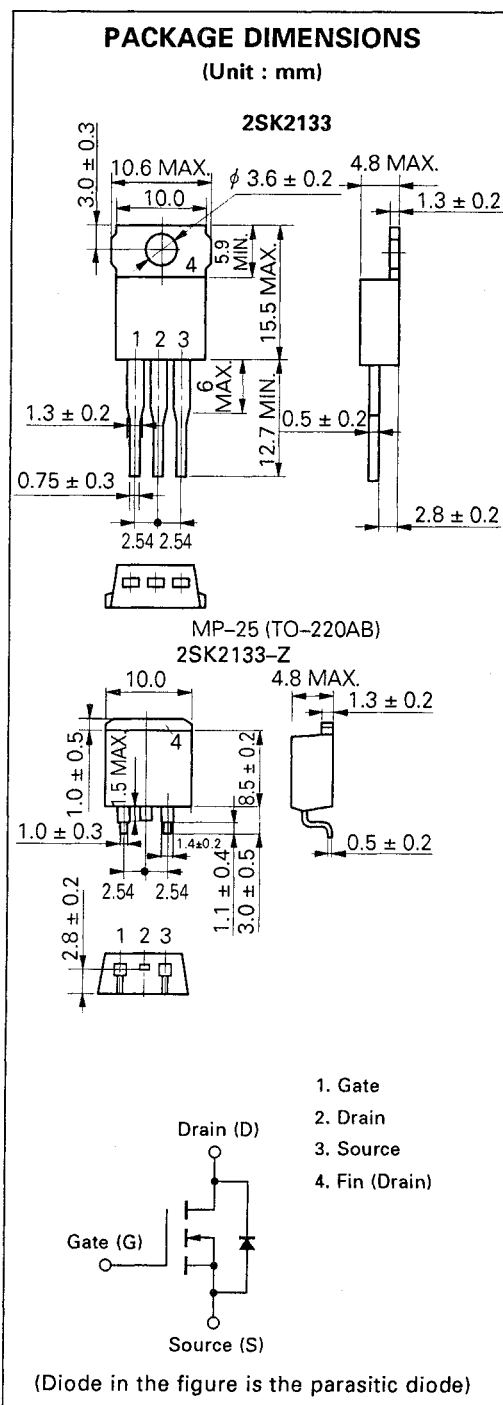


# MOS FIELD EFFECT POWER TRANSISTORS 2SK2133, 2SK2133-Z

## SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE



**DESCRIPTION**

The 2SK2133, 2SK2133-Z are N-channel Power MOS Field Effect Transistors designed for high voltage switching applications.

**FEATURES**

- Low On-state Resistance  
 $R_{DS(on)} = 0.21 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 8.0 \text{ A)}$
- Low  $C_{iss}$   $C_{iss} = 1090 \text{ pF TYP.}$
- 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**

<b>Maximum Temperatures</b>			
Storage Temperature		-55 to +150	°C
Channel Temperature		150	°C MAX.
<b>Maximum Power Dissipation</b>			
Total Power Dissipation ( $T_A = 25 \text{ °C}$ )	1.5		W
Total Power Dissipation ( $T_C = 25 \text{ °C}$ )	75		W
<b>Maximum Voltages and Currents (<math>T_A = 25 \text{ °C}</math>)</b>			
$V_{DS}$	Drain to Source Voltage	250	V
$V_{GS}$	Gate to Source Voltage	±30	V
$I_{D(DC)}$	Drain Current (DC)	±16	A
$I_{D(pulse)*}$	Drain Current (pulse)	±64	A
<b>Maximum Avalanche Capability Ratings**</b>			
$I_{AS}$	Single Avalanche Current	16	A
$E_{AS}$	Single Avalanche Energy	320	mJ

