NEC

MOS FIELD EFFECT TRANSISTOR
2SK3326

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

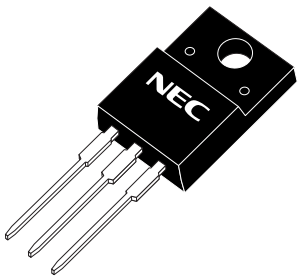
DESCRIPTION

The 2SK3326 is N-Channel DMOS FET device that features a low gate charge and excellent switching characteristics, and designed for high voltage applications such as switching power supply, AC adapter.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3326	Isolated TO-220

(Isolated TO-220)



FEATURES

- Low gate charge :
  Q_G = 22 nC TYP. (V_{DD} = 400 V, V_{GS} = 10 V, I_D = 10 A)
- Gate voltage rating : ±30 V
- Low on-state resistance :
  $R_{DS(on)}$ = 0.85 Ω MAX. (V_{GS} = 10 V, I_D = 5.0 A)
- Avalanche capability ratings
- Isolated TO-220(MP-45F) package

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	500	V
Gate to Source Voltage (V_{DS} = 0 V)	$V_{GSS(AC)}$	±30	V
Drain Current (DC)	$I_{D(DC)}$	±10	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±40	A
Total Power Dissipation (T_C = 25°C)	P_T	40	W
Total Power Dissipation (T_A = 25°C)	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current Note2	I_{AS}	10	A
Single Avalanche Energy Note2	E_{AS}	10.7	mJ

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

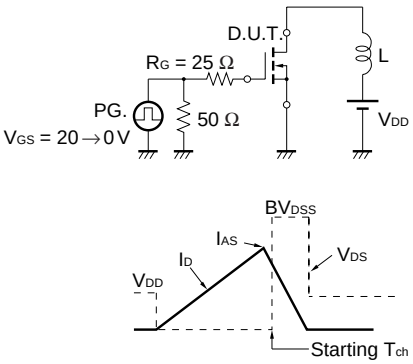
2. Starting T_{ch} = 25 °C, V_{DD} = 150 V, R_G = 25 Ω, V_{GS} = 20 V → 0 V

Document No. D14204EJ1V0DS00 (1st edition)
Date Published March 2000 NS CP(K)
Printed in Japan

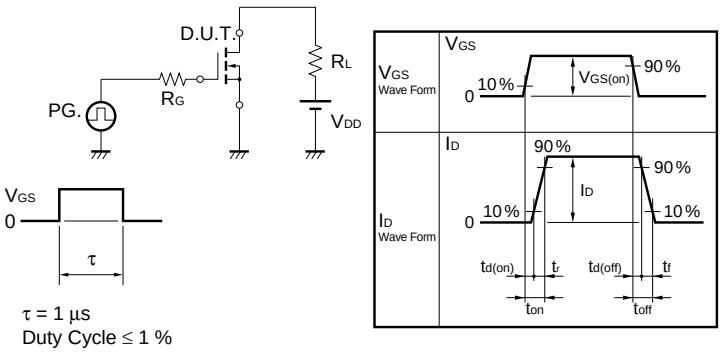
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Leakage Current	I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V			100	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V			±100	nA
Gate to Source Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	2.5		3.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 5.0 A	2.0	4.0		S
Drain to Source On-state Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 5.0 A		0.68	0.85	Ω
Input Capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		1200		pF
Output Capacitance	C_{oss}			190		pF
Reverse Transfer Capacitance	C_{rss}			10		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 150 V, I_D = 5.0 A, $V_{GS(on)}$ = 10 V, R_G = 10 Ω, R_L = 60 Ω		21		ns
Rise Time	t_r			11		ns
Turn-off Delay Time	$t_{d(off)}$			40		ns
Fall Time	t_f			9.5		ns
Total Gate Charge	Q_G	V_{DD} = 400 V, V_{GS} = 10 V, I_D = 10 A		22		nC
Gate to Source Charge	Q_{GS}			6.5		nC
Gate to Drain Charge	Q_{GD}			7.5		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 10 A, V_{GS} = 0 V		1.0		V
Reverse Recovery Time	t_{rr}	I_F = 10 A, V_{GS} = 0 V, di/dt = 50 A/μs		0.5		μs
Reverse Recovery Charge	Q_{rr}			2.6		μC

