

MOS FIELD EFFECT TRANSISTOR

2SK2409

SWITCHING

N-CHANNEL POWER MOS FET

INDUSTRIAL USE

DESCRIPTION

The 2SK2409 is N-Channel MOS Field Effect Transistor designed for solenoid, motor, and lamp driver.

FEATURES

- Low On-Resistance
 $R_{DS(on)} \leq 27 \text{ m}\Omega$ ($V_{GS} = 10 \text{ V}$, $I_D = 20 \text{ A}$)
 $R_{DS(on)} \leq 40 \text{ m}\Omega$ ($V_{GS} = 4 \text{ V}$, $I_D = 20 \text{ A}$)
- Low C_{iss} $C_{iss} = 2040 \text{ pF TYP.}$
- Built-in Gate Protection Diode

QUALITY GRADE

Standard

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

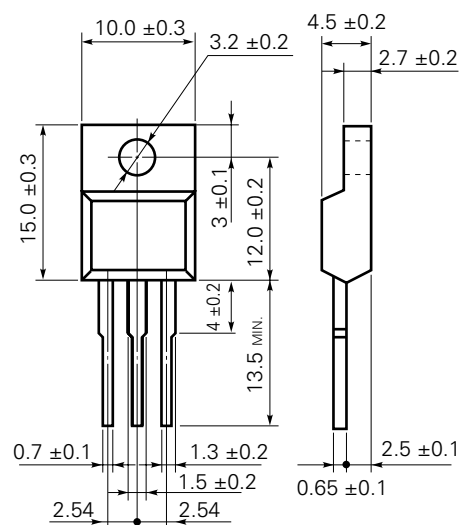
ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

Drain to Source Voltage	V_{DSS}	60	V
Gate to Source Voltage	V_{GSS}	± 20	V
Drain Current (DC)	$I_{D(DC)}$	± 40	A
Drain Current (pulse)	$I_{D(pulse)}^*$	± 160	A
Total Power Dissipation ($T_a = 25^\circ\text{C}$)	P_{T1}	2.0	W
Total Power Dissipation ($T_c = 25^\circ\text{C}$)	P_{T2}	35	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}^{**}	40	A
Single Avalanche Energy	E_{AS}^{**}	160	mJ

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

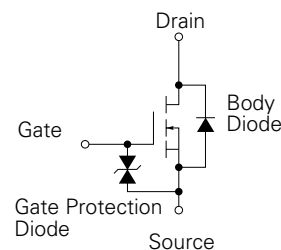
** Starting $T_{ch} = 25^\circ\text{C}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0$

PACKAGE DIMENSION (in millimeters)



1. Gate
2. Drain
3. Source

MP-45F (ISOLATED TO-220)