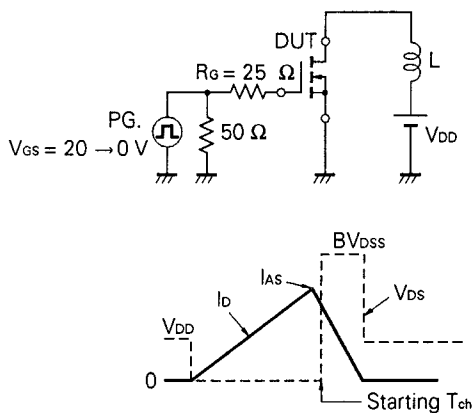
\*  $PW \leq 10 \mu s$ , Duty Cycle  $\leq 1 \%$

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

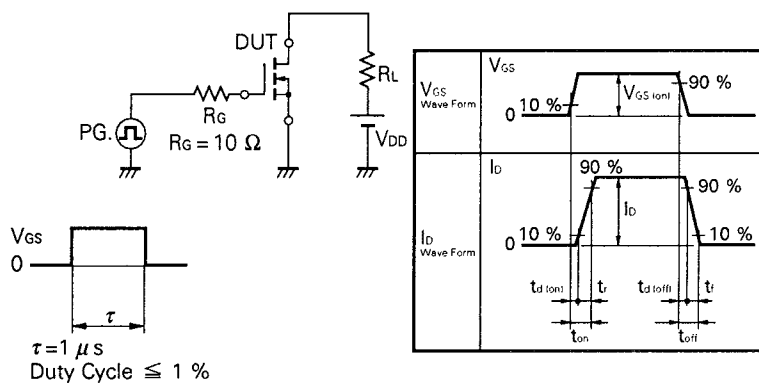
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-state Resistance	R <sub>DS(on)</sub>		0.21	0.26	Ω	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 8.0 A
Gate to Source Cutoff Voltage	V <sub>GS(off)</sub>	2.0		4.0	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Forward Transfer Admittance	y <sub>fs</sub>	4.0			S	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 8.0 A
Drain Leakage Current	I <sub>DSS</sub>			100	μA	V <sub>DS</sub> = 250 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>		1 090		pF	V <sub>DS</sub> = 10 V
Output Capacitance	C <sub>oss</sub>		420		pF	V <sub>GS</sub> = 0
Reverse Transfer Capacitance	C <sub>rss</sub>		80		pF	f = 1 MHz
Turn-On Delay Time	t <sub>d(on)</sub>		20		ns	V <sub>GS</sub> = 10 V
Rise Time	t <sub>r</sub>		40		ns	V <sub>DD</sub> = 150 V
Turn-Off Delay Time	t <sub>d(off)</sub>		60		ns	I <sub>D</sub> = 8.0 A, R <sub>G</sub> = 10 Ω
Fall Time	t <sub>f</sub>		20		ns	R <sub>L</sub> = 18.75 Ω
Total Gate Charge	Q <sub>G</sub>		25		nC	V <sub>GS</sub> = 10 V
Gate to Source Charge	Q <sub>GS</sub>		8.0		nC	I <sub>D</sub> = 16 A
Gate to Drain Charge	Q <sub>GD</sub>		14		nC	V <sub>DD</sub> = 200 V
Diode Forward Voltage	V <sub>F(S-D)</sub>		1.0		V	I <sub>F</sub> = 16 A, V <sub>GS</sub> = 0
Reverse Recovery Time	t <sub>rr</sub>		400		ns	I <sub>F</sub> = 16 A
Reverse Recovery Charge	Q <sub>rr</sub>		2.0		μC	di / dt = 50 A / μs

