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P1 98.2

MOS FIELD EFFECT POWER TRANSISTOR  
**2SK1499/2SK1500**

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

**DESCRIPTION**

The 2SK1499/2SK1500 is N-channel MOS Field Effect Transistor designed for high voltage switching applications.

**FEATURES**

- Low On-state Resistance  
 $R_{DS(on)} \leq 0.25 \Omega / 0.27 \Omega$  ( $V_{GS} = 10 V, I_D = 13 A$ )
- Low  $C_{iss}$   $C_{iss} = 3\ 300\ pF$  TYP.
- Built-in G-S Gate Protection Diode
- High Avalanche Capability Ratings

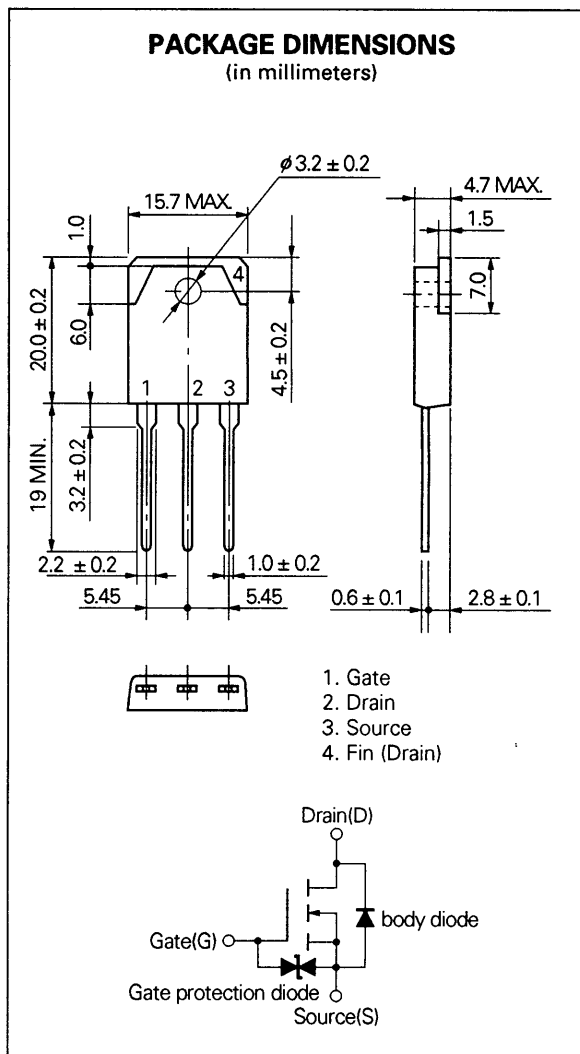
**QUALITY GRADE**

Standard  
 Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

**ABSOLUTE MAXIMUM RATINGS ( $T_a = 25\ ^\circ C$ )**

Drain to Source Voltage	$V_{DSS}$	450/500	V
		(2SK1499/2SK1500)	
Gate to Source Voltage	$V_{GSS}$	$\pm 30$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 25$	A
Drain Current (pulse)	$I_{D(pulse)^*}$	$\pm 100$	A
Total Power Dissipation ( $T_c = 25\ ^\circ C$ )	$P_T$	160	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ C$
Single Avalanche Current	$I_{AS}^{**}$	37.5	A
Single Avalanche Energy	$E_{AS}^{**}$	907	mJ

\*  $PW \leq 10\ \mu s$ , Duty Cycle  $\leq 2\ %$   
 \*\* Starting  $T_{ch} = 25\ ^\circ C$ ,  $R_G = 25\ \Omega$ ,  $V_{GS} = 20\ V \rightarrow 0$

