NEC

MOS FIELD EFFECT TRANSISTOR
2SJ601

SWITCHING
P-CHANNEL POWER MOS FET

DESCRIPTION

The 2SJ601 is P-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

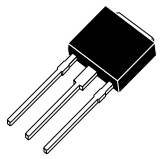
ORDERING INFORMATION

PART NUMBER	PACKAGE
2SJ601	TO-251
2SJ601-Z	TO-252

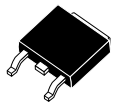
FEATURES

- Low on-state resistance:
  $R_{DS(on)1}$ = 31 mΩ MAX. (V_{GS} = –10 V, I_D = –18 A)
  $R_{DS(on)2}$ = 46 mΩ MAX. (V_{GS} = –4.0 V, I_D = –18 A)
- Low input capacitance:
  C_{iss} = 3300 pF TYP. (V_{DS} = –10 V, V_{GS} = 0 V)
- Built-in gate protection diode
- TO-251/TO-252 package

(TO-251)



(TO-252)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	–60	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	∓20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	∓36	A
Drain Current (pulse) **Note1**	$I_{D(pulse)}$	∓120	A
Total Power Dissipation (T_C = 25°C)	P_T	65	W
Total Power Dissipation (T_A = 25°C)	P_T	1.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current **Note2**	I_{AS}	–35	A
Single Avalanche Energy **Note2**	E_{AS}	123	mJ

Notes 1. PW ≤ 10 μs, Duty cycle ≤ 1%

2. Starting T_{ch} = 25°C, V_{DD} = –30 V, R_G = 25 Ω, V_{GS} = –20 → 0 V

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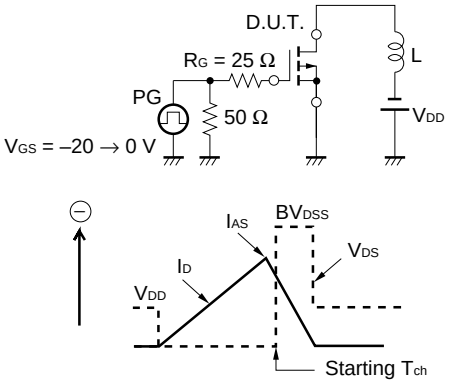
The mark ★ shows major revised points.

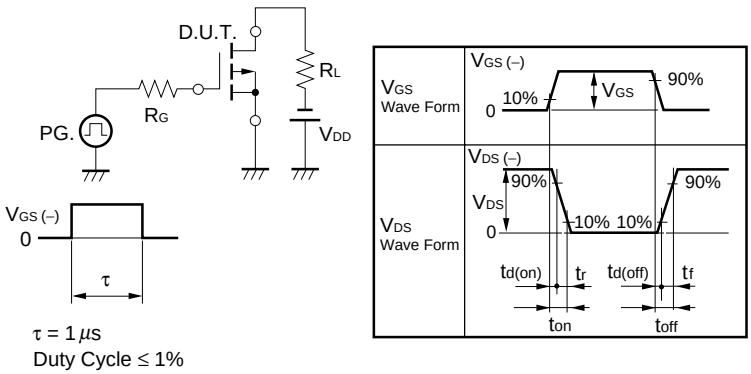
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

	CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
	Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –60 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	–1.5	–2.0	–2.5	V
	Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = –10 V, I_D = –18 A	15	30		S
	Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = –10 V, I_D = –18 A		25	31	mΩ
		$R_{DS(on)2}$	V_{GS} = –4.0 V, I_D = –18 A		32	46	mΩ
	Input Capacitance	C_{iss}	V_{DS} = –10 V		3300		pF
	Output Capacitance	C_{oss}	V_{GS} = 0 V		580		pF
	Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		230		pF
	Turn-on Delay Time	$t_{d(on)}$	I_D = –18 A		11		ns
	Rise Time	t_r	V_{GS} = –10 V		12		ns
	Turn-off Delay Time	$t_{d(off)}$	V_{DD} = –30 V		80		ns
	Fall Time	t_f	R_G = 0 Ω		53		ns
★	Total Gate Charge	Q_G	V_{DD} = –48 V		63		nC
★	Gate to Source Charge	Q_{GS}	V_{GS} = –10 V		10		nC
★	Gate to Drain Charge	Q_{GD}	I_D = –36 A		16		nC
	Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 36 A, V_{GS} = 0 V		1.0		V
	Reverse Recovery Time	t_{rr}	I_F = 36 A, V_{GS} = 0 V		52		ns
	Reverse Recovery Charge	Q_{rr}	di/dt = 100 A /μs		108		nC

