

NEC

MOS FIELD EFFECT POWER TRANSISTOR

2SK1994

SWITCHING

N-CHANNEL POWER MOS FET

INDUSTRIAL USE

DESCRIPTION

The 2SK1994 is N-channel MOS Field Effect Transistor designed for high voltage switching applications.

FEATURES

- Low On-state Resistance
 $R_{DS(on)} = 7.5 \Omega$ ($V_{GS} = 10 \text{ V}$, $I_D = 1.0 \text{ A}$)
- Low C_{iss} $C_{iss} = 430 \text{ pF TYP.}$
- Built-in G-S Gate Protection Diode
- High Avalanche Capability Ratings

QUALITY GRADE

Standard

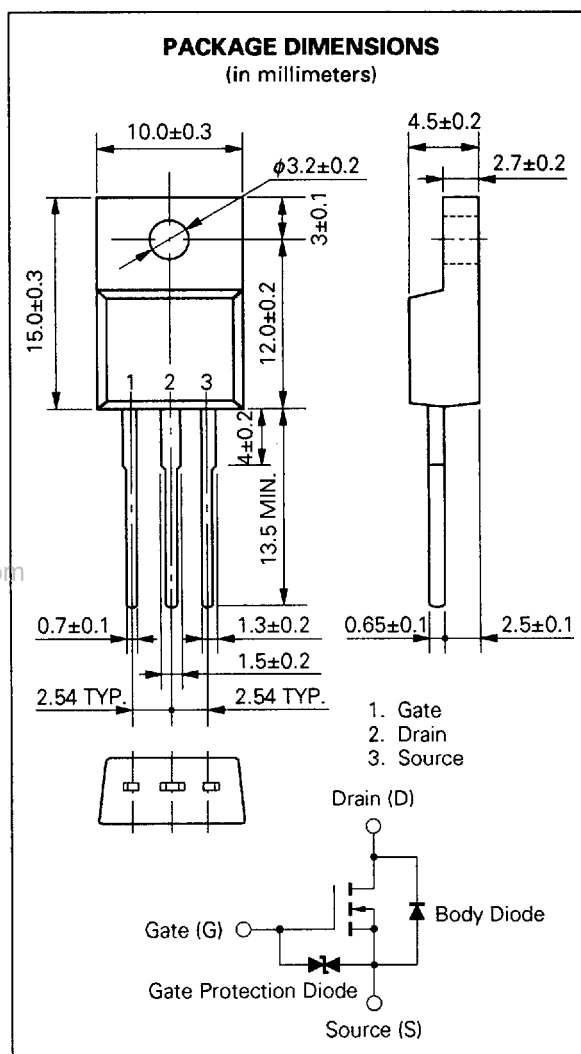
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

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

Drain to Source Voltage	V_{DS}	900	V
Gate to Source Voltage	V_{GS}	± 30	V
Drain Current (DC)	$I_{D(DC)}$	± 2.0	A
Drain Current (pulse)	$I_{D(pulse)}^*$	± 4.0	A
Total Power Dissipation ($T_c = 25^\circ\text{C}$)	PT_1	30	W
Total Power Dissipation ($T_a = 25^\circ\text{C}$)	PT_2	2.0	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}^{**}	2.0	A
Single Avalanche Energy	E_{AS}^{**}	7.2	mJ

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

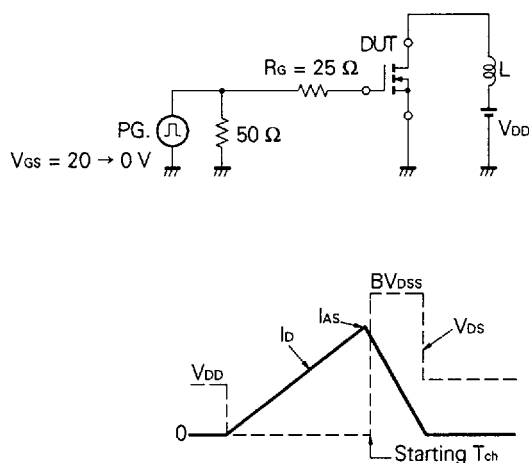
** Starting $T_{ch} = 25^\circ\text{C}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0$