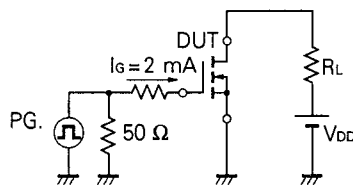
Test Circuit 1 : Avalanche Capability



Test Circuit 2 : Switching Time

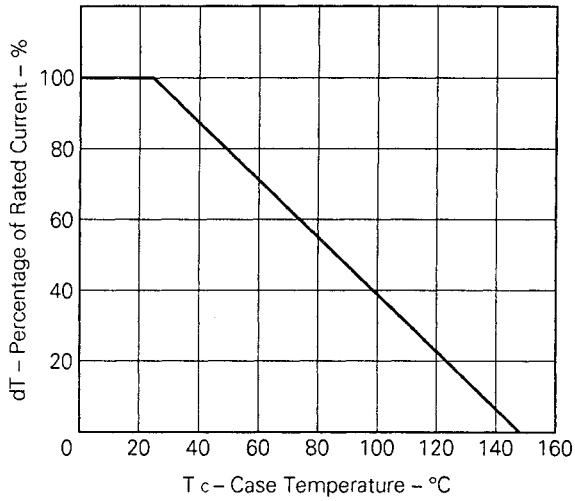


Test Circuit 3 : Gate Charge

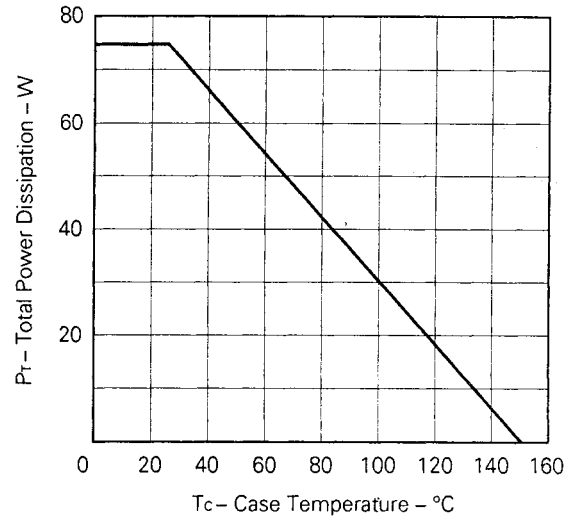


TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

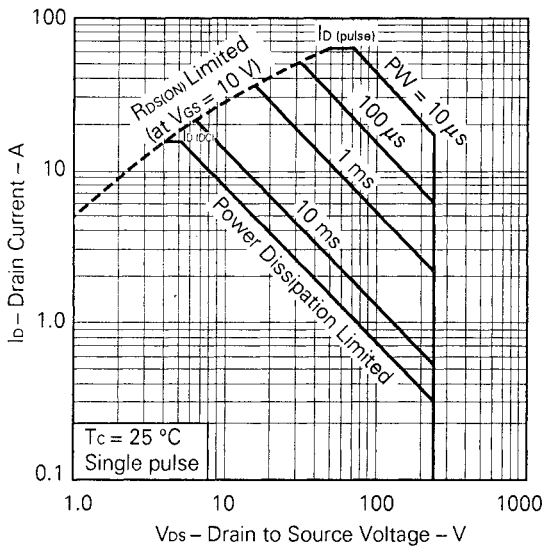
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



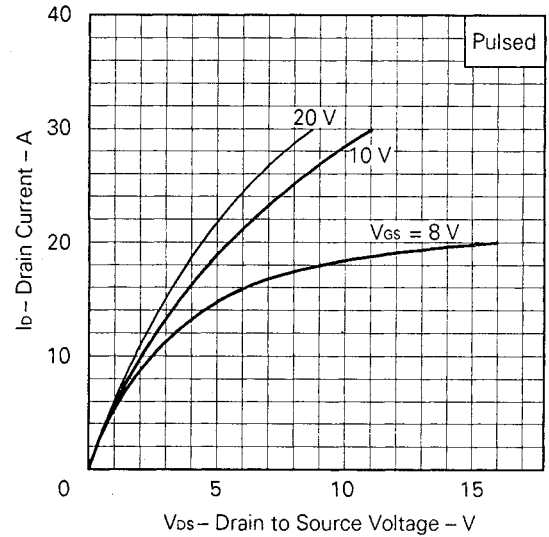
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