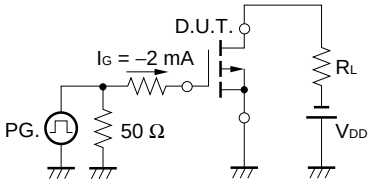
TEST CIRCUIT 1 AVALANCHE CAPABILITY



★ TEST CIRCUIT 2 SWITCHING TIME

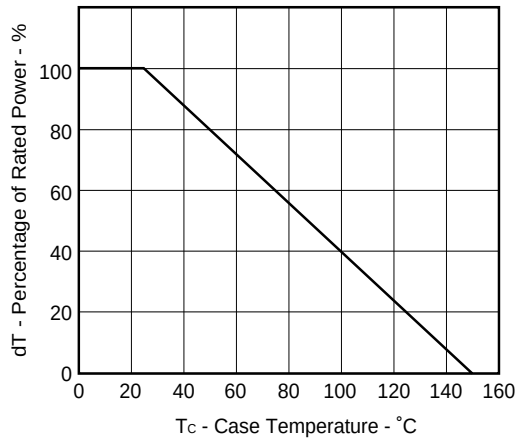


TEST CIRCUIT 3 GATE CHARGE

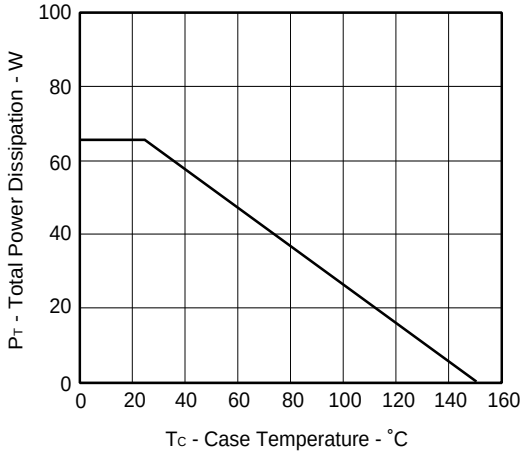


TYPICAL CHARACTERISTICS (T_A = 25°C)

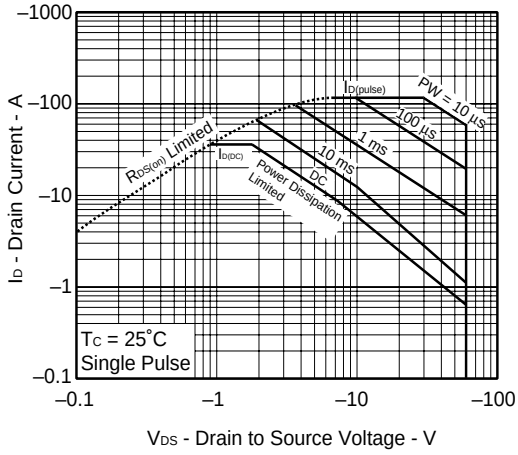
★ DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