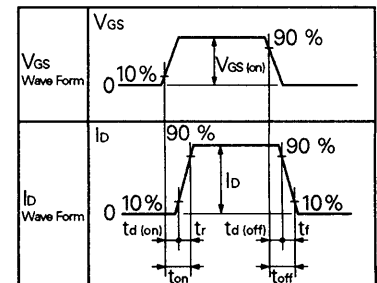
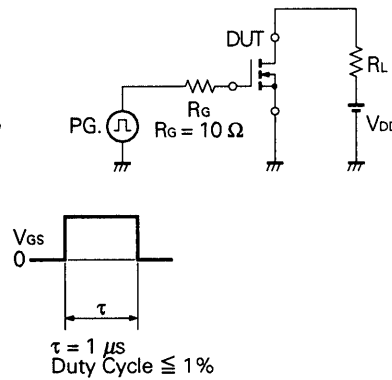
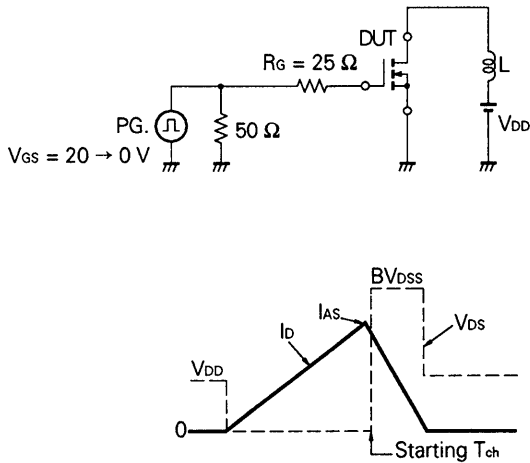


**ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)**

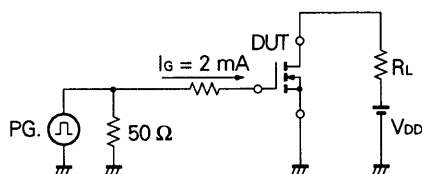
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-state Resistance (2SK1499)	R <sub>DS(on)</sub>		0.20	0.25	Ω	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 13 A
Drain to Source On-state Resistance (2SK1500)	R <sub>DS(on)</sub>		0.22	0.27	Ω	
Gate to Source Cutoff Voltage	V <sub>GS(off)</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>	8.0			S	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 13 A
Drain Leakage Current (2SK1499)	I <sub>DSS</sub>			100	μA	V <sub>DS</sub> = 450 V, V <sub>GS</sub> = 0
Drain Leakage Current (2SK1500)	I <sub>DSS</sub>			100	μA	V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0
Gate to Source Leakage Current	I <sub>GSS</sub>			±10	μA	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0
Input Capacitance	C <sub>iss</sub>		3 300		pF	V <sub>DS</sub> = 10 V V <sub>GS</sub> = 0 f = 1 MHz
Output Capacitance	C <sub>oss</sub>		1 100		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		480		pF	
Turn-On Delay Time	t <sub>d(on)</sub>		50		ns	V <sub>GS</sub> = 10 V V <sub>DD</sub> = 150 V I <sub>D</sub> = 13 A, R <sub>G</sub> = 10 Ω R <sub>L</sub> = 11.5 Ω
Rise Time	t <sub>r</sub>		130		ns	
Turn-Off Delay Time	t <sub>d(off)</sub>		180		ns	
Fall Time	t <sub>f</sub>		70		ns	
Total Gate Charge	Q <sub>G</sub>		115		nC	
Gate to Source Charge	Q <sub>GS</sub>		20		nC	V <sub>GS</sub> = 10 V I <sub>D</sub> = 25 A V <sub>DD</sub> = 400 V
Gate to Drain Charge	Q <sub>GD</sub>		70		nC	
Diode Forward Voltage	V <sub>FI(S-D)</sub>		1.0		V	I <sub>D</sub> = 25 A, V <sub>GS</sub> = 0
Reverse Recovery Time	t <sub>rr</sub>		670		ns	I <sub>D</sub> = 25 A, V <sub>GS</sub> = 0
Reverse Recovery Charge	Q <sub>rr</sub>		7.0		μC	di/dt = 50 A/μs

