

## MOS FIELD EFFECT TRANSISTOR

### NP88N055CHE, NP88N055DHE, NP88N055EHE

#### SWITCHING

#### N-CHANNEL POWER MOS FET

#### INDUSTRIAL USE

#### DESCRIPTION

These products are N-channel MOS Field Effect Transistor designed for high current switching applications.

#### FEATURES

- Channel temperature 175 degree rated
- Super low on-state resistance  
 $R_{DS(on)} = 5.3 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 44 \text{ A)}$
- Low  $C_{iss}$  :  $C_{iss} = 7600 \text{ pF TYP.}$
- Built-in gate protection diode

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
NP88N055CHE	TO-220AB
NP88N055DHE	TO-262
NP88N055EHE	TO-263

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

Drain to Source Voltage	$V_{DS}$	55	V
Gate to Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current (DC) <sup>Note1</sup>	$I_D(\text{DC})$	$\pm 88$	A
Drain Current (Pulse) <sup>Note2</sup>	$I_D(\text{pulse})$	$\pm 352$	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	1.8	W
Total Power Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_T$	288	W
Single Avalanche Current	$I_{AS}$	65 / 88	A
★ Single Avalanche Energy <sup>Note3</sup>	$E_{AS}$	422 / 15	mJ
Channel Temperature	$T_{ch}$	175	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$

**Notes** 1. Package Limit =  $\pm 75 \text{ A}$

2.  $PW \leq 10 \mu\text{s}$ , Duty cycle  $\leq 1 \%$

3. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

#### THERMAL RESISTANCE

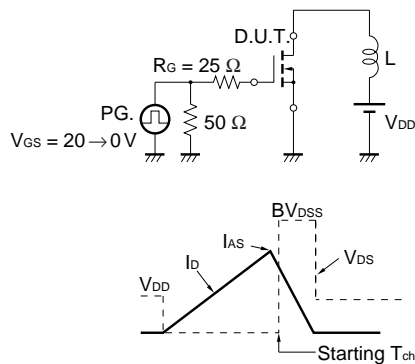
Channel to Case	$R_{th(ch-C)}$	0.52	$^\circ\text{C/W}$
Channel to Ambient	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

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 Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

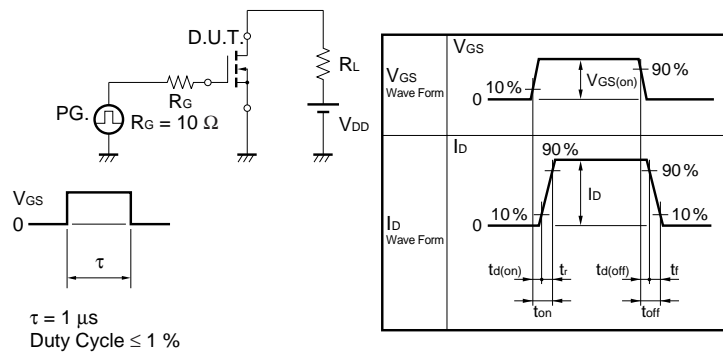
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 44 A		4.2	5.3	mΩ
Gate to Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.0	3.0	4.0	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 44 A	30	60		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 55 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V		7600	11400	pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		1100	1700	pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		480	870	pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 44 A		150	330	ns
Rise Time	t <sub>r</sub>	V <sub>GS(on)</sub> = 10 V		1300	3300	ns
Turn-off Delay Time	t <sub>d(off)</sub>	V <sub>DD</sub> = 28 V		320	640	ns
Fall Time	t <sub>f</sub>	R <sub>G</sub> = 10 Ω		290	730	ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 88 A		130	200	nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = 44 V		31		nC
Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS</sub> = 10 V		49		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 88 A, V <sub>GS</sub> = 0 V		1.0		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 88 A, V <sub>GS</sub> = 0 V		62		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		120		nC

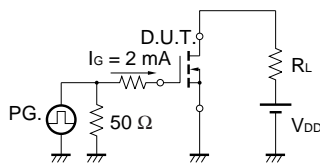
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

