

MOS FIELD EFFECT TRANSISTOR

NP82N06CLC, NP82N06DLC, NP82N06ELC

SWITCHING

N-CHANNEL POWER MOS FET

INDUSTRIAL USE

DESCRIPTION

This product is N-Channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Channel Temperature 175 degree rated
- Super Low On-state Resistance
 $R_{DS(on)1} = 9.0 \text{ m}\Omega$ (MAX.)($V_{GS} = 10 \text{ V}$, $I_D = 41 \text{ A}$)
 $R_{DS(on)2} = 12 \text{ m}\Omega$ (MAX.)($V_{GS} = 5 \text{ V}$, $I_D = 25 \text{ A}$)
- Low C_{iss} : $C_{iss} = 3350 \text{ pF}$ (TYP.)
- Built-in Gate protection diode

ORDERING INFORMATION

PART NUMBER	PACKAGE
NP82N06CLC	TO-220AB
NP82N06DLC	TO-262
NP82N06ELC	TO-263

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Drain to Source Voltage ($V_{GS} = 0$)	V_{DSS}	60	V
Gate to Source Voltage ($V_{DS} = 0$)	V_{GSS}	± 20	V
Drain Current (DC) ^{Note1}	$I_{D(DC)}$	± 82	A
Drain Current (Pulse) ^{Note2}	$I_{D(pulse)}$	± 200	A
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T1}	1.8	W
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T2}	185	W
Channel Temperature	T_{ch}	175	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +175	$^\circ\text{C}$
Single Avalanche Current ^{Note3}	I_{AS}	Figure4	A
Single Avalanche Energy ^{Note3}	E_{AS}	Figure4	mJ
Repetitive Avalanche Current ^{Note4}	I_{AR}	50	A
Repetitive Avalanche Energy ^{Note4}	E_{AR}	18.5	mJ

- Notes**
1. Package Limit = $\pm 75 \text{ A}$
 2. $PW \leq 10 \mu\text{s}$, Duty cycle $\leq 1 \%$
 3. Starting $T_{ch} = 25^\circ\text{C}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$
 4. $T_{ch} \leq 175^\circ\text{C}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$, Duty cycle $\leq 3\%$

THERMAL RESISTANCE

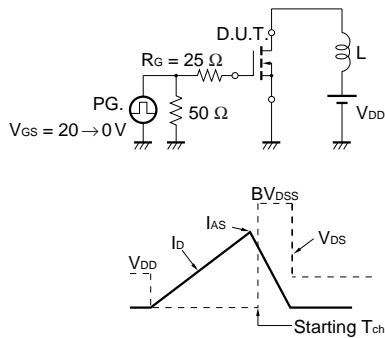
Channel to Case	$R_{th(ch-C)}$	0.81	$^\circ\text{C/W}$
Channel to Ambient	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

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.

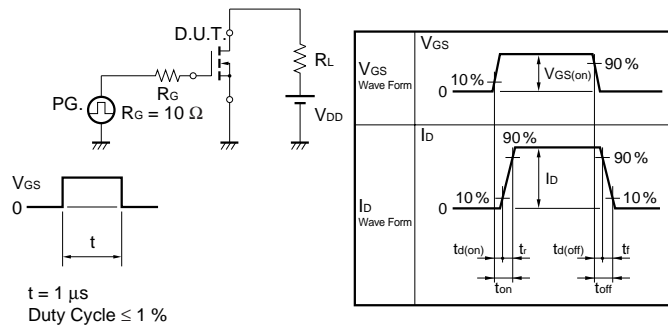
ELECTRICAL CHARACTERISTICS (TA = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 41\text{ A}$		7.3	9.0	mΩ
	$R_{DS(on)2}$	$V_{GS} = 5\text{ V}, I_D = 25\text{ A}$		9.0	12.0	mΩ
	$R_{DS(on)3}$	$V_{GS} = 4\text{ V}, I_D = 25\text{ A}$		11.0	14.0	mΩ
Gate to Source Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.0	1.5	2.0	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 25\text{ A}$	20	58		S
Drain Leakage Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0$			10	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0$			±10	μA
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}$		3350	5000	pF
Output Capacitance	C_{oss}	$V_{GS} = 0$		1600	2400	pF
Reverse Transfer Capacitance	C_{riss}	$f = 1\text{ MHz}$		800	1400	pF
Turn-on Delay Time	$t_{d(on)}$	$I_D = 25\text{ A}$		55	121	ns
Rise Time	t_r	$V_{GS(on)} = 10\text{ V}$		360	900	ns
Turn-off Delay Time	$T_{d(off)}$	$V_{DD} = 30\text{ V}$		480	960	ns
Fall Time	t_f	$R_G = 10\ \Omega$		360	900	ns
Total Gate Charge	Q_G	$I_D = 50\text{ A}$		152	230	nC
Gate to Source Charge	Q_{GS}	$V_{DD} = 48\text{ V}$		15		nC
Gate to Drain Charge	Q_{GD}	$V_{GS} = 10\text{ V}$		60		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 50\text{ A}, V_{GS} = 0$		0.93		V
Reverse Recovery Time	t_{rr}	$I_f = 50\text{ A}, V_{GS} = 0$		105		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{ A}/\mu\text{s}$		265		nC

