DATA SHEET

MOS FIELD EFFECT TRANSISTOR

NP24N10CLB, NP24N10DLB, NP24N10ELB

SWITCHING
N-CHANNEL POWER MOS FET

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
  $R_{DS(on)1}$ = 80 mΩ MAX. (V_{GS} = 10 V, I_D = 12 A)
  $R_{DS(on)2}$ = 93 mΩ MAX. (V_{GS} = 5.0 V, I_D = 10 A)
- Low C_{iss}: C_{iss} = 1300 pF TYP.
- Built-in gate protection diode

ORDERING INFORMATION

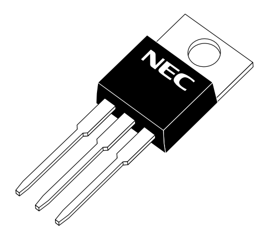
PART NUMBER	PACKAGE
NP24N10CLB	TO-220AB
NP24N10DLB	TO-262
NP24N10ELB	TO-263

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

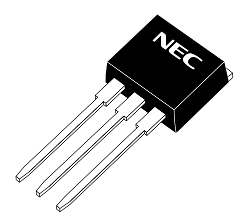
Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	100	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±24	A
Drain Current (Pulse) Note1	$I_{D(pulse)}$	±80	A
Total Power Dissipation (T_A = 25°C)	P_T	1.8	W
Total Power Dissipation (T_C = 25°C)	P_T	100	W
Single Avalanche Current Note2	I_{AS}	24 / 7	A
Single Avalanche Energy Note2	E_{AS}	57 / 245	mJ
Repetitive Avalanche Current Note3	I_{AR}	20	A
Repetitive Avalanche Energy Note3	E_{AR}	10	mJ
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–55 to +175	°C

Notes 1. PW ≤ 10 μs, Duty cycle ≤ 1%
2. Starting T_{ch} = 25°C, V_{DD} = 50 V, R_G = 25 Ω , V_{GS} = 20 → 0 V
3. T_{ch} ≤ 175°C, R_G = 25 Ω , V_{GS} = 20 → 0 V, Duty cycle ≤ 3%

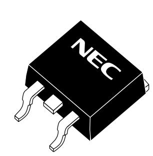
(TO-220AB)



(TO-262)



(TO-263)



THERMAL RESISTANCE

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	1.50	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	°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.

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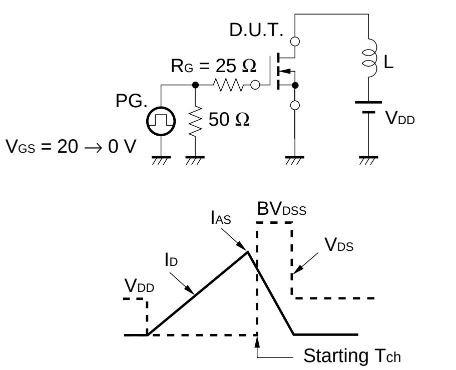
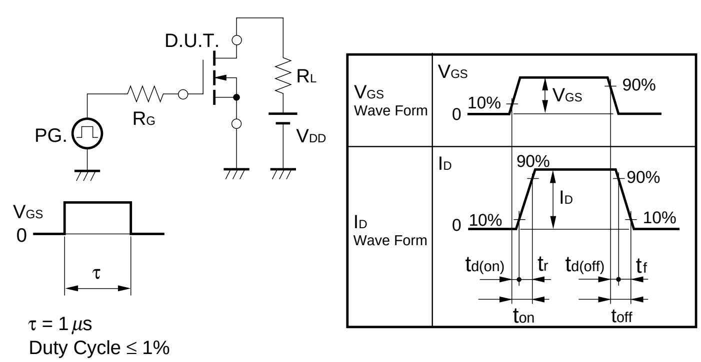
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} =10 V, I_D = 1 mA	1.0	1.5	2.0	V
Forward Transfer Admittance	$\| y_{fs} \|$	V_{DS} = 10 V, I_D = 10 A	12	22		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 12 A		55	80	mΩ
	$R_{DS(on)2}$	V_{GS} = 5.0 V, I_D = 10 A		61	93	mΩ
	$R_{DS(on)3}$	V_{GS} = 4.0 V, I_D = 10 A		65	100	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		1300	3100	pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		460	700	pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		150	300	pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 50 V, I_D = 10 A		22	50	ns
Rise Time	t_r	V_{GS} = 10 V		110	280	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		140	280	ns
Fall Time	t_f			120	280	ns
Total Gate Charge	Q_G	V_{DD} = 80 V		51	80	nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		4.9		nC
Gate to Drain Charge	Q_{GD}	I_D = 20 A		15		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 20 A, V_{GS} = 0 V		1.1		V
Reverse Recovery Time	t_{rr}	I_F = 20 A, V_{GS} = 0 V		170		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		770		nC

