

MOS FIELD EFFECT TRANSISTORS 2SK2359/2SK2360

SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

DESCRIPTION

The 2SK2359, 2SK2359-Z/2SK2360, 2SK2360-Z is N-Channel MOS Field Effect Transistor designed for high voltage switching applications.

FEATURES

- Low On-Resistance
2SK2359: $R_{DS(on)} = 0.9 \Omega$ ($V_{GS} = 10 \text{ V}$, $I_D = 4.0 \text{ A}$)
2SK2360: $R_{DS(on)} = 1.0 \Omega$ ($V_{GS} = 10 \text{ V}$, $I_D = 4.0 \text{ A}$)
- Low C_{iss} $C_{iss} = 1050 \text{ pF TYP.}$
- High Avalanche Capability Ratings

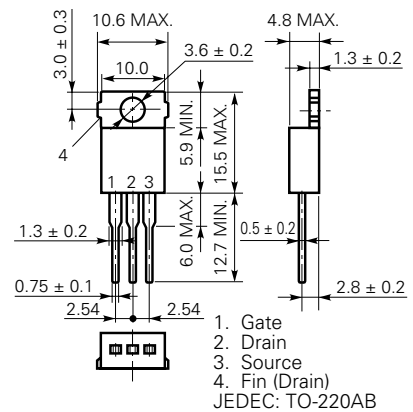
ABSOLUTE MAXIMUM RATINGS ($T_A = 25 \text{ }^\circ\text{C}$)

Drain to Source Voltage(2SK2359/2SK2360)	V_{DSS}	450/500	V
Gate to Source Voltage	V_{GSS}	± 30	V
Drain Current (DC)	$I_{D(DC)}$	± 7.0	A
Drain Current (pulse)*	$I_{D(pulse)}$	± 28	A
Total Power Dissipation ($T_c = 25 \text{ }^\circ\text{C}$)	P_{T1}	75	W
Total Power Dissipation ($T_A = 25 \text{ }^\circ\text{C}$)	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	$-55 \text{ to } +150$	$^\circ\text{C}$
Single Avalanche Current**	I_{AS}	7.0	A
Single Avalanche Energy**	E_{AS}	17	mJ

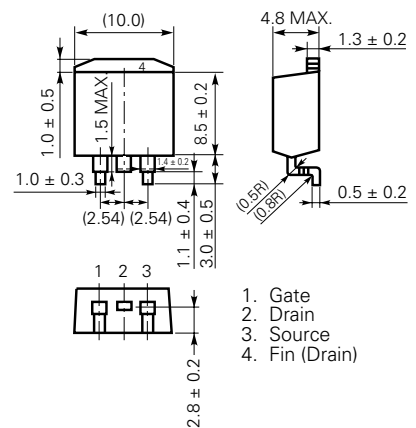
* $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1 \%$

** Starting $T_{ch} = 25 \text{ }^\circ\text{C}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0$

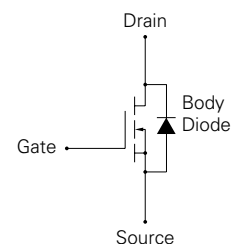
PACKAGE DIMENSIONS (in millimeters)



MP-25 (TO220)



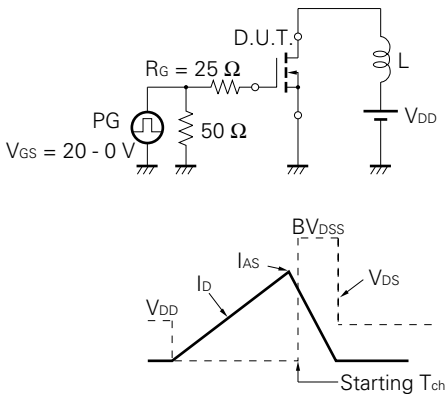
MP-25Z (SURFACE MOUNT TYPE)



