NEC

MOS FIELD EFFECT TRANSISTOR

μPA1913

P-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

DESCRIPTION

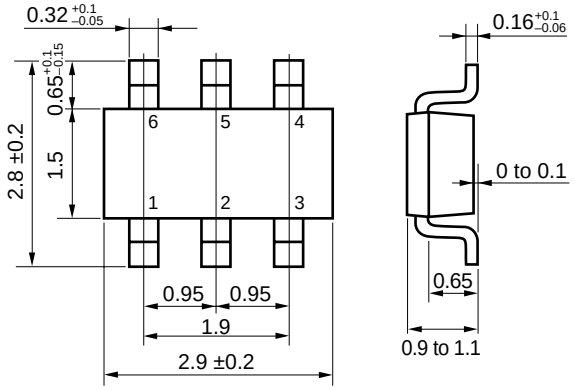
The μPA1913 is a switching device which can be driven directly by a 2.5-V power source.

The μPA1913 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
  $R_{DS(on)1}$ = 55 mΩ MAX. (V_{GS} = –4.5 V, I_D = –2.5 A)
  $R_{DS(on)2}$ = 58 mΩ MAX. (V_{GS} = –4.0 V, I_D = –2.5 A)
  $R_{DS(on)3}$ = 82 mΩ MAX. (V_{GS} = –2.7 V, I_D = –2.5A)
  $R_{DS(on)4}$ = 90 mΩ MAX. (V_{GS} = –2.5 V, I_D = –2.5A)

PACKAGE DRAWING (Unit : mm)

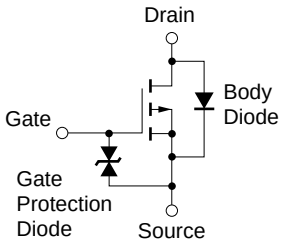


1, 2, 5, 6 : Drain
3 : Gate
4 : Source

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1913TE	SC-95 (Mini Mold Thin Type)

EQUIVALENT CIRCUIT



Marking: TE

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage	V_{DSS}	–20	V
Gate to Source Voltage	V_{GSS}	±12	V
Drain Current (DC)	$I_{D(DC)}$	±4.5	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±18	A
Total Power Dissipation	P_{T1}	0.2	W
Total Power Dissipation Note2	P_{T2}	2	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

2. Mounted on FR4 board, t ≤ 5 sec.

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.

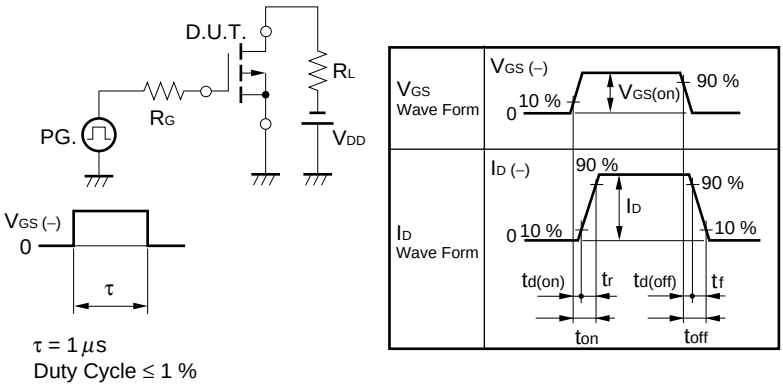
Document No. D13807EJ3V0DS00 (3rd edition)
Date Published May 2001 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

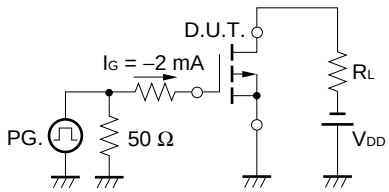
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –20 V, V_{GS} = 0 V			–10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±12 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = –10 V, I_D = –1 mA	–0.5	–1.1	–1.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = –10 V, I_D = –2.5 A	3	8.8		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = –4.5 V, I_D = –2.5 A		44	55	mΩ
	$R_{DS(on)2}$	V_{GS} = –4.0 V, I_D = –2.5 A		46	58	mΩ
	$R_{DS(on)3}$	V_{GS} = –2.7 V, I_D = –2.5 A		60	82	mΩ
	$R_{DS(on)4}$	V_{GS} = –2.5 V, I_D = –2.5 A		66	90	mΩ
Input Capacitance	C_{iss}	V_{DS} = –10 V		700		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		208		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		100		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = –10 V		300		ns
Rise Time	t_r	I_D = –2.5 A		528		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GS(on)}$ = –4.0 V		242		ns
Fall Time	t_f	R_G = 10 Ω		698		ns
Total Gate Charge	Q_G	V_{DD}= –16 V		6.0		nC
Gate to Source Charge	Q_{GS}	I_D = –4.5 A		2.1		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = –4.0 V		2.8		nC
Diode Forward Voltage	$V_{F(S-D)}$	I_F = 4.5 A, V_{GS} = 0 V		0.86		V
Reverse Recovery Time	t_{rr}	I_F = 4.5 A, V_{GS} = 0 V		32		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 10 A/μs		2.2		nC