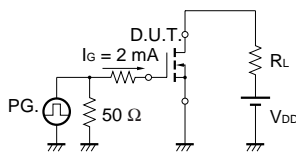
TEST CIRCUIT 1 AVALANCHE CAPABILITY



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

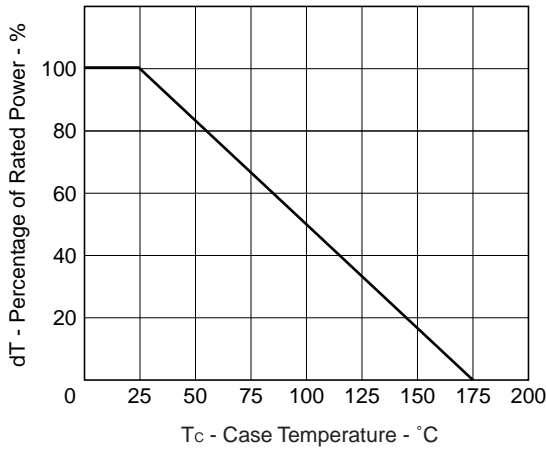


Figure2. TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

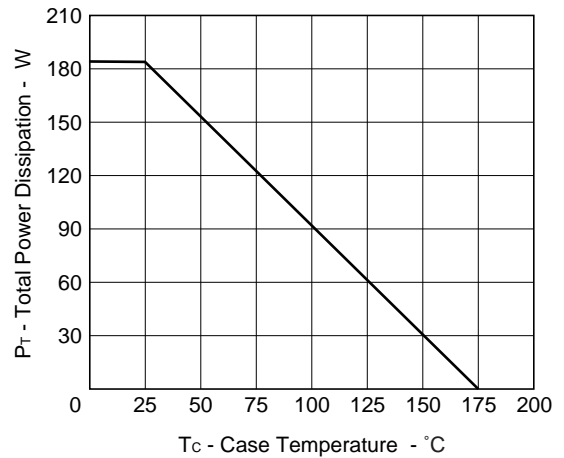


Figure3. FORWARD BIAS SAFE OPERATING AREA

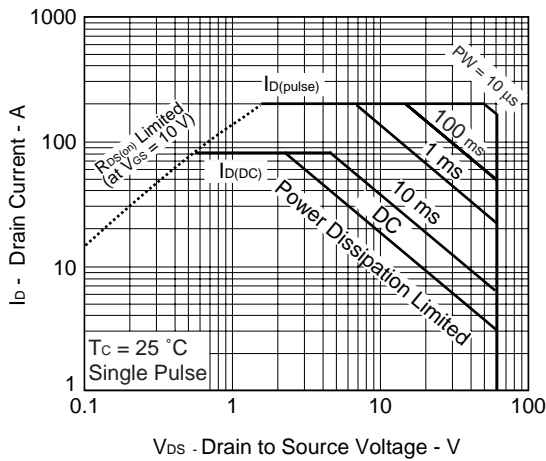


Figure4. SINGLE AVALANCHE ENERGY DERATING FACTOR