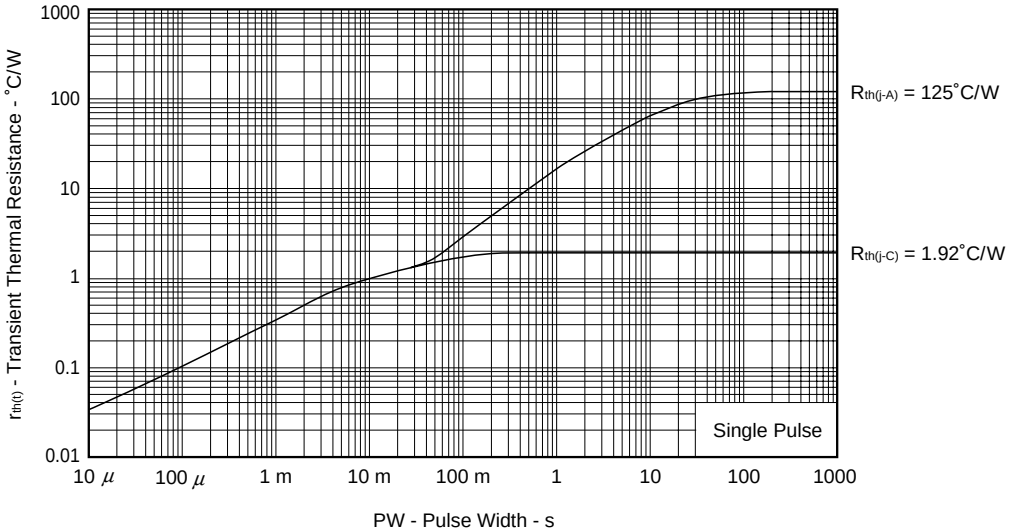
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



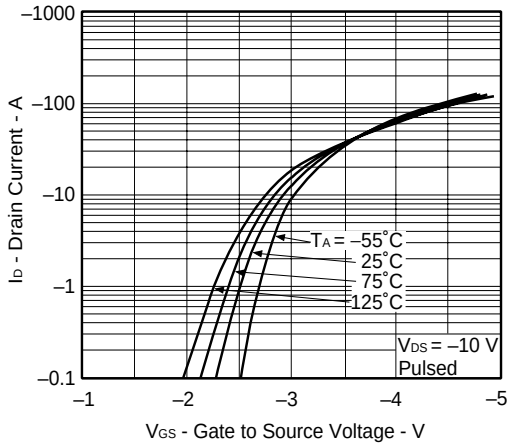
FORWARD BIAS SAFE OPERATING AREA



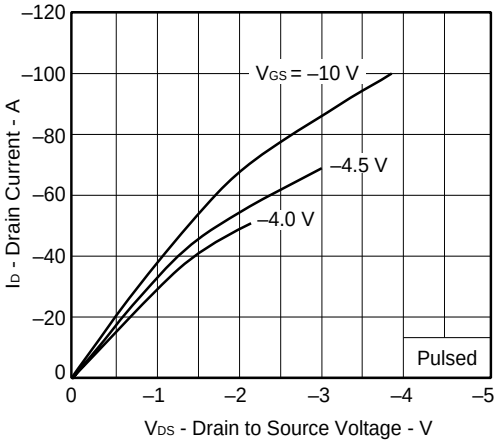
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



