

# MOS FIELD EFFECT TRANSISTORS 2SK2361/2SK2362

### SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

The 2SK2361/2SK2362 is N-Channel MOS Field Effect Transistor designed for high voltage switching applications.

#### FEATURES

- Low On-Resistance  
2SK2361:  $R_{DS(on)} = 0.9 \Omega$  ( $V_{GS} = 10 V, I_D = 5.0 A$ )  
2SK2362:  $R_{DS(on)} = 1.0 \Omega$  ( $V_{GS} = 10 V, I_D = 5.0 A$ )
- Low  $C_{iss}$   $C_{iss} = 1050 pF$  TYP.
- High Avalanche Capability Ratings

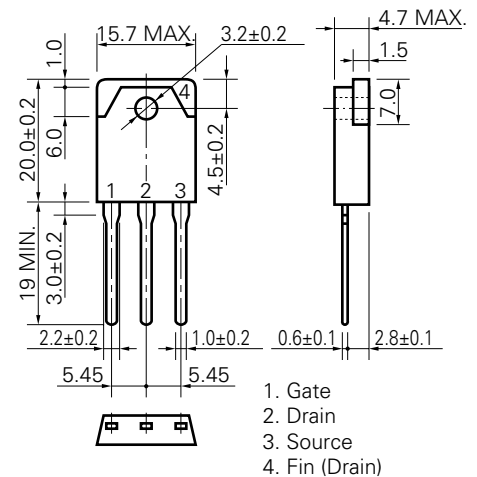
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ )

Drain to Source Voltage (2SK2361/2SK2362)	$V_{DSS}$	450/500	V
Gate to Source Voltage	$V_{GSS}$	$\pm 30$	V
Drain Current (DC)	$I_D(DC)$	$\pm 10$	A
Drain Current (pulse)*	$I_D(pulse)$	$\pm 40$	A
Total Power Dissipation ( $T_c = 25^\circ C$ )	$P_{T1}$	100	W
Total Power Dissipation ( $T_A = 25^\circ C$ )	$P_{T2}$	3.0	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ C$
Single Avalanche Current**	$I_{AS}$	10	A
Single Avalanche Energy**	$E_{AS}$	142	mJ

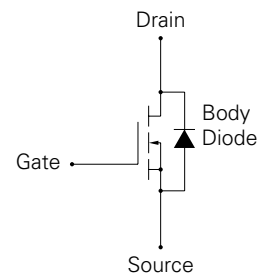
\*  $PW \leq 10 \mu s$ , Duty Cycle  $\leq 1\%$

