DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

2SK2414, 2414-Z

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK2414 is N-Channel MOS Field Effect Transistor designed for high voltage switching applications.

FEATURES

- Low On-Resistance
  $R_{DS(on)1}$ = 70 mΩ MAX. (V_{GS} = 10 V, I_D = 5.0 A)
  $R_{DS(on)2}$ = 95 mΩ MAX. (V_{GS} = 4 V, I_D = 5.0 A)
- <R> Low C_{iss}: C_{iss} = 860 pF TYP.
- Built-in G-S Gate Protection Diodes
- High Avalanche Capability Ratings

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

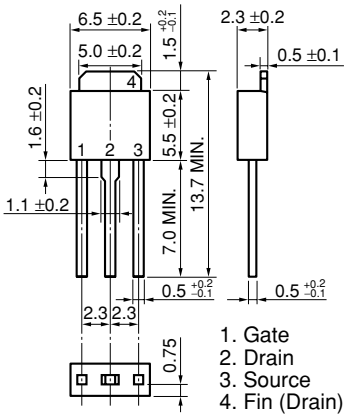
Drain to Source Voltage	V_{DSS}	60	V
Gate to Source Voltage	V_{GSS}	±20	V
Drain Current (DC)	$I_{D(DC)}$	±10	A
Drain Current (pulse) Note 1	$I_{D(pulse)}$	±40	A
Total Power Dissipation (T_C = 25 °C)	P_{T1}	20	W
Total Power Dissipation (T_A = 25 °C)	P_{T2}	1.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current Note 2	I_{AS}	10	A
Single Avalanche Energy Note 2	E_{AS}	10	mJ

Notes 1 PW ≤ 10 μs, Duty Cycle ≤ 1 %

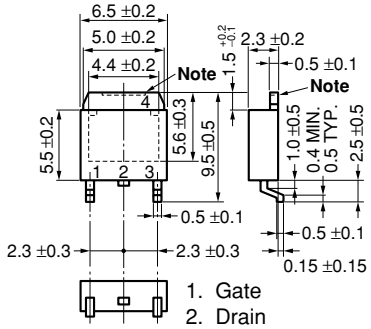
2 Starting T_{ch} = 25 °C, R_G = 25 Ω, V_{GS} = 20 → 0 V

<R> **PACKAGE DIMENSIONS**

(Unit: mm)



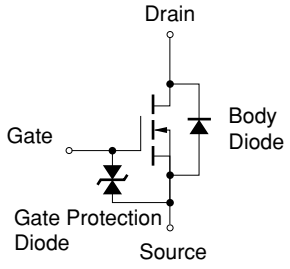
MP-3



Note The depth of notch at the top of the fin is from 0 to 0.2 mm.

MP-3Z (SURFACE MOUNT TYPE)

EQUIVALENT CIRCUIT



Document No. D13193EJ4V0DS00 (4th edition)
Date Published August 2006 N CP(K)
Printed in Japan

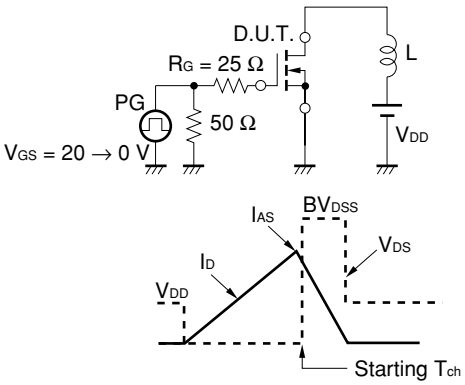
The mark <R> shows major revised points.

The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what." field.

