DATA SHEET

RENESAS

MOS FIELD EFFECT TRANSISTOR
'84N06CLD, NP84N06DLD, NP84N06ELD

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
  $R_{DS(on)1}$ = 6.5 mΩ MAX. (V_{GS} = 10 V, I_D = 42 A)
  $R_{DS(on)2}$ = 9.5 mΩ MAX. (V_{GS} = 5 V, I_D = 35 A)
- Built-in gate protection diode

ORDERING INFORMATION

PART NUMBER	PACKAGE
NP84N06CLD	TO-220AB
NP84N06DLD	TO-262
NP84N06ELD	TO-263

ABSOLUTE MAXIMUM RATINGS (T_A = 25°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	$I_{D(DC)}$	±84	A
Drain Current (Pulse) Note2	$I_{D(pulse)}$	±280	A
Total Power Dissipation (T_A = 25°C)	P_{T1}	1.8	W
Total Power Dissipation (T_C = 25°C)	P_{T2}	185	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	-55 to +175	°C
Single Avalanche Current Note3	I_{AS}	**Figure4**	A
Single Avalanche Energy Note3	E_{AS}	**Figure4**	mJ
Repetitive Avalanche Current Note4	I_{AR}	70	A
Repetitive Avalanche Energy Note4	E_{AR}	490	mJ

Notes 1. Package Limit = ± 75 A
2. PW ≤ 10 μs, Duty cycle ≤ 1 %
3. Starting T_{ch} = 25°C, R_G = 25 Ω , V_{GS} = 20 V→0 V
4. T_{ch} ≤ 175°C, R_G = 25 Ω , V_{GS} = 20 V→0 V, Duty cycle ≤ 3%

THERMAL RESISTANCE

Channel to Case	R_{th}(ch-C)	0.81	°C/W
Channel to Ambient	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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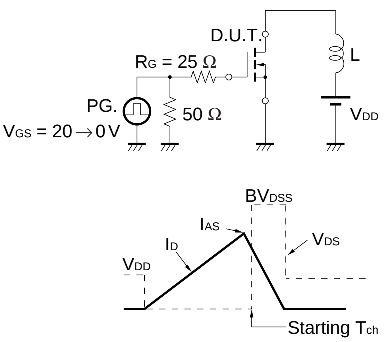
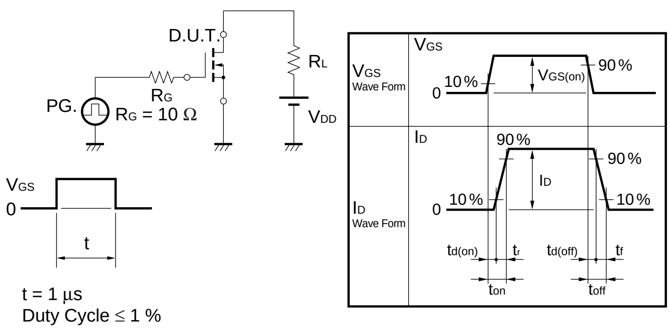
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 42 A		5.5	6.5	mΩ
	$R_{DS(on)2}$	V_{GS} = 5 V, I_D = 35 A		6.4	9.5	mΩ
	$R_{DS(on)3}$	V_{GS} = 4 V, I_D = 35 A		7.0	10.5	mΩ
Gate to Source 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 = 35 A	20	94		S
Drain Leakage Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			10	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Input Capacitance	C_{iss}	V_{DS} = 10 V		7200	10900	pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		2000	3000	pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		700	1300	pF
Turn-on Delay Time	$t_{d(on)}$	I_D = 35 A		50	110	ns
Rise Time	t_r	$V_{GS(on)}$ = 10 V		650	1700	ns
Turn-off Delay Time	$T_{d(off)}$	V_{DD} = 30 V		450	900	ns
Fall Time	t_f	R_G = 10 Ω		800	2000	ns
Total Gate Charge	Q_G	I_D = 70 A		150	230	nC
Gate to Source Charge	Q_{GS}	V_{DD} = 48 V		19		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 10 V		40		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 70 A, V_{GS} = 0 V		0.97		V
Reverse Recovery Time	t_{rr}	I_F = 70A, V_{GS} = 0 V		80		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100A/μs		256		nC