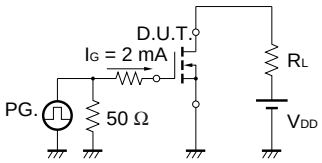
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME



TEST CIRCUIT 3 GATE CHARGE



TYPICAL CHARACTERISTICS(T_A = 25 °C)

Figure1. DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

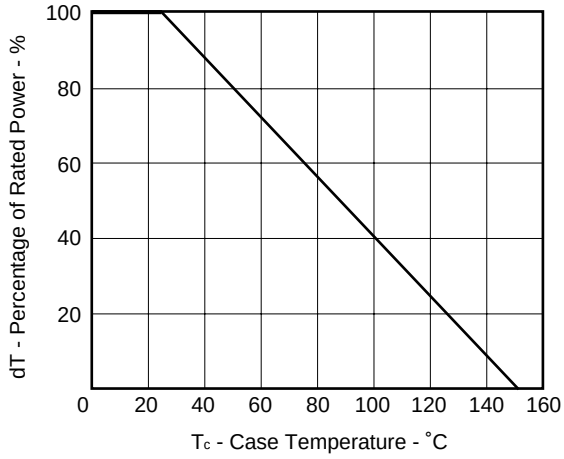


Figure2. TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

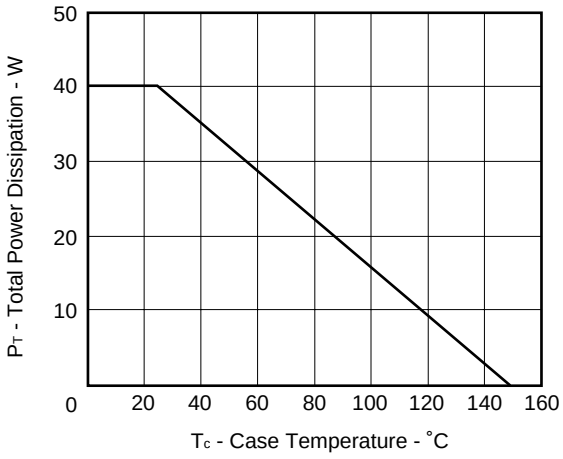


Figure3. FORWARD BIAS SAFE OPERATING AREA

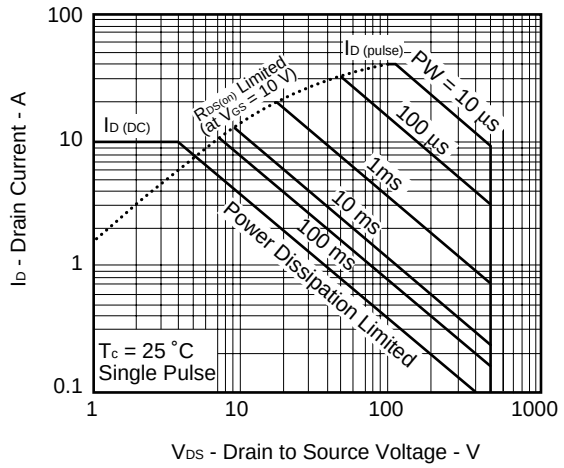