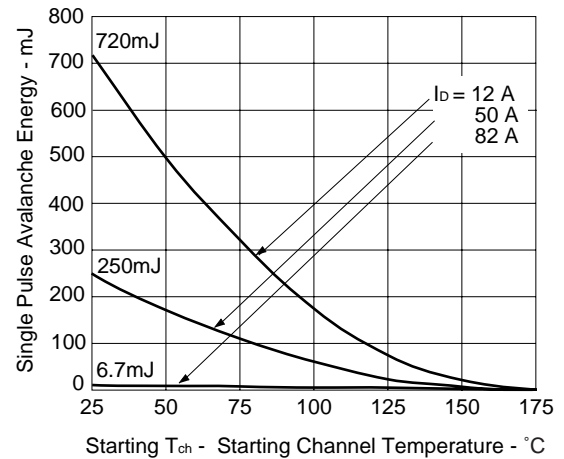


Figure5. FORWARD TRANSFER CHARACTERISTICS

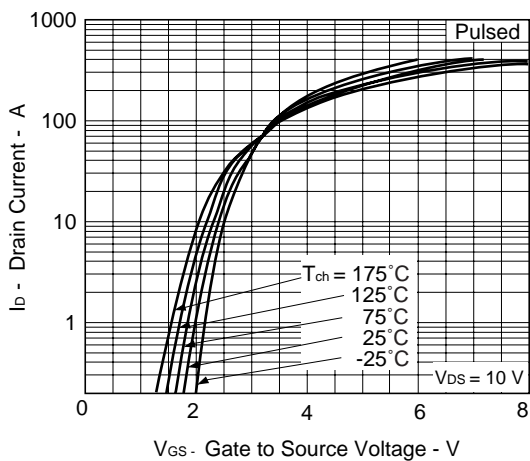


Figure6. DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

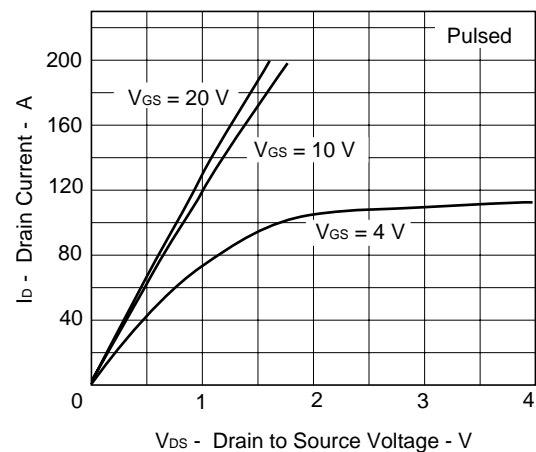


Figure7. TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

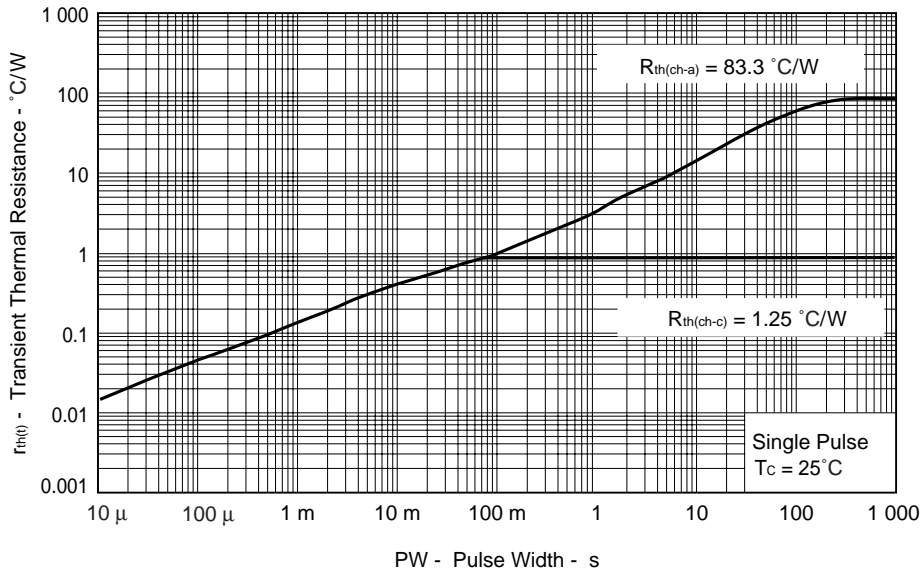


Figure8. FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

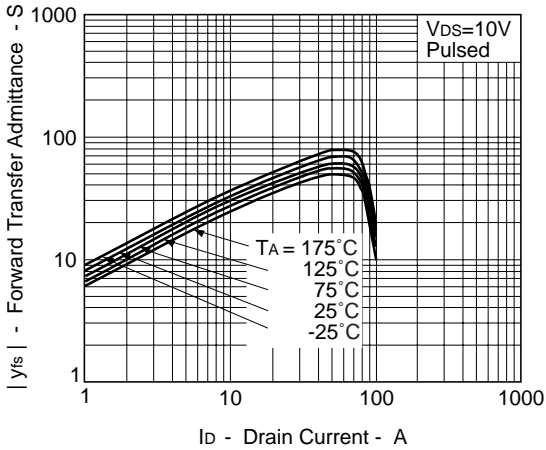