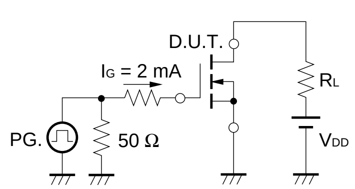
TEST CIRCUIT 1 AVALANCHE CAPABILITY



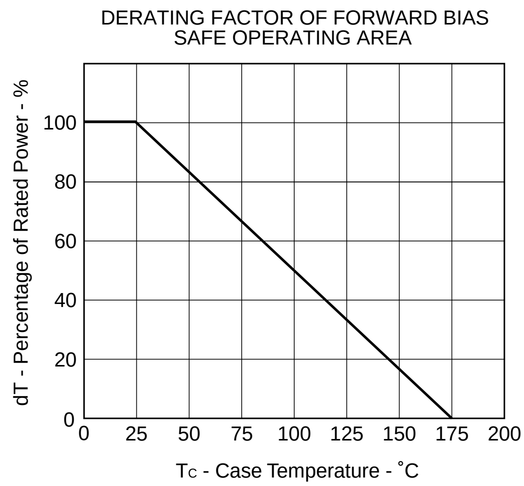
TEST CIRCUIT 2 SWITCHING TIME

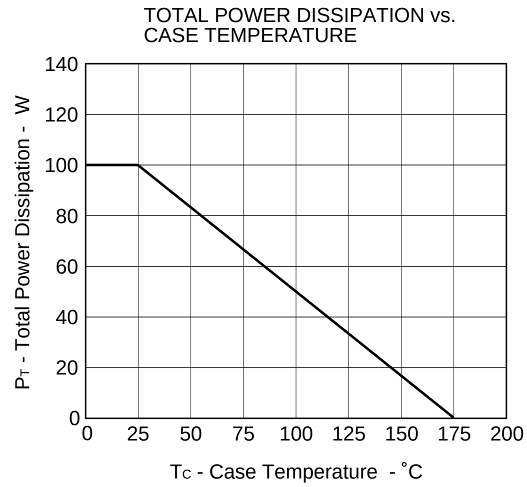


