

MOS FIELD EFFECT TRANSISTOR

2SK3712

SWITCHING

N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3712 is N-channel MOS FET device that features a low on-state resistance and excellent switching characteristics, and designed for high voltage applications such as DC/DC converter.

FEATURES

- High voltage: $V_{DS} = 250$ V
- Gate voltage rating: ± 30 V
- Low on-state resistance
 $R_{DS(on)} = 0.58 \Omega$ MAX. ($V_{GS} = 10$ V, $I_D = 4.5$ A)
- Low C_{iss} : $C_{iss} = 450$ pF TYP. ($V_{DS} = 10$ V, $I_D = 0$ A)
- Built-in gate protection diode
- TO-251/TO-252 package

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

Drain to Source Voltage ($V_{GS} = 0$ V)	V_{DS}	250	V
Gate to Source Voltage ($V_{DS} = 0$ V)	V_{GSS}	± 30	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 9.0	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 27	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	40	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.0	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to $+150$	$^\circ\text{C}$
Single Avalanche Current ^{Note2}	I_{AS}	9	A
Single Avalanche Energy ^{Note2}	E_{AS}	8.1	mJ
Repetitive Avalanche Current ^{Note3}	I_{AR}	9	A
Repetitive Pulse Avalanche Energy ^{Note3}	E_{AR}	8.1	mJ

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

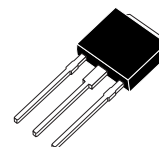
2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 125$ V, $R_G = 25 \Omega$, $V_{GS} = 20 \rightarrow 0$ V, $L = 100 \mu\text{H}$

3. $T_{ch(peak)} \leq 150^\circ\text{C}$, $L = 100 \mu\text{H}$

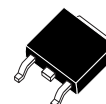
★ ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3712	TO-251 (MP-3)
2SK3712-Z	TO-252 (MP-3Z)

(TO-251)



(TO-252)



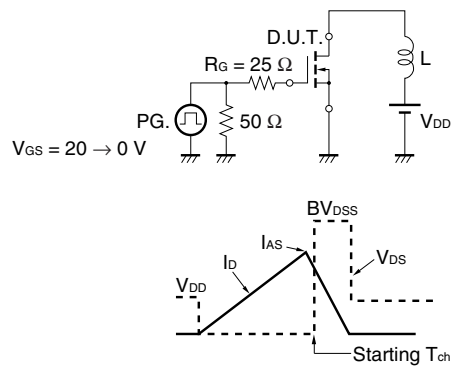
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

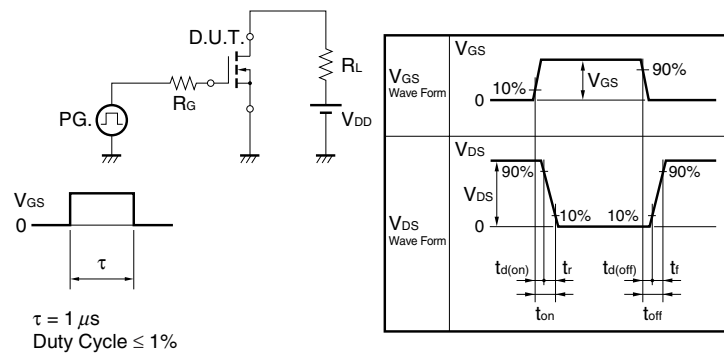
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 250 V, V _{GS} = 0 V			10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±30 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	2.5	3.5	4.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10 V, I _D = 4.5 A	3	6		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)}	V _{GS} = 10 V, I _D = 4.5 A		0.45	0.58	Ω
Input Capacitance	C _{iss}	V _{DS} = 10 V		450		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		100		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		40		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 125 V, I _D = 4.5 A		8		ns
Rise Time	t _r	V _{GS} = 10 V		8		ns
Turn-off Delay Time	t _{d(off)}	R _G = 0 Ω		21		ns
Fall Time	t _f			6		ns
Total Gate Charge	Q _G	V _{DD} = 200 V		14		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V		3		nC
Gate to Drain Charge	Q _{GD}	I _D = 9.0 A		7		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 9 A, V _{GS} = 0 V		0.9	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 9 A, V _{GS} = 0 V		150		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		630		nC