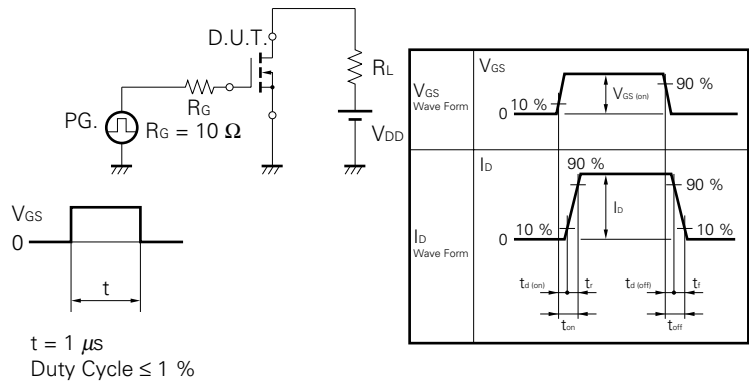
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-State Resistance	R _{DS(on)}		0.7	0.9	mΩ	V _{GS} = 10 V
			0.8	1.0		V _D = 4.0 V
Gate to Source Cutoff Voltage	V _{GS(off)}	2.5		3.5	V	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance	y _{fs}	3.0			S	V _{DS} = 10 V, I _D = 4.0 A
Drain Leakage Current	I _{DSS}			100	μA	V _{DS} = V _{DSS} , V _{GS} = 0
Gate to Source Leakage Current	I _{GSS}			±100	nA	V _{GS} = ±30 V, V _{DS} = 0
Input Capacitance	C _{iss}		1050		pF	V _{DS} = 10 V
Output Capacitance	C _{oss}		200			V _{GS} = 0
Reverse Transfer Capacitance	C _{rss}		26		pF	f = 1 MHz
Turn-On Delay Time	t _{d(on)}		14		ns	I _D = 4.0 A
Rise Time	t _r		9			V _{GS} = 10 V
Turn-Off Delay Time	t _{d(off)}		56		ns	V _{DD} = 150 V
Fall Time	t _f		14			R _G = 10 Ω R _L = 37.5 Ω
Total Gate Charge	Q _G		27		nC	I _D = 7.0 A
Gate to Source Charge	Q _{GS}		5.5			V _{DD} = 400 V
Gate to Drain Charge	Q _{GD}		12		nC	V _{GS} = 10 V
Body Diode Forward Voltage	V _{F(S-D)}		1.0		V	I _F = 7.0 A, V _{GS} = 0
Reverse Recovery Time	t _{rr}		300		ns	I _F = 7.0 A, V _{GS} = 0
Reverse Recovery Charge	Q _{rr}		1.5			μC

