

## MOS FIELD EFFECT TRANSISTOR

# 2SK2137

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

#### DESCRIPTION

The 2SK2137 is N-Channel MOS Field Effect Transistor designed for high voltage switching applications.

#### FEATURES

- Low On-Resistance  
2SK2137:  $R_{DS(on)} = 2.4 \Omega$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 2.0 \text{ A}$ )
- Low  $C_{iss}$   $C_{iss} = 550 \text{ pF TYP.}$
- High Avalanche Capability Ratings
- Isolate TO-220 Package

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

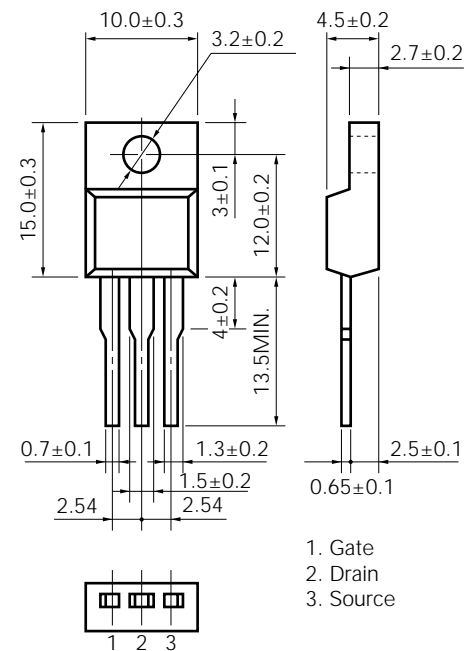
Drain to Source Voltage	$V_{DS}$	600	V
Gate to Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 4.0$	A
Drain Current (pulse)*	$I_{D(pulse)}$	$\pm 16$	A
Total Power Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_{T1}$	30	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T2}$	2.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	$-55$ to $+150$	$^\circ\text{C}$
Single Avalanche Current**	$I_{AS}$	4.0	A
Single Avalanche Energy**	$E_{AS}$	5.3	mJ

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

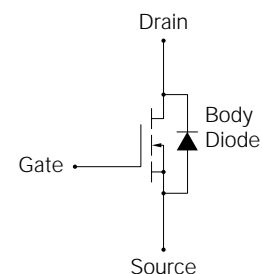
\*\* Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0$

#### PACKAGE DIMENSIONS

(in millimeters)



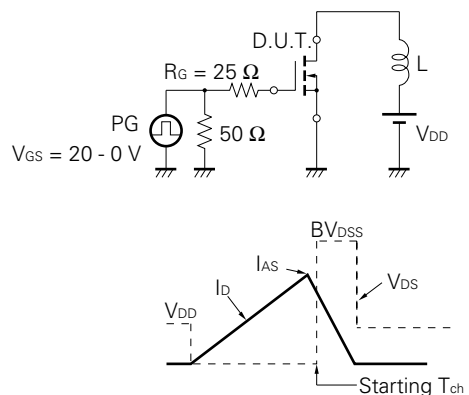
#### MP-45F (ISOLATED TO-220)



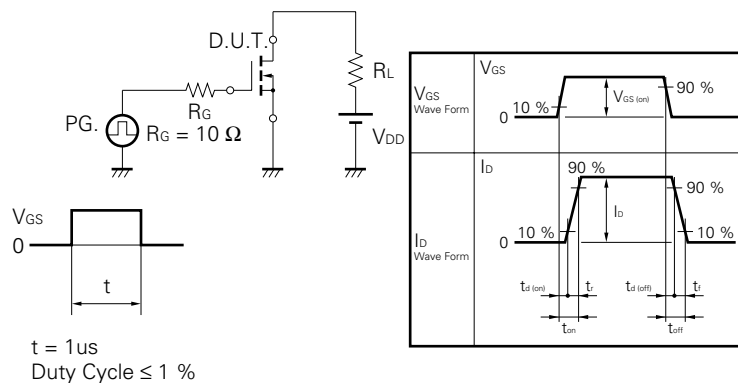
ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ )

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-State Resistance	$R_{DS(on)}$		1.7	2.4	$\Omega$	$V_{GS} = 10\text{ V}$ , $I_D = 2.0\text{ A}$
Gate to Source Cutoff Voltage	$V_{GS(off)}$	2.5		3.5	V	$V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$
Forward Transfer Admittance	$ y_{fs} $	1.0			S	$V_{DS} = 10\text{ V}$ , $I_D = 2.0\text{ A}$
Drain Leakage Current	$I_{DSS}$			100	$\mu\text{A}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0$
Gate to Source Leakage Current	$I_{GSS}$			$\pm 100$	nA	$V_{GS} = \pm 30\text{ V}$ , $V_{DS} = 0$
Input Capacitance	$C_{iss}$		550		pF	$V_{DS} = 10\text{ V}$ $V_{GS} = 0$ $f = 1\text{ MHz}$
Output Capacitance	$C_{oss}$		130		pF	
Reverse Transfer Capacitance	$C_{rss}$		25		pF	
Turn-On Delay Time	$t_{d(on)}$		11		ns	$I_D = 2.0\text{ A}$ $V_{GS(on)} = 10\text{ V}$ $V_{DD} = 150\text{ V}$ $R_G = 10\ \Omega$ $R_L = 75\ \Omega$
Rise Time	$t_r$		6		ns	
Turn-Off Delay Time	$t_{d(off)}$		45		ns	
Fall Time	$t_f$		7		ns	
Total Gate Charge	$Q_G$		20		nC	$I_D = 4.0\text{ A}$ $V_{DD} = 480\text{ V}$ $V_{GS} = 10\text{ V}$
Gate to Source Charge	$Q_{GS}$		4		nC	
Gate to Drain Charge	$Q_{GD}$		10		nC	
Body Diode Forward Voltage	$V_{F(S-D)}$		1.0		V	$I_F = 4.0\text{ A}$ , $V_{GS} = 0$
Reverse Recovery Time	$t_{rr}$		320		ns	$I_F = 4.0\text{ A}$ , $V_{GS} = 0$
Reverse Recovery Charge	$Q_{rr}$		1.2		$\mu\text{C}$	$di/dt = 50\text{ A}/\mu\text{s}$