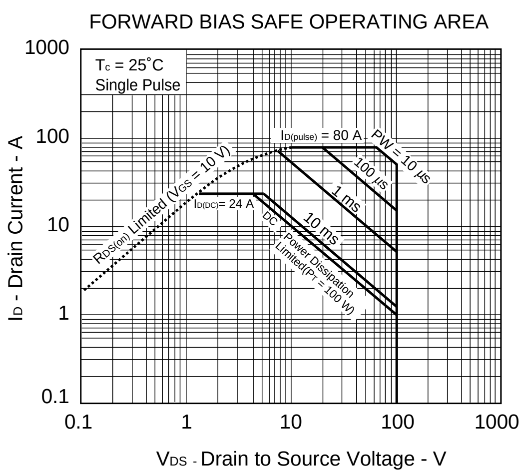
TEST CIRCUIT 3 GATE CHARGE

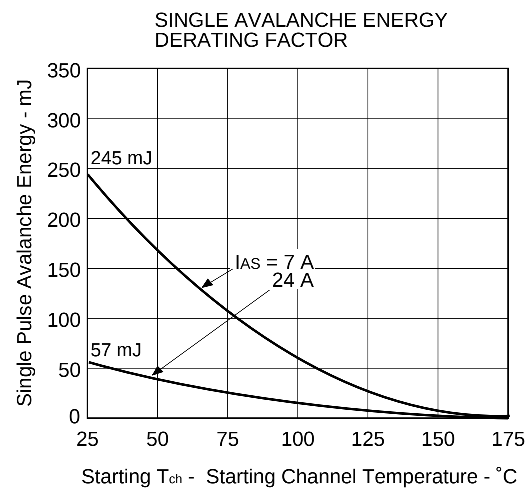


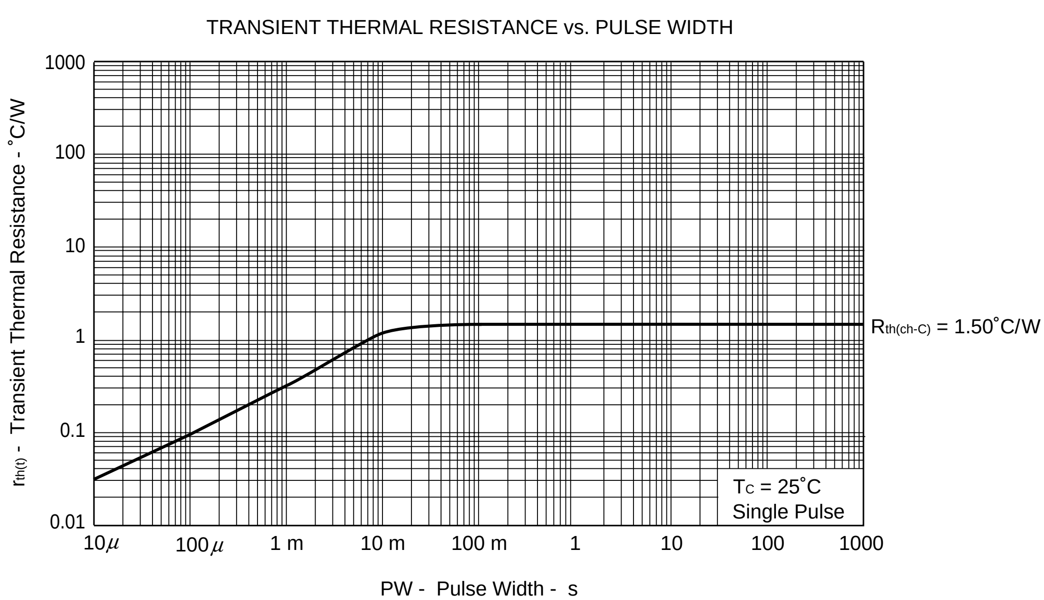
TYPICAL CHARACTERISTICS (T_A = 25°C)