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

#### PACKAGE DIMENSIONS (in millimeter)



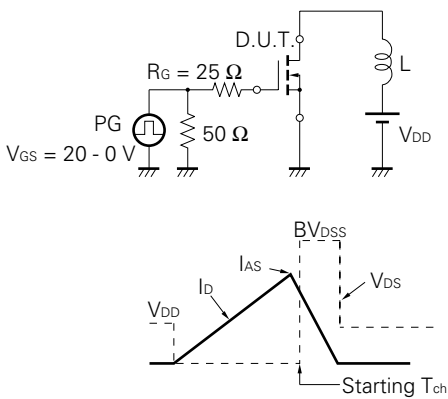
#### MP-88



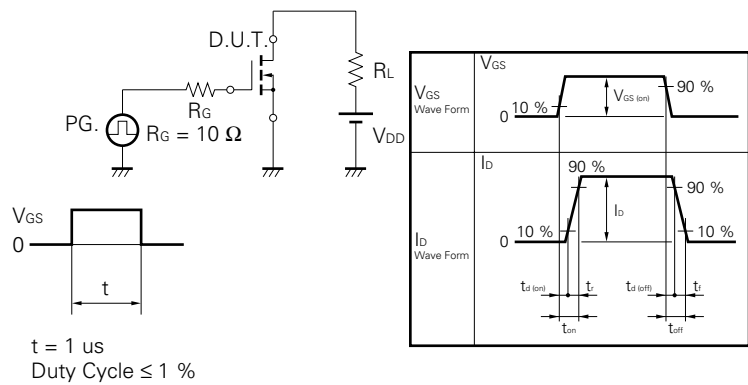
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS	
Drain to Source On-Resistance	R <sub>DS(on)</sub>		0.7	0.9	Ω	V <sub>GS</sub> = 10 V	2SK2361
			0.8	1.0	Ω	I <sub>D</sub> = 5.0 A	2SK2362
Gate to Source Cutoff Voltage	V <sub>GS(off)</sub>	2.5		3.5	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	
Forward Transfer Admittance	y <sub>fs</sub>	3.0			S	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 5.0 A	
Drain Leakage Current	I <sub>DSS</sub>			100	μA	V <sub>DS</sub> = V <sub>DSS</sub> , V <sub>GS</sub> = 0	
Gate to Source Leakage Current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0	
Input Capacitance	C <sub>iss</sub>		1050		pF	V <sub>DS</sub> = 10 V	
Output Capacitance	C <sub>oss</sub>		200		pF	V <sub>GS</sub> = 0	
Reverse Transfer Capacitance	C <sub>rss</sub>		26		pF	f = 1 MHz	
Turn-On Delay Time	t <sub>d(on)</sub>		15		ns	I <sub>D</sub> = 5.0 A	
Rise Time	t <sub>r</sub>		24		ns	V <sub>GS</sub> = 10 V	
Turn-Off Delay Time	t <sub>d(off)</sub>		50		ns	V <sub>DD</sub> = 150 V	
Fall Time	t <sub>f</sub>		14		ns	R <sub>G</sub> = 10 Ω R <sub>L</sub> = 30 Ω	
Total Gate Charge	Q <sub>G</sub>		26		nC	I <sub>D</sub> = 10 A	
Gate to Source Charge	Q <sub>GS</sub>		6.1		nC	V <sub>DD</sub> = 400 V	
Gate to Drain Charge	Q <sub>GD</sub>		12		nC	V <sub>GS</sub> = 10 V	
Body Diode Forward Voltage	V <sub>F(S-D)</sub>		1.0		V	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0	
Reverse Recovery Time	t <sub>rr</sub>		350		ns	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0	
Reverse Recovery Charge	Q <sub>rr</sub>		2.0		μC	di/dt = 50 A/μs	

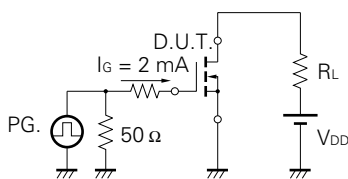
**Test Circuit 1 Avalanche Capability**



**Test Circuit 2 Switching Time**



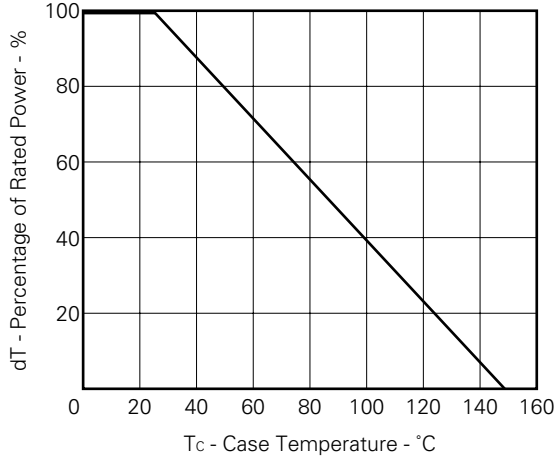
**Test Circuit 3 Gate Charge**



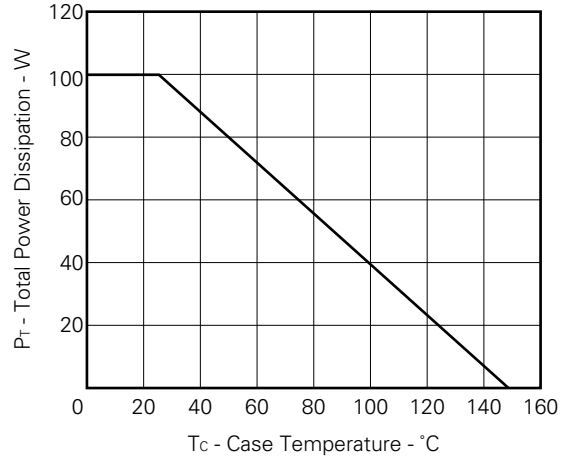
The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