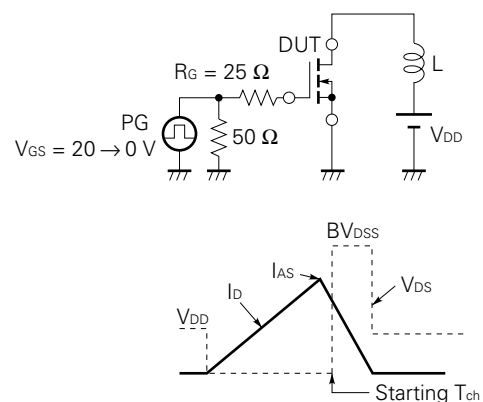


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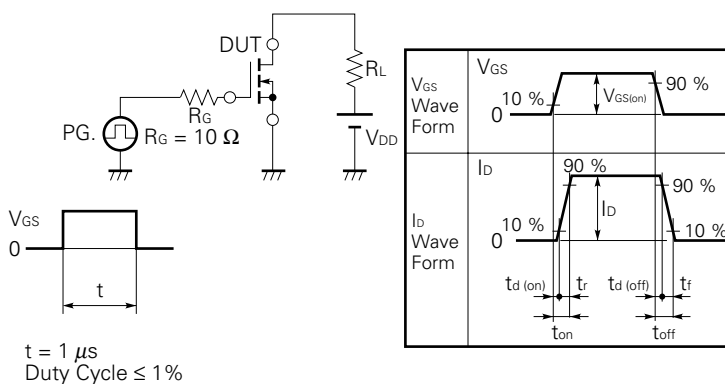
ELECTRICAL CHARACTERISTICS ($T_a = 25\text{ }^{\circ}\text{C}$)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-State Resistance	$R_{DS(on)1}$		22	27	$\text{m}\Omega$	$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$
Drain to Source On-State Resistance	$R_{DS(on)2}$		30	40	$\text{m}\Omega$	$V_{GS} = 4\text{ V}$, $I_D = 20\text{ A}$
Gate to Source Cutoff Voltage	$V_{GS(off)}$	1.0	1.5	2.0	V	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$
Forward Transfer Admittance	$ y_{fs} $	20	35		S	$V_{DS} = 10\text{ V}$, $I_D = 20\text{ A}$
Drain Cutoff Current	I_{BSS}			10	μA	$V_{DS} = 60\text{ V}$, $V_{GS} = 0$
Gate to Source Leakage Current	I_{GSS}			± 10	μA	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0$
Input Capacitance	C_{iss}		2040		pF	$V_{DS} = 10\text{ V}$
Output Capacitance	C_{oss}		1080		pF	$V_{GS} = 0$
Reverse Transfer Capacitance	C_{rss}		300		pF	$f = 1\text{ MHz}$
Turn-On Delay Time	$t_{d(on)}$		30		ns	$I_D = 20\text{ A}$
Rise Time	t_r		350		ns	$V_{GS(on)} = 10\text{ V}$
Turn-Off Delay Time	$t_{d(off)}$		210		ns	$V_{DD} = 30\text{ V}$
Fall Time	t_f		260		ns	$R_G = 10\text{ }\Omega$
Total Gate Charge	Q_G		72		nC	$I_D = 40\text{ A}$
Gate to Source Charge	Q_{GS}		6.0		nC	$V_{DD} = 48\text{ V}$
Gate to Drain Charge	Q_{GD}		24		nC	$V_{GS} = 10\text{ V}$
Body Diode Forward Voltage	$V_{F(S-D)}$		1.1		V	$I_F = 40\text{ A}$, $V_{GS} = 0$
Reverse Recovery Time	t_{rr}		110		ns	$I_F = 40\text{ A}$, $V_{GS} = 0$
Reverse Recovery Charge	Q_{rr}		360		nC	$di/dt = 100\text{ A}/\mu\text{s}$