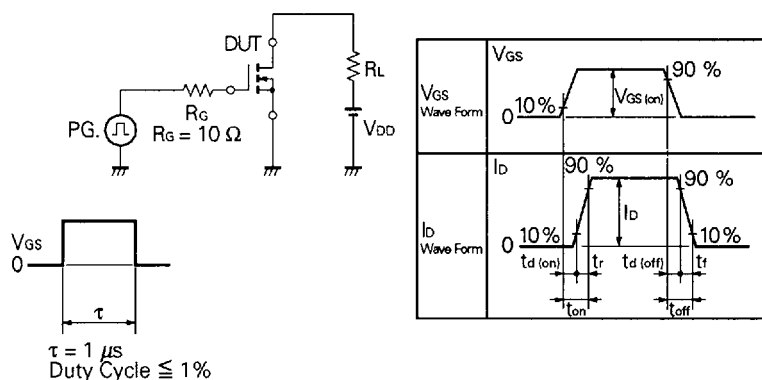
ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-state Resistance	R _{DS(on)}		5.5	7.5	Ω	V _{GS} = 10 V, I _D = 1 A
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}	0.6			S	V _{DS} = 20 V, I _D = 1 A
Drain Leakage Current	I _{DSS}			100	μA	V _{DS} = 900 V, V _{GS} = 0
Gate to Source Leakage Current	I _{GSS}			±10	μA	V _{GS} = ±30 V, V _{DS} = 0
Input Capacitance	C _{iss}		430		pF	V _{DS} = 10 V V _{GS} = 0 f = 1 MHz
Output Capacitance	C _{oss}		65		pF	
Reverse Transfer Capacitance	C _{rss}		21		pF	
Turn-On Delay Time	t _{d(on)}		10		ns	V _{GS} = 10 V V _{DD} = 150 V I _D = 3.0 A, R _G = 10 Ω R _L = 150 Ω
Rise Time	t _r		4		ns	
Turn-Off Delay Time	t _{d(off)}		50		ns	
Fall Time	t _f		10		ns	
Total Gate Charge	Q _G		15.5		nC	V _{GS} = 10 V I _D = 2 A V _{DD} = 720 V
Gate to Source Charge	Q _{GS}		2.4		nC	
Gate to Drain Charge	Q _{GD}		8.3		nC	
Diode Forward Voltage	V _{F(S-D)}		0.9		V	I _F = 2 A, V _{GS} = 0
Reverse Recovery Time	t _{rr}		470		ns	I _F = 2 A di/dt = 50 A/μs
Reverse Recovery Charge	Q _{rr}		2.0		μC	

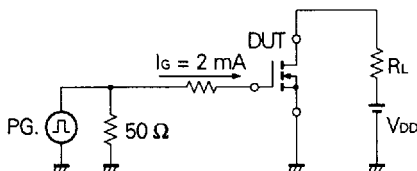
Test Circuit 1: Avalanche Capability

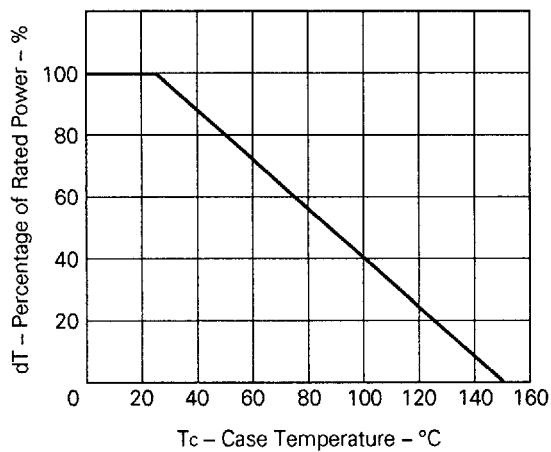
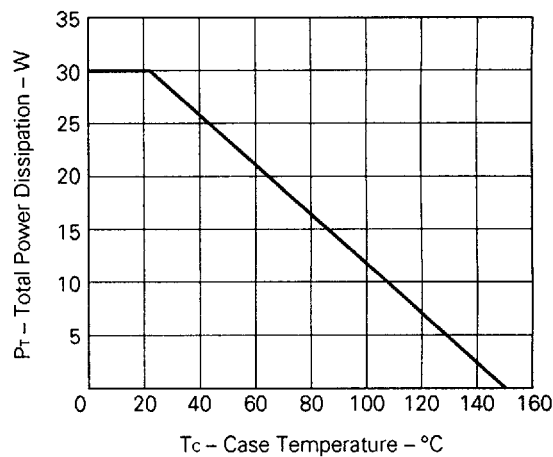