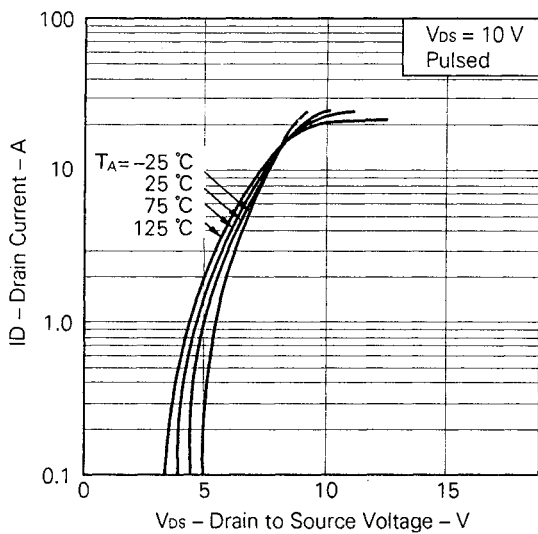
FORWARD BIAS SAFE OPERATING AREA



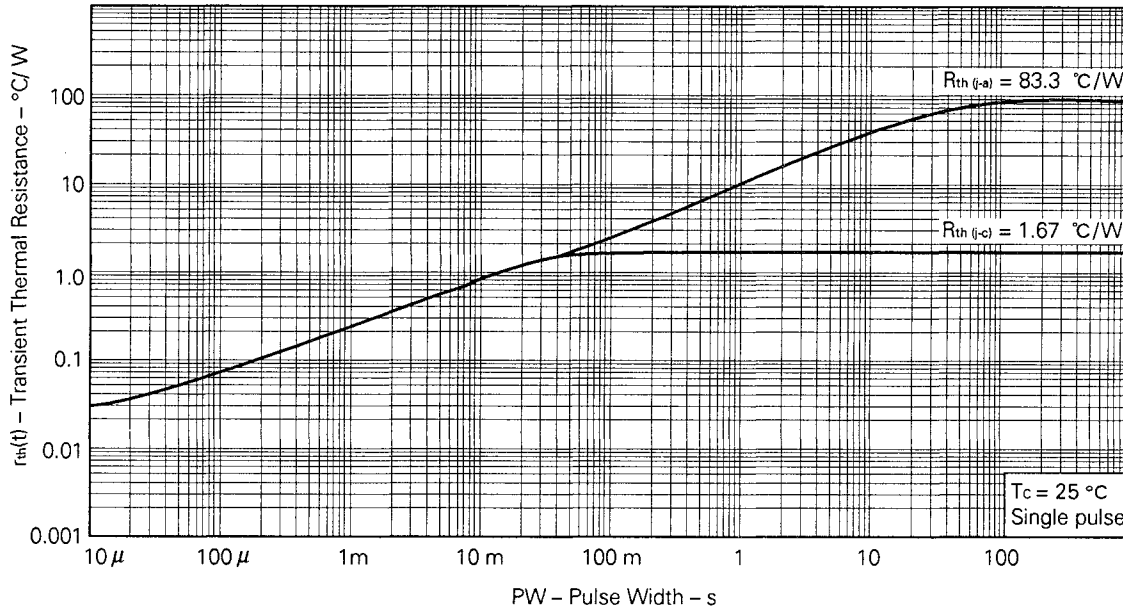
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