Figure9. DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

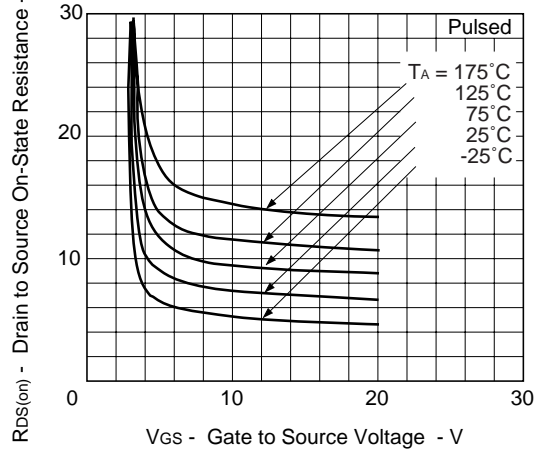


Figure10. DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

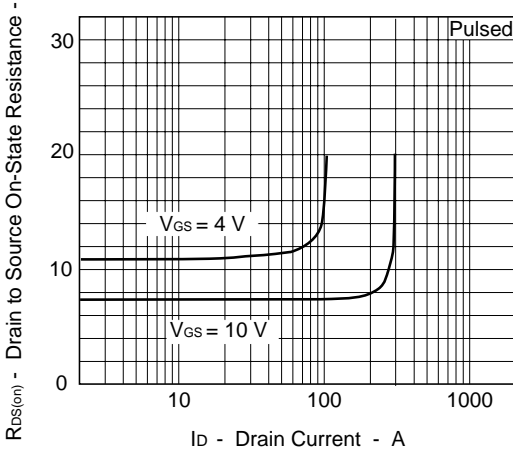


Figure11. GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE

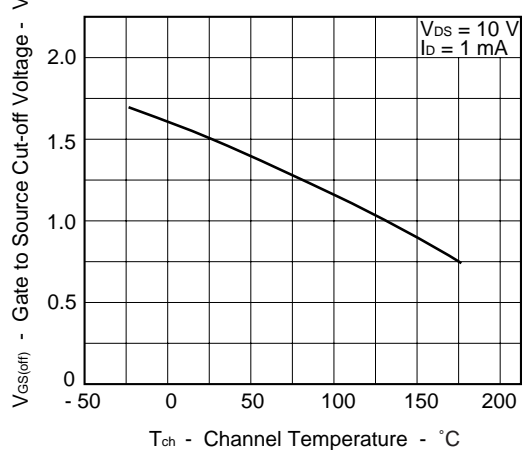


Figure12. DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

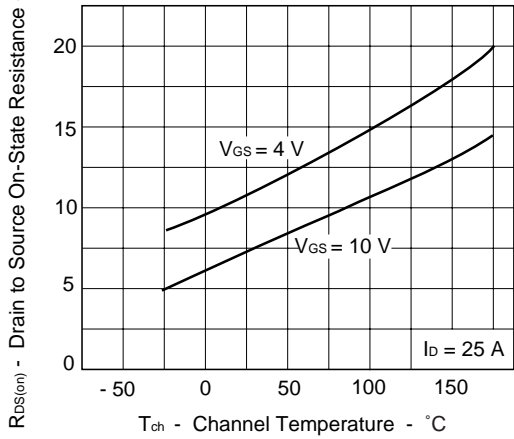