TEST CIRCUIT 1 SWITCHING TIME



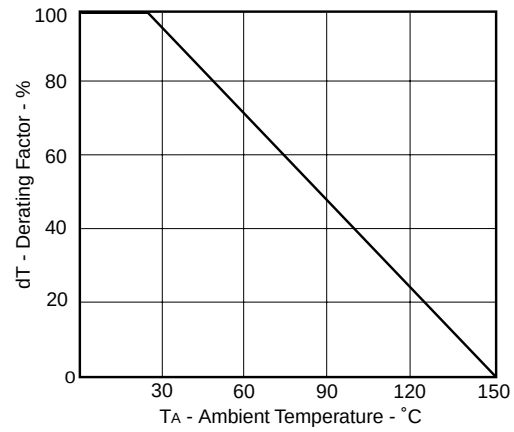
τ = 1 μs
Duty Cycle ≤ 1 %

TEST CIRCUIT 2 GATE CHARGE

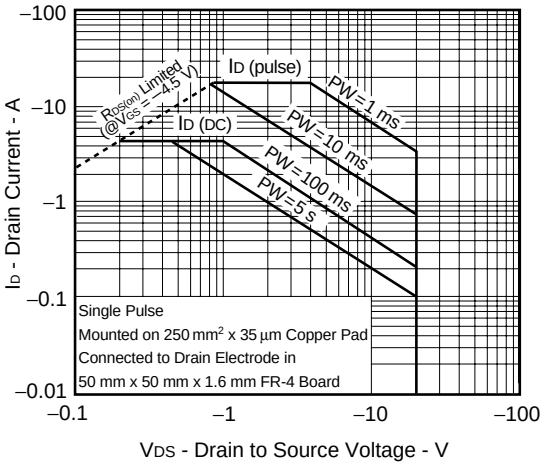


TYPICAL CHARACTERISTICS (T_A = 25°C)

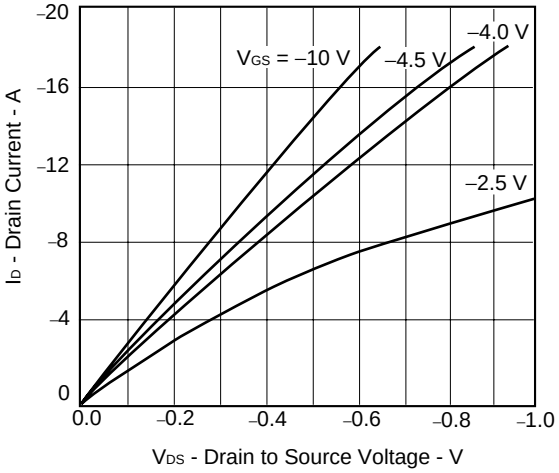
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