**Test Circuit 1: Avalanche Capability**

**Test Circuit 2: Switching Time**

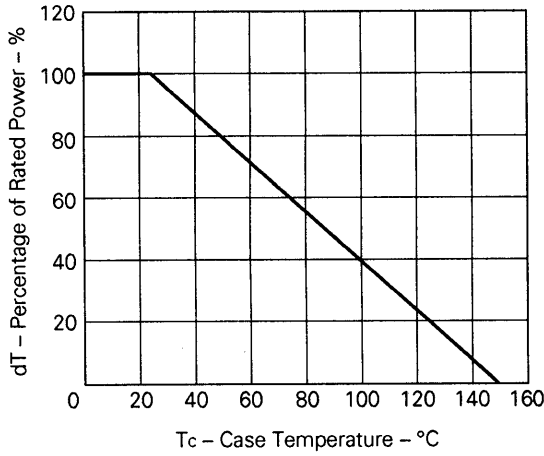


**Test Circuit 3: Gate Charge**

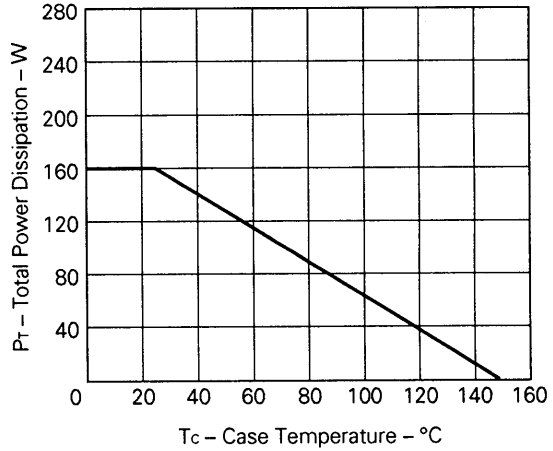


TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

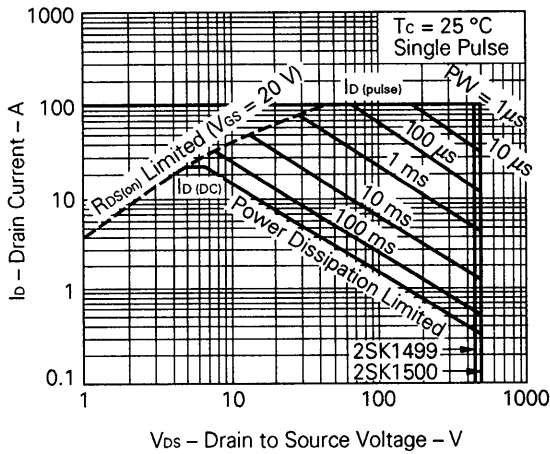
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



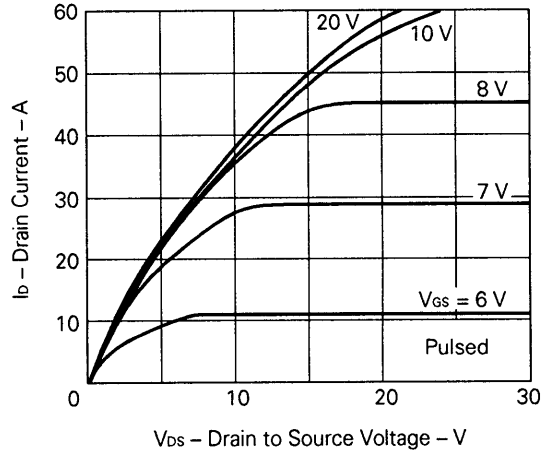
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



