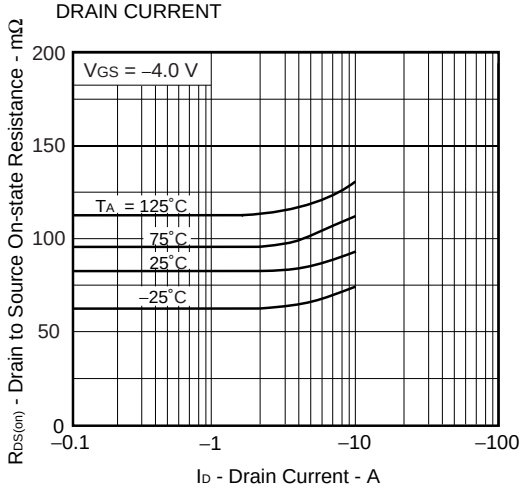
FORWARD TRANSFER ADMMITTANCE vs. DRAIN CURRENT



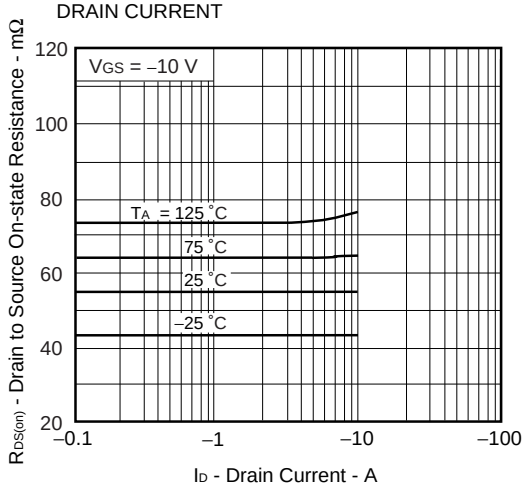
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



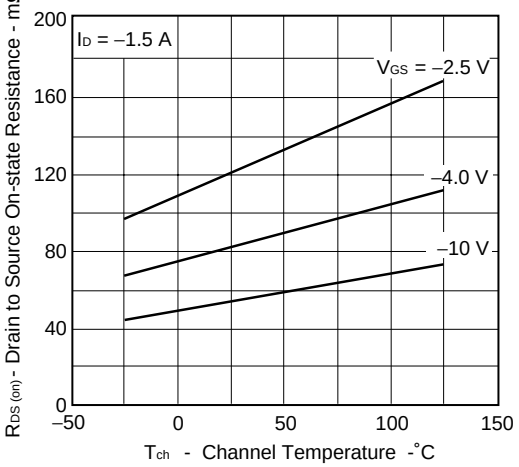
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



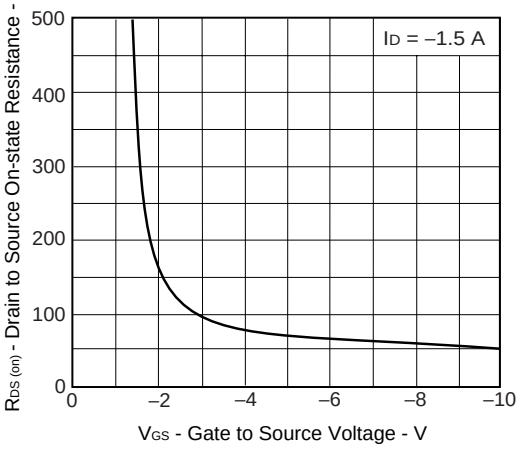
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



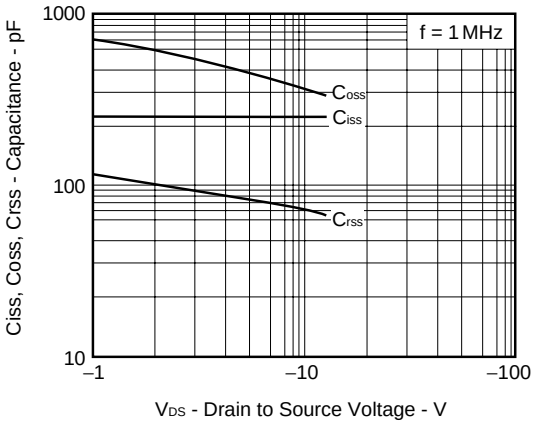
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