Test Circuit 2: Switching Time

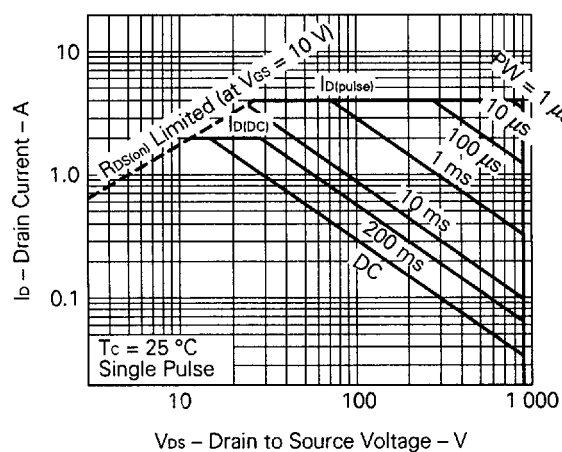
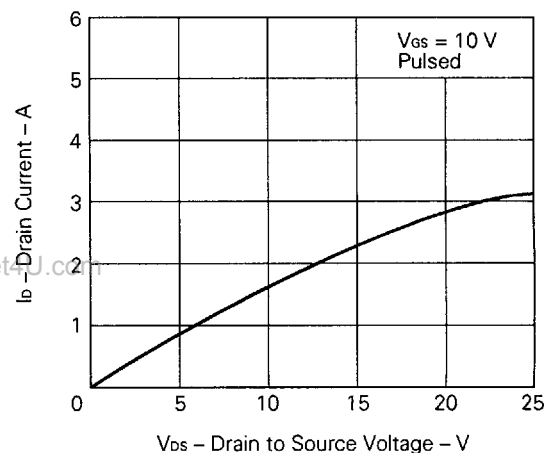


