

## MOS FIELD EFFECT TRANSISTOR

### NP48N055CHE, NP48N055DHE, NP48N055EHE

#### 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
- ★  $R_{DS(on)} = 17 \text{ m}\Omega$  MAX. ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 24 \text{ A}$ )
- ★ • Low  $C_{iss}$  :  $C_{iss} = 1600 \text{ pF}$  TYP.
- Built-in gate protection diode

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
NP48N055CHE	TO-220AB(MP-25)
NP48N055DHE	TO-262(MP-25 Fin Cut)
NP48N055EHE	TO-263(MP-25ZJ)

#### 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)	$I_{D(DC)}$	$\pm 48$	A
Drain Current (Pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 192$	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	1.8	W
★ Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_T$	85	W
★ Single Avalanche Current <sup>Note2</sup>	$I_{AS}$	48 / 28 / 10	A
★ Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	2.3 / 78 / 100	mJ
Channel Temperature	$T_{ch}$	175	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$

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

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

#### THERMAL RESISTANCE

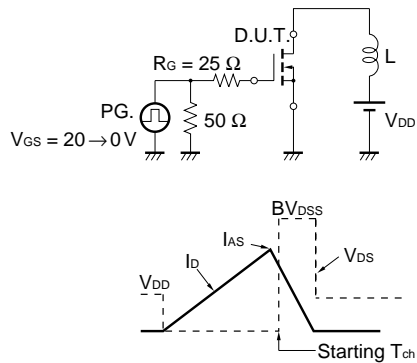
★ Channel to Case	$R_{th(ch-C)}$	1.76	$^\circ\text{C/W}$
★ Channel to Ambient	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

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

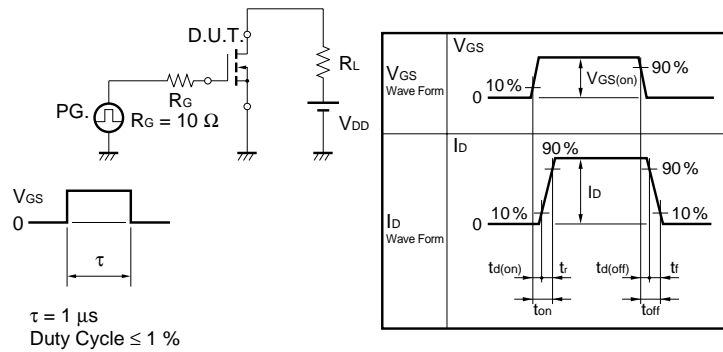
★ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

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> = 24 A		14	17	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	4.0	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 24 A	8	17		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, V <sub>GS</sub> = 0 V, f = 1 MHz		1600	2400	pF
Output Capacitance	C <sub>oss</sub>			250	380	pF
Reverse Transfer Capacitance	C <sub>rss</sub>			120	220	pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 24 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 28 V, R <sub>G</sub> = 10 Ω		51	120	ns
Rise Time	t <sub>r</sub>			500	1240	ns
Turn-off Delay Time	t <sub>d(off)</sub>			69	140	ns
Fall Time	t <sub>f</sub>			93	240	ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 48 A, V <sub>DD</sub> = 44 V, V <sub>GS</sub> = 10 V		33	50	nC
Gate to Source Charge	Q <sub>GS</sub>			9		nC
Gate to Drain Charge	Q <sub>GD</sub>			12		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 48 A, V <sub>GS</sub> = 0 V		1.0		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 48 A, V <sub>GS</sub> = 0 V, di/dt = 100 A/μs		40		ns
Reverse Recovery Charge	Q <sub>rr</sub>			55		nC

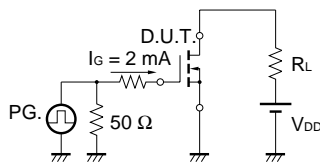
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