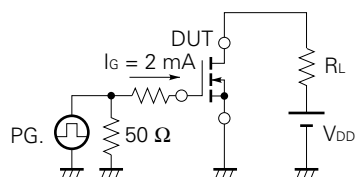
Test Circuit 1 Avalanche Capability



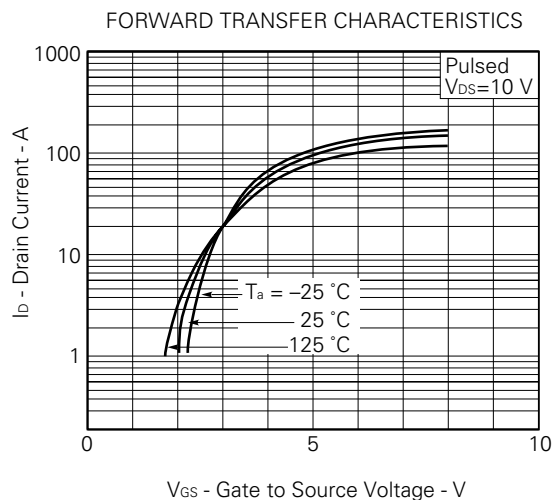
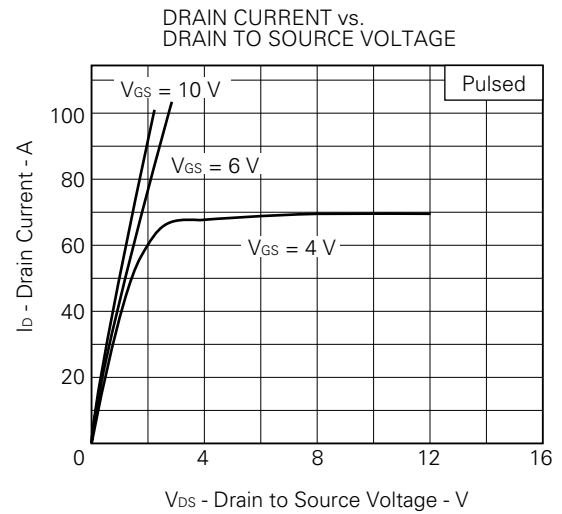
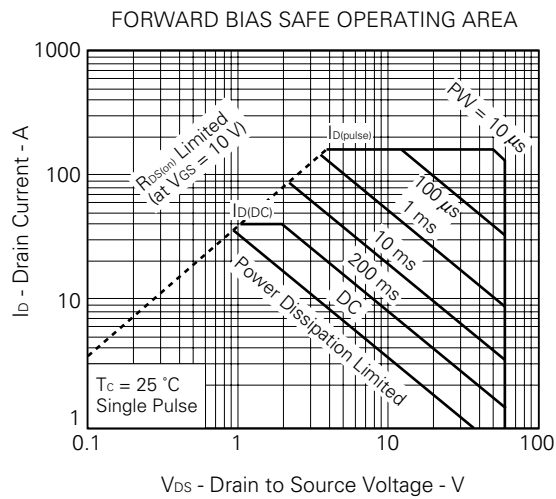
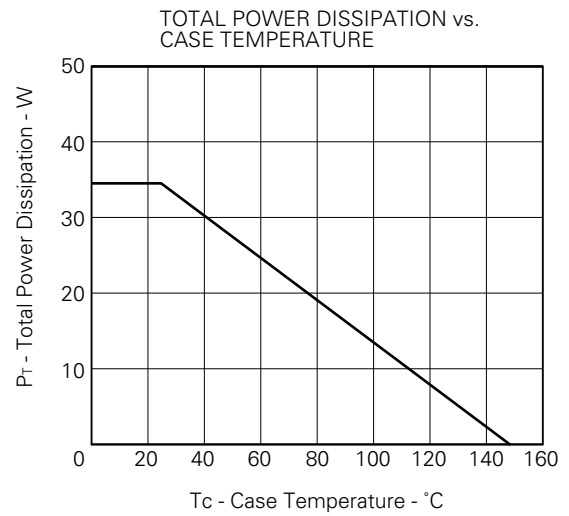
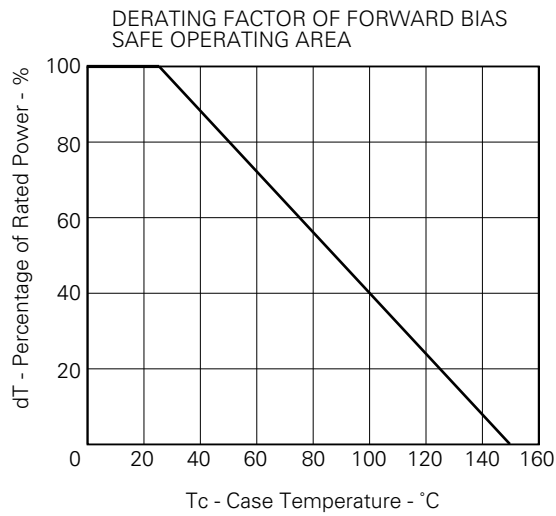
Test Circuit 2 Switching Time