Figure4. DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

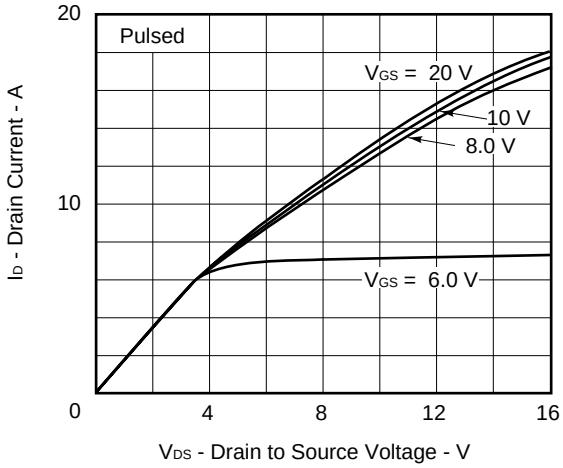


Figure5. DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE

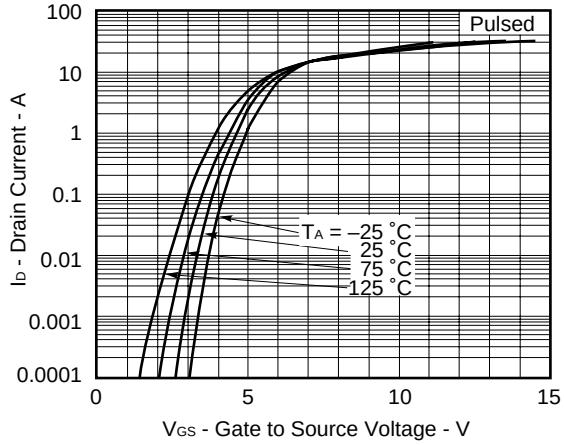


Figure6. TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

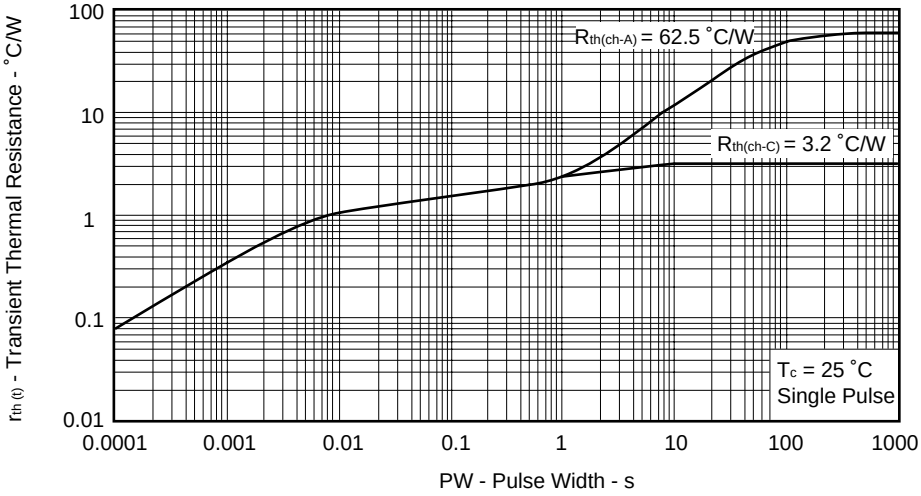


Figure7. FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

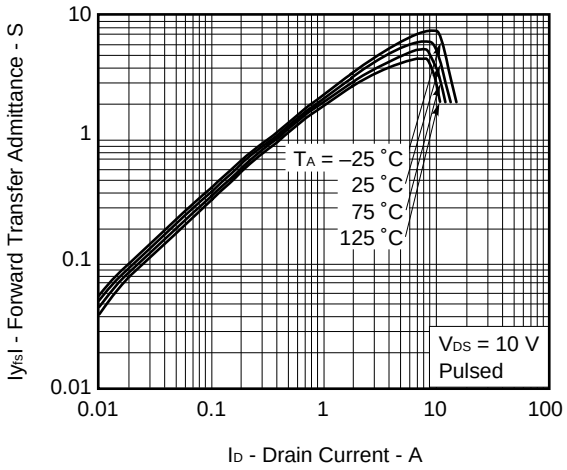


Figure8. DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