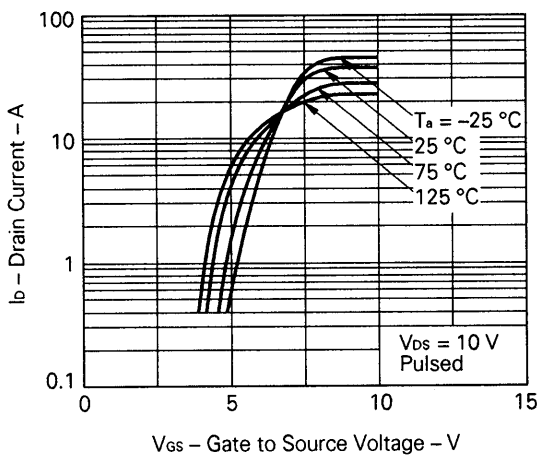
FORWARD BIAS SAFE OPERATING AREA

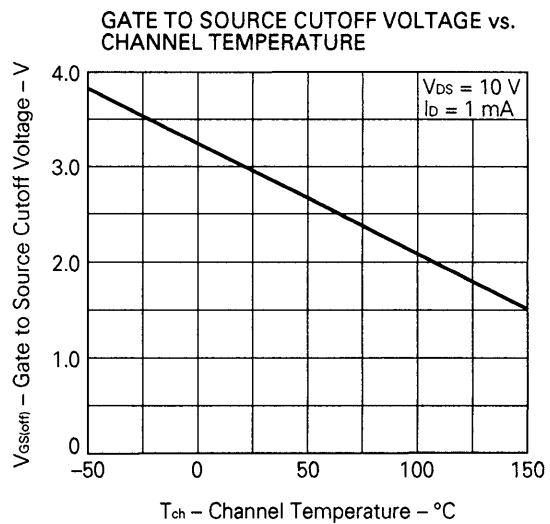
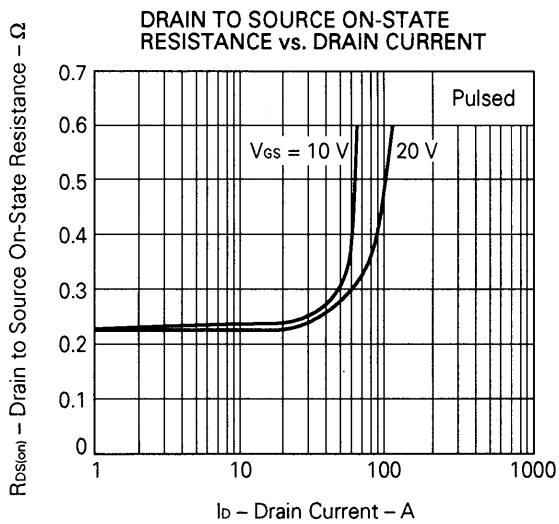
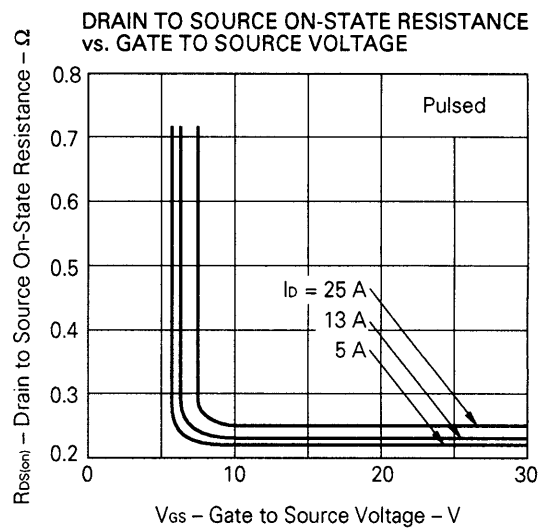
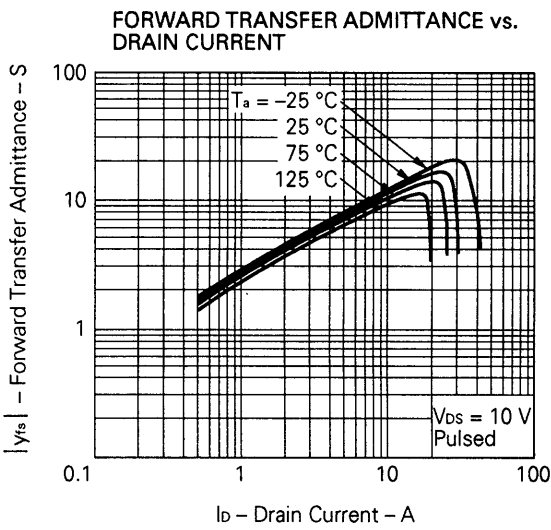
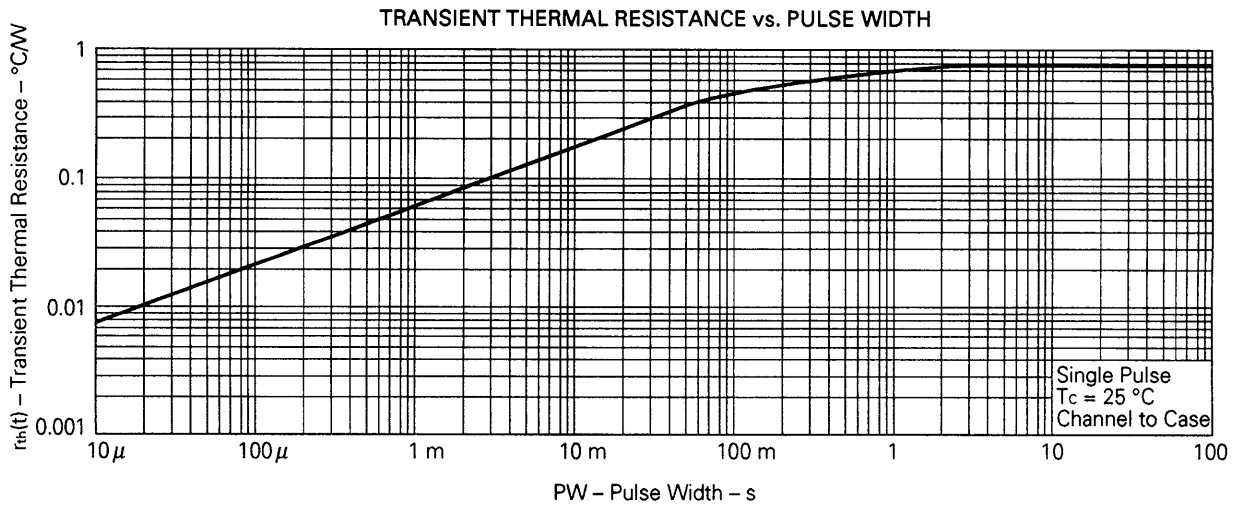


DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

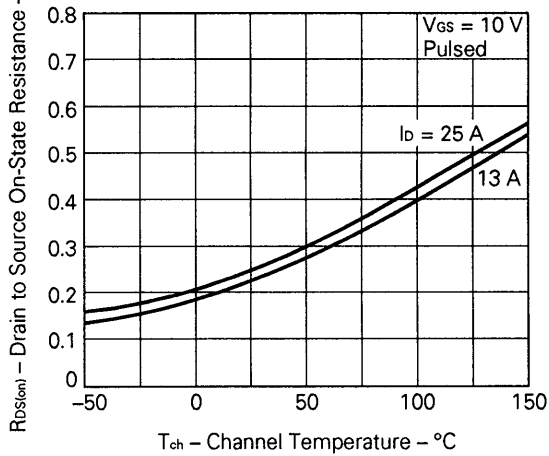


TRANSFER CHARACTERISTICS

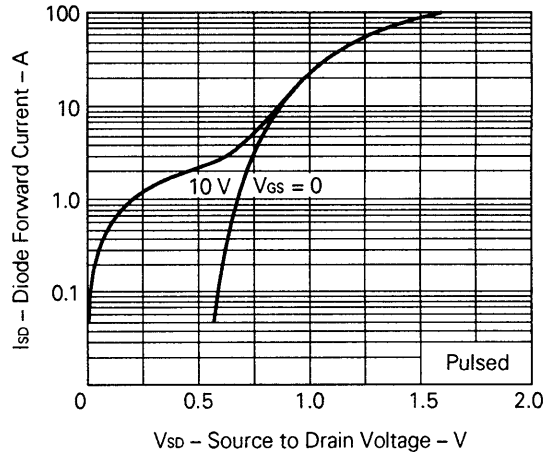




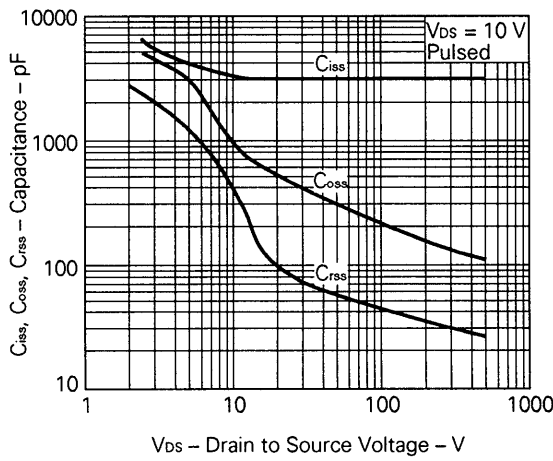
**DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE**



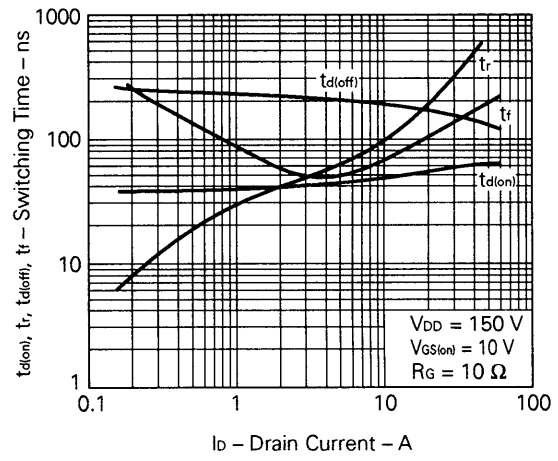
**SOURCE TO DRAIN DIODE FORWARD VOLTAGE**