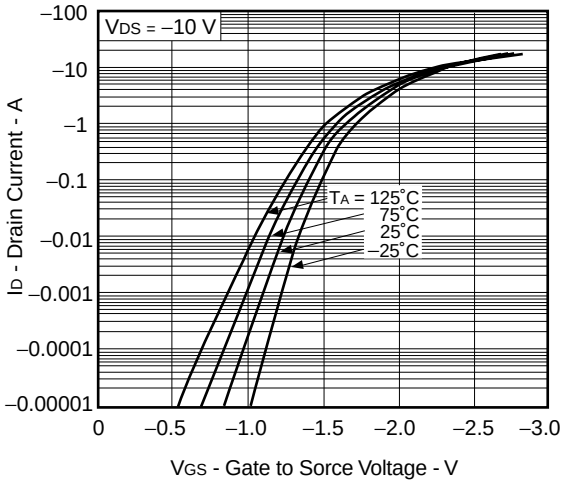
★ FORWARD BIAS SAFE OPERATING AREA



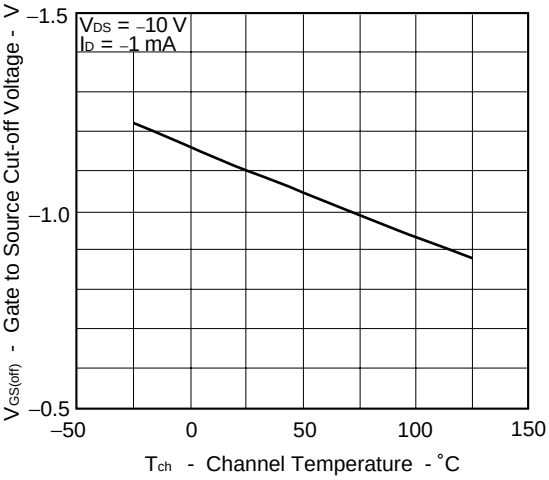
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



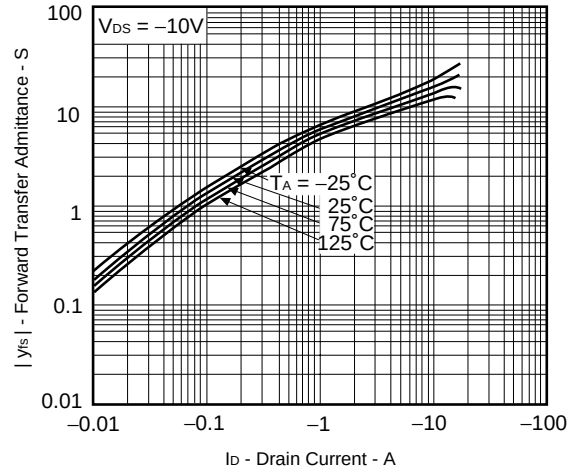
TRANSFER CHARACTERISTICS



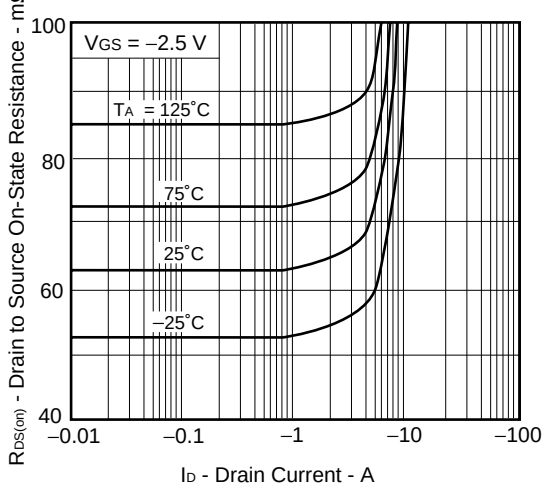
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



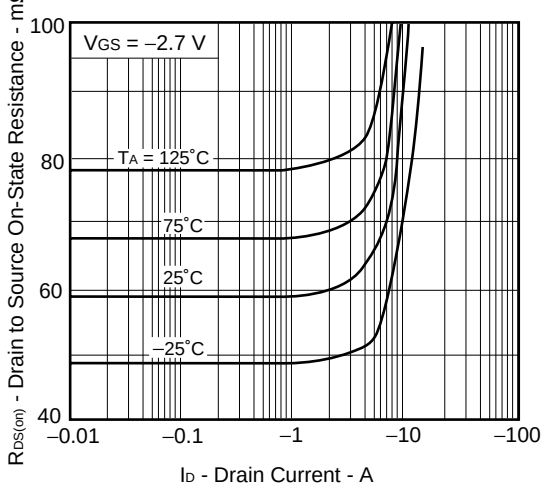
FORWARD TRANSFER ADMITTANCE Vs. DRAIN CURRENT



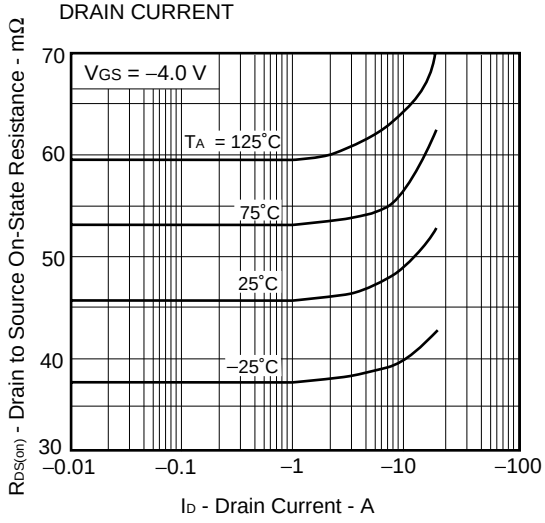
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