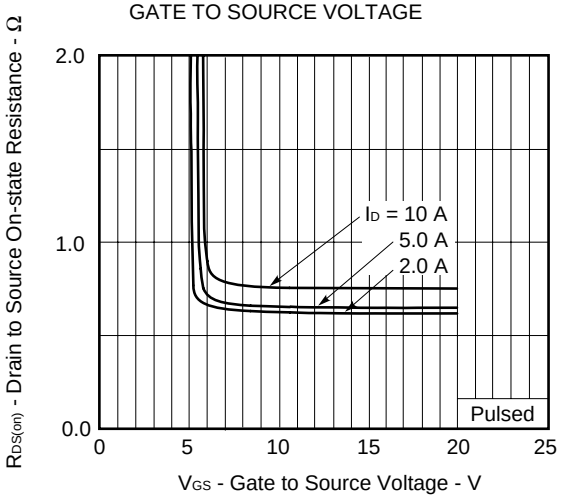


Figure9. DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

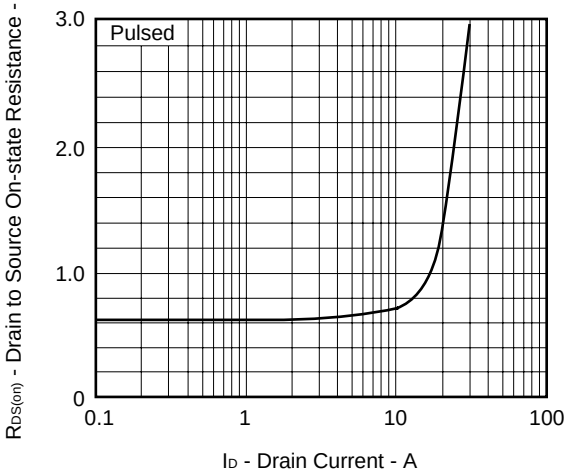


Figure10. GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE

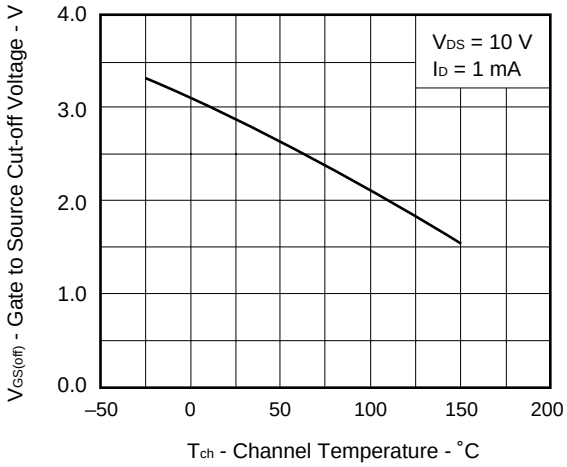


Figure11. DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

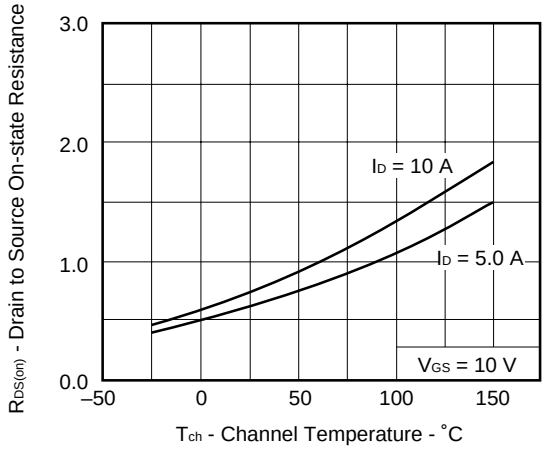


Figure12. SOURCE TO DRAIN DIODE FORWARD VOLTAGE