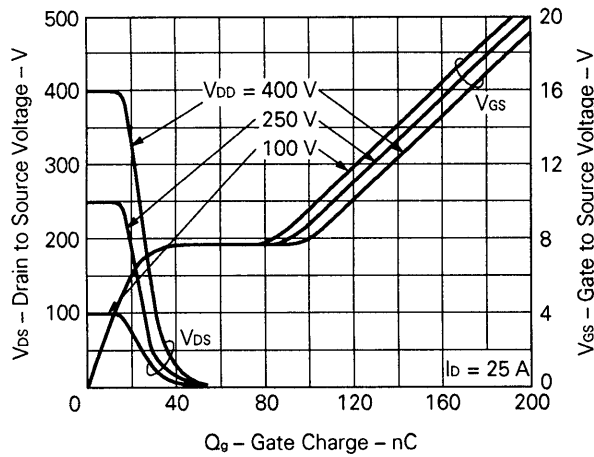
**CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE**



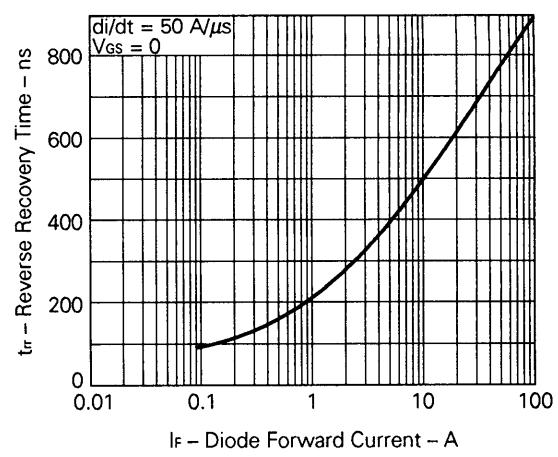
**SWITCHING CHARACTERISTICS**



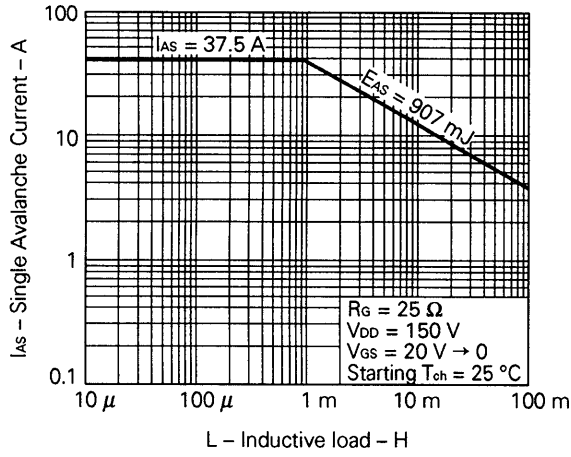
**DYNAMIC INPUT CHARACTERISTICS**



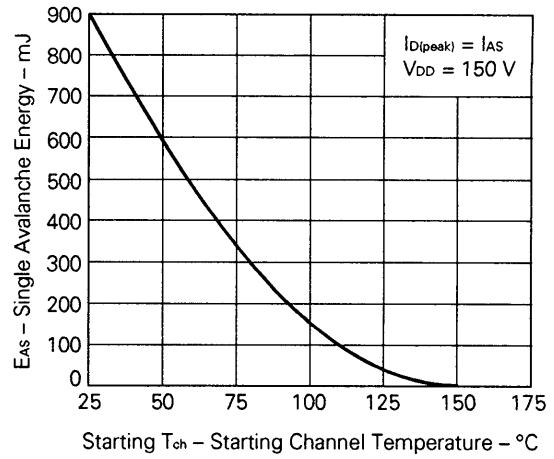
**REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT**



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY vs. STARTING CHANNEL TEMPERATURE



**Reference**

Application note name	No.
Safe operating area of Power MOS FET.	TEA-1034
Application circuit using Power MOS FET.	TEA-1035
Quality control of NEC semiconductors devices.	TEI-1202
Quality control guide of semiconductors devices.	MEI-1202
Assembly manual of semiconductors devices.	IEI-1207



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