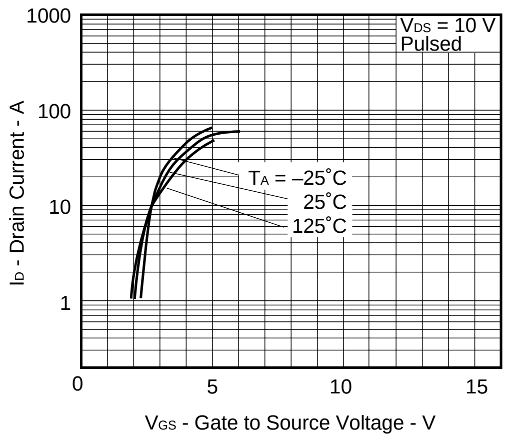




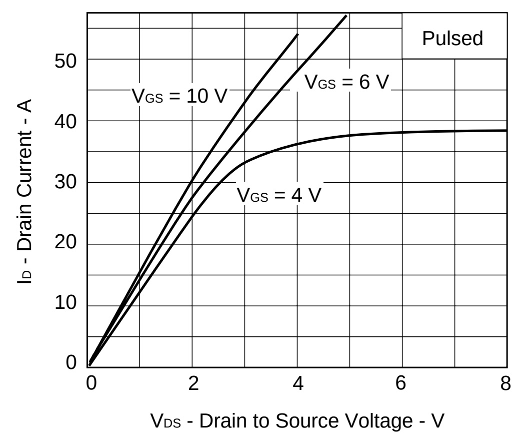




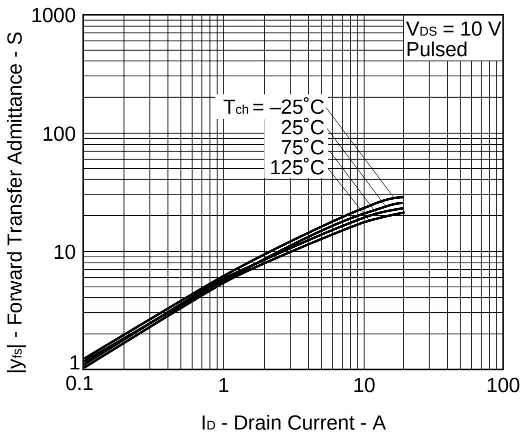
FORWARD TRANSFER CHARACTERISTICS



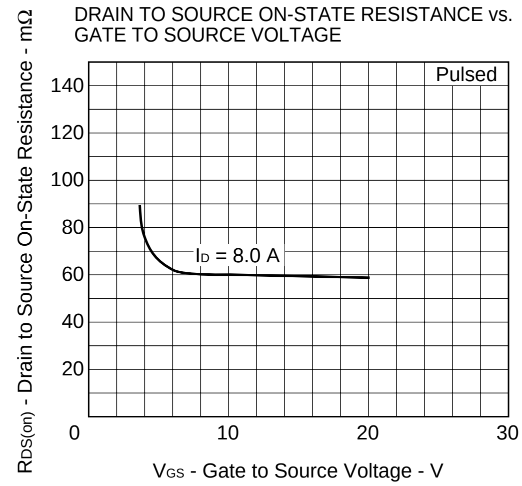
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



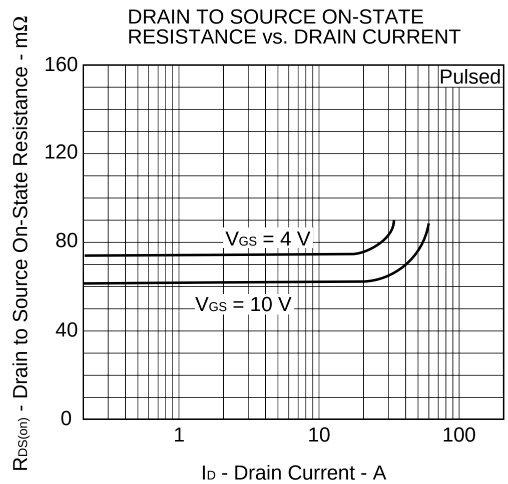
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



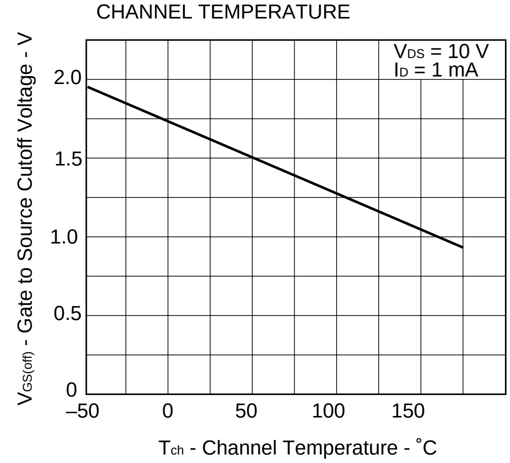
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



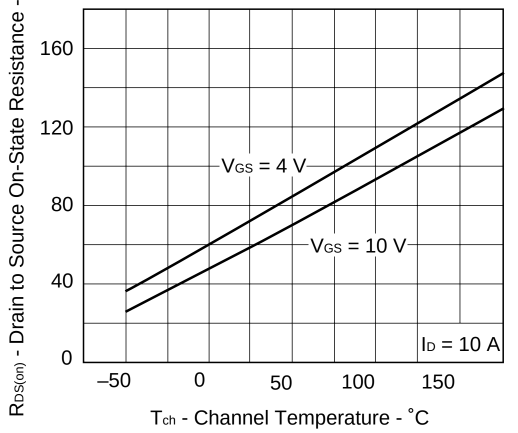
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