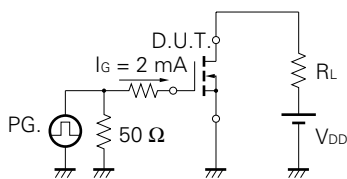
Test Circuit 1 Avalanche Capability



Test Circuit 2 Switching Time

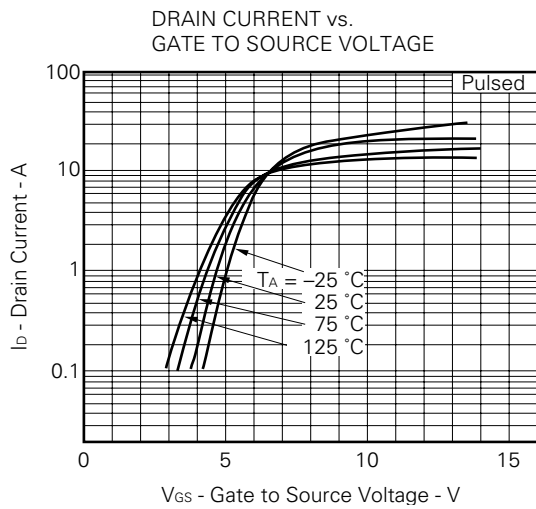
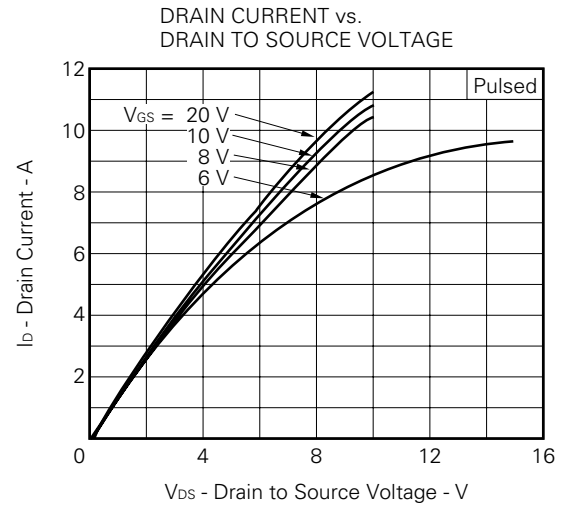
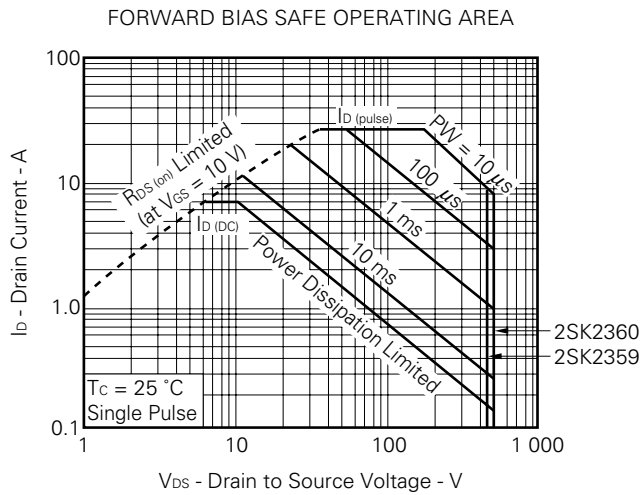
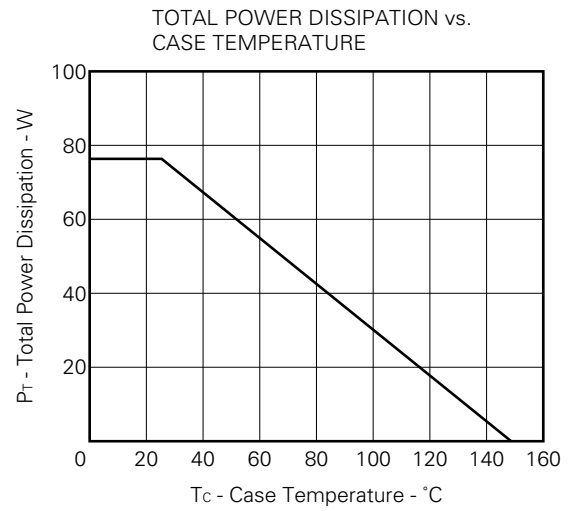
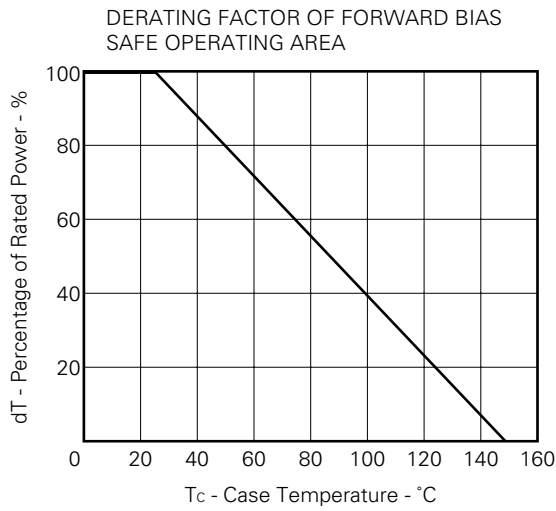