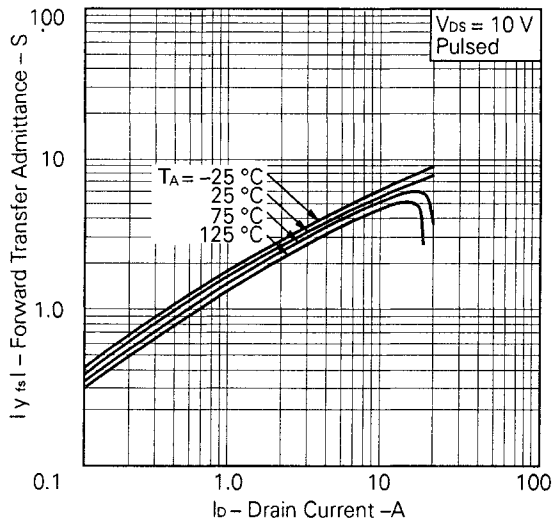
TRANSFER CHARACTERISTICS



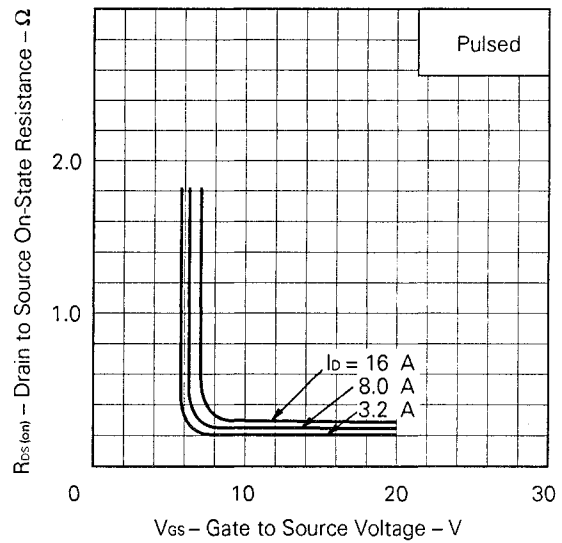
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



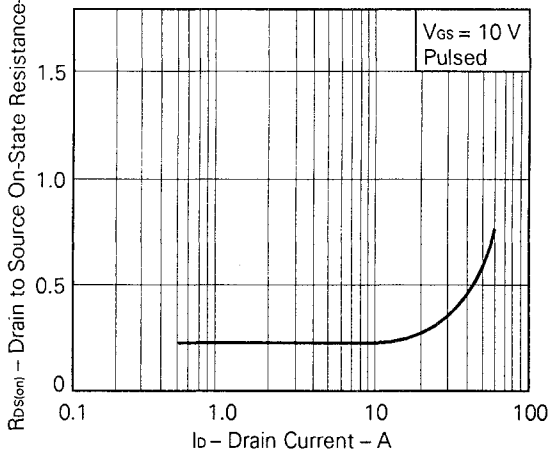
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



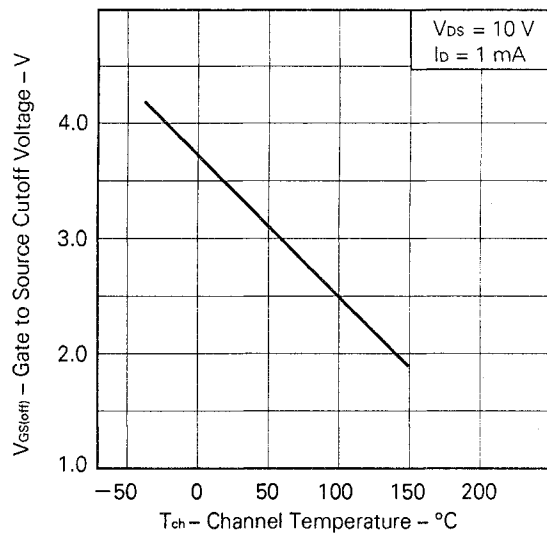
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



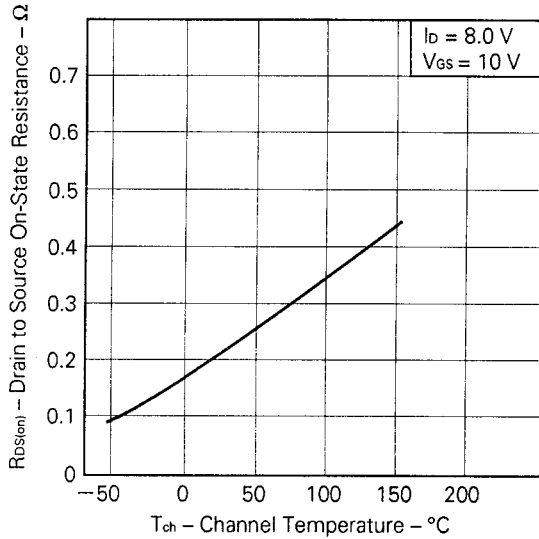
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