Test Circuit 3: Gate Charge

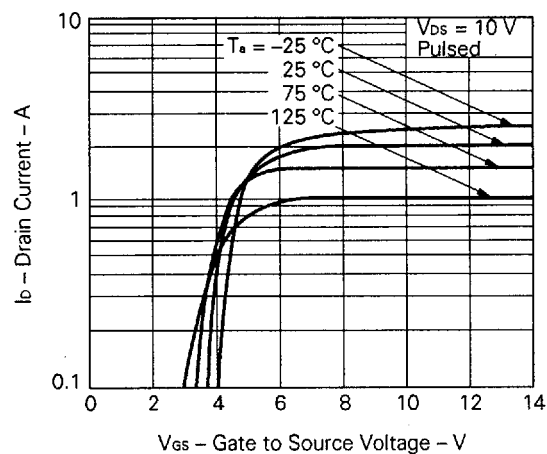


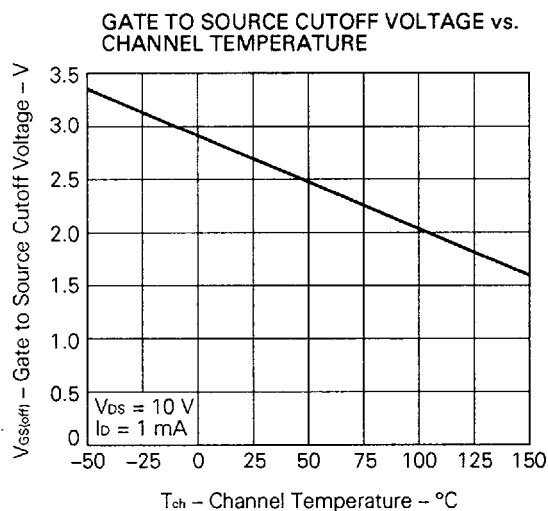
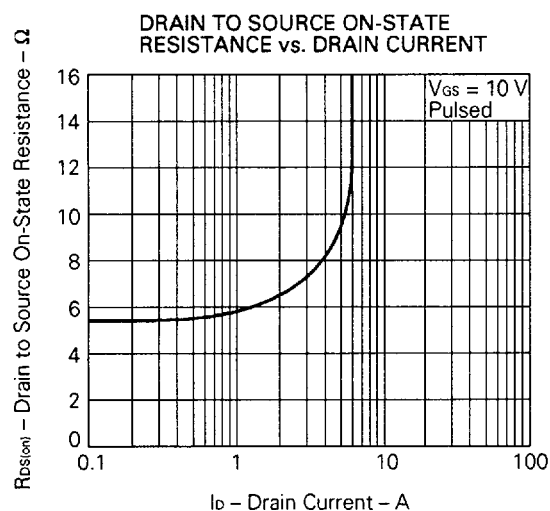
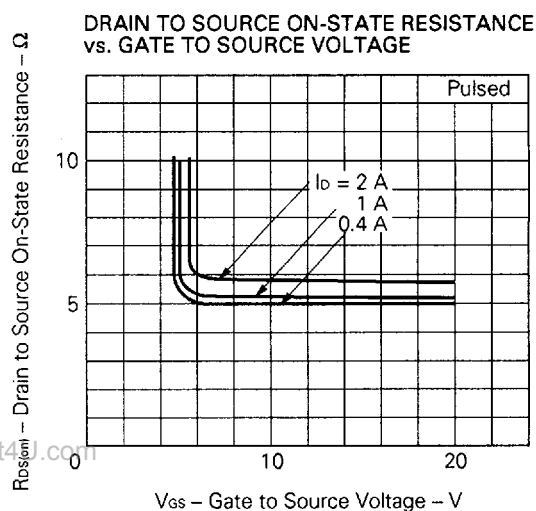
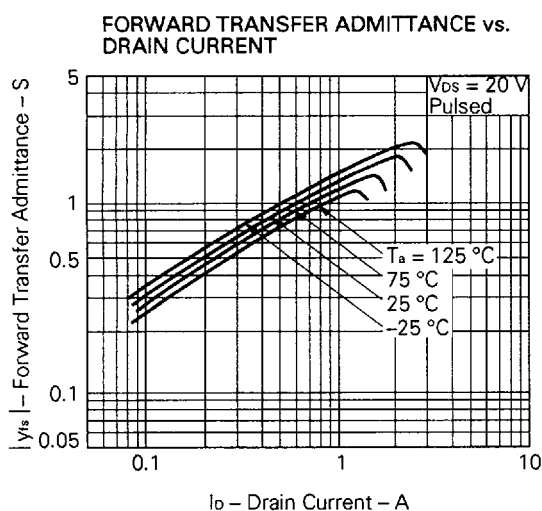
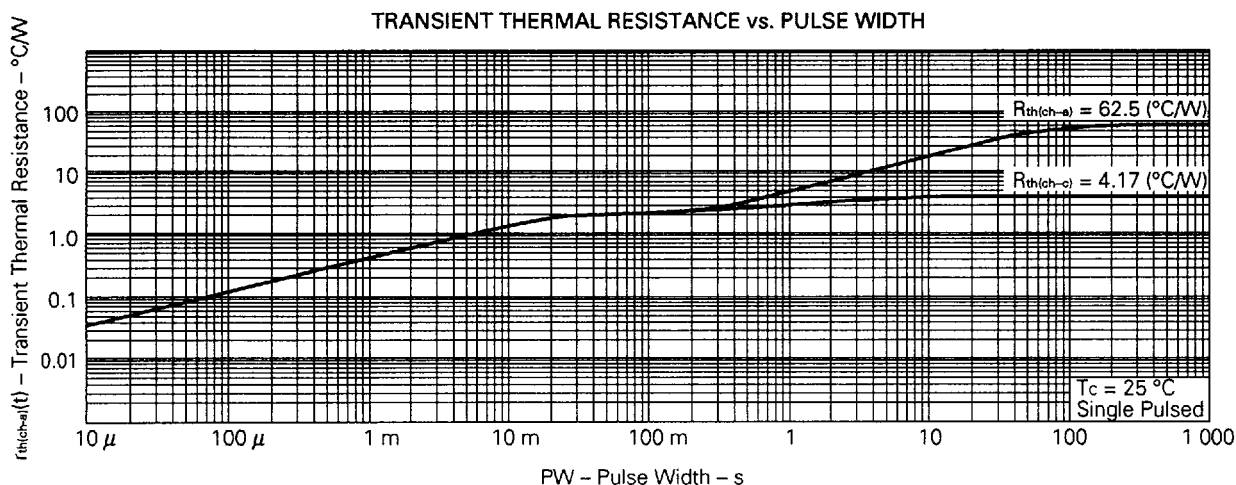
TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)DERATING FACTOR OF FORWARD BIAS
SAFE OPERATING AREATOTAL POWER DISSIPATION vs.
CASE TEMPERATURE