Test Circuit 3 Gate Charge

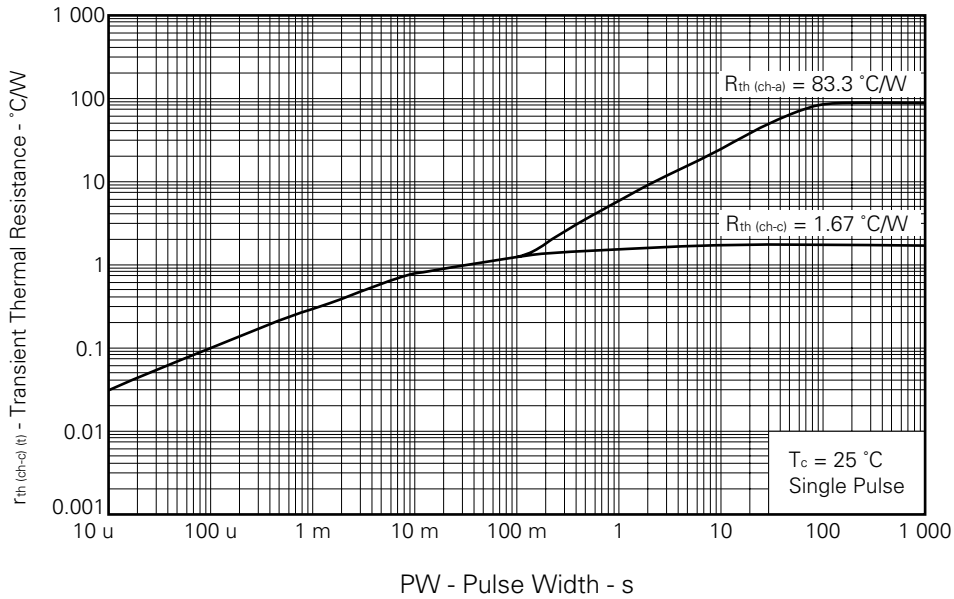


The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

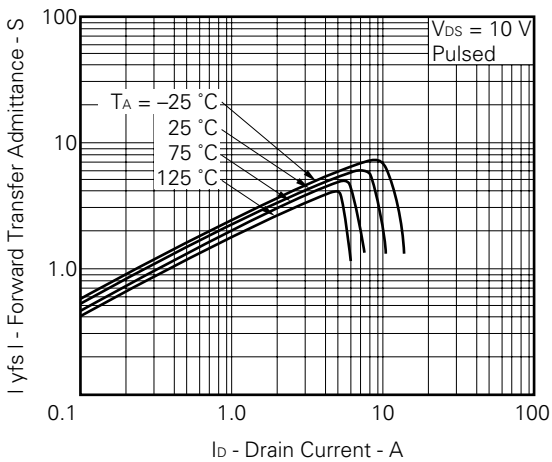
TYPICAL CHARACTERISTICS (T_A = 25 °C)



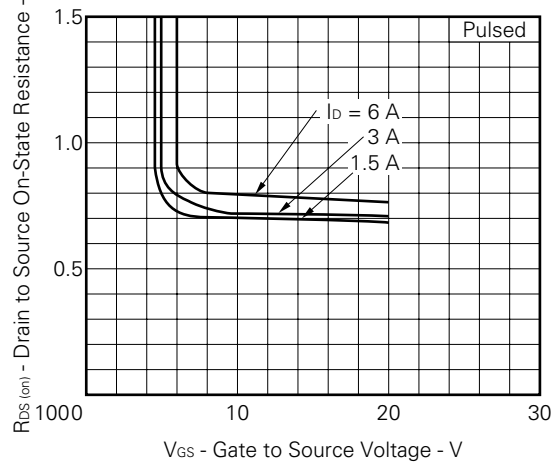
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



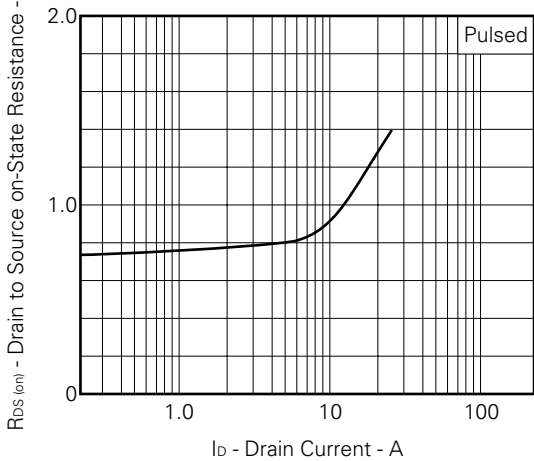
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



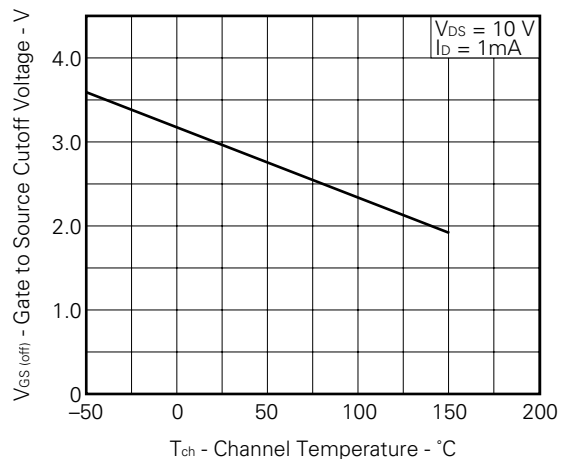
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