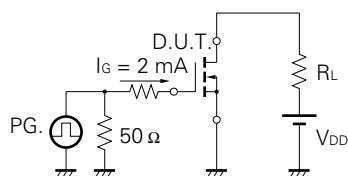
## Test Circuit 1 Avalanche Capability



## Test Circuit 2 Switching Time

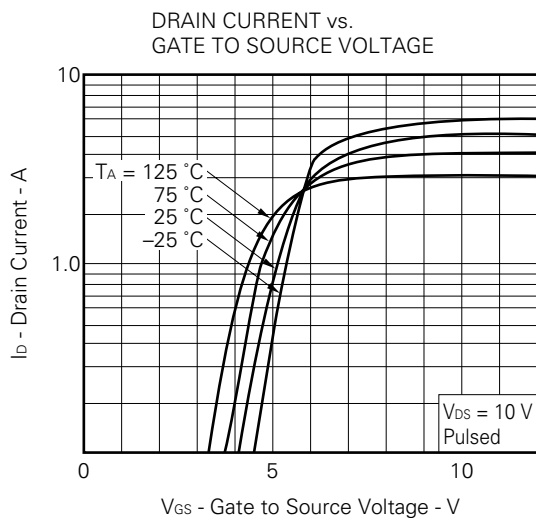
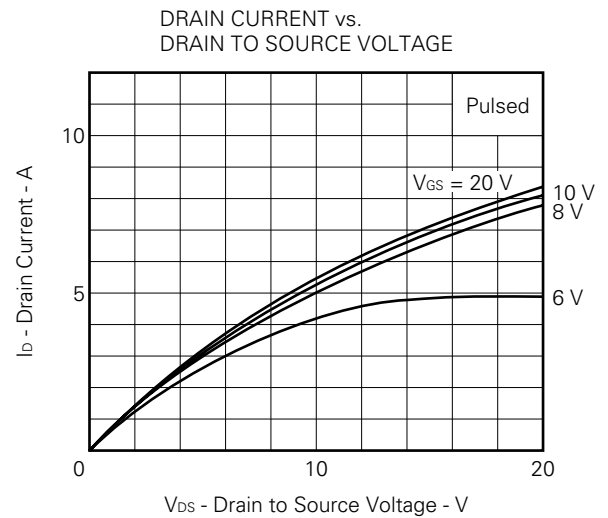
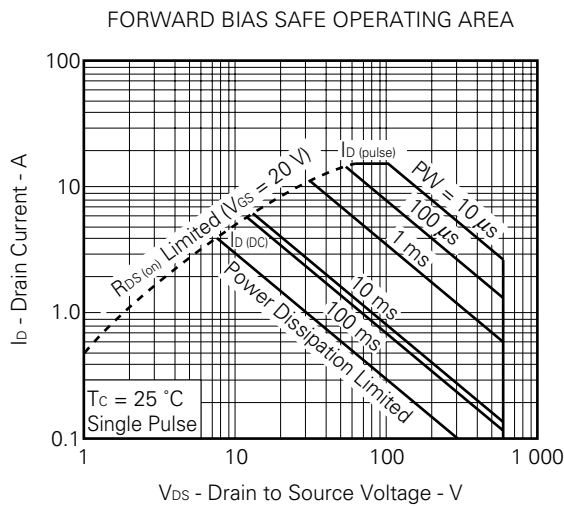
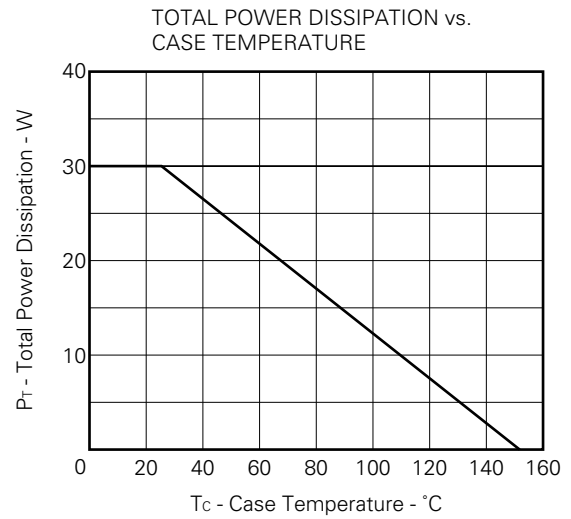
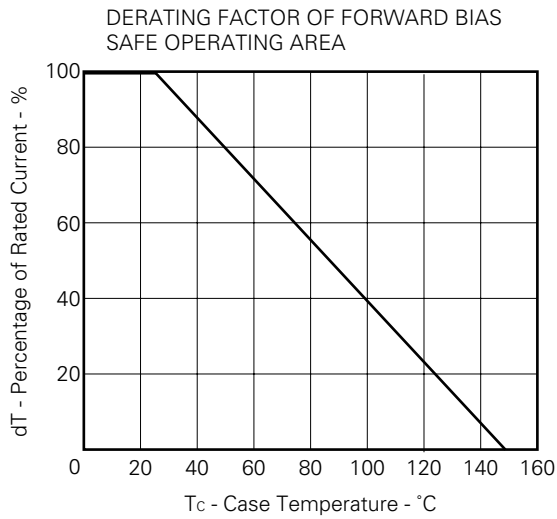