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

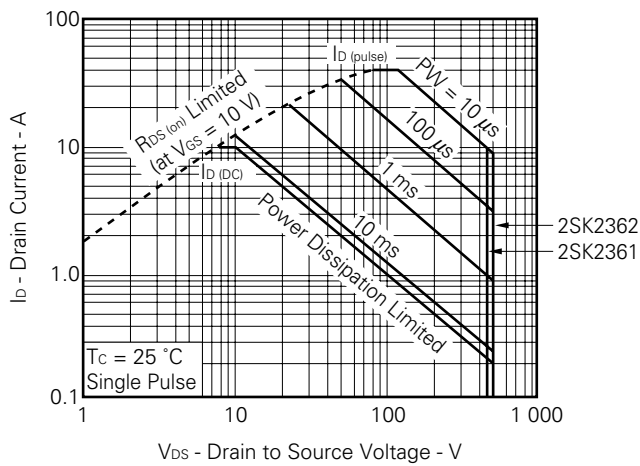
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



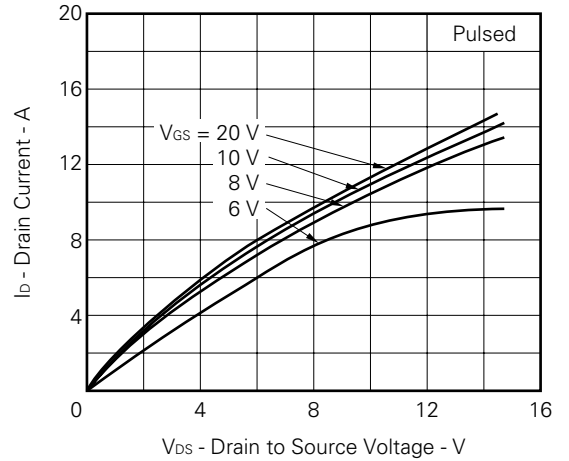
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