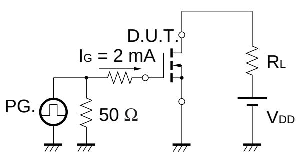
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME



TEST CIRCUIT 3 GATE CHARGE



TYPICAL CHRACTERISTICS (T_A = 25°C)

Figure1. DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

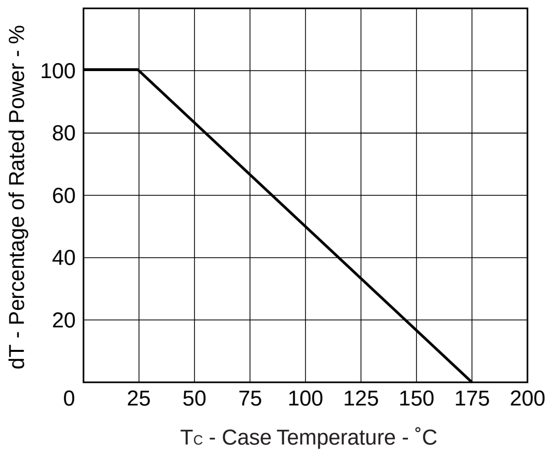


Figure2. TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

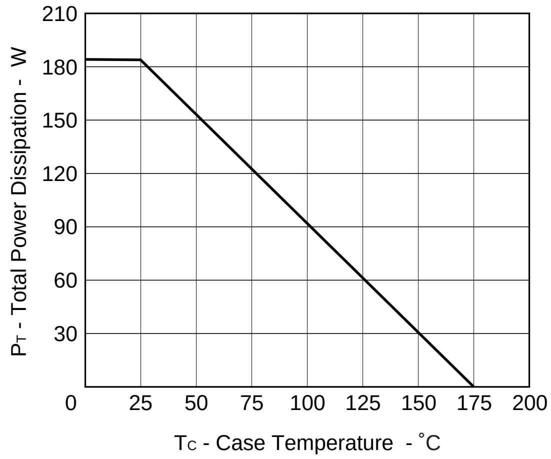


Figure.3 FORWARD BIAS SAFE OPERATING AREA

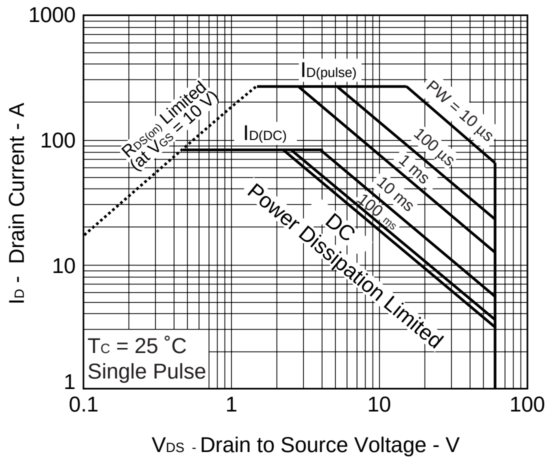