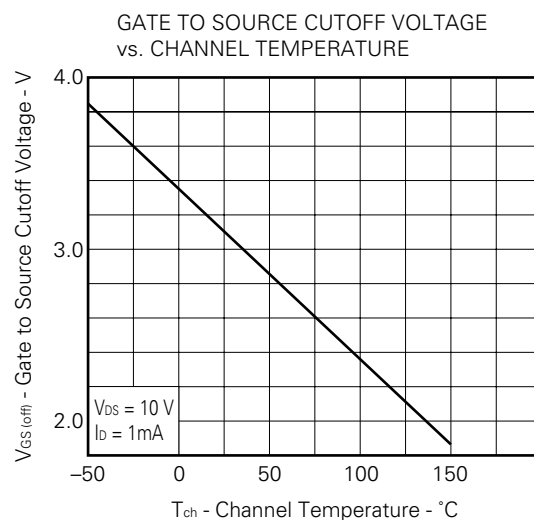
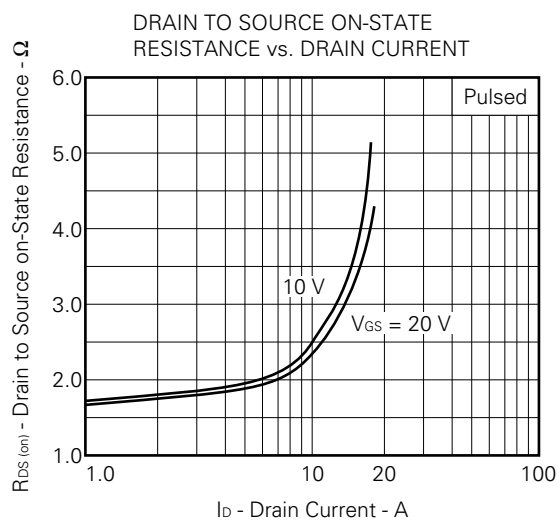
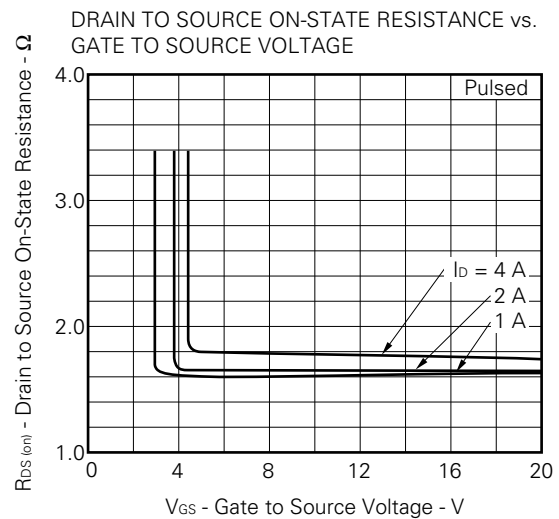
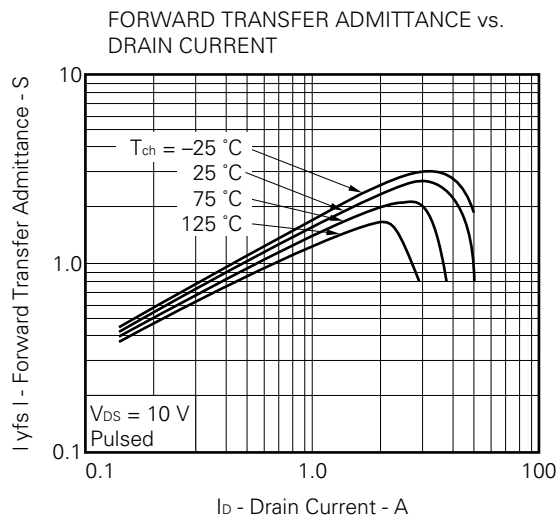
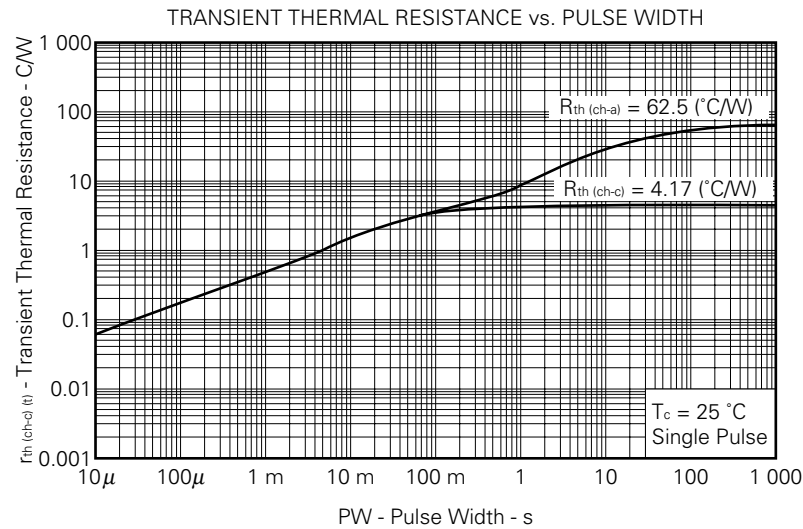
## Test Circuit 3 Gate Charge