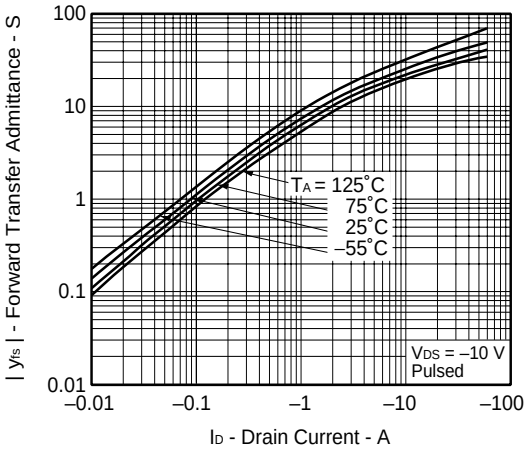
FORWARD TRANSFER CHARACTERISTICS



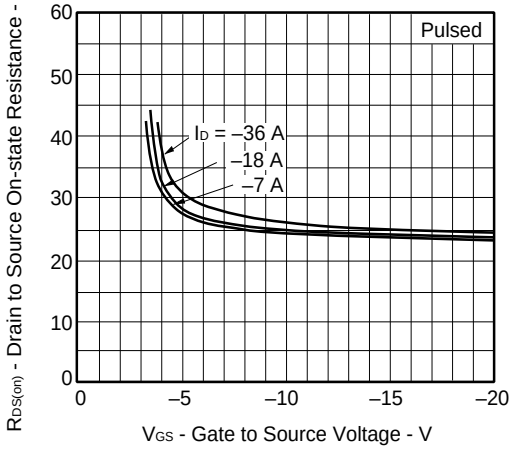
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



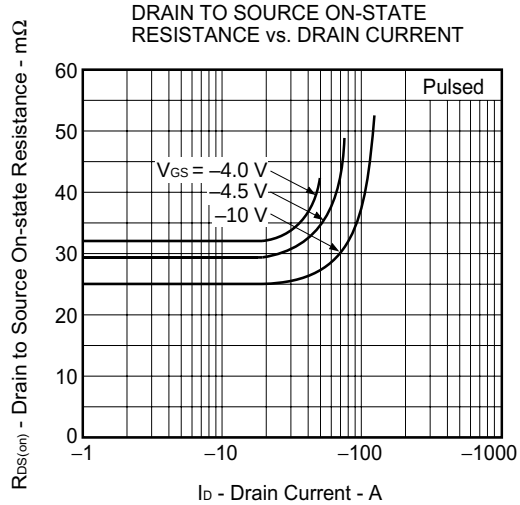
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



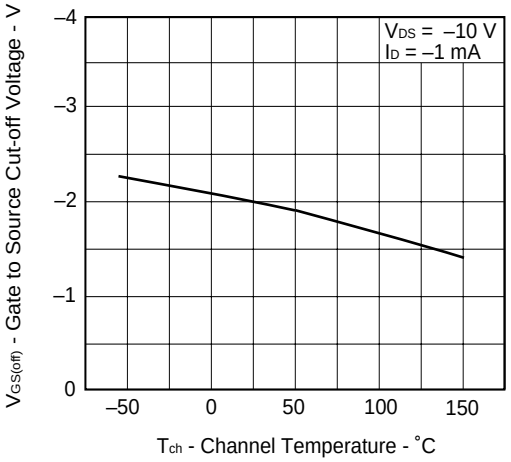
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



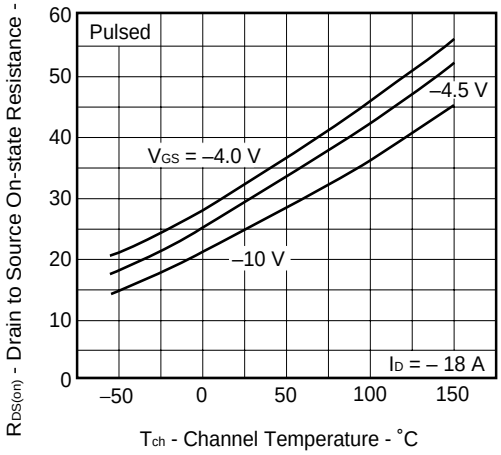
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



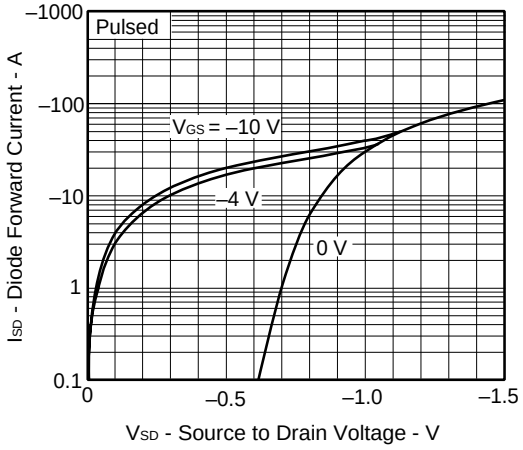
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