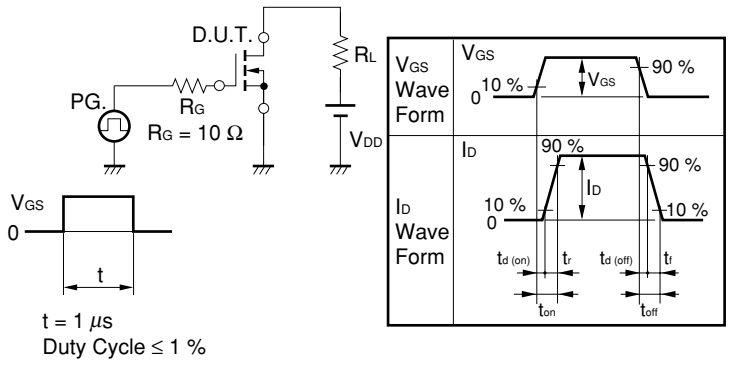
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-Resistance	$R_{DS(on)1}$		52	70	mΩ	V_{GS} = 10 V, I_D = 5.0 A
Drain to Source On-Resistance	$R_{DS(on)2}$		68	95	mΩ	V_{GS} = 4 V, I_D = 5.0 A
Gate to Source Cutoff Voltage	$V_{GS(off)}$	1.0	1.6	2.0	V	V_{DS} = 10 V, I_D = 1 mA
Forward Transfer Admittance	$\|y_{fs}\|$	7.0	12		S	V_{DS} = 10 V, I_D = 5.0 A
Drain Leakage Current	I_{DSS}			10	μA	V_{DS} = 60 V, V_{GS} = 0 V
Gate to Source Leakage Current	I_{GSS}			±10	μA	V_{GS} = ±20 V, V_{DS} = 0 V
Input Capacitance	C_{iss}		860		pF	V_{DS} = 10 V
Output Capacitance	C_{oss}		440		pF	V_{GS} = 0 V
Reverse Transfer Capacitance	C_{rss}		110		pF	f = 1 MHz
Turn-On Delay Time	$t_{d(on)}$		15		ns	I_D = 5.0 A
Rise Time	t_r		90		ns	V_{GS} = 10 V
Turn-Off Delay Time	$t_{d(off)}$		75		ns	V_{DD} = 30 V
Fall Time	t_f		35		ns	R_G = 10 Ω
Total Gate Charge	Q_G		24		nC	I_D = 10 A
Gate to Source Charge	Q_{GS}		2.6		nC	V_{DD} = 48 V
Gate to Drain Charge	Q_{GD}		6.0		nC	V_{GS} = 10 V
Body Diode Forward Voltage	$V_{F(S-D)}$		1.0		V	I_F = 10 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}		85		ns	I_F = 10 A, V_{GS} = 0 V
Reverse Recovery Charge	Q_{rr}		220		nC	di/dt = 50 A/μs