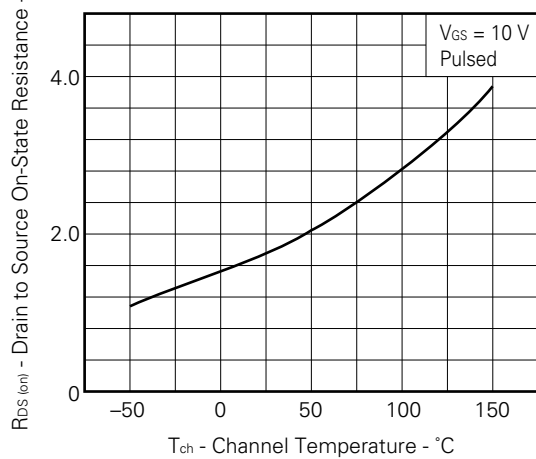
The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

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

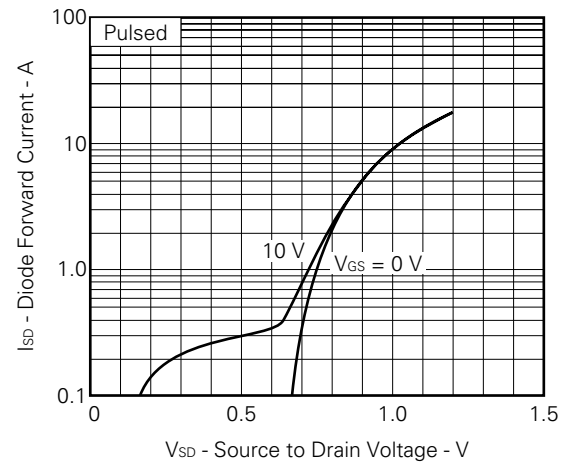




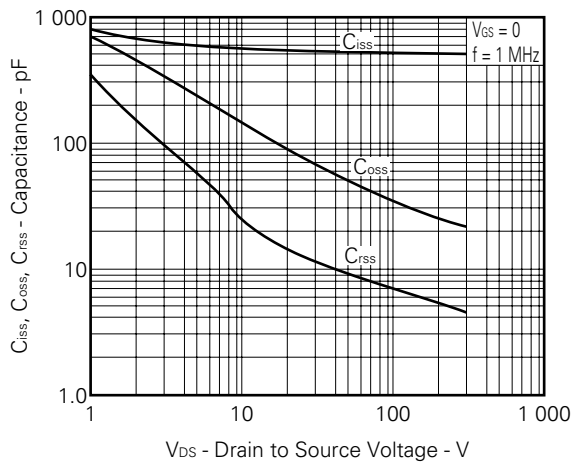
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



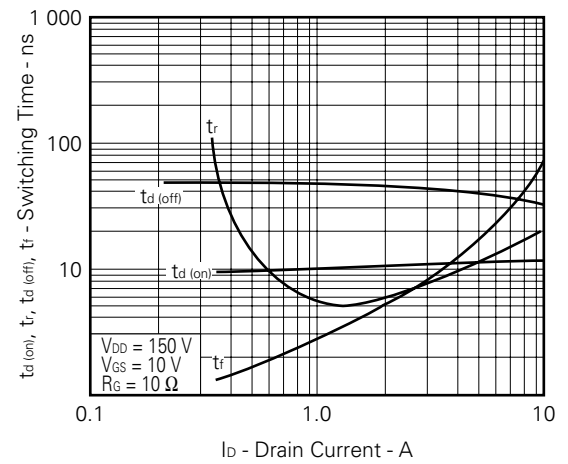
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