Note Pulsed

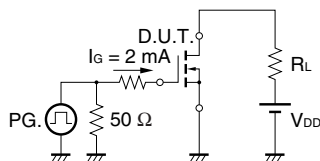
TEST CIRCUIT 1 AVALANCHE CAPABILITY



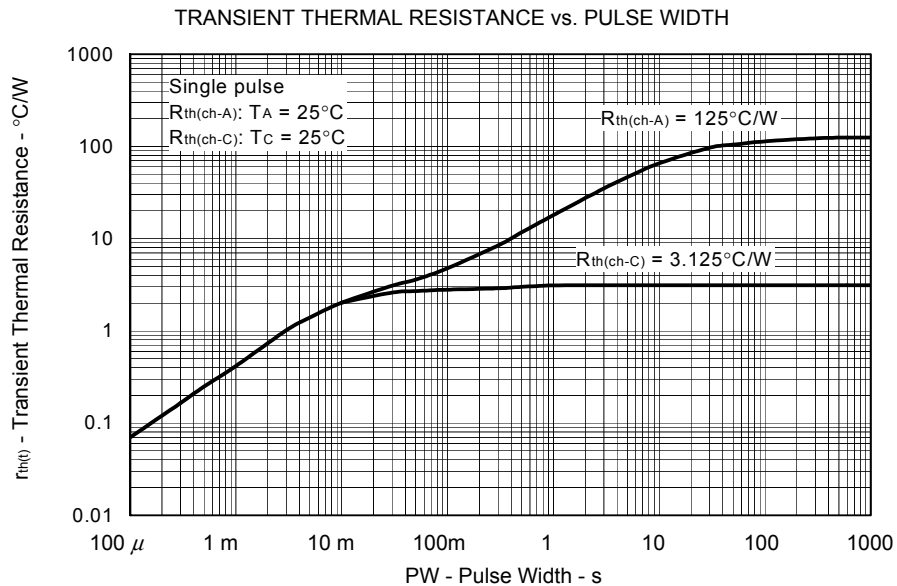
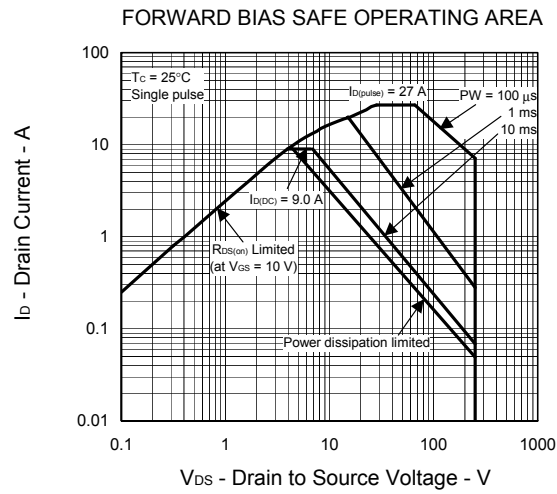
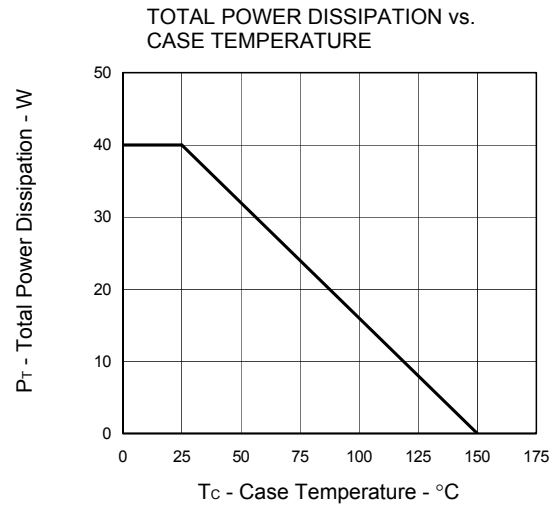
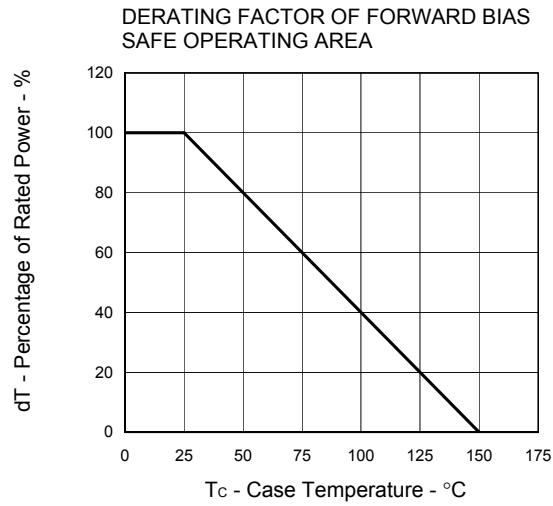
TEST CIRCUIT 2 SWITCHING TIME