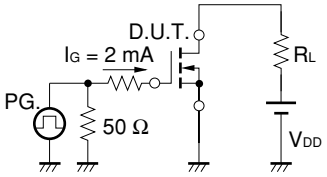
Test Circuit 1 Avalanche Capability



Test Circuit 2 Switching Time

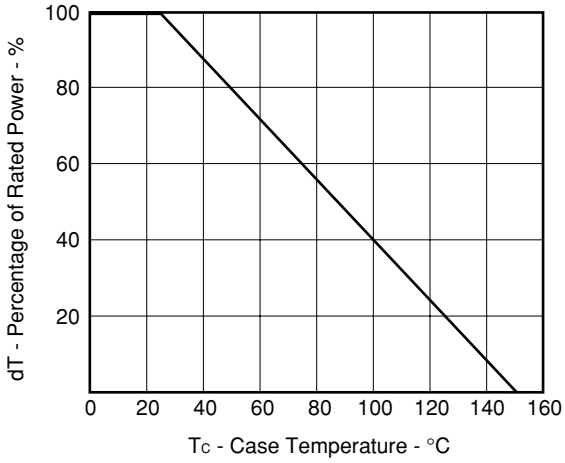


Test Circuit 3 Gate Charge

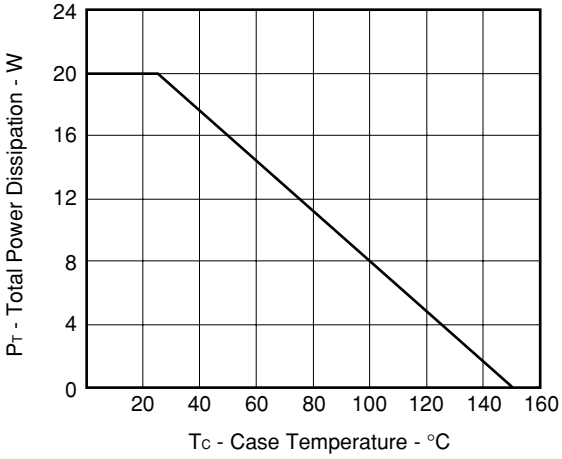


TYPICAL CHARACTERISTICS (T_A = 25 °C)

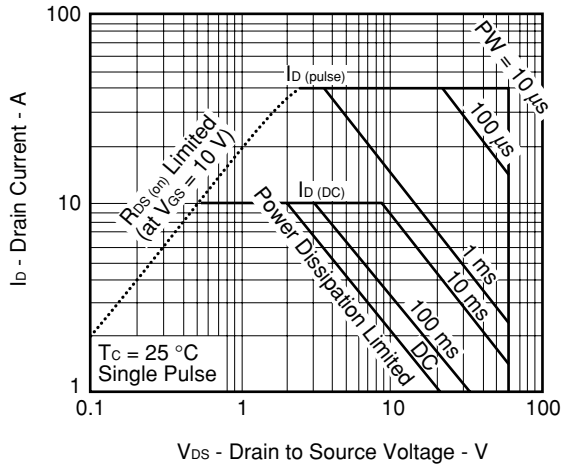
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



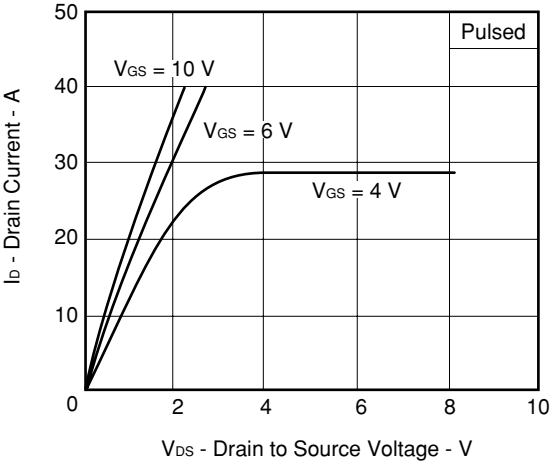
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