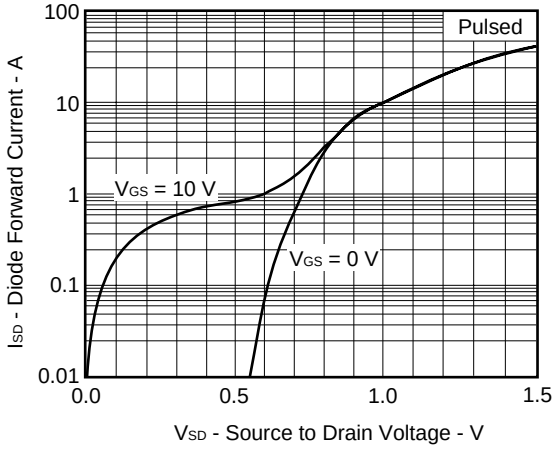


Figure13. CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

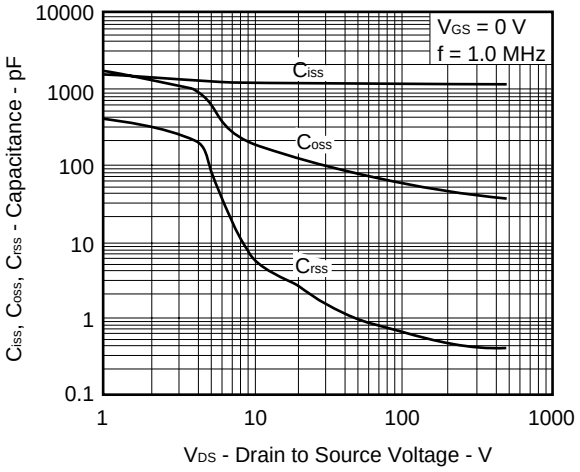


Figure14. SWITCHING CHARACTERISTICS

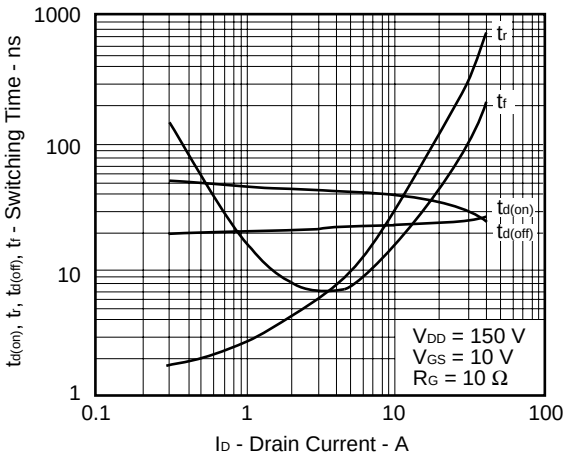


Figure15. REVERSE RECOVERY TIME vs. DRAIN CURRENT

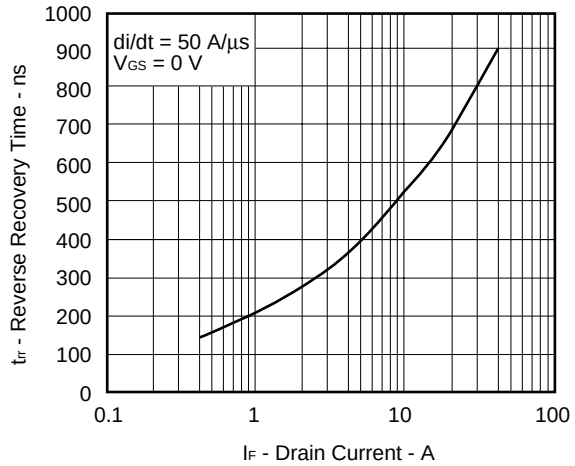


Figure16. DYNAMIC INPUT/OUTPUT CHARACTERISTICS

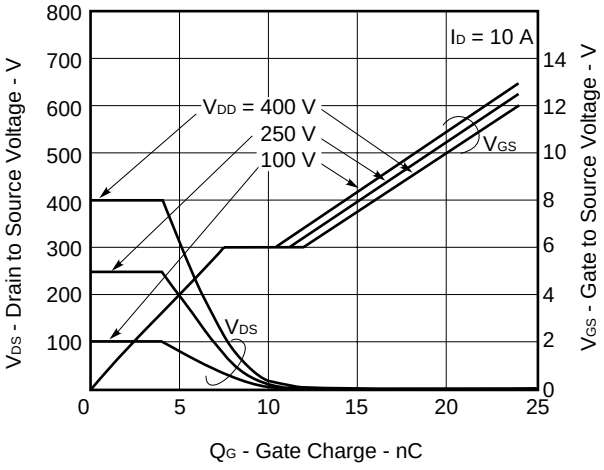


Figure17. SINGLE AVALANCHE ENERGY vs STARTING CHANNEL TEMPERATURE

