

## MOS FIELD EFFECT TRANSISTOR

# 2SK3635

### SWITCHING

### N-CHANNEL POWER MOS FET

#### DESCRIPTION

The 2SK3635 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:  $V_{DSS} = 200\text{ V}$
- Gate voltage rating:  $\pm 30\text{ V}$
- Low on-state resistance  
 $R_{DS(on)} = 0.43\ \Omega\ \text{MAX.}$  ( $V_{GS} = 10\text{ V}$ ,  $I_D = 4.0\text{ A}$ )
- Low  $C_{iss}$ :  $C_{iss} = 390\text{ pF TYP.}$
- Built-in gate protection diode
- TO-251/TO-252 package
- Avalanche capability rated

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

Drain to Source Voltage ( $V_{GS} = 0\text{ V}$ )	$V_{DSS}$	200	V
Gate to Source Voltage ( $V_{DS} = 0\text{ V}$ )	$V_{GSS}$	$\pm 30$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 8.0$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 24$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	24	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 <sup>Note2</sup>	$I_{AS}$	8	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	6.4	mJ
Repetitive Avalanche Current <sup>Note3</sup>	$I_{AR}$	8	A
Repetitive Avalanche Energy <sup>Note3</sup>	$E_{AR}$	2.4	mJ

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

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

**3.**  $T_{ch} \leq 125^\circ\text{C}$ ,  $R_G = 25\ \Omega$ ,  $V_{DD} = 100\text{ V}$

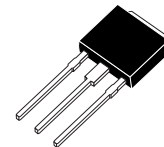
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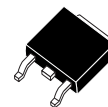
#### ★ ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3635	TO-251 (MP-3)
2SK3635-Z	TO-252 (MP-3Z)

(TO-251)



(TO-252)

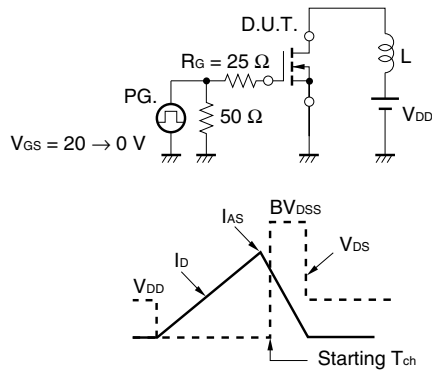


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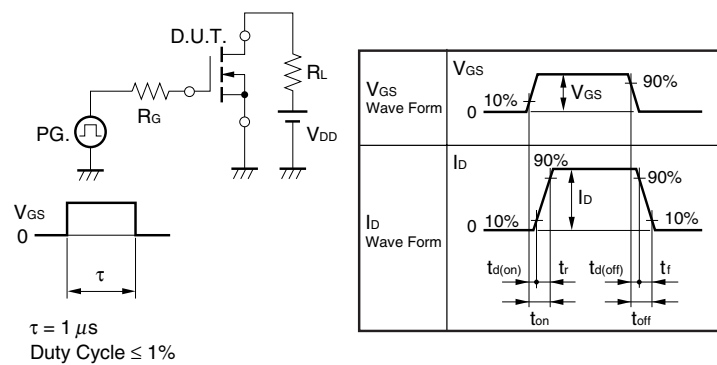
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V			10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V			±10	μA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.5	3.5	4.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.0 A	3	5		S
Drain to Source On-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.0 A		0.34	0.43	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		390		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		95		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		45		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 100 V, I <sub>D</sub> = 4.0 A		5		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		7		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 0 Ω		19		ns
Fall Time	t <sub>f</sub>			6		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 160 V		12		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		2		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 8.0 A		6		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 8 A, V <sub>GS</sub> = 0 V		1.0		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8 A, V <sub>GS</sub> = 0 V		110		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		360		nC

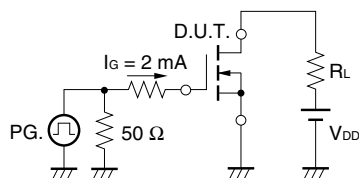
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

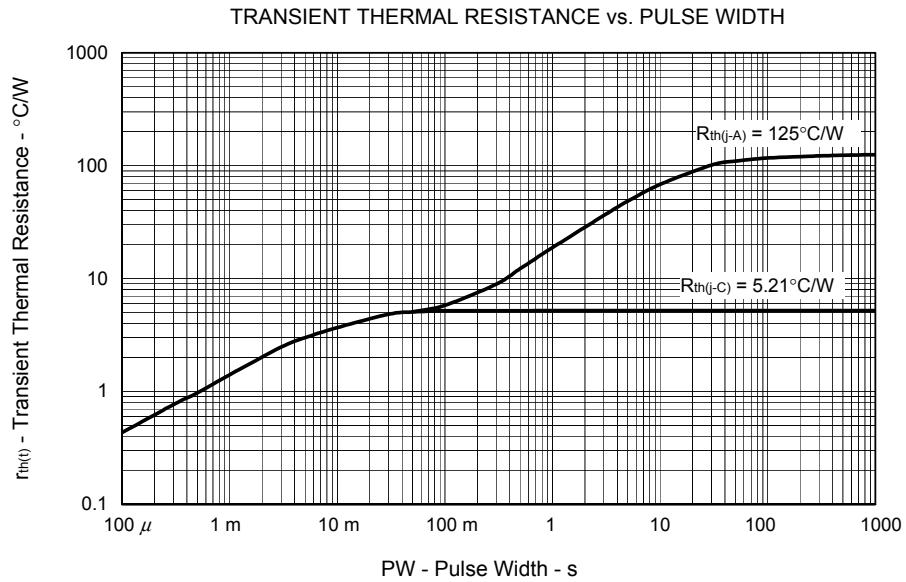
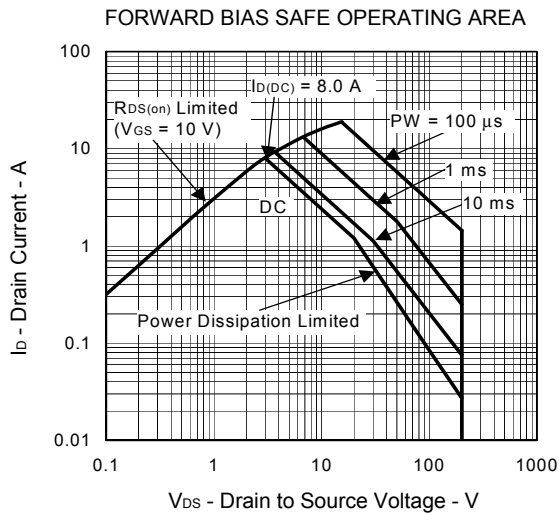
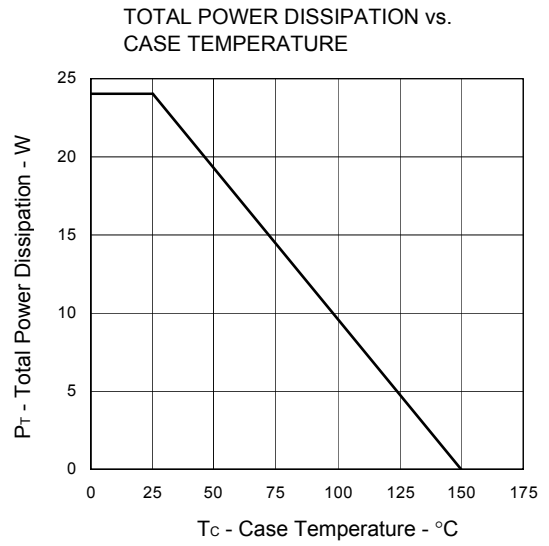
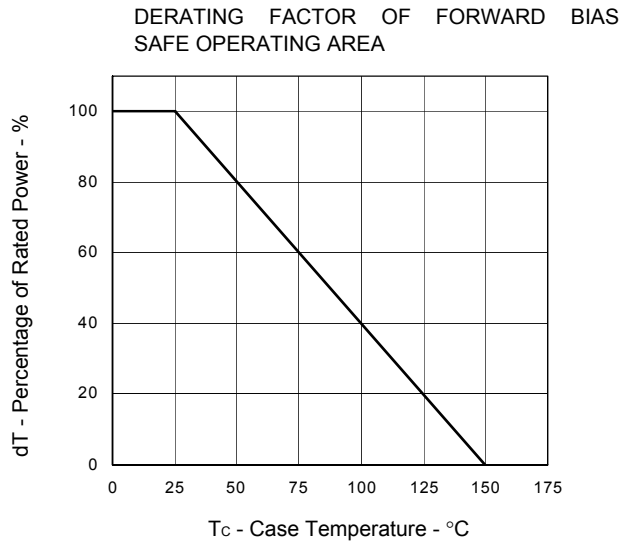


TEST CIRCUIT 3 GATE CHARGE

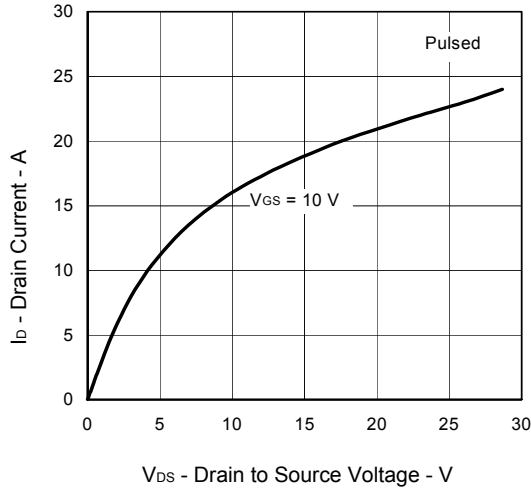


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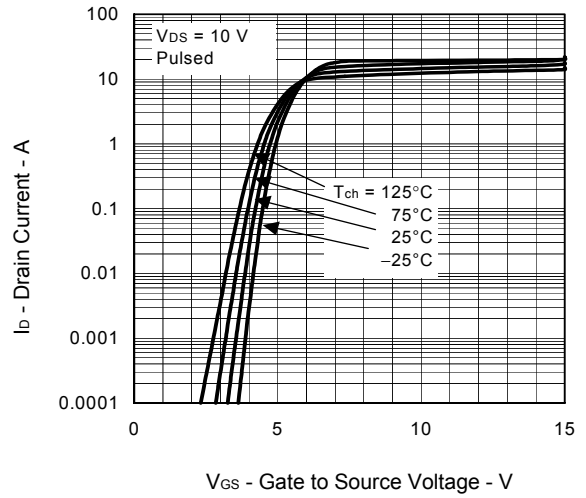
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



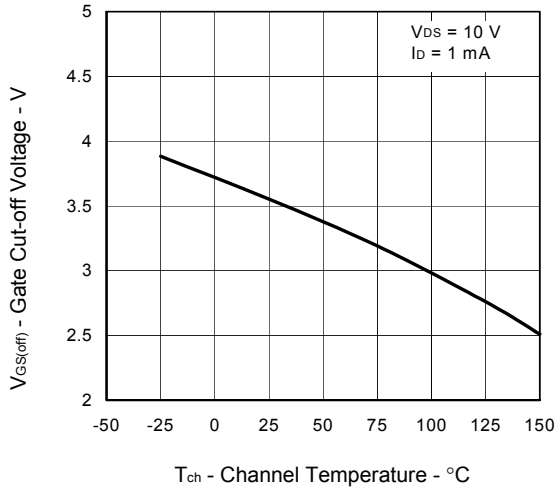
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 DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



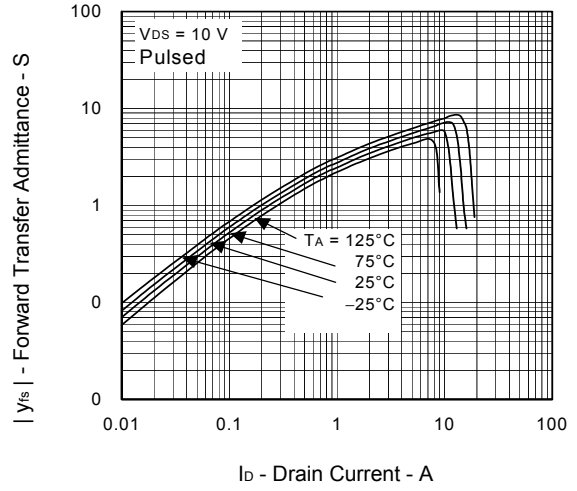
FORWARD TRANSFER CHARACTERISTICS



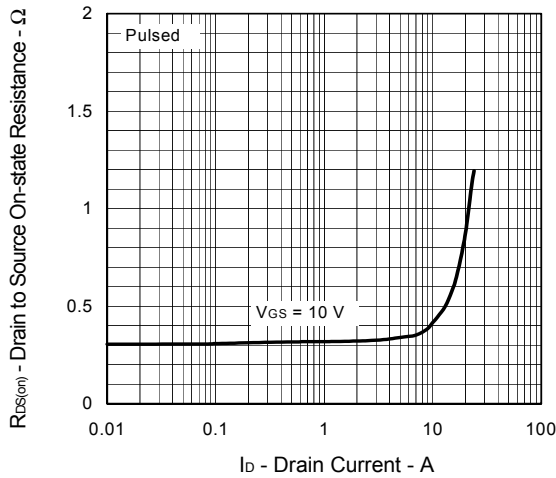
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



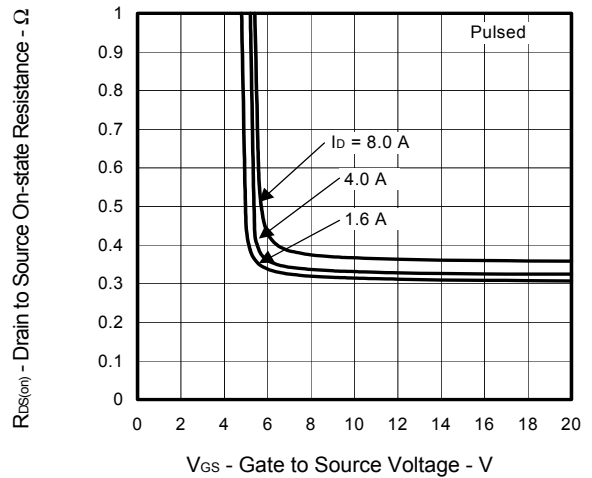
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



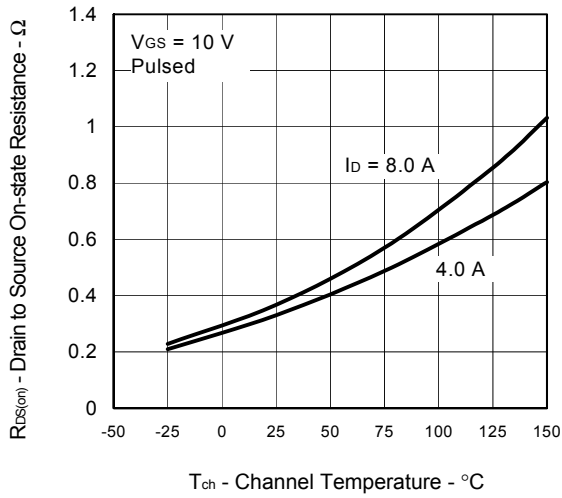
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



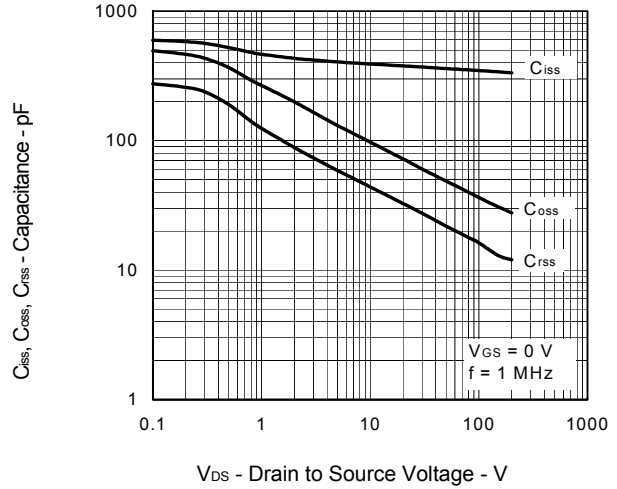
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



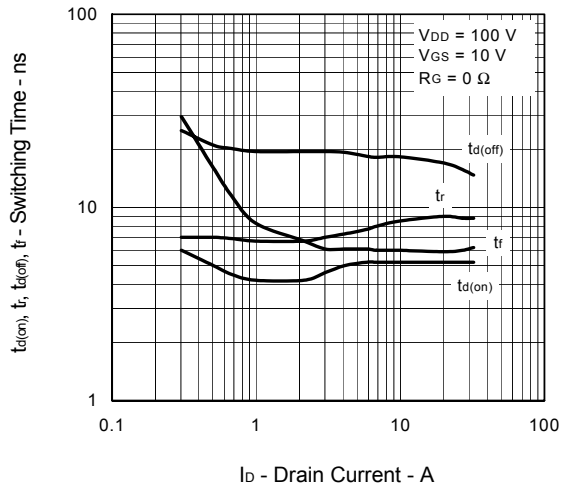
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 PULSE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



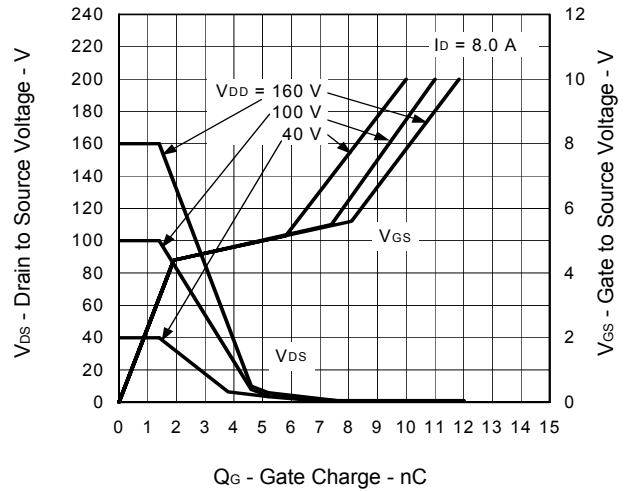
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



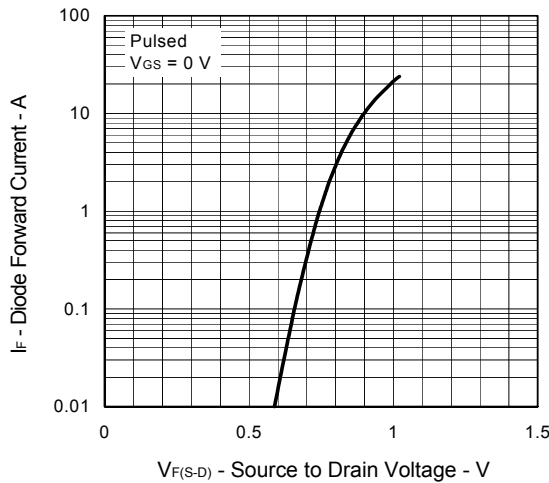
SWITCHING CHARACTERISTICS



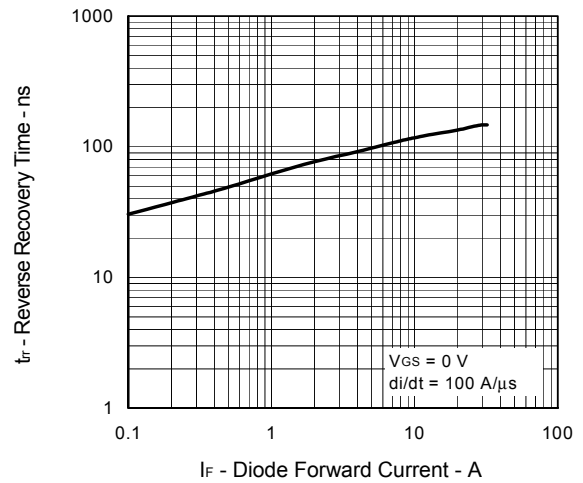
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



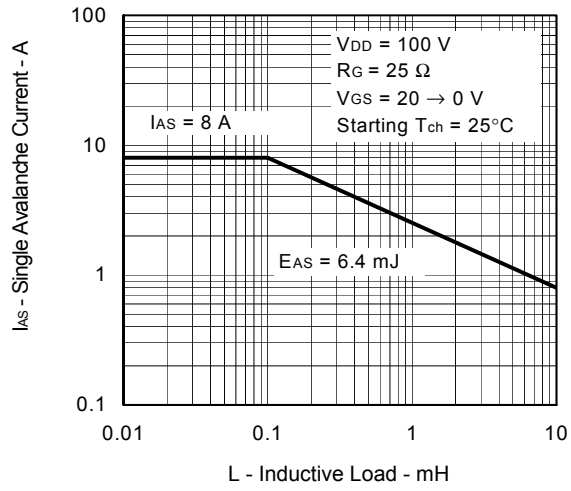
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



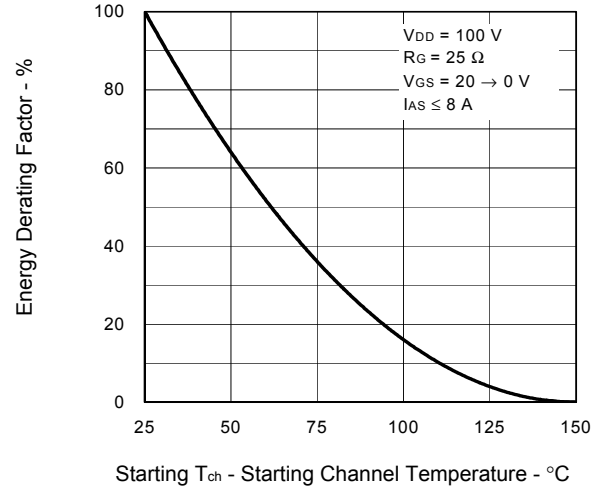
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



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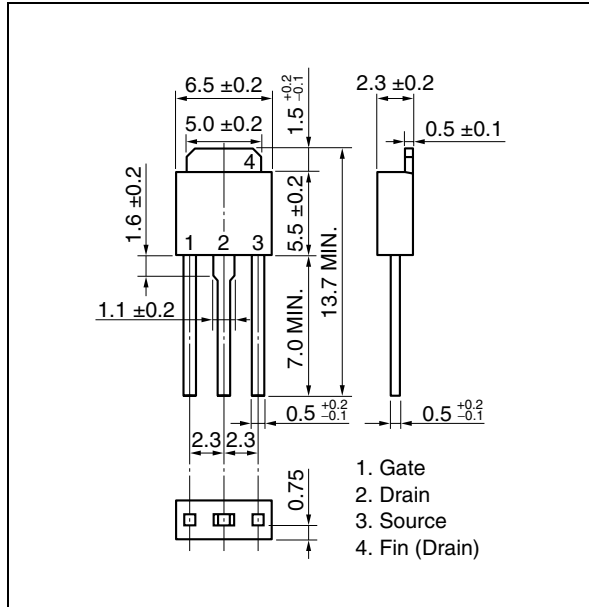


SINGLE AVALANCHE ENERGY DERATING FACTOR

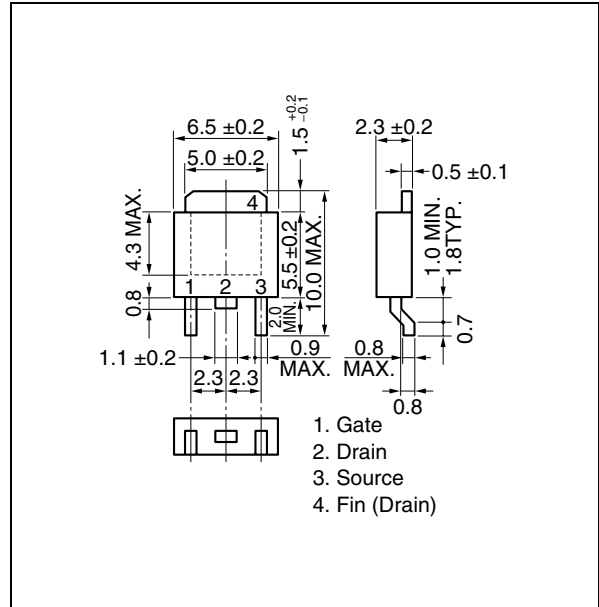


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**PACKAGE DRAWINGS (Unit: mm)**

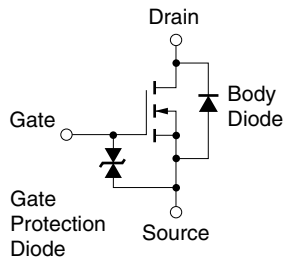
1) TO-251 (MP-3)



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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