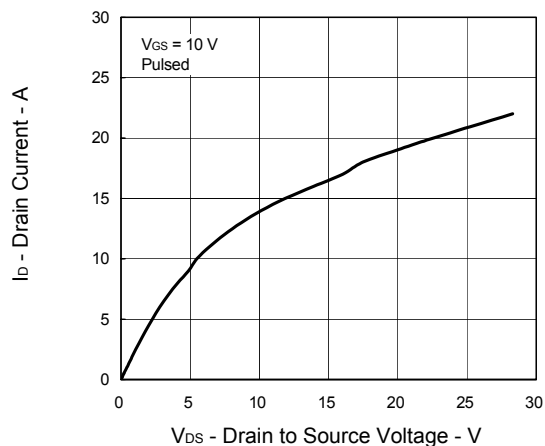
TEST CIRCUIT 3 GATE CHARGE



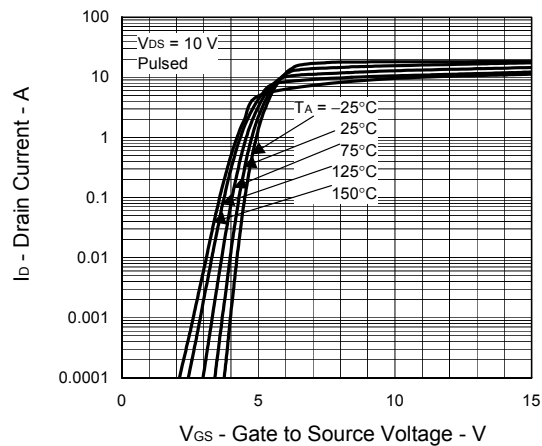
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



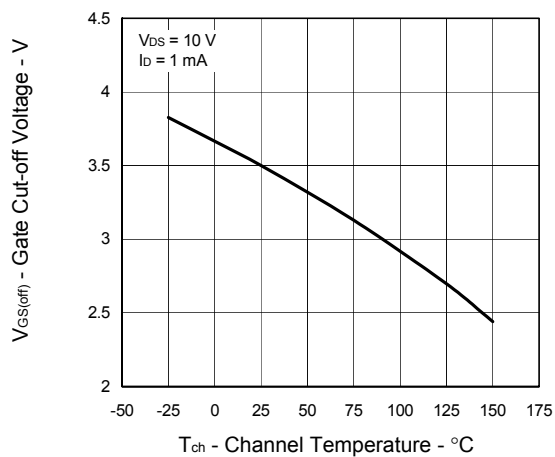
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