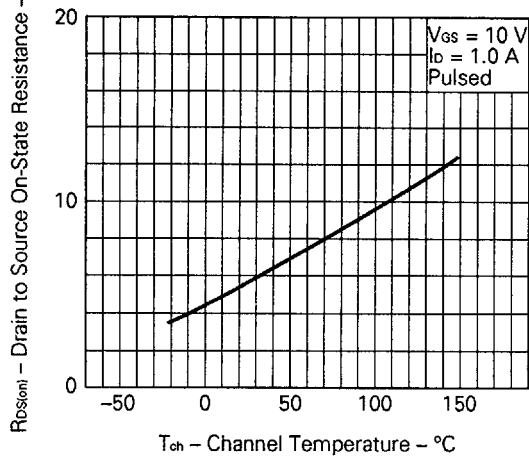
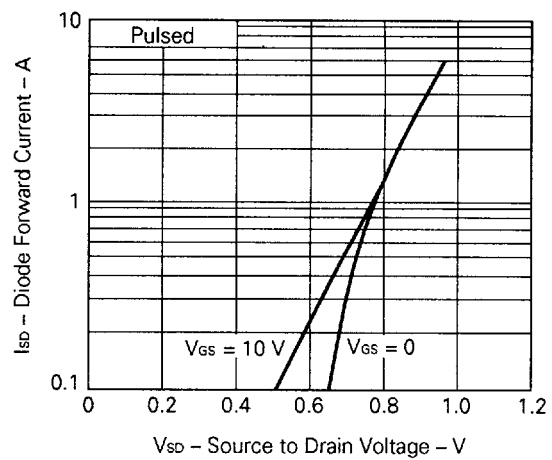
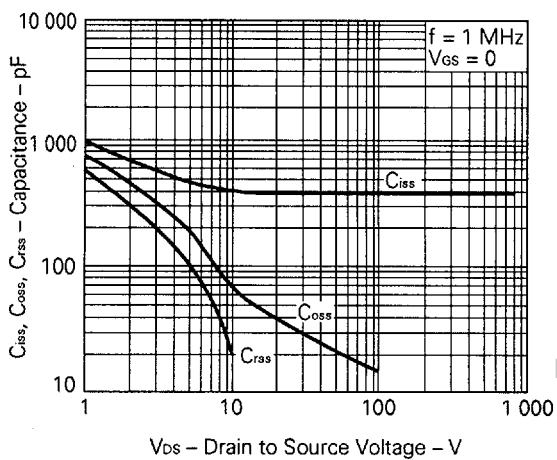
FORWARD BIAS SAFE OPERATING AREA

DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE

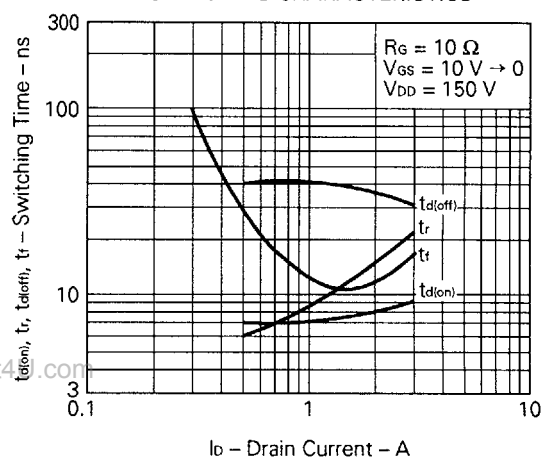
TRANSFER CHARACTERISTICS



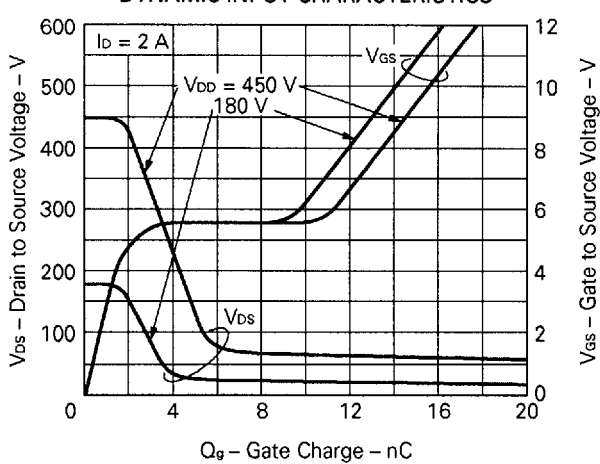
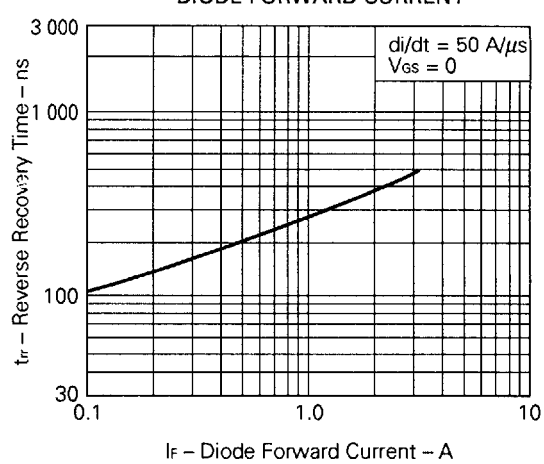


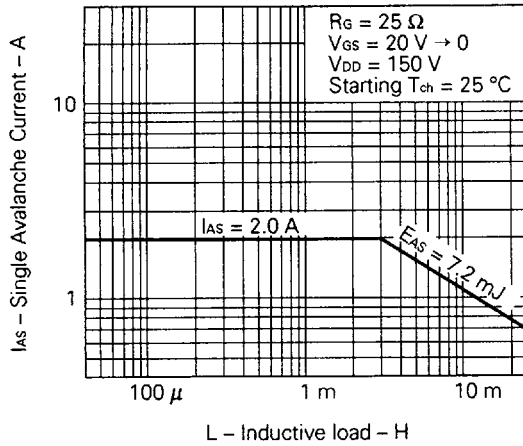
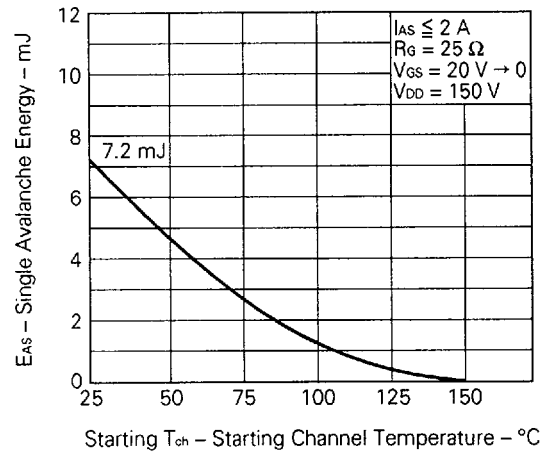
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. CHANNEL TEMPERATURESOURCE TO DRAIN DIODE
FORWARD VOLTAGECAPACITANCE vs. DRAIN TO
SOURCE VOLTAGE

SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS

REVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT

SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOADSINGLE 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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