Figure4. SINGLE AVALANCHE ENERGY DERATING FACTOR

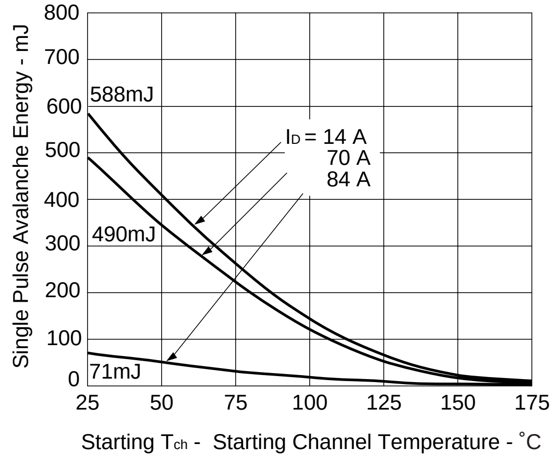


Figure5. FORWARD TRANSFER CHARACTERISTICS

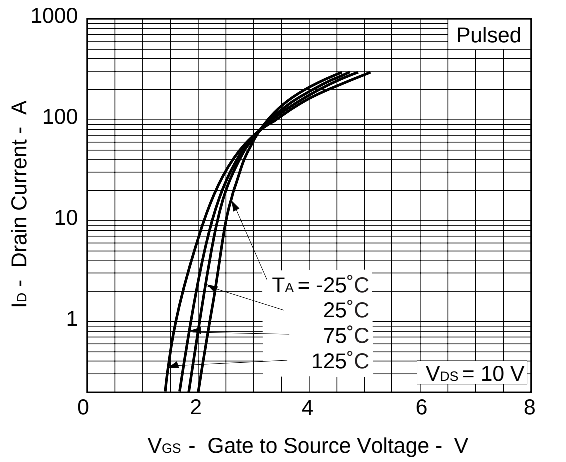


Figure6. DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

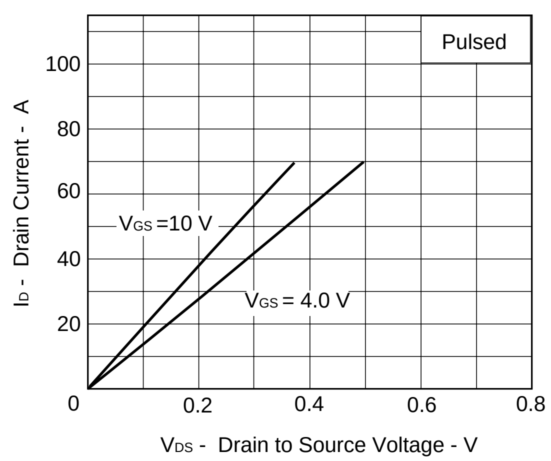


Figure7. TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

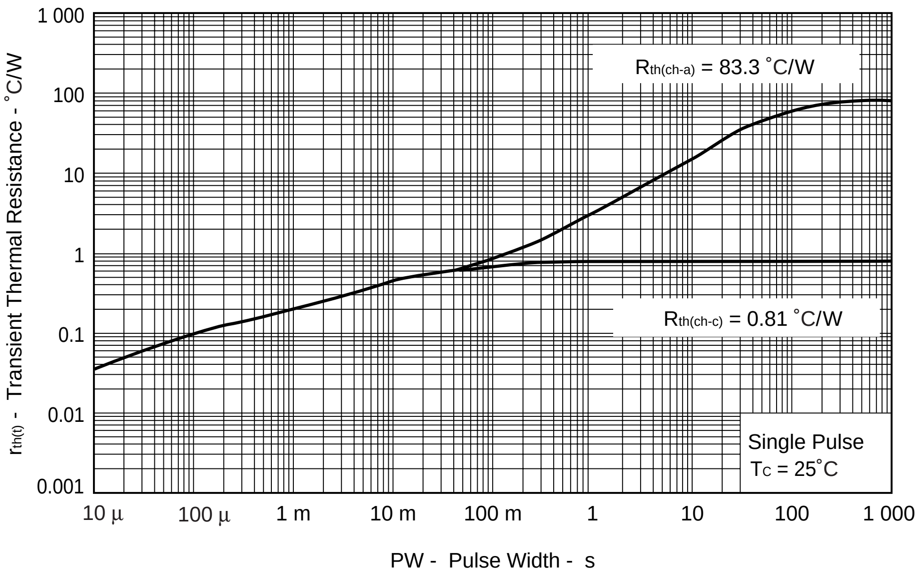


Figure8. FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