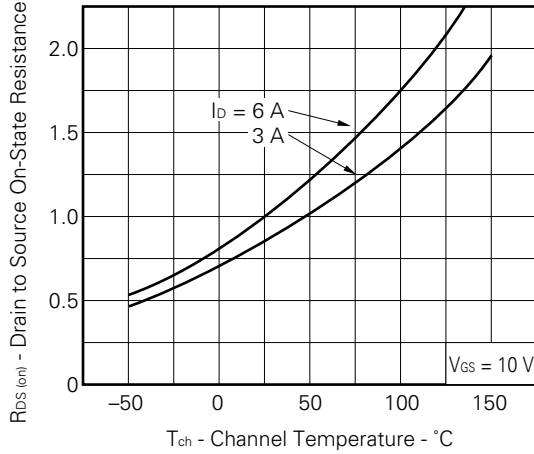
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



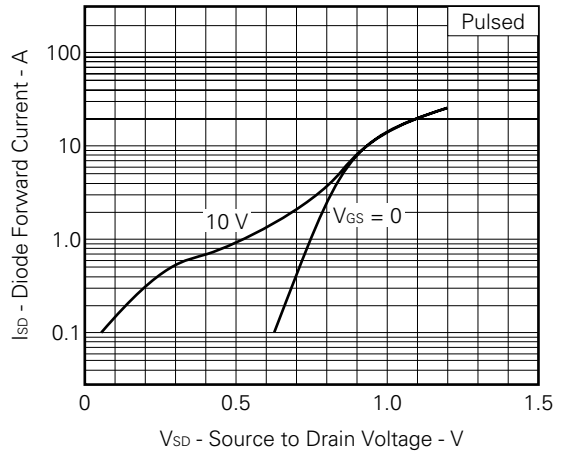
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



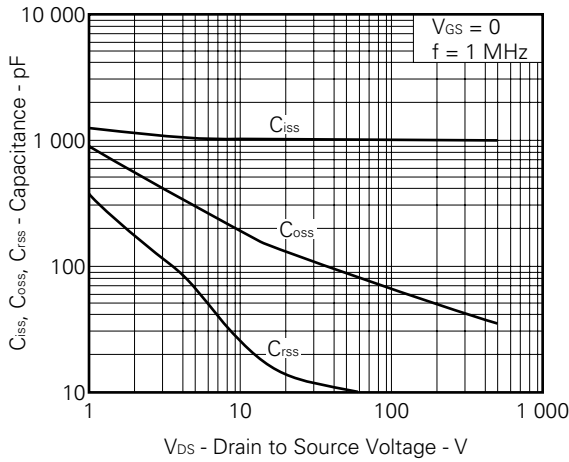
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



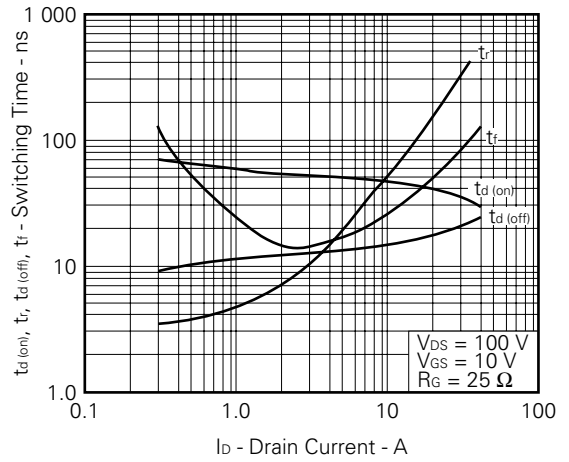
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