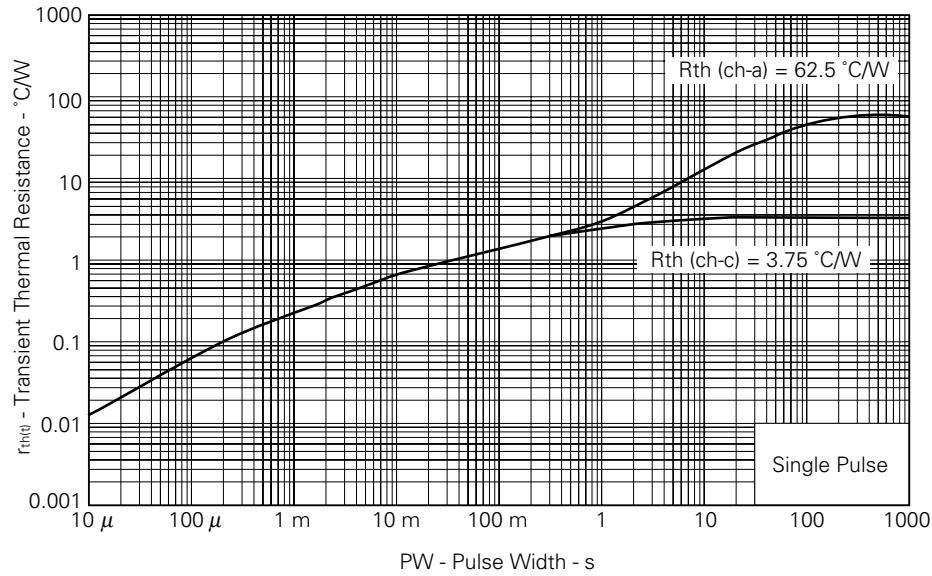
Test Circuit 3 Gate Charge



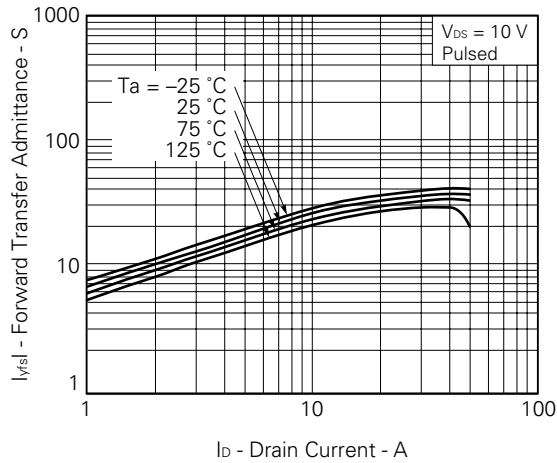
TYPICAL CHARACTERISTICS ($T_a = 25\text{ }^{\circ}\text{C}$)



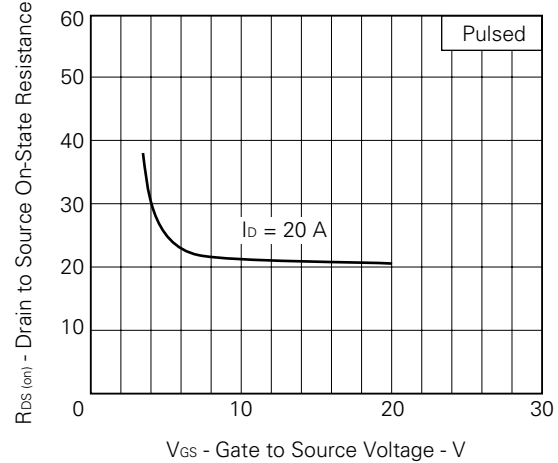
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



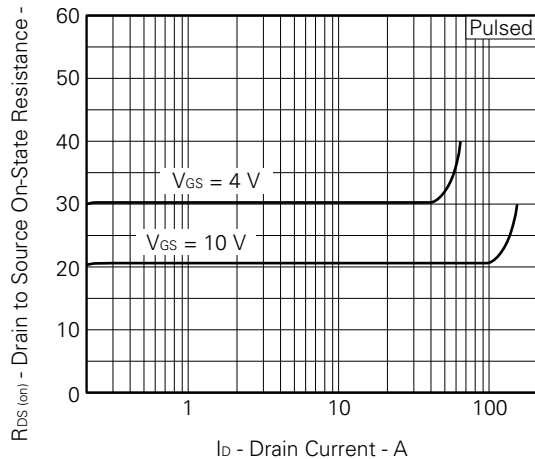
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



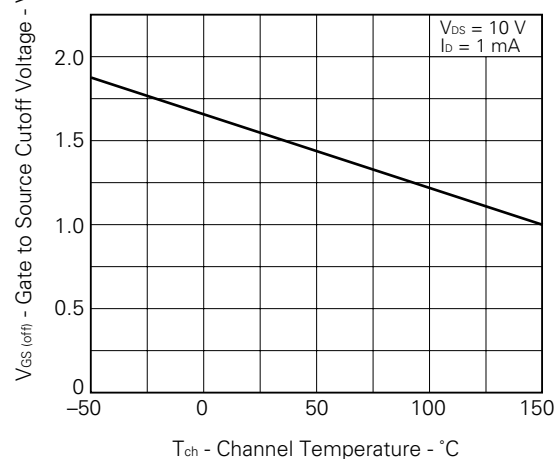
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

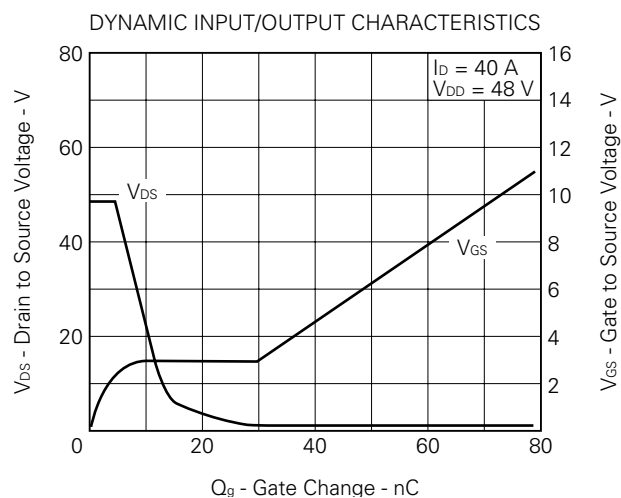