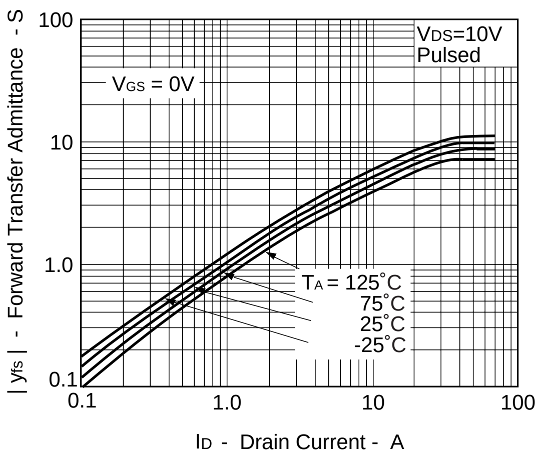


Figure9. DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

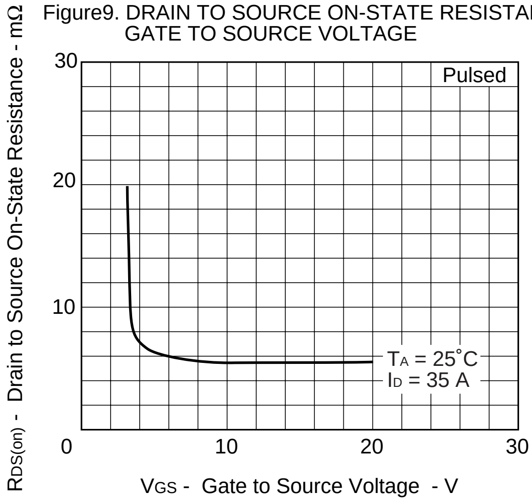


Figure10. DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

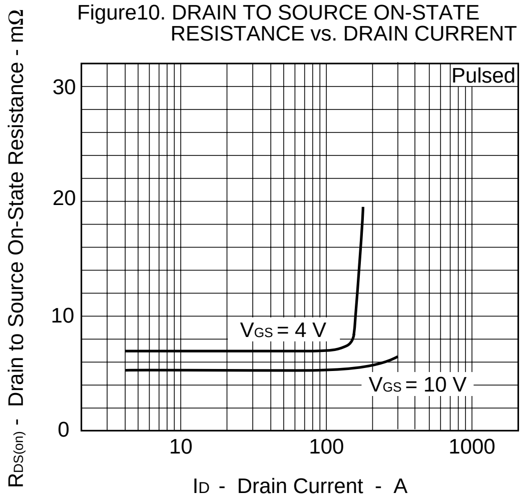


Figure11. GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE

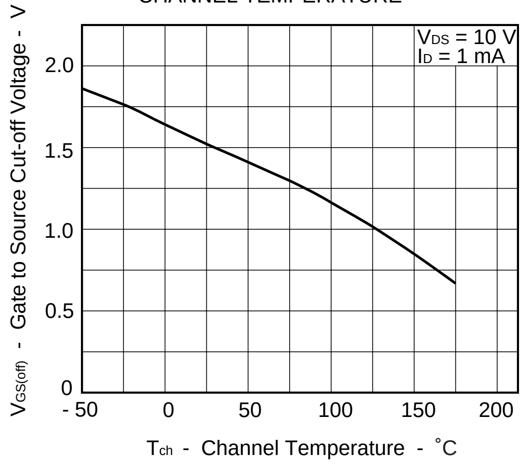


Figure12. DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

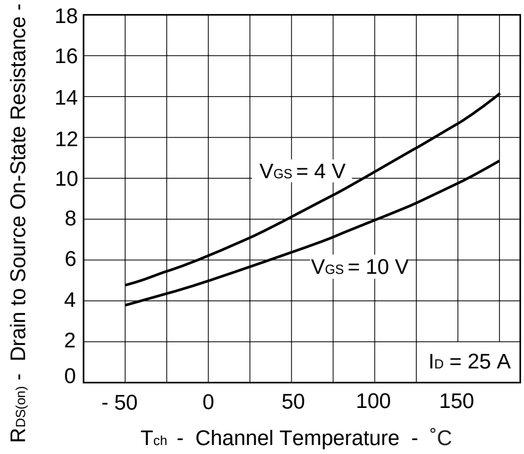