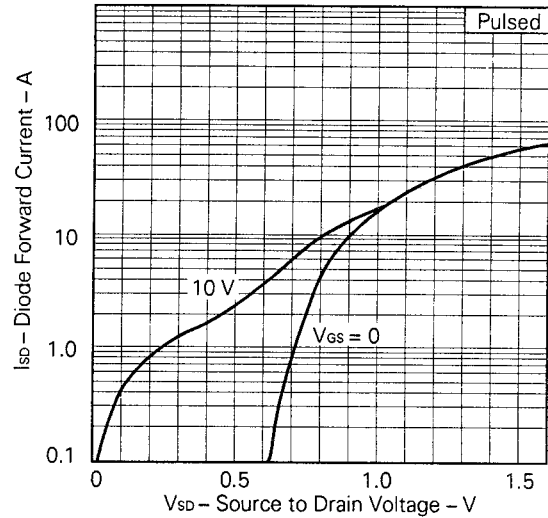
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



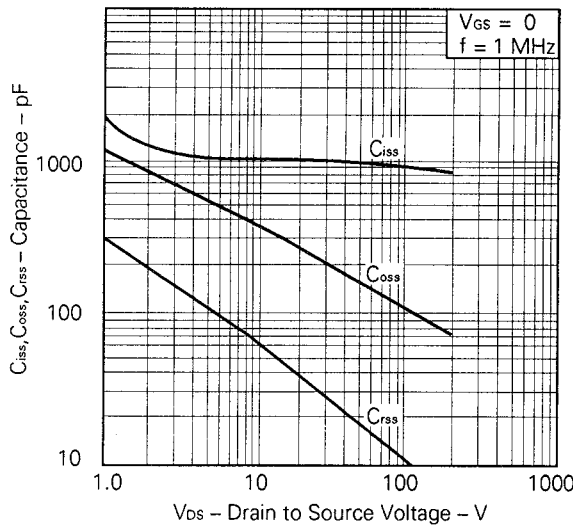
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



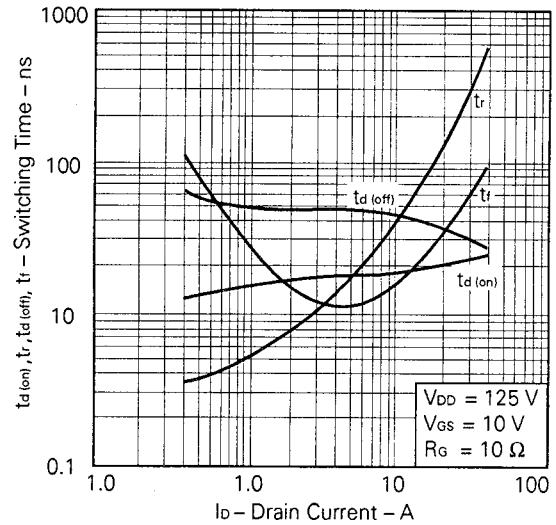
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