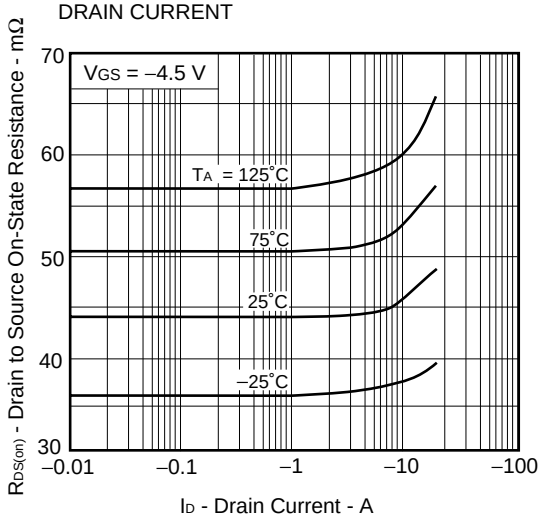
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



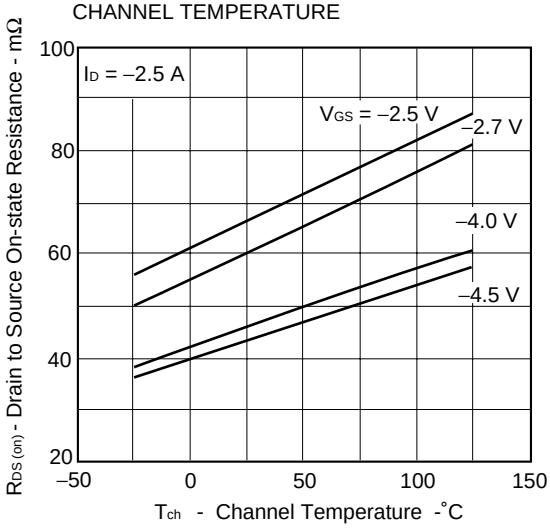
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



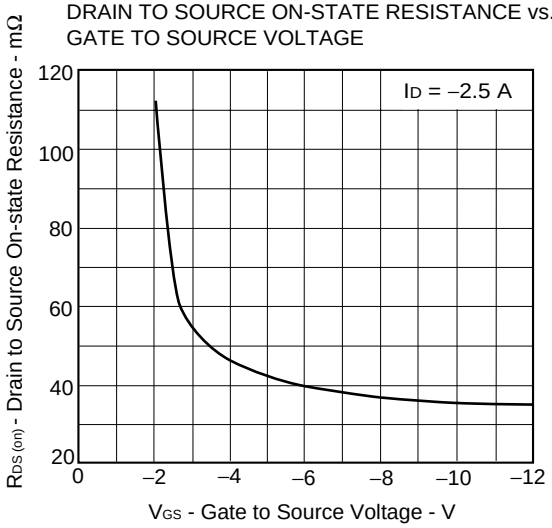
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



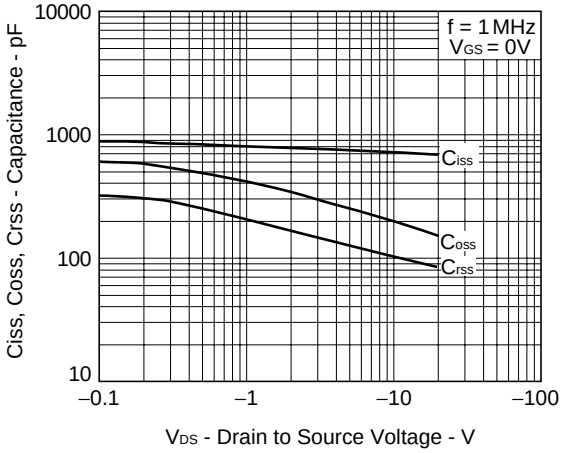
DRAIN TO SOURCE ON STATE RESISTANCE vs. CHANNEL TEMPERATURE