Figure13. SOURCE TO DRAIN DIODE FORWARD VOLTAGE

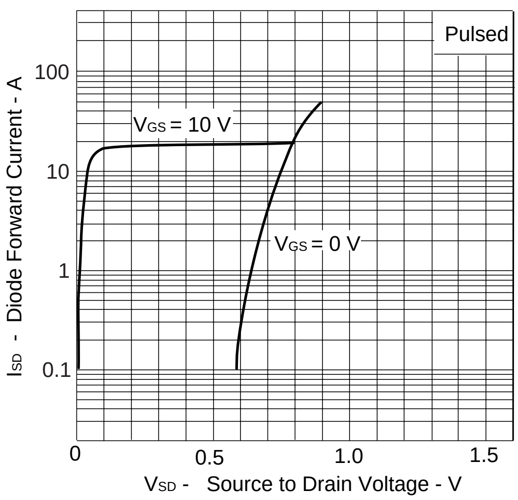


Figure14. CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

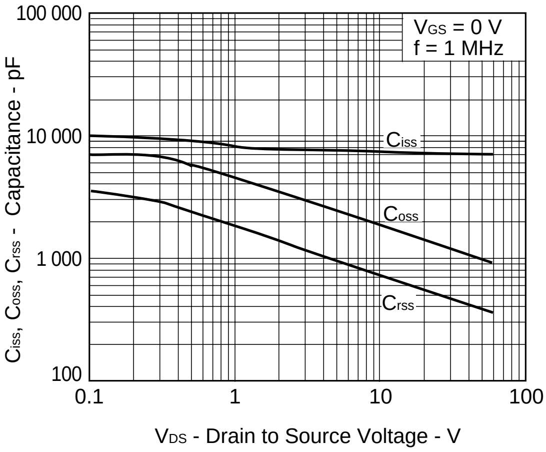


Figure15. SWITCHING CHARACTERISTICS

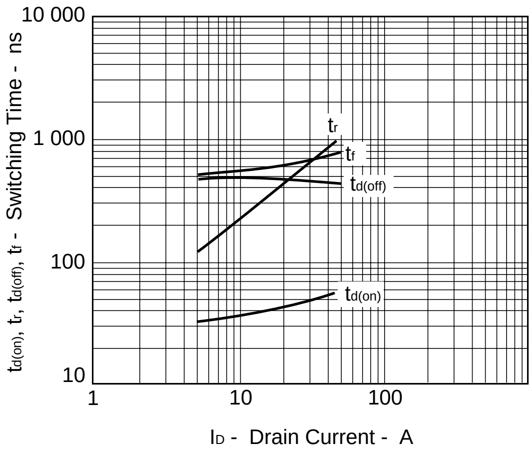


Figure16. REVERSE RECOVERY TIME vs. DRAIN CURRENT

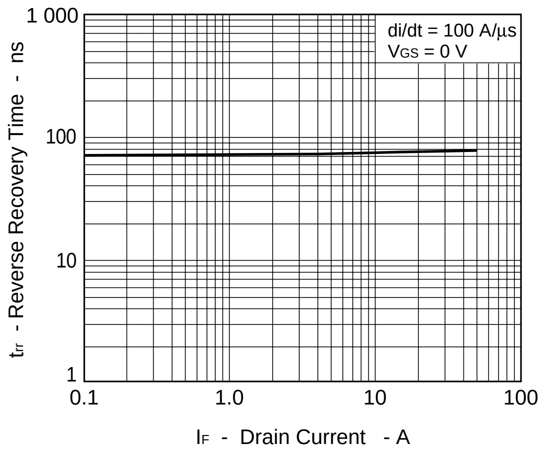
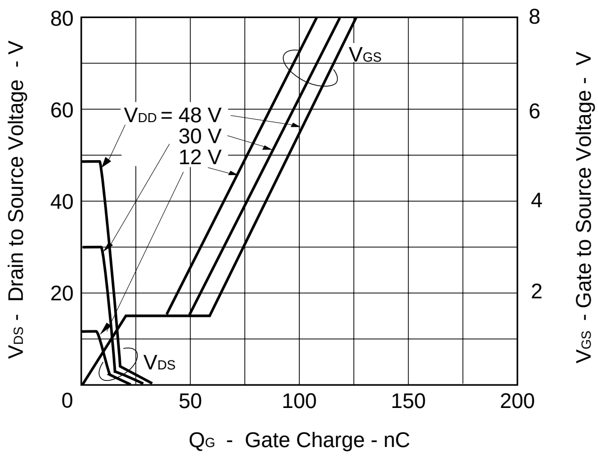
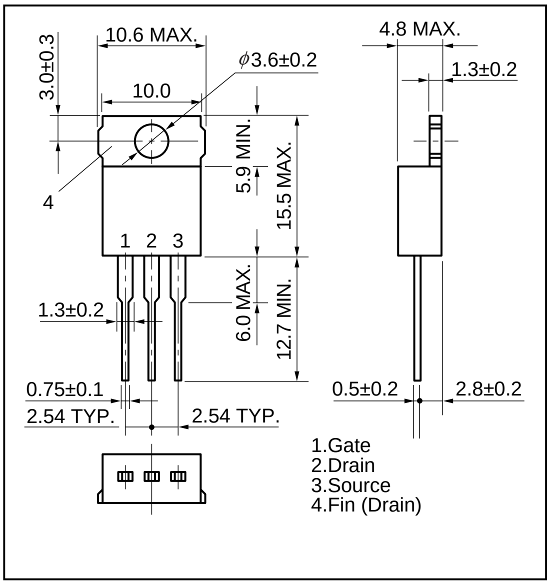