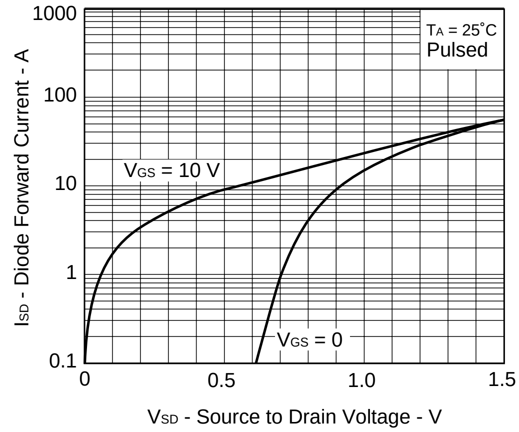
GATE TO SOURCE CUTOFF VOLTAGE vs.
CHANNEL TEMPERATURE



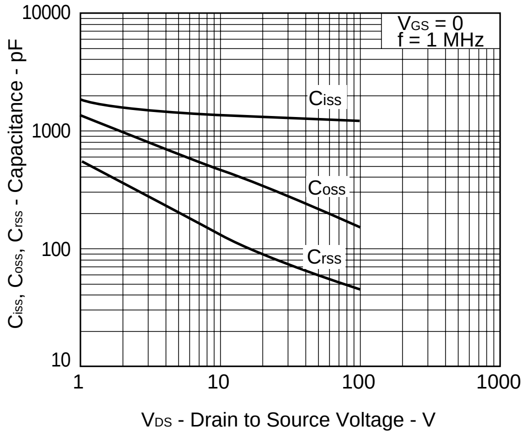
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



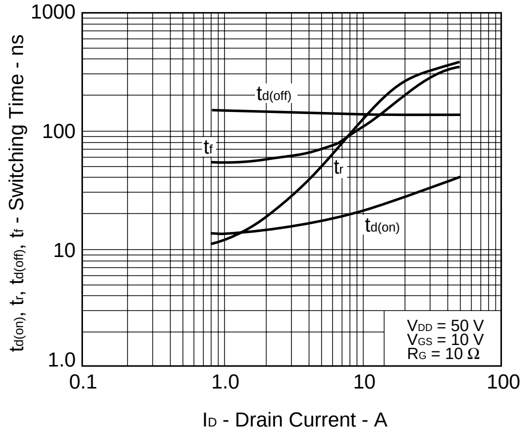
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



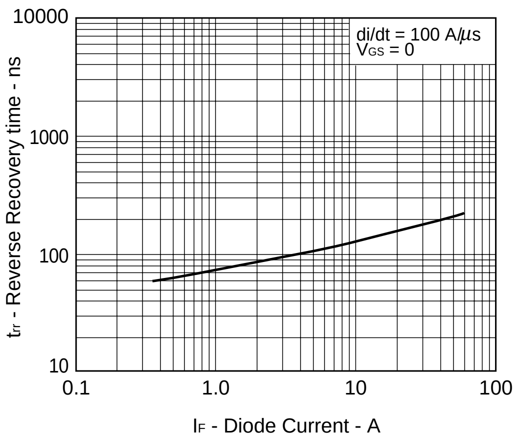
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



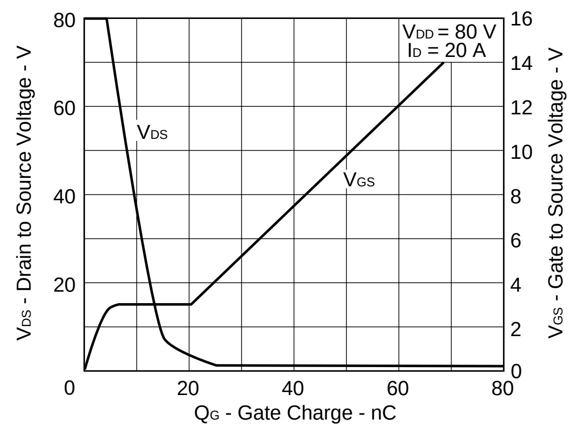
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT