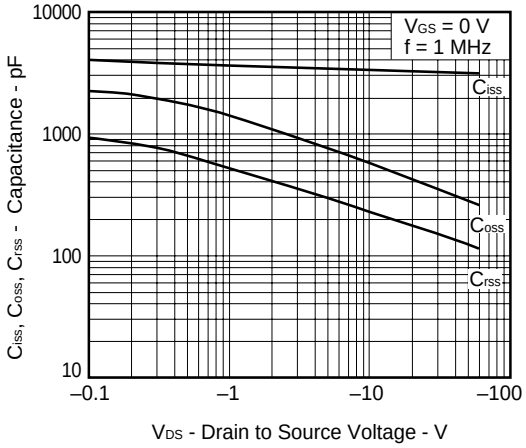
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



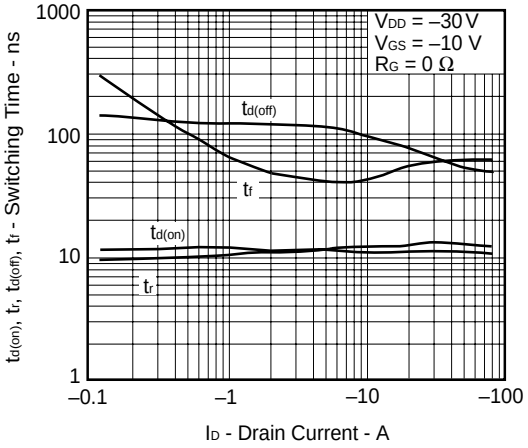
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



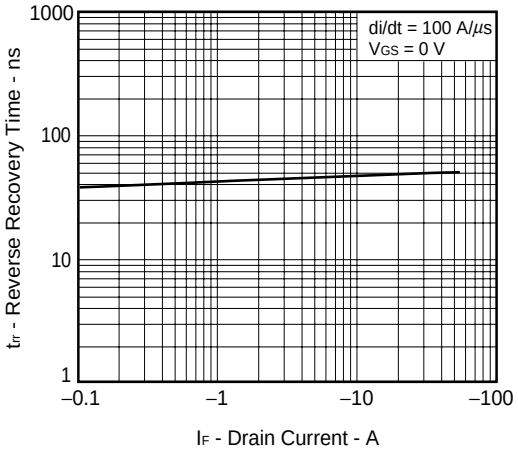
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