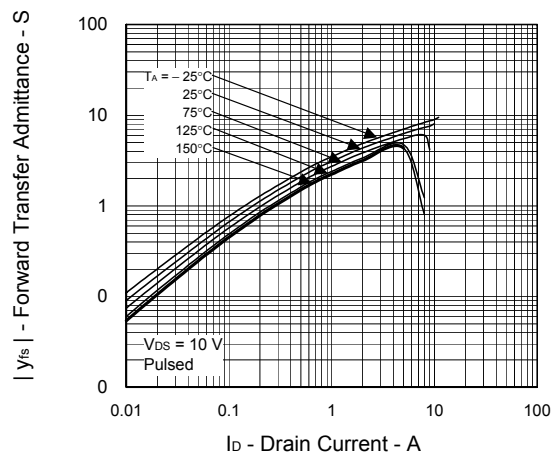
FORWARD TRANSFER CHARACTERISTICS



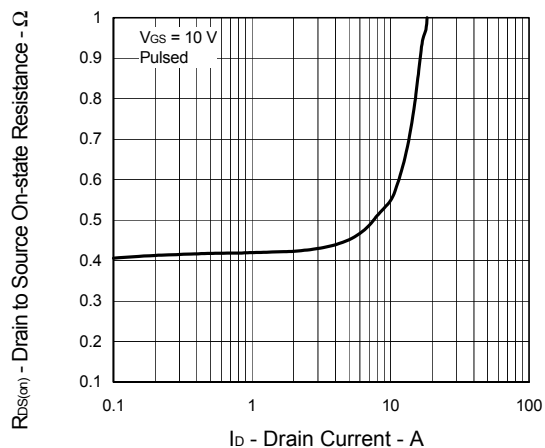
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



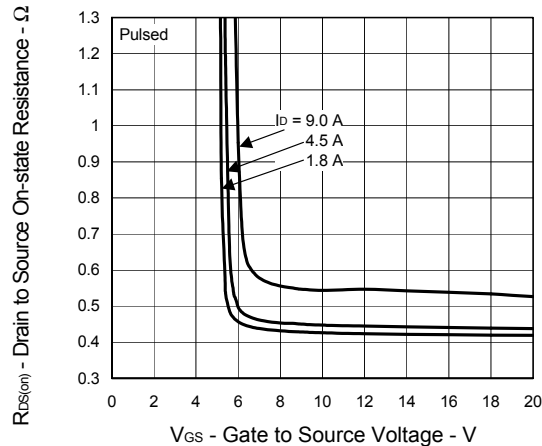
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



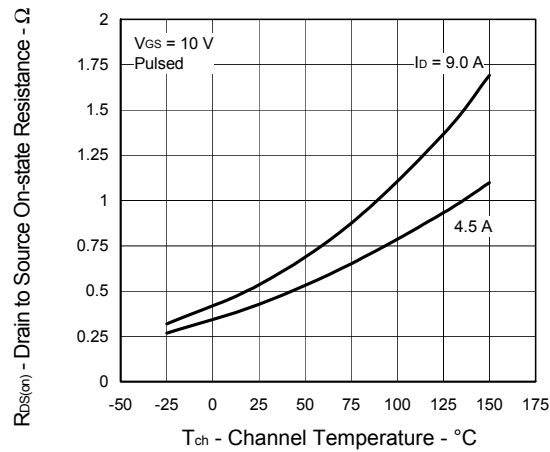
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



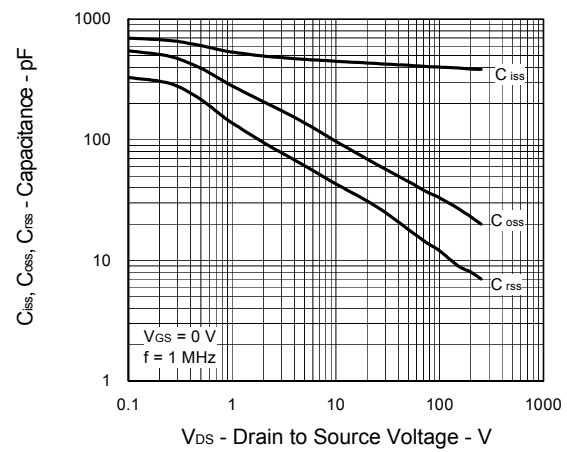
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



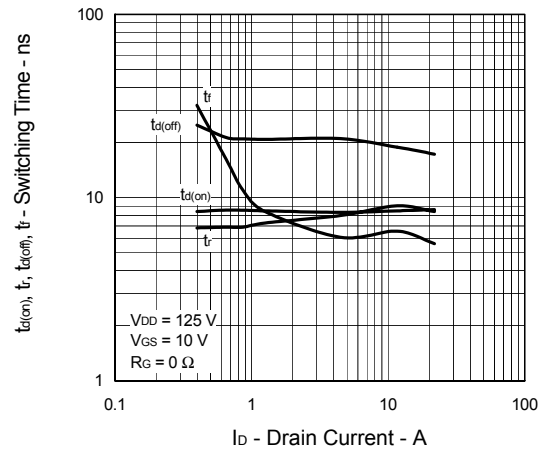
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



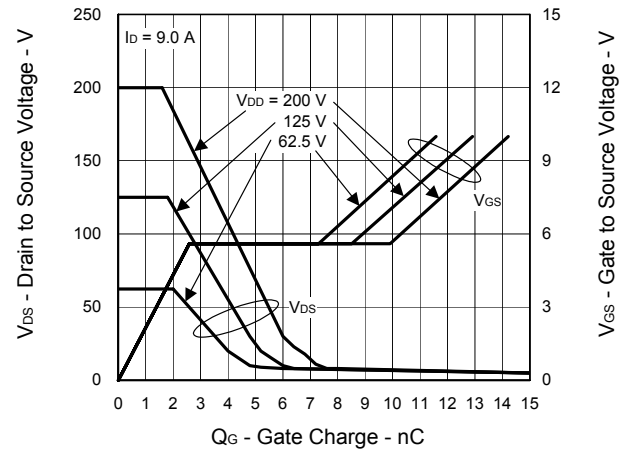
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



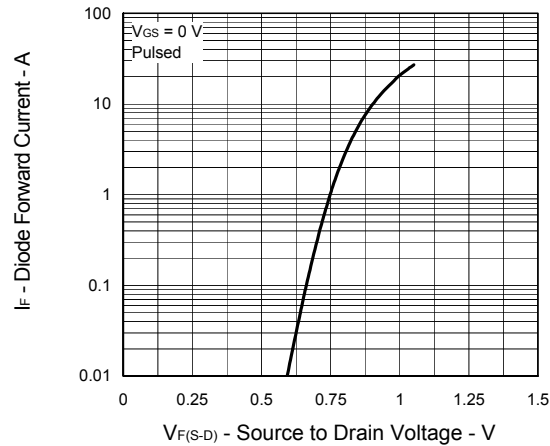
SWITCHING CHARACTERISTICS



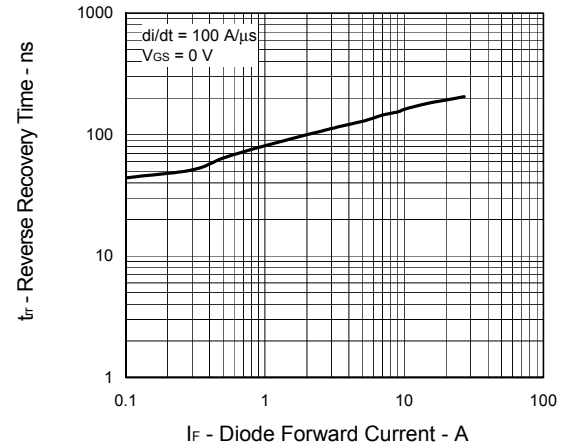
DYNAMIC INPUT/OUTPUT CHARACTERISTICS

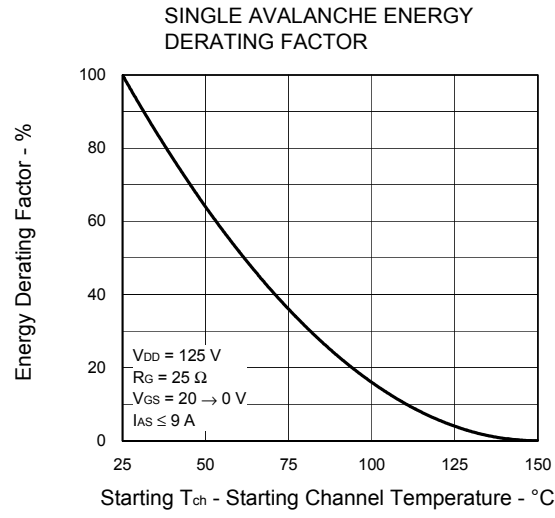
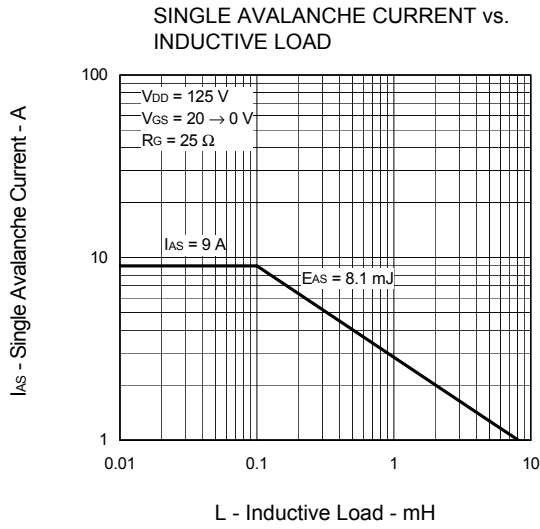


SOURCE TO DRAIN DIODE FORWARD VOLTAGE



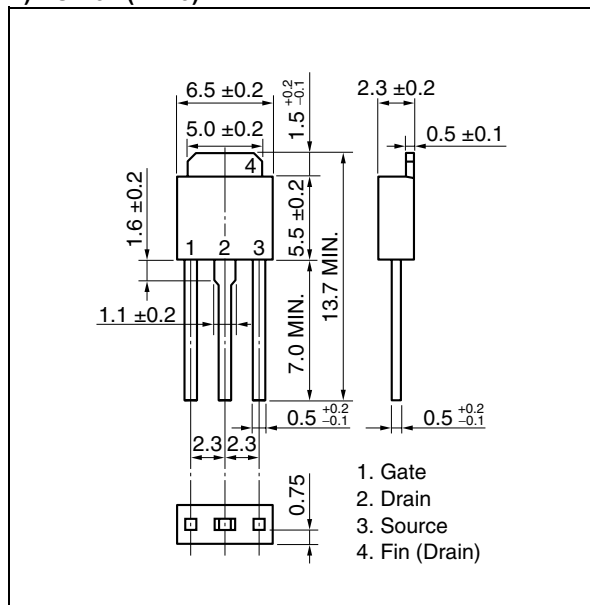
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



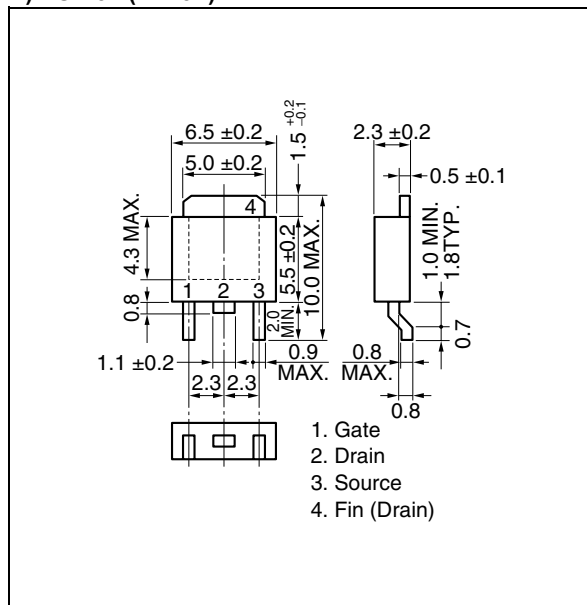


★ PACKAGE DRAWINGS (Unit: mm)

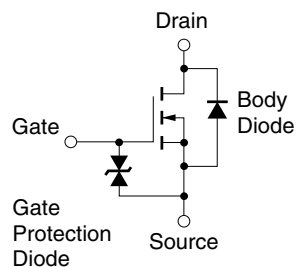
1) TO-251 (MP-3)



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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