

To our customers,

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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SWITCHING

N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3812 is N-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3812-ZP	TO-263 (MP-25ZP)

FEATURES

- Super low on-state resistance

$R_{DS(on)1} = 2.8 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 55 \text{ A)}$

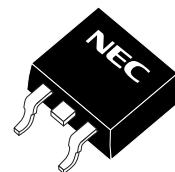
$R_{DS(on)2} = 3.7 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 55 \text{ A)}$

- High current rating: $I_{D(DC)} = \pm 110 \text{ A}$

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

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	60	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 110	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 440	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	213	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Single Avalanche Energy ^{Note2}	E_{AS}	397	mJ
Repetitive Avalanche Current ^{Note3}	I_{AR}	63	A
Repetitive Avalanche Energy ^{Note3}	E_{AR}	397	mJ

(TO-263)



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

2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 30 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20 \rightarrow 0 \text{ V}$, $L = 100 \mu\text{H}$

3. $T_{ch(peak)} \leq 150^\circ\text{C}$, $R_G = 25 \Omega$

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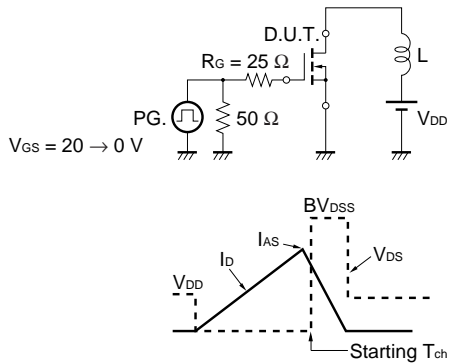
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

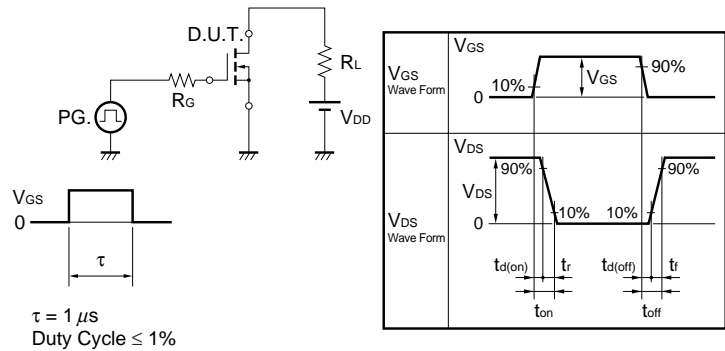
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±100	nA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10 V, I _D = 55 A	50	110		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 10 V, I _D = 55 A		2.3	2.8	mΩ
	R _{DS(on)2}	V _{GS} = 4.5 V, I _D = 55 A		2.6	3.7	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		16800		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		1600		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		1000		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 30 V, I _D = 55 A		42		ns
Rise Time	t _r	V _{GS} = 10 V		160		ns
Turn-off Delay Time	t _{d(off)}	R _G = 0 Ω		140		ns
Fall Time	t _f			15		ns
Total Gate Charge	Q _G	V _{DD} = 48 V		250		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V		41		nC
Gate to Drain Charge	Q _{GD}	I _D = 110 A		66		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 110 A, V _{GS} = 0 V		0.87	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 110 A, V _{GS} = 0 V		53		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		74		nC

Note Pulsed

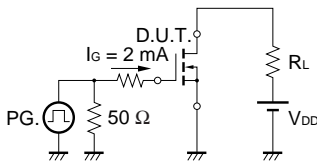
TEST CIRCUIT 1 AVALANCHE CAPABILITY



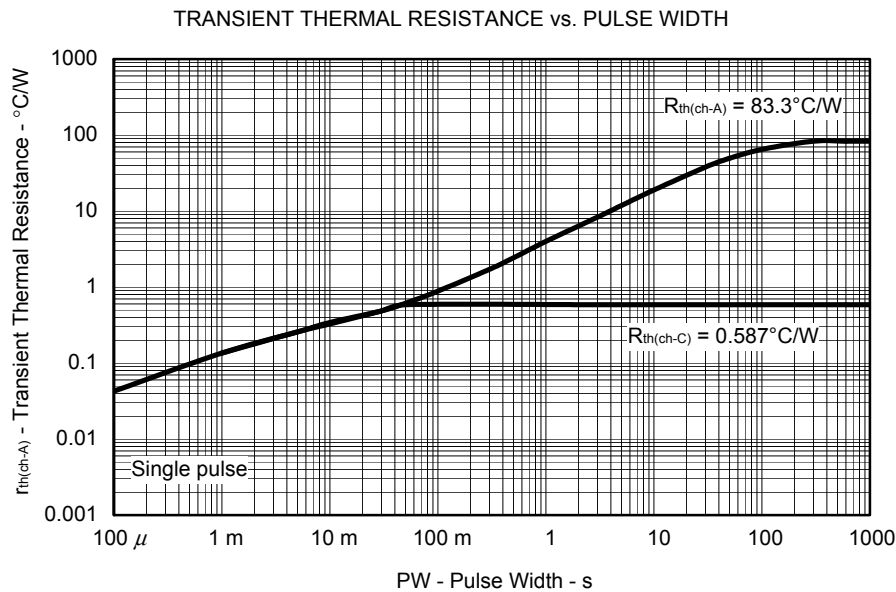
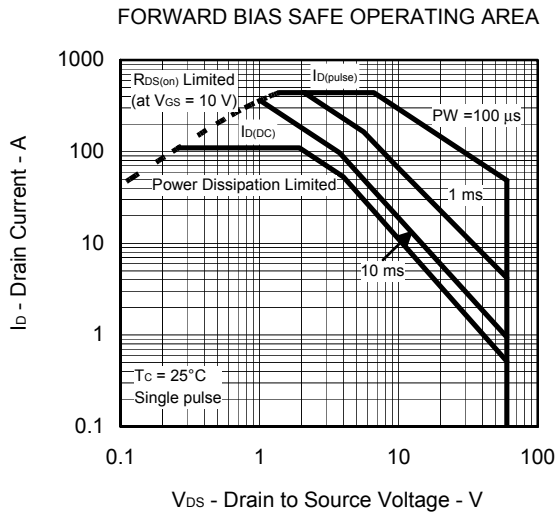
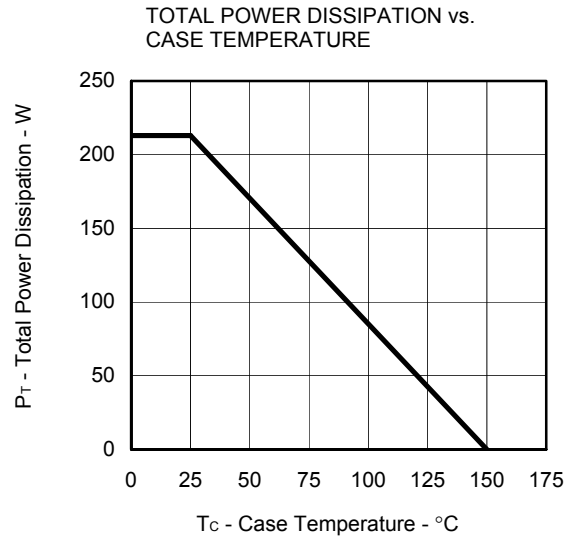
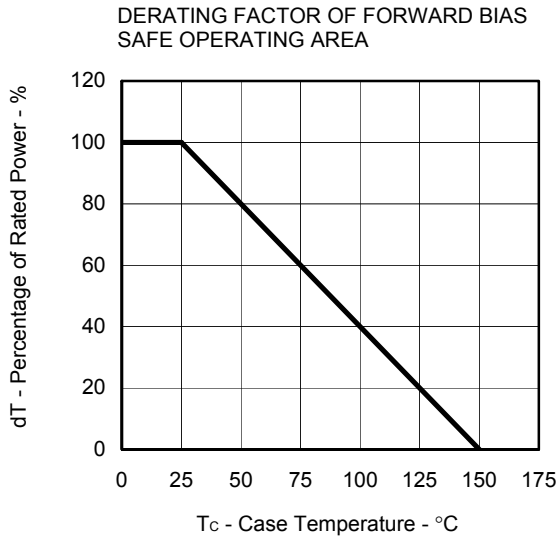
TEST CIRCUIT 2 SWITCHING TIME



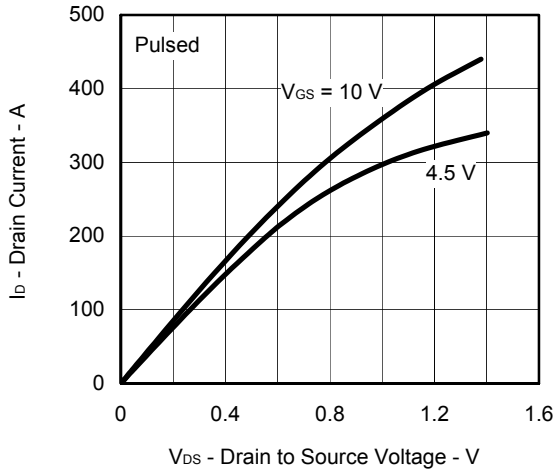
TEST CIRCUIT 3 GATE CHARGE



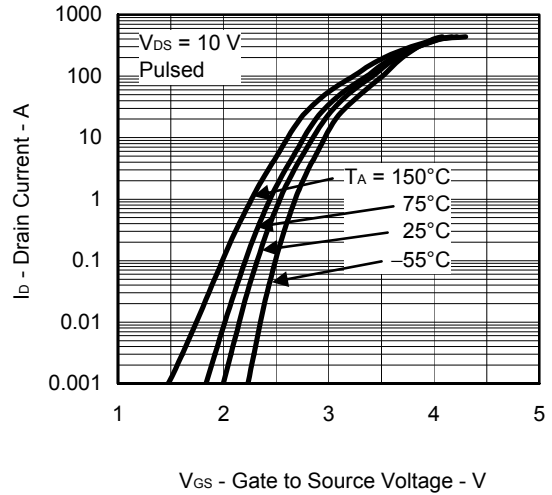
TYPICAL CHARACTERISTICS (T_A = 25°C)



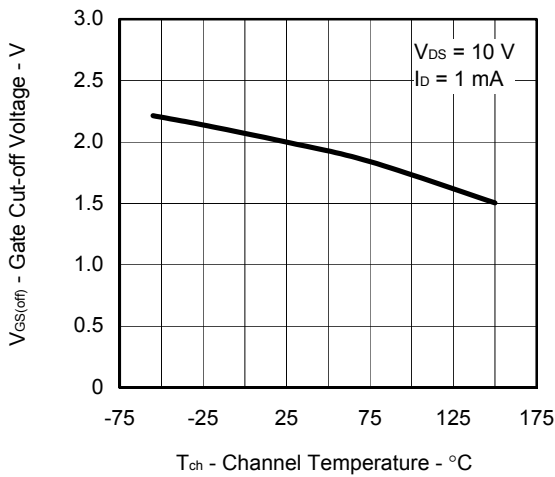
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



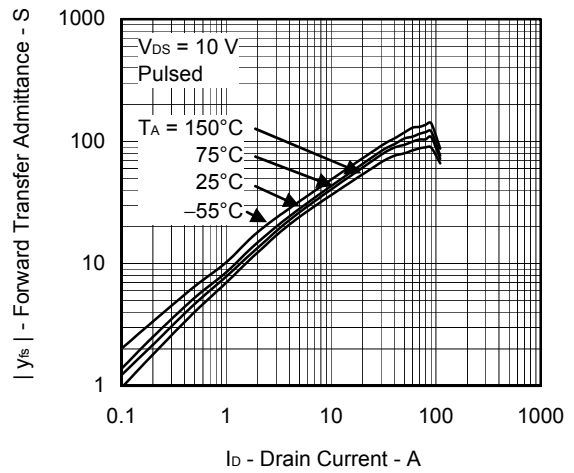
FORWARD TRANSFER CHARACTERISTICS



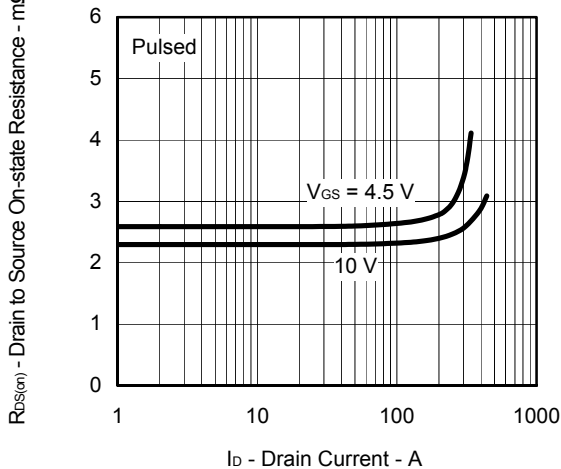
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



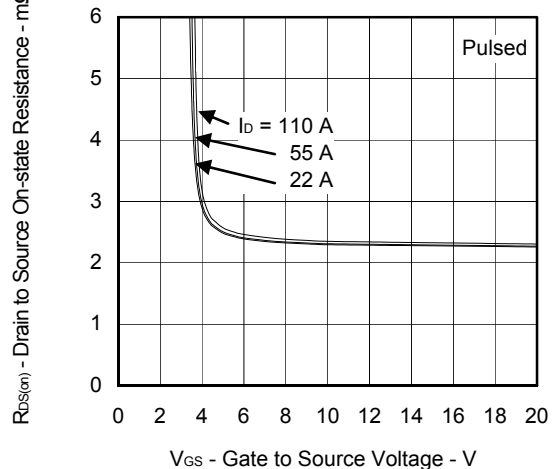
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



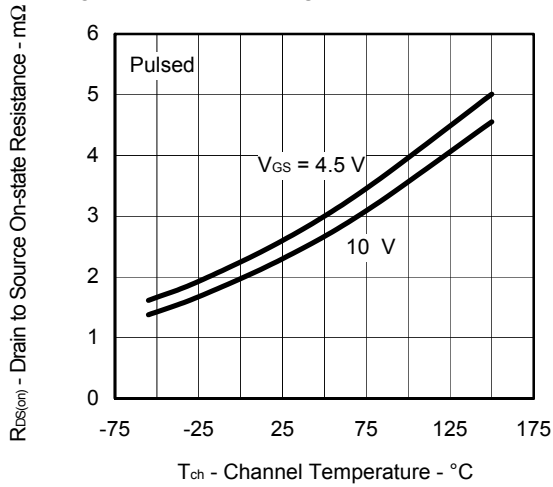
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



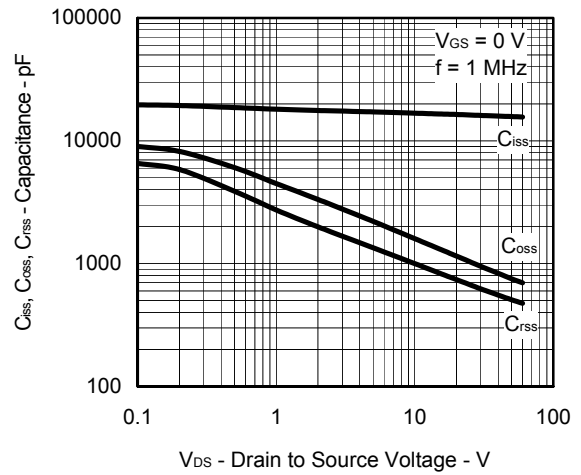
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



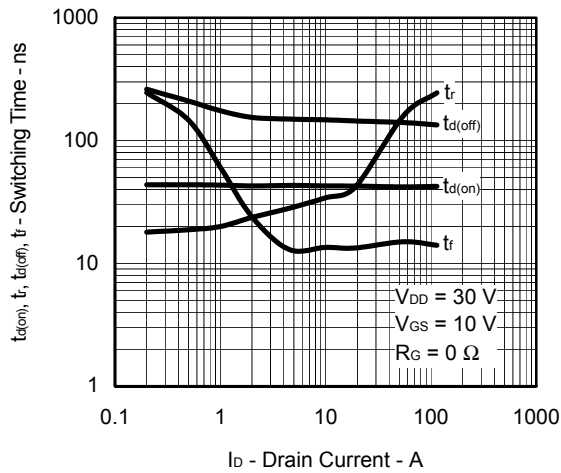
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



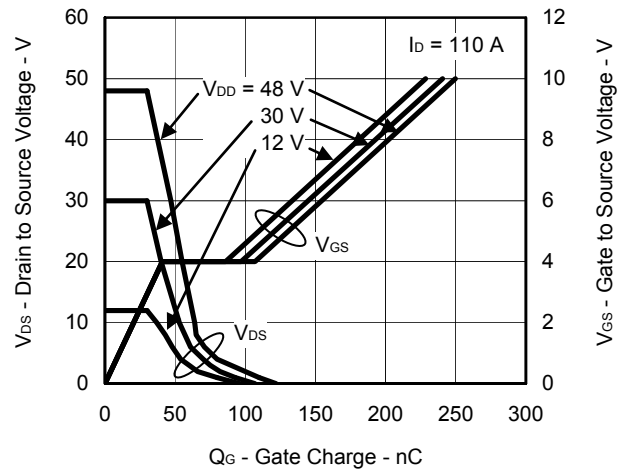
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



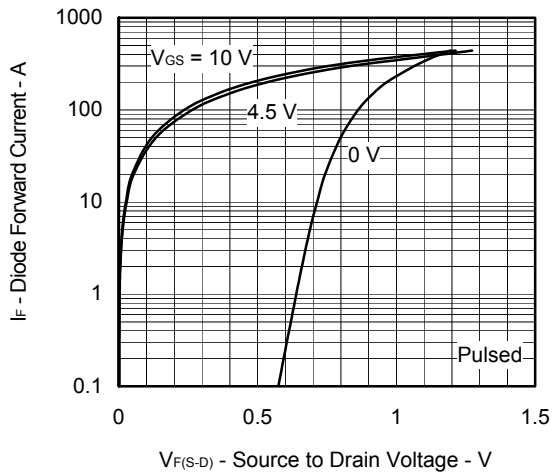
SWITCHING CHARACTERISTICS



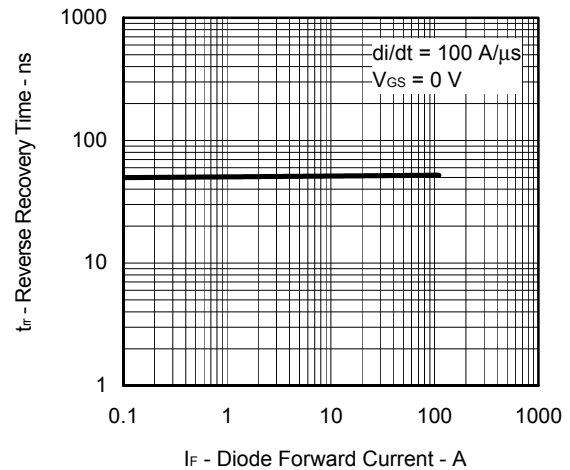
DYNAMIC INPUT/OUTPUT CHARACTERISTICS

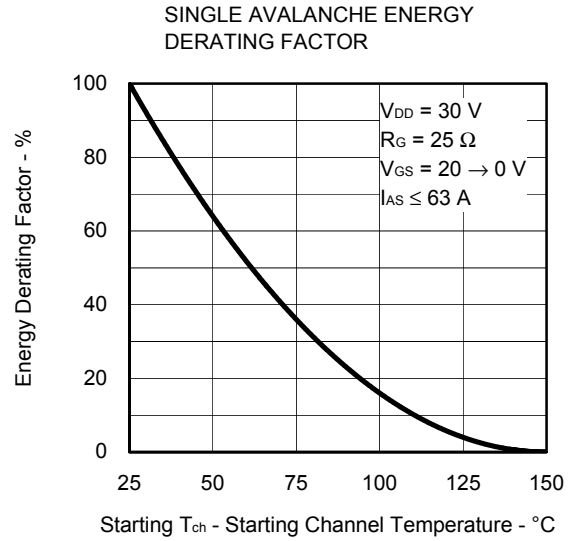
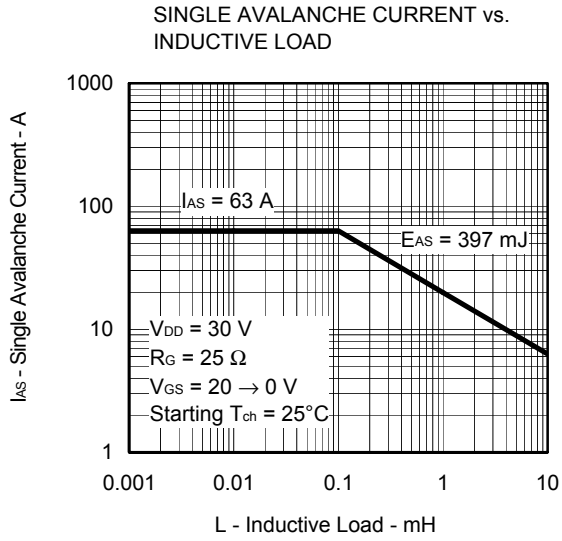


SOURCE TO DRAIN DIODE FORWARD VOLTAGE



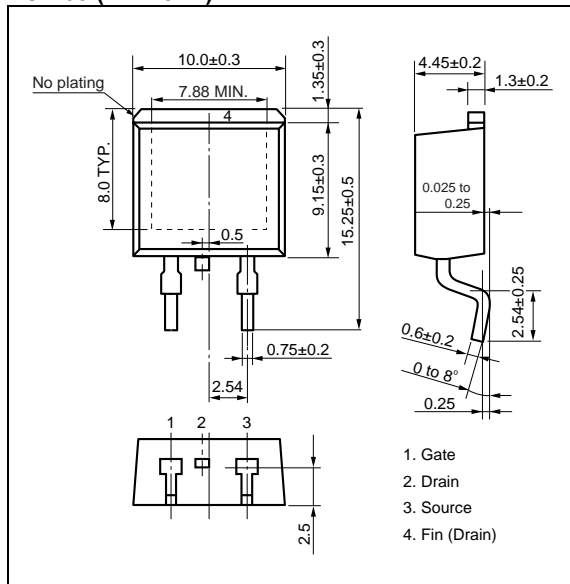
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



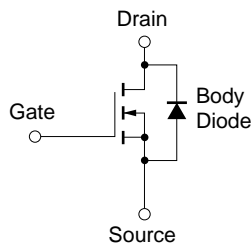


PACKAGE DRAWING (Unit: mm)

TO-263 (MP-25ZP)



EQUIVALENT CIRCUIT



Remark Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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