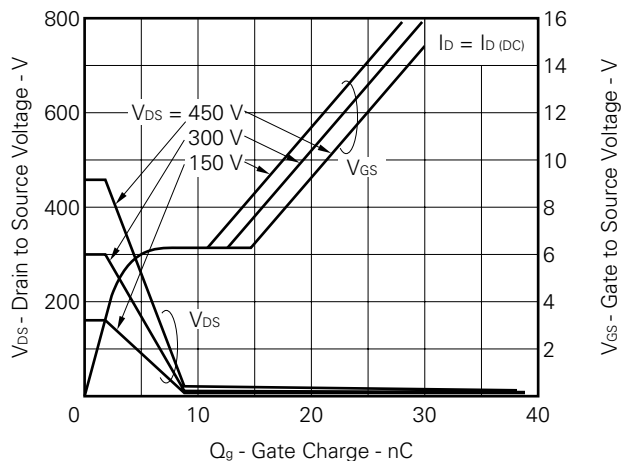
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



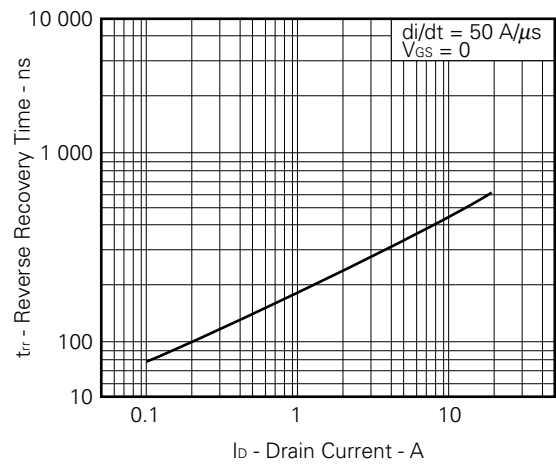
SWITCHING CHARACTERISTICS

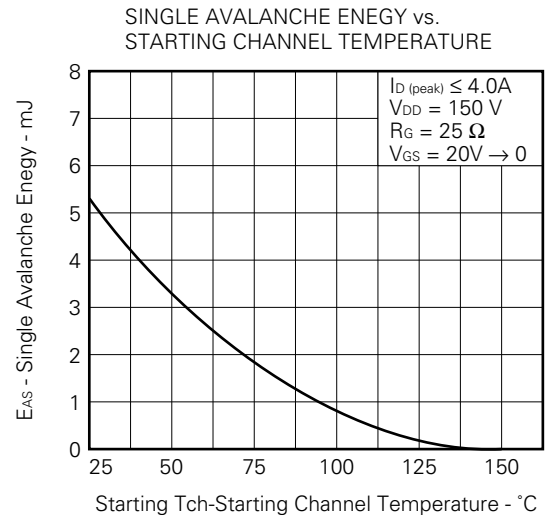
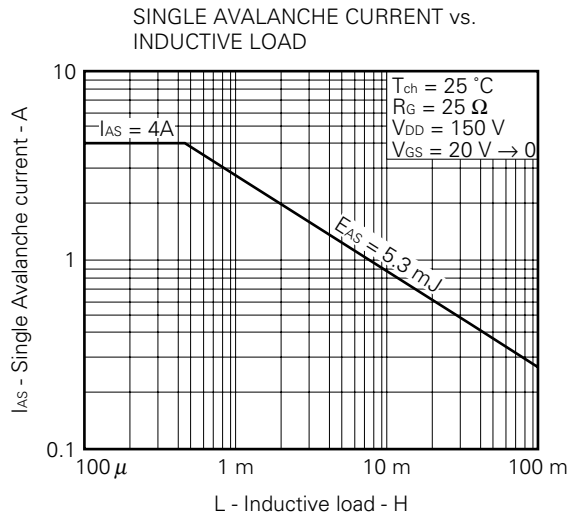


DYNAMIC INPUT CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT





## 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.