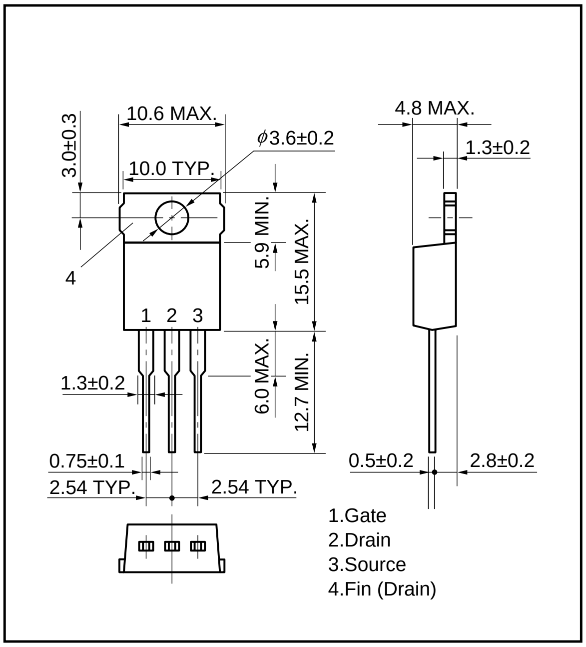


DYNAMIC INPUT/OUTPUT CHARACTERISTICS

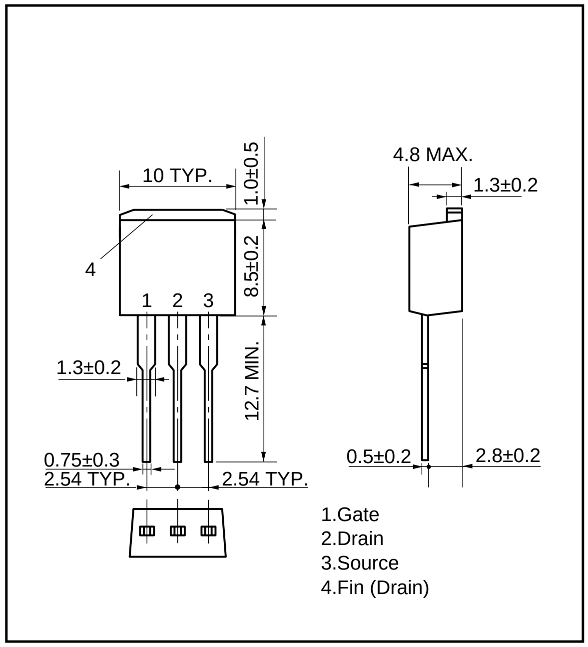


PACKAGE DRAWINGS (Unit: mm)

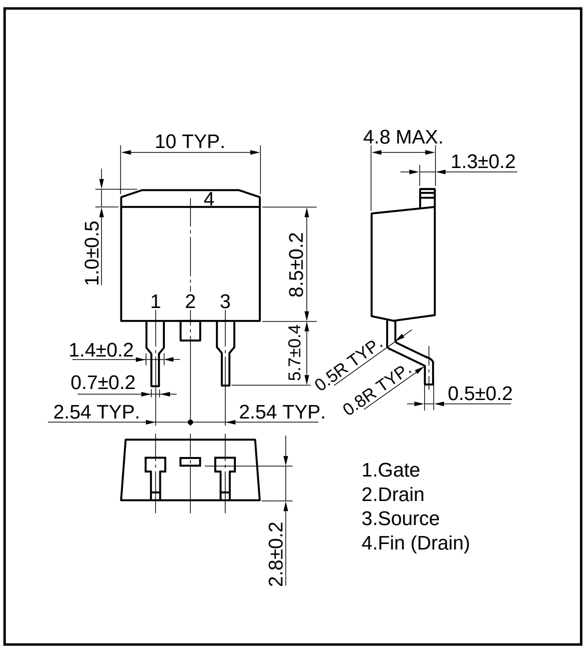
1) TO-220AB (MP-25)



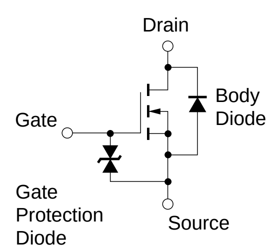
2) TO-262 (MP-25 Fin Cut)



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.

[MEMO]