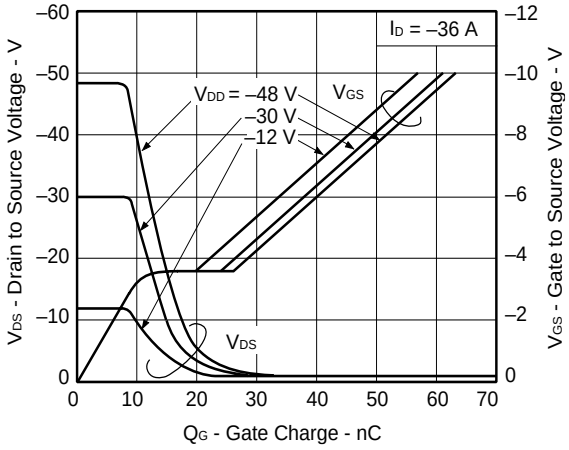
SWITCHING CHARACTERISTICS



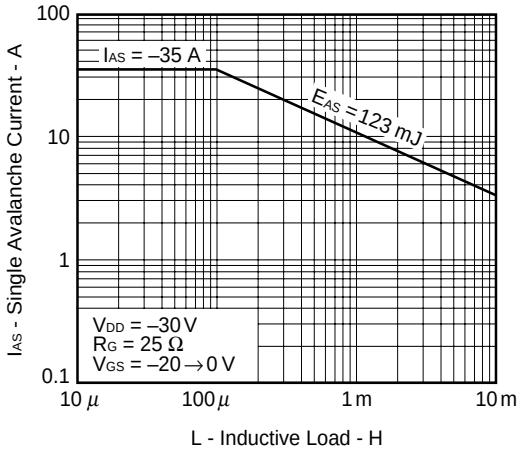
REVERSE RECOVERY TIME vs. DRAIN CURRENT



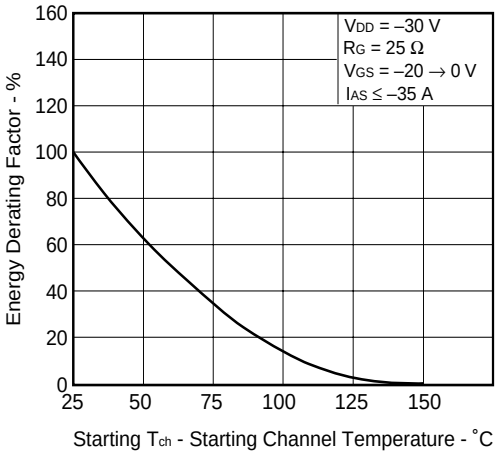
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



★ SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

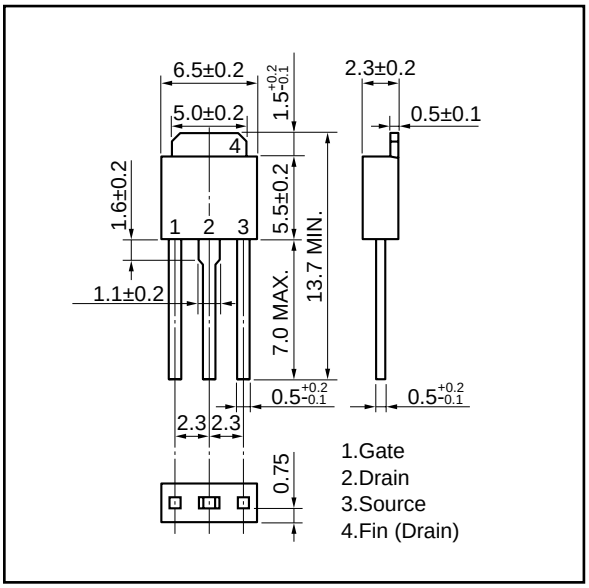


SINGLE AVALANCHE ENERGY DERATING FACTOR

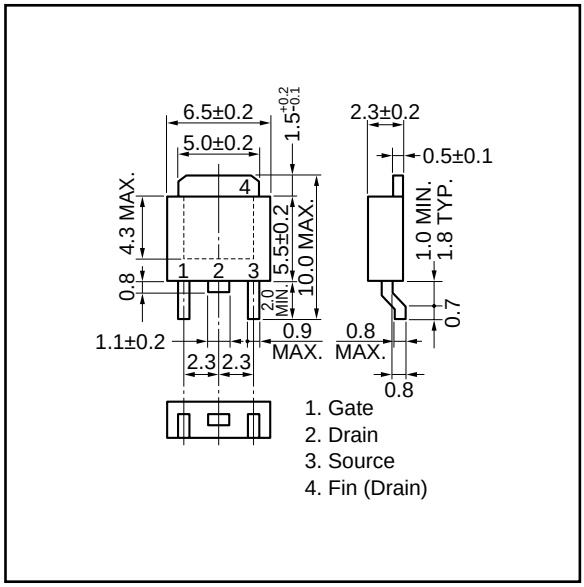


PACKAGE DRAWINGS (Unit: mm)

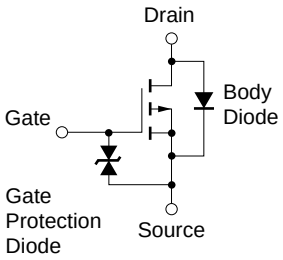
1) TO-251 (MP-3)



2) TO-252 (MP-3Z)



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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