Figure17. DYNAMIC INPUT/OUTPUT CHARACTERISTICS

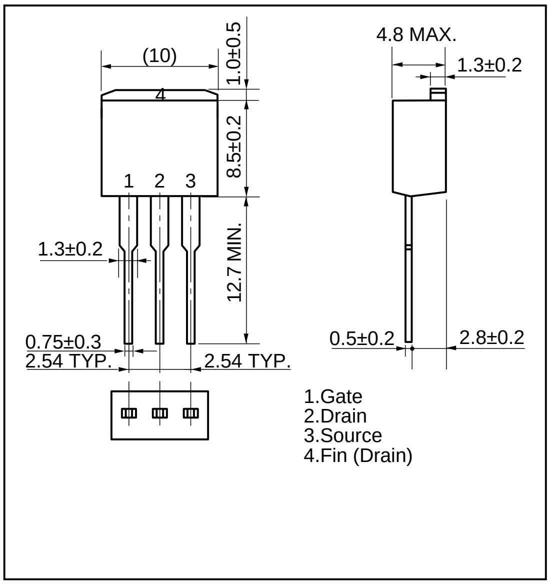


PACKAGE DRAWINGS (Unit : mm)

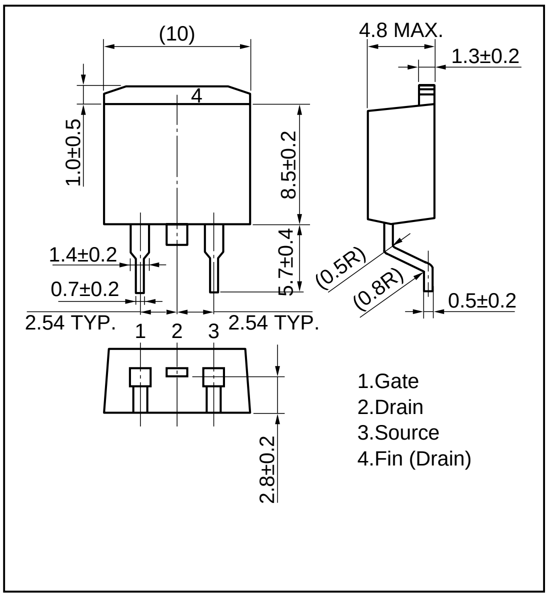
1)TO-220AB (MP-25)



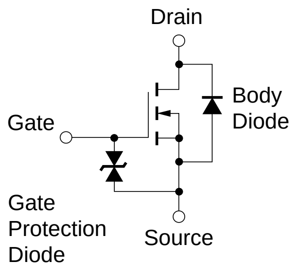
2)TO-262 (MP-25 Fin Cut)



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



EQUIVALENT CIRCUIT



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]