Figure13. SOURCE TO DRAIN DIODE FORWARD VOLTAGE

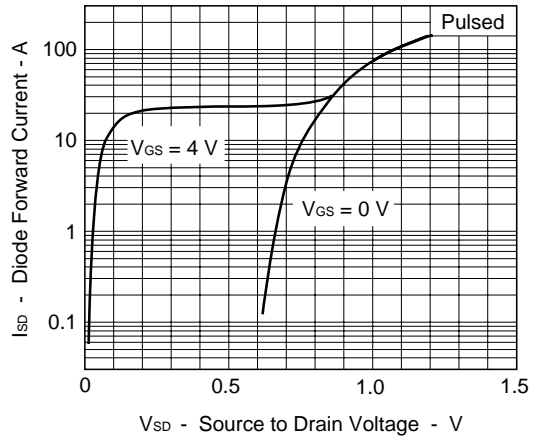


Figure14. CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

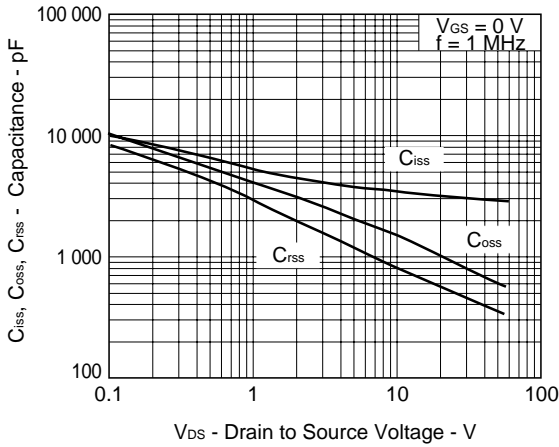


Figure15. SWITCHING CHARACTERISTICS

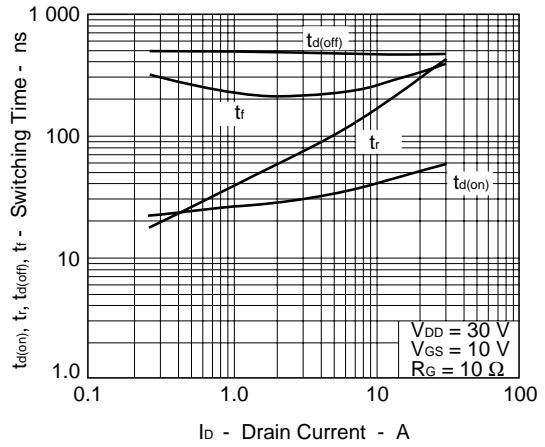


Figure16. REVERSE RECOVERY TIME vs. DRAIN CURRENT

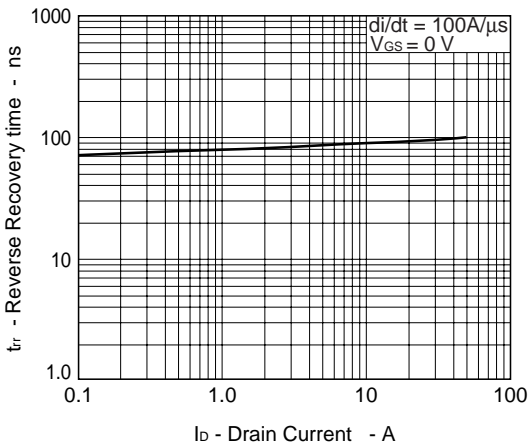
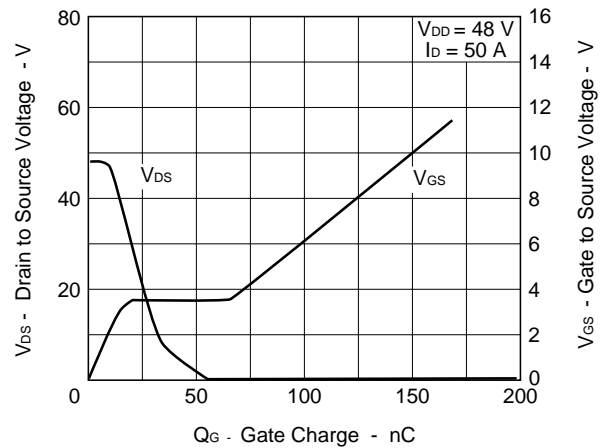
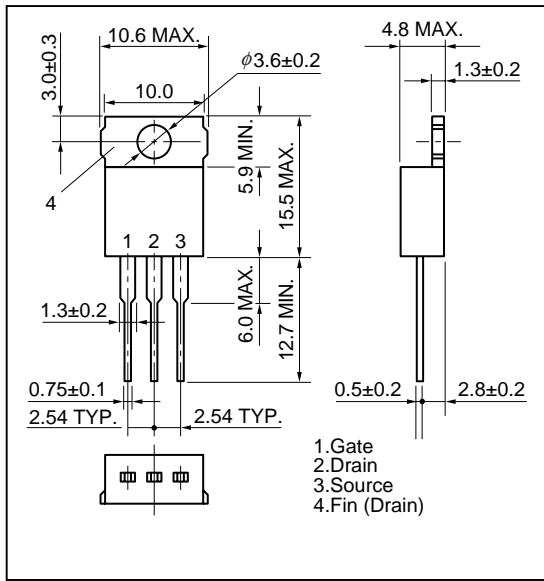