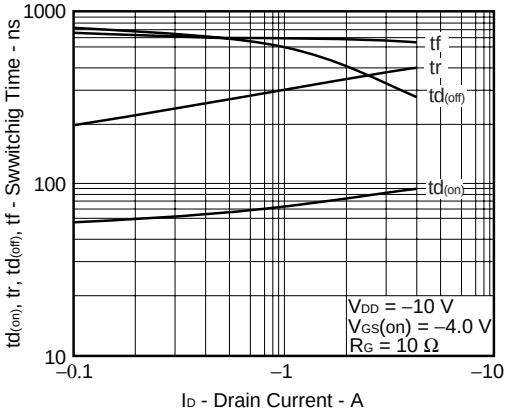
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



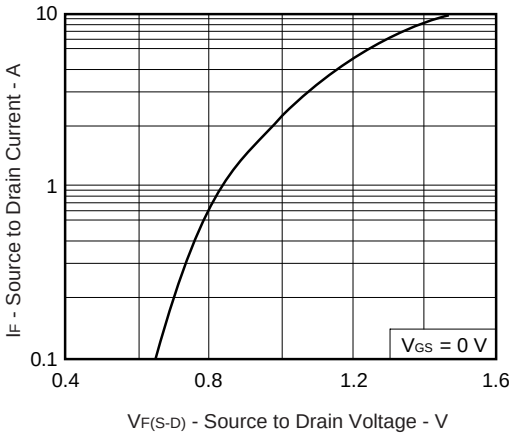
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



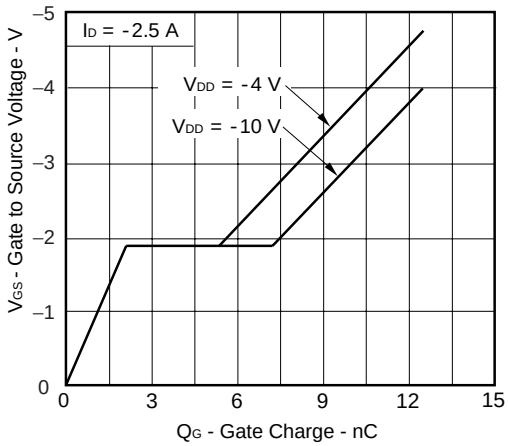
SWITCHING CHARACTERISTICS



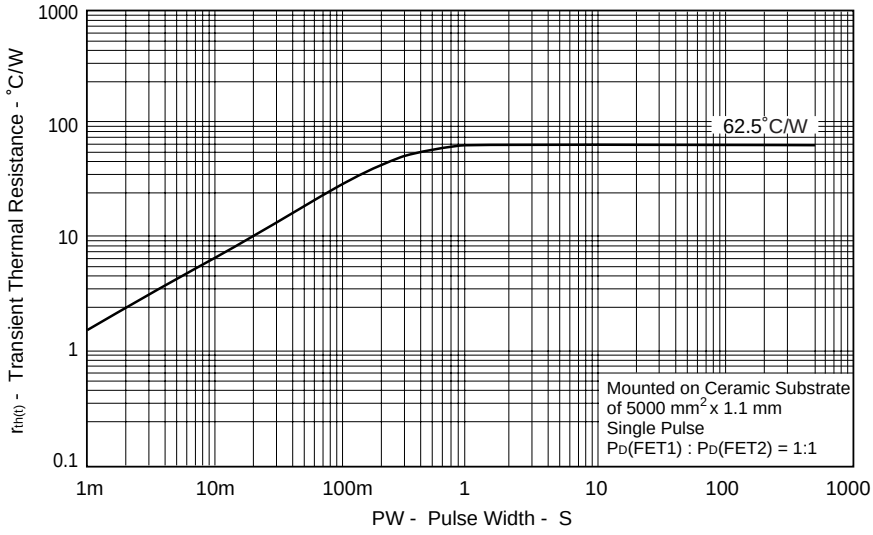
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



DYNAMIC INPUT CHARACTERISTICS



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



[MEMO]

[MEMO]

- **The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.**
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.
- NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.
- Descriptions of circuits, software, and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software, and information in the design of the customer's equipment shall be done under the full responsibility of the customer. NEC Corporation assumes no responsibility for any losses incurred by the customer or third parties arising from the use of these circuits, software, and information.
- While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.
- NEC devices are classified into the following three quality grades:
  "Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.
  - Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
  - Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
  - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

  The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

M7 98.8