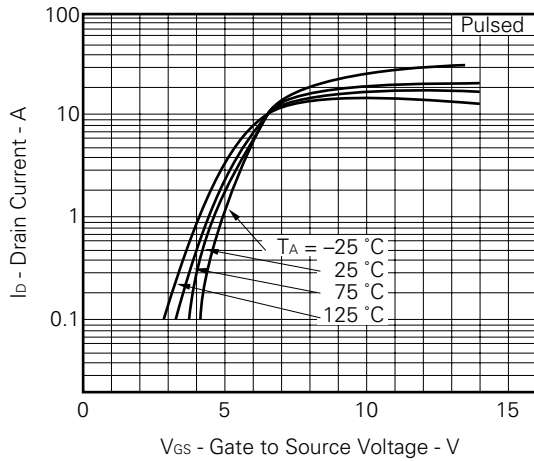
FORWARD BIAS SAFE OPERATING AREA

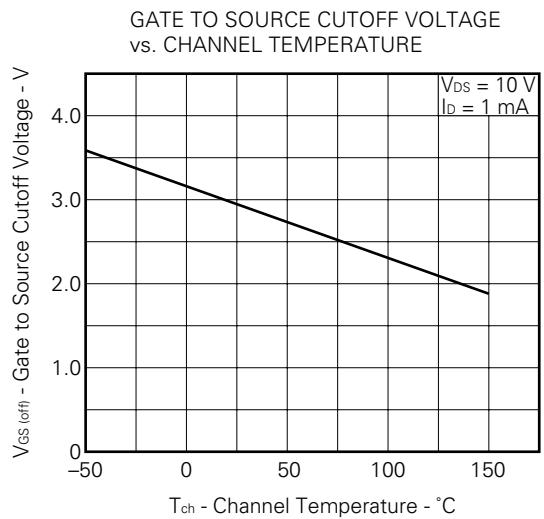
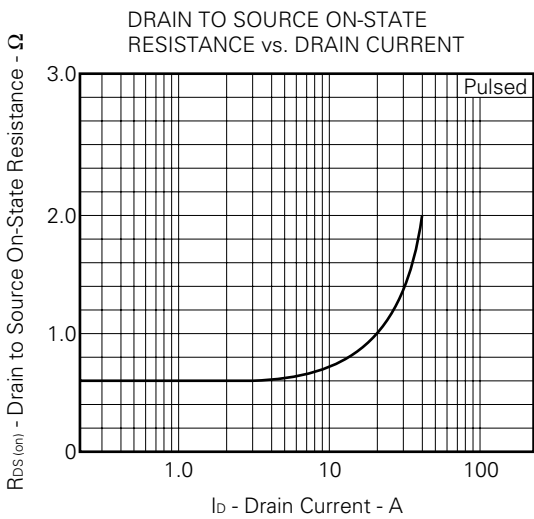
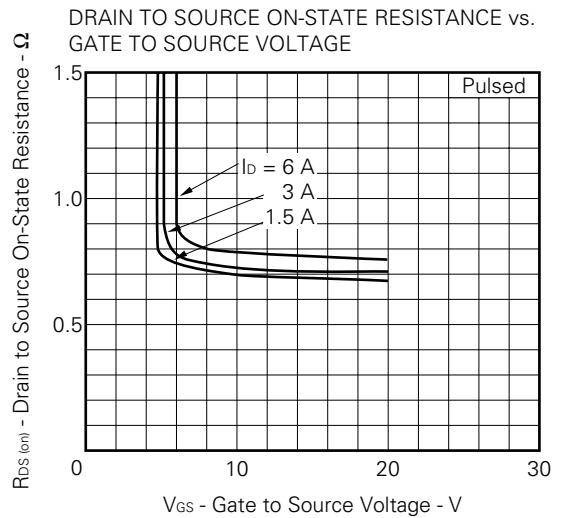
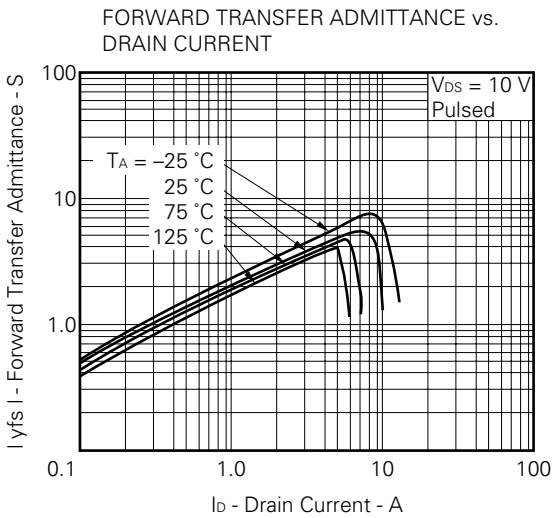
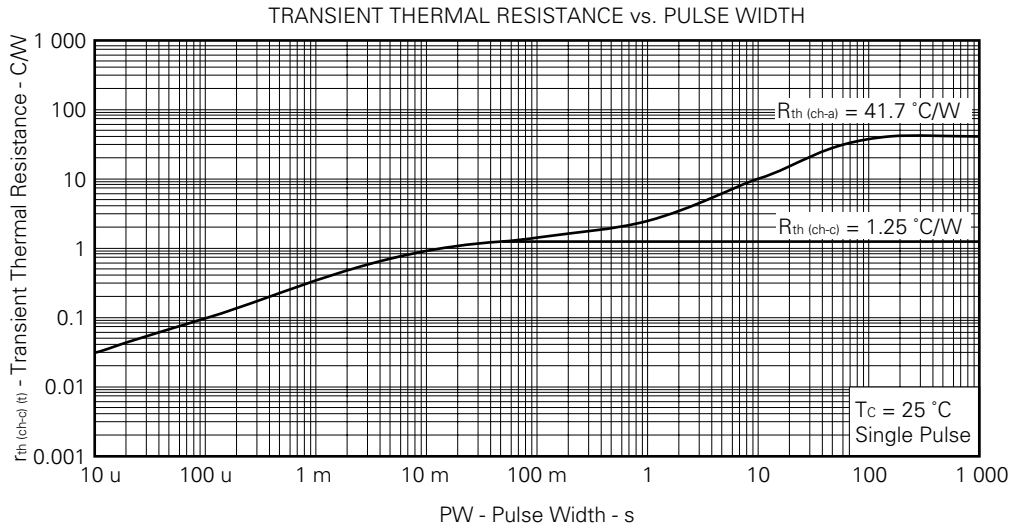


DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

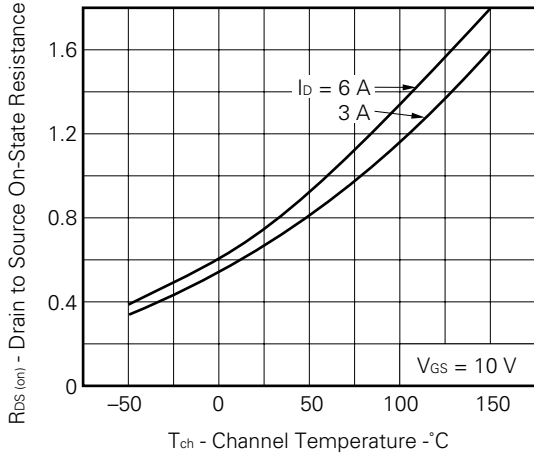


DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE

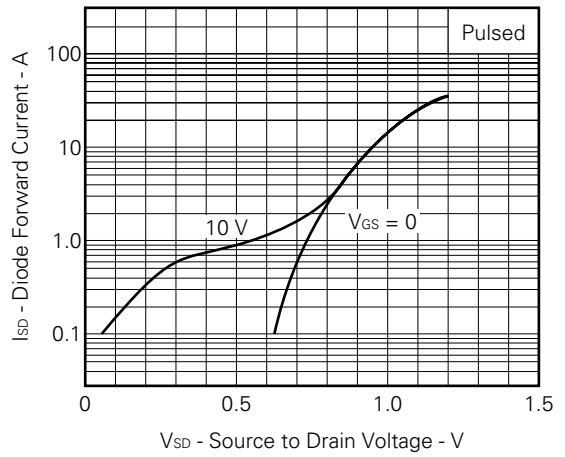




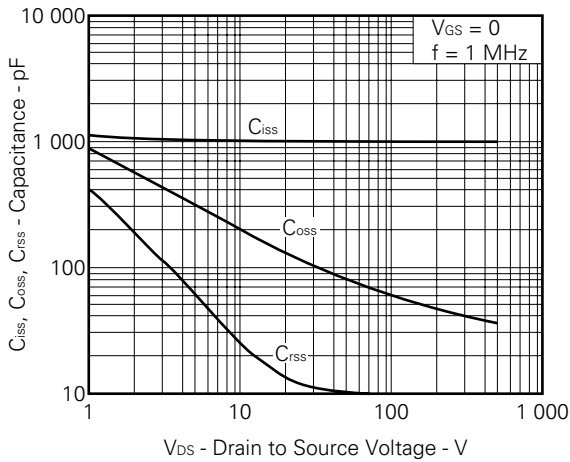
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



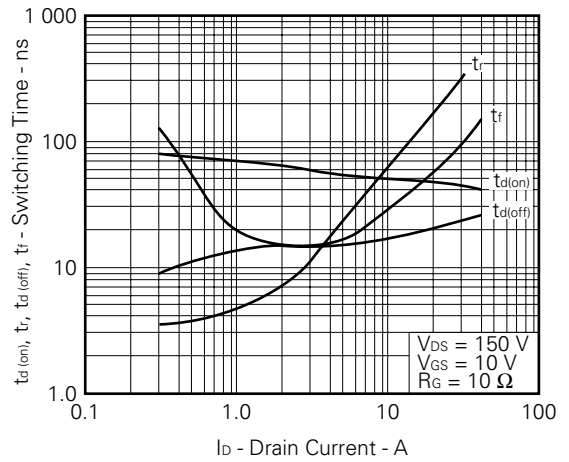
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