Figure17. DYNAMIC INPUT/OUTPUT CHARACTERISTICS

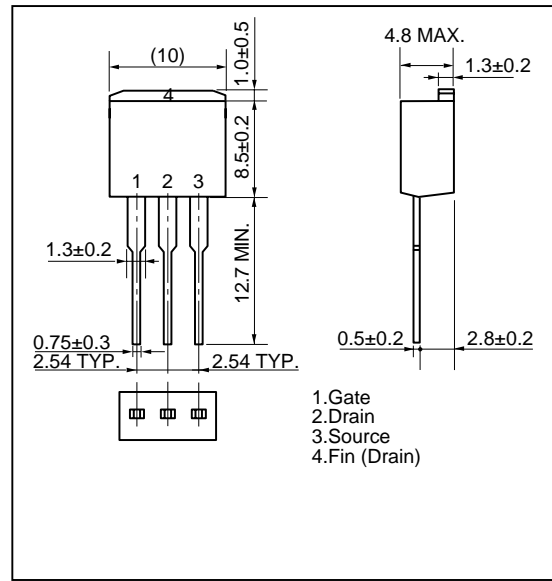


PACKAGE DRAWINGS (Unit : mm)

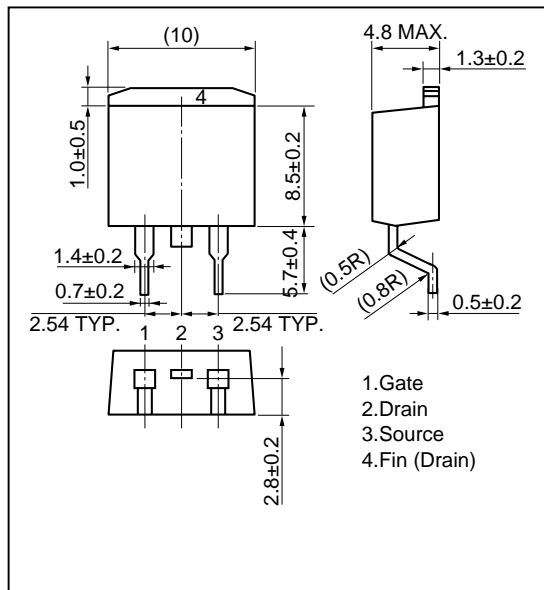
1)TO-220AB (MP-25)



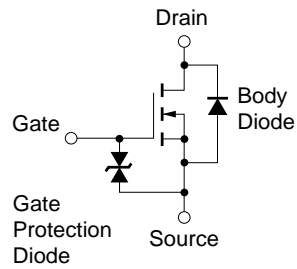
2)TO-262 (MP-25 Fin Cut)



3)TO-263 (JEDEC TYPE:MP-25ZJ)



EQUIVALENT CIRCUIT



[MEMO]

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.

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: Aircrafts, 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.

Anti-radioactive design is not implemented in this product.