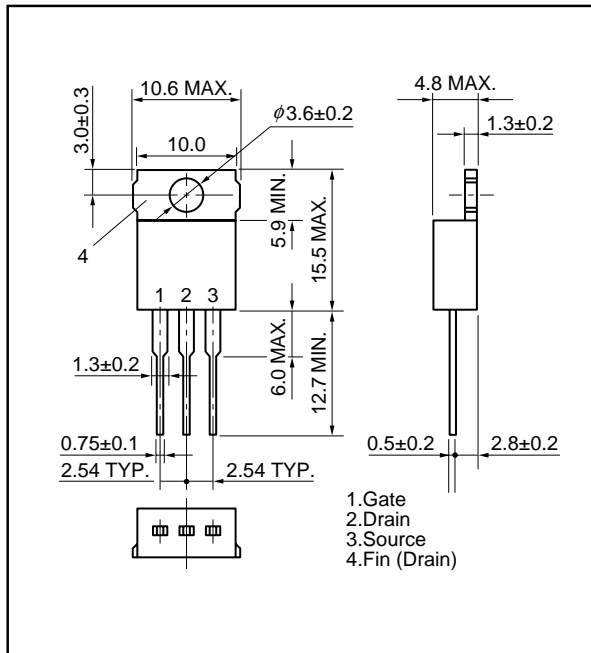


TEST CIRCUIT 3 GATE CHARGE

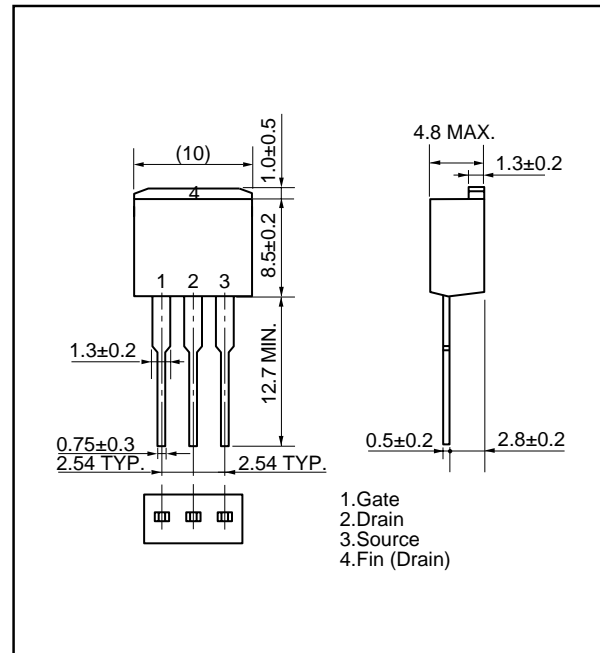


PACKAGE DRAWINGS (Unit: mm)

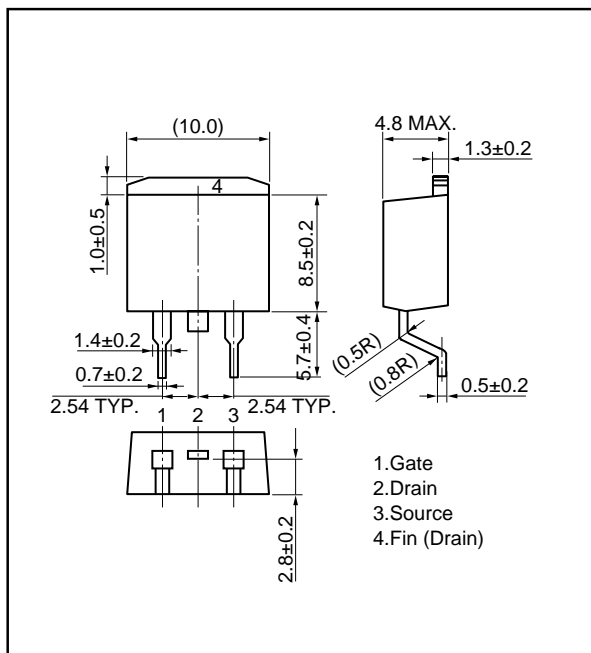
1) TO-220AB (MP-25)



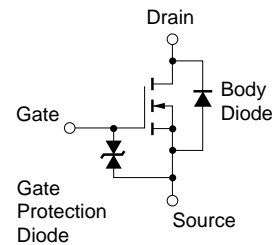
2) TO-262 (MP-25 Fin Cut)



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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