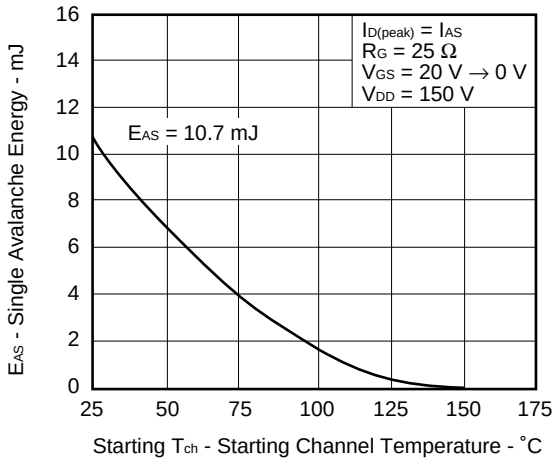
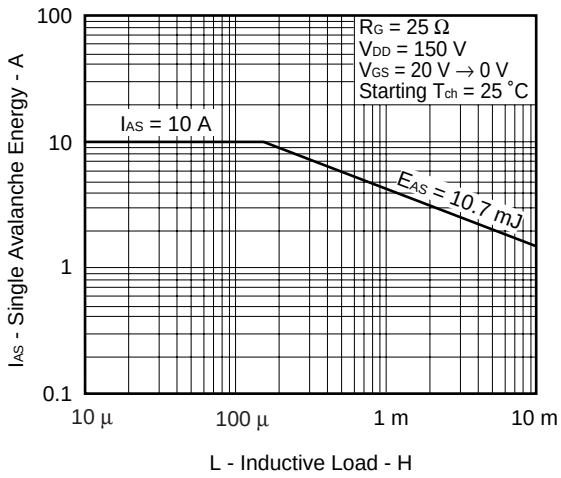
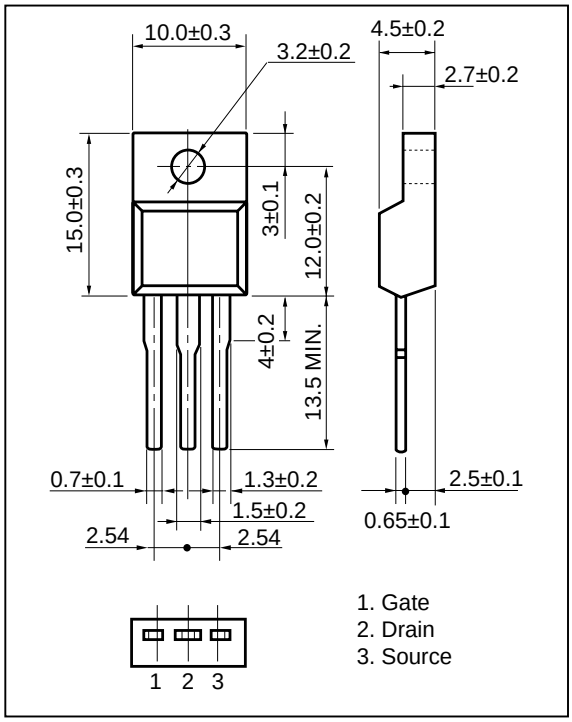


Figure18. SINGLE AVALANCHE ENERGY vs INDUCTIVE LOAD

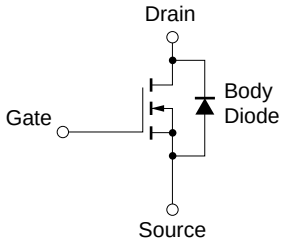


PACKAGE DRAWING (Unit: mm)

Isolated TO-220(MP-45F)



EQUIVALENT CIRCUIT



Remark Strong electric field, when exposed to this device, 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.

- **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