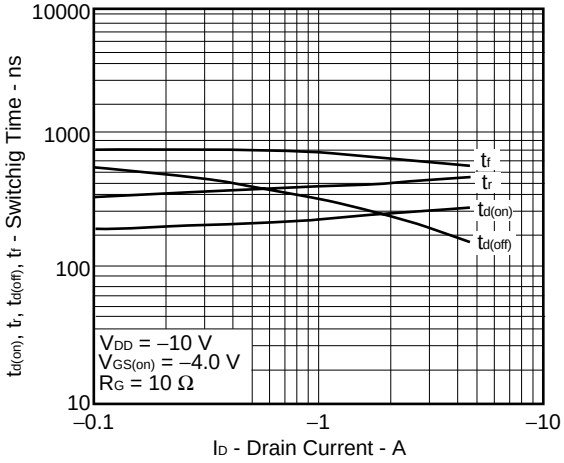
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



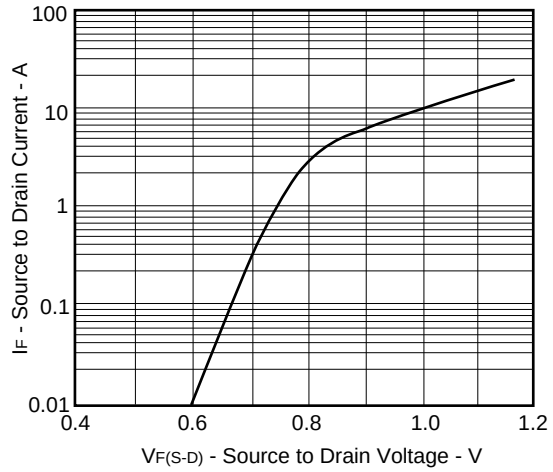
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



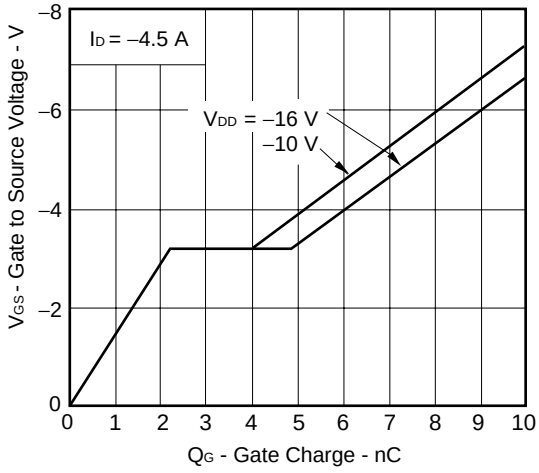
SWITCHING CHARACTERISTICS



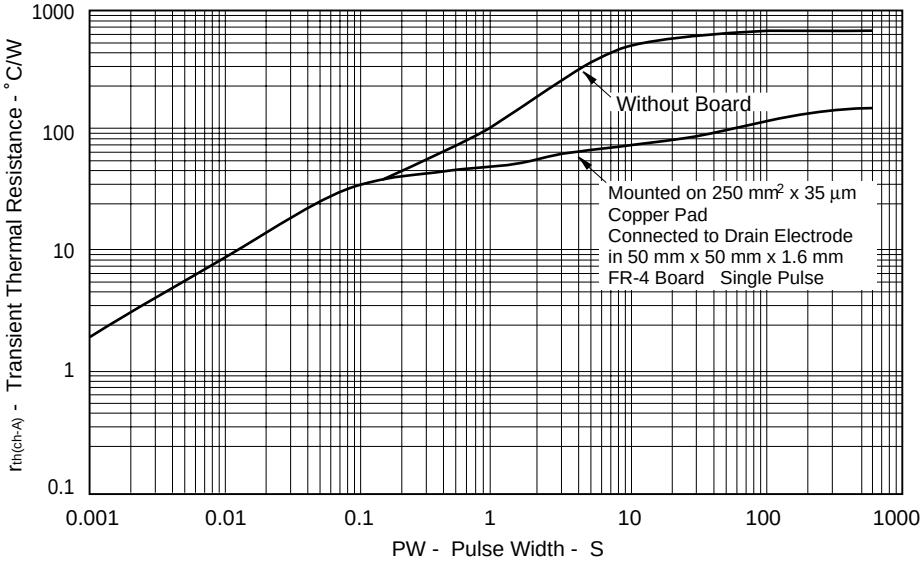
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



DYNAMIC INPUT CHARACTERISTICS



★ TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



[MEMO]

[MEMO]

- **The information in this document is current as of May, 2001. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC 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 customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product 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 and medical equipment for life support, etc.
  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
  (Note)
  (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00. 4