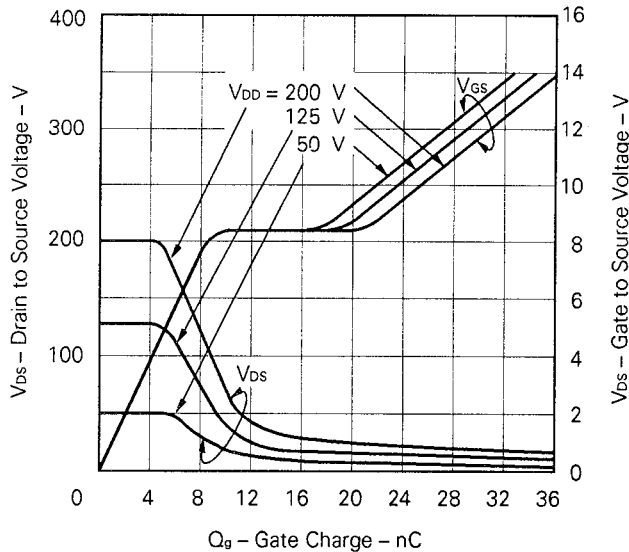
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



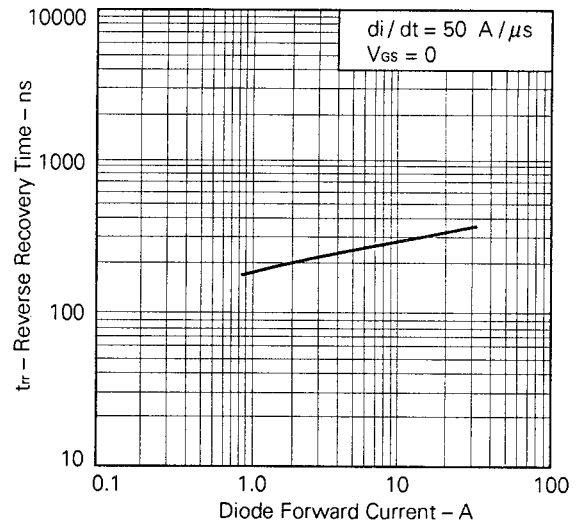
SWITCHING CHARACTERISTICS



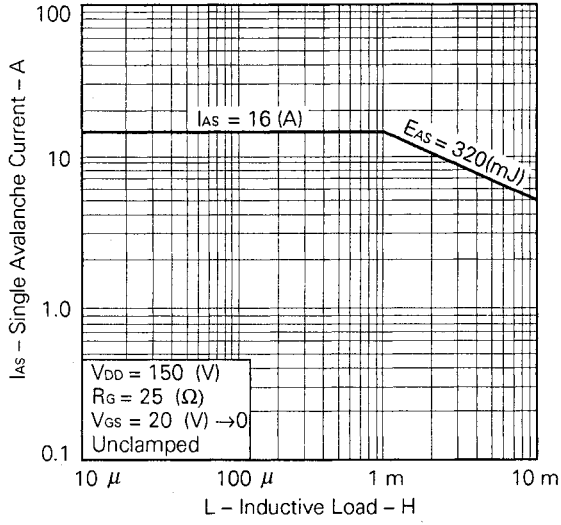
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



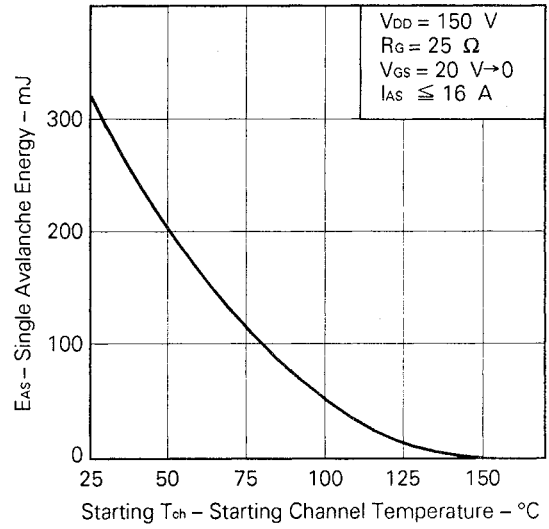
REVERSE RECOVERY TIME vs. REVERSE DRAIN CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY vs. STARTING CHANNEL TEMPERATURE



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Anti-radioactive design is not implemented in this product.