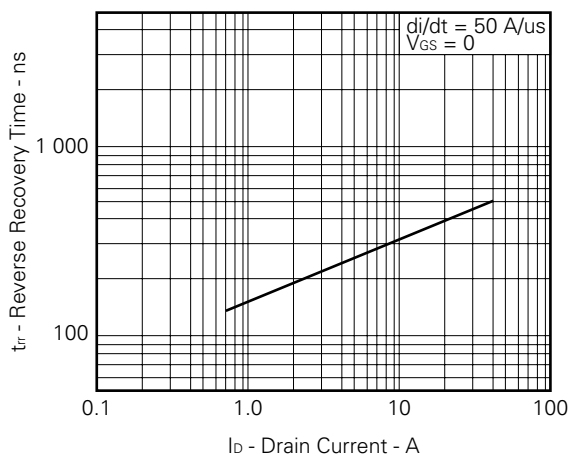
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



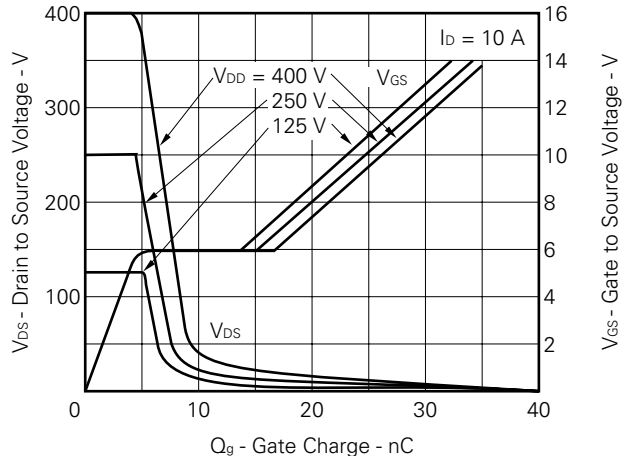
SWITCHING CHARACTERISTICS



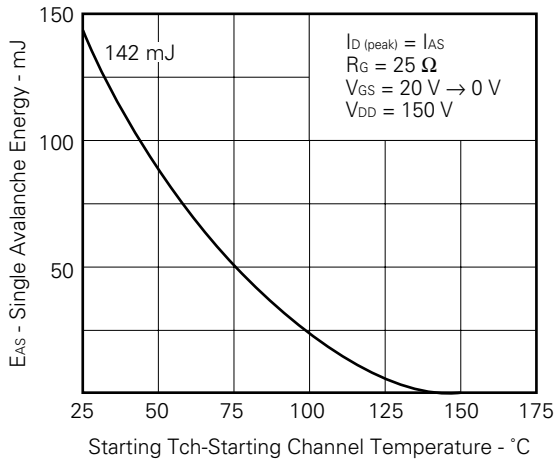
REVERSE RECOVERY TIME vs. DRAIN CURRENT



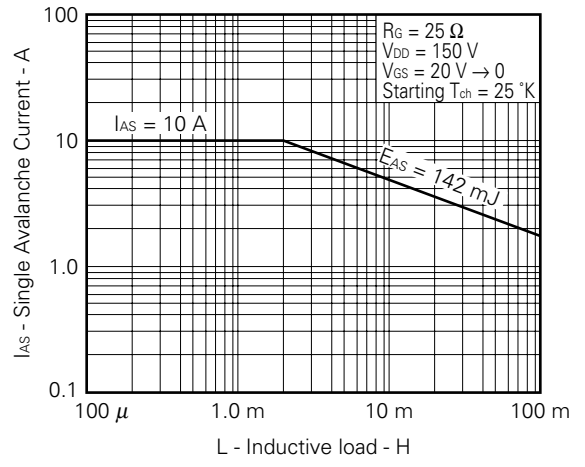
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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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