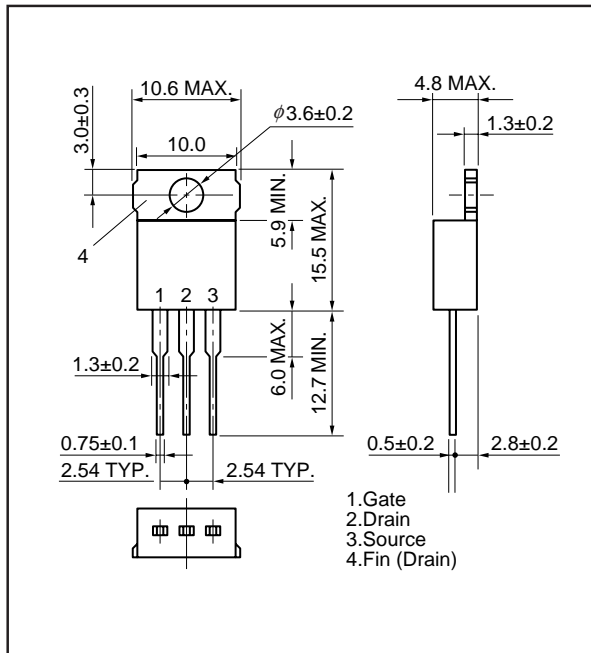


**TEST CIRCUIT 3 GATE CHARGE**

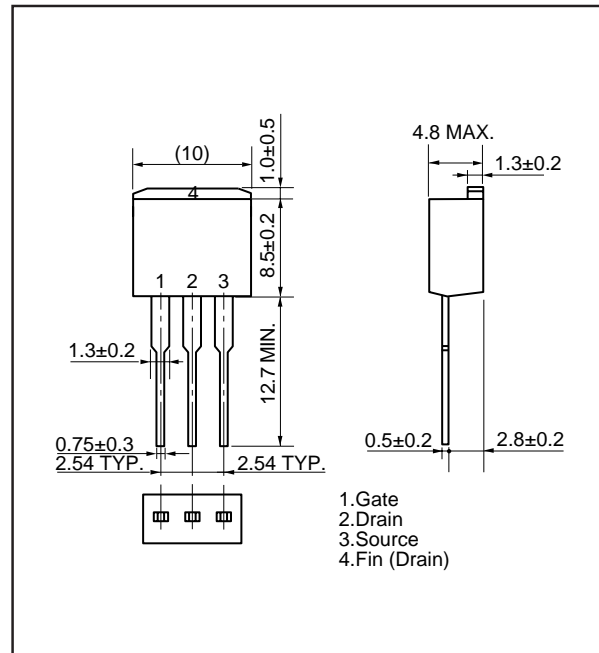


PACKAGE DRAWINGS (Unit: mm)

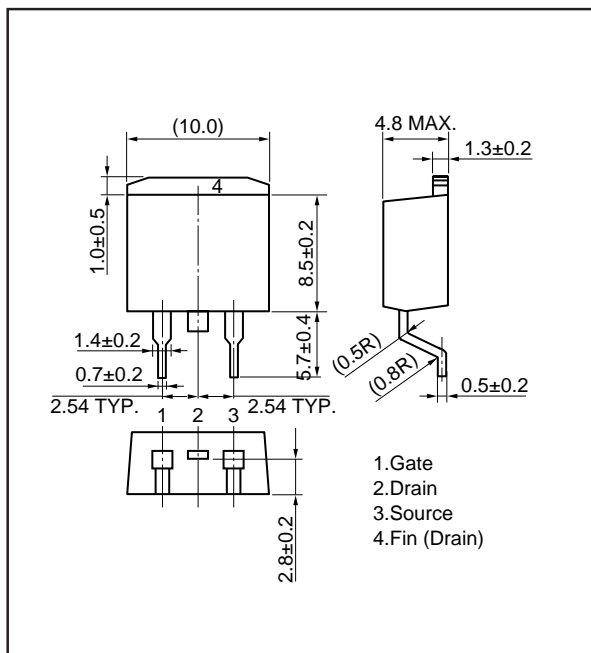
1) TO-220AB (MP-25)



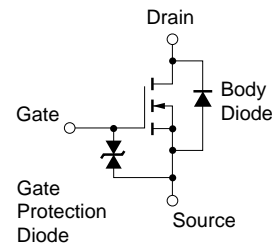
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)



EQUIVALENT CIRCUIT



**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.

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