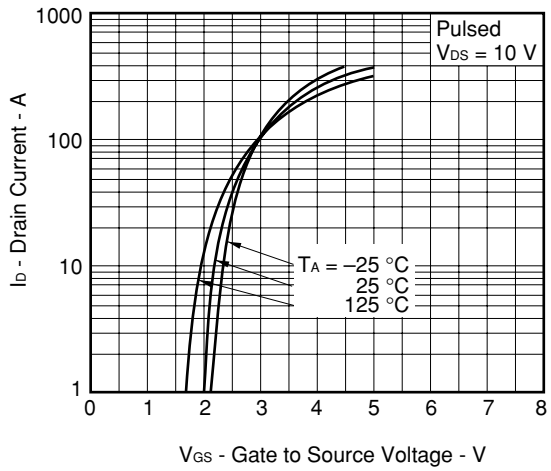
FORWARD BIAS SAFE OPERATING AREA



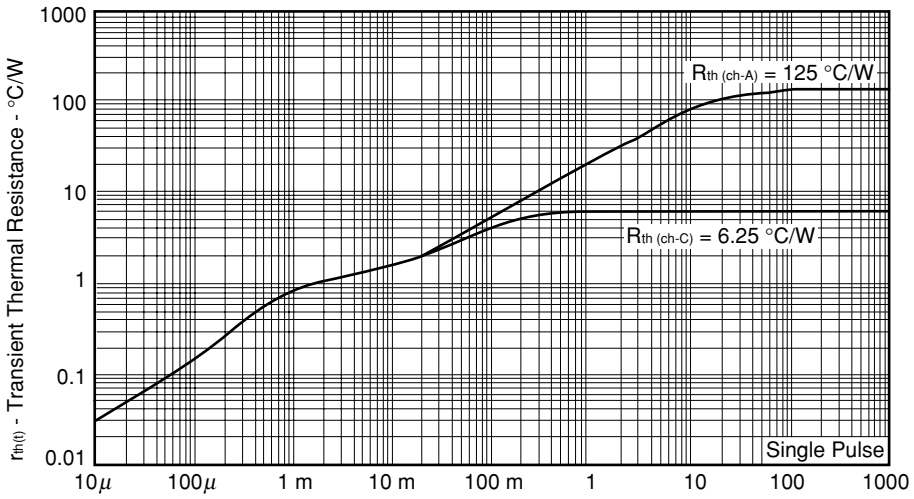
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



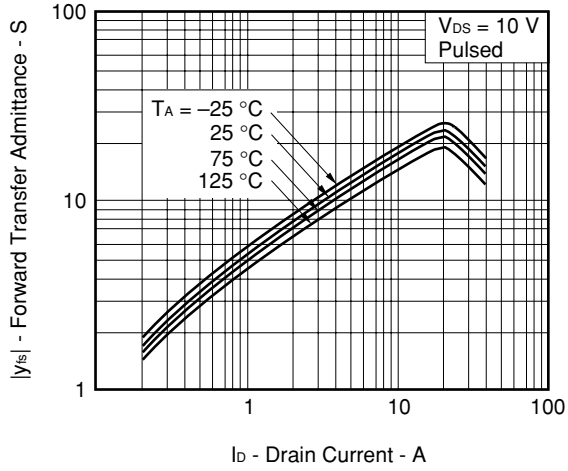
FORWARD TRANSFER CHARACTERISTICS



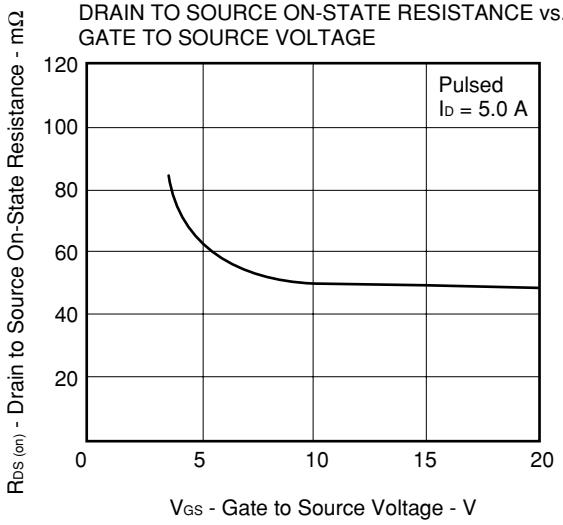
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



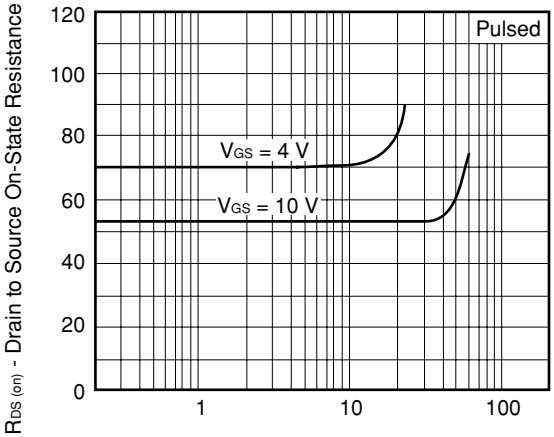
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



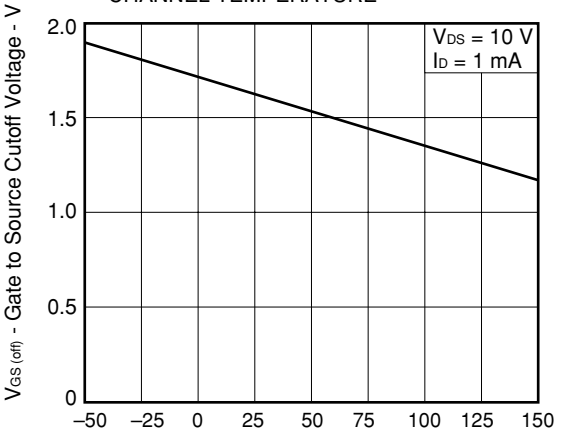
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



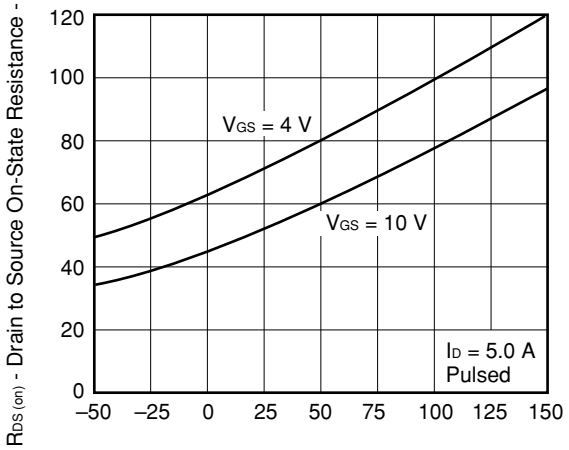
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



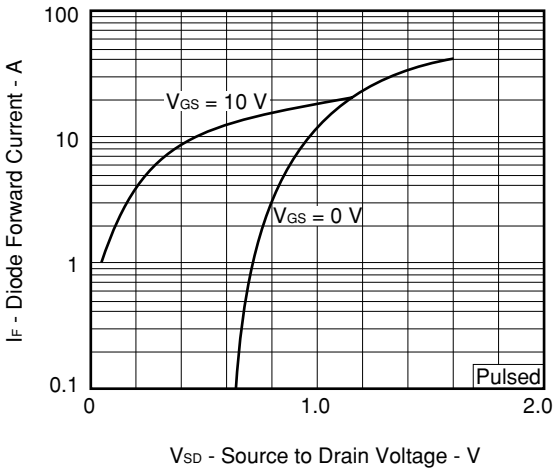
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



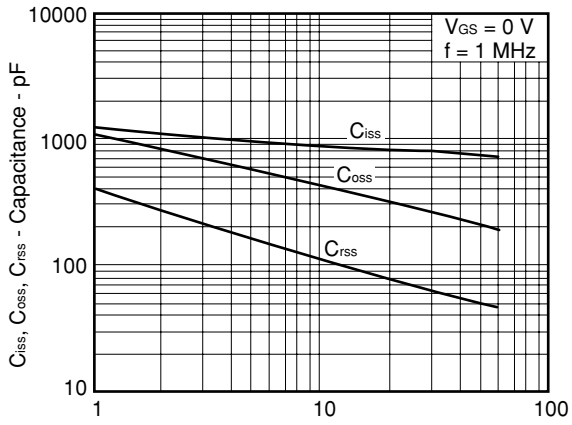
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



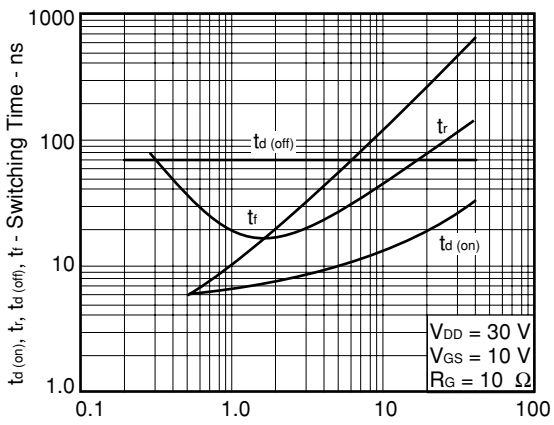
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



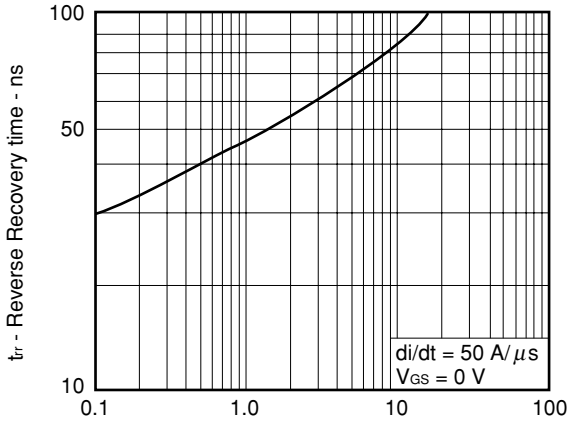
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



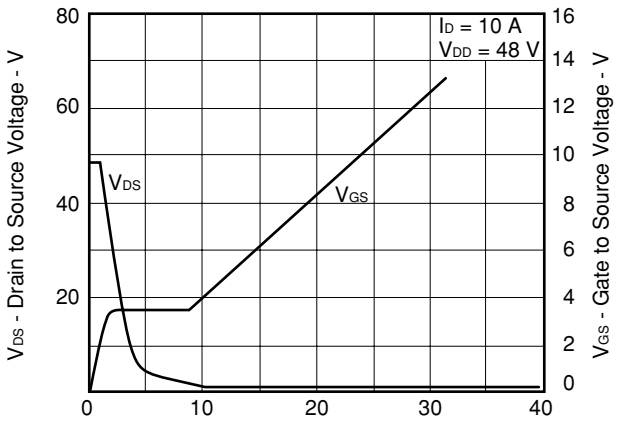
SWITCHING CHARACTERISTICS



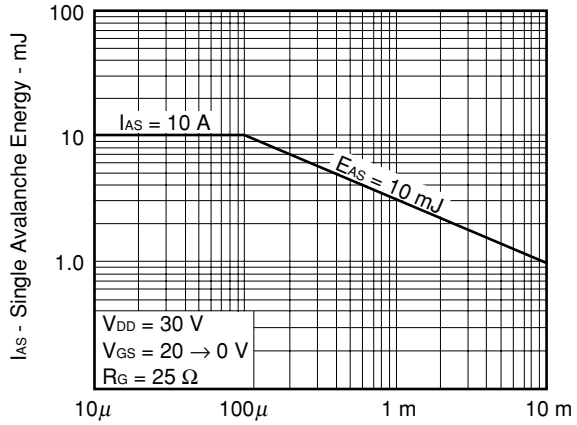
REVERSE RECOVERY TIME vs. DRAIN CURRENT



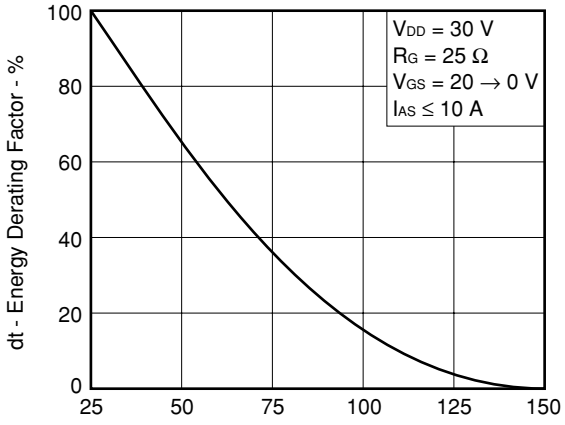
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SINGLE AVALANCHE ENERGY vs.
INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY
DERATING FACTOR



- **The information in this document is current as of August, 2006. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics 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 the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics 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 Electronics 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 Electronics 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 a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics 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 Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".
  The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics 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 Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)
(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E 02.11-1