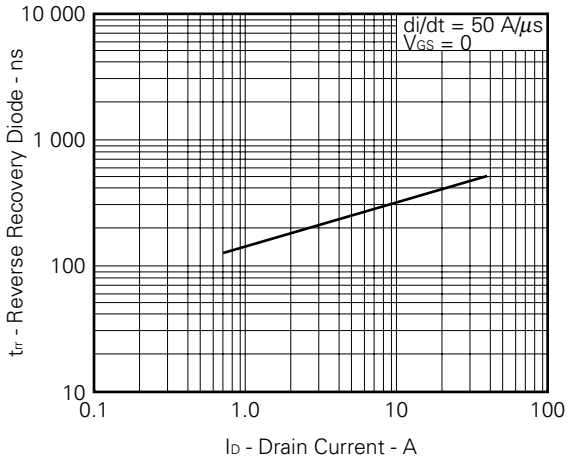
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



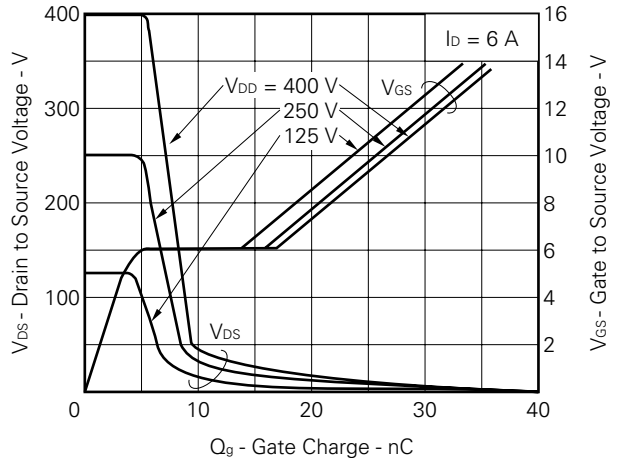
SWITCHING CHARACTERISTICS



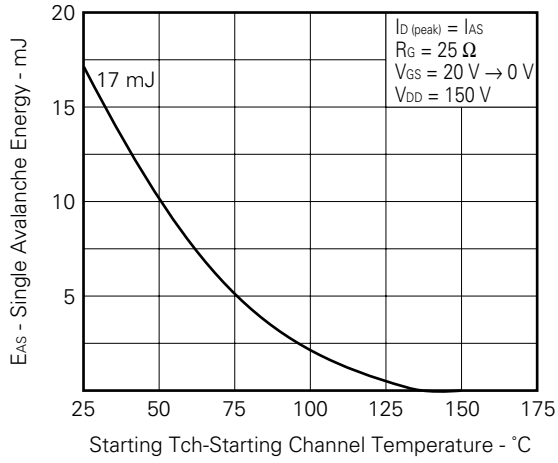
REVERSE RECOVERY TIME vs. DRAIN CURRENT



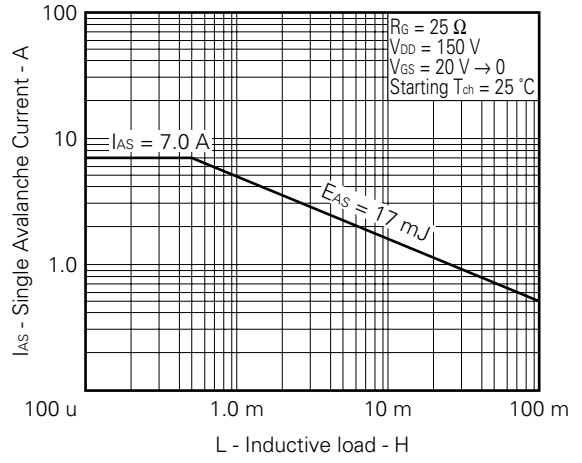
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SINGLE AVALANCHE ENERGY vs. STARTING CHANNEL TEMPERATURE



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



REFERENCE

Document Name	Document No.
NEC semiconductor device reliability/quality control system.	TEI-1202
Quality grade on NEC semiconductor devices.	IEI-1209
Semiconductor device mounting technology manual.	IEI-1207
Semiconductor device package manual.	IEI-1213
Guide to quality assurance for semiconductor devices.	MEI-1202
Semiconductor selection guide.	MF-1134
Power MOS FET features and application switching power supply.	TEA-1034
Application circuits using Power MOS FET.	TEA-1035
Safe operating area of Power MOS FET.	TEA-1037

The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device is 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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Anti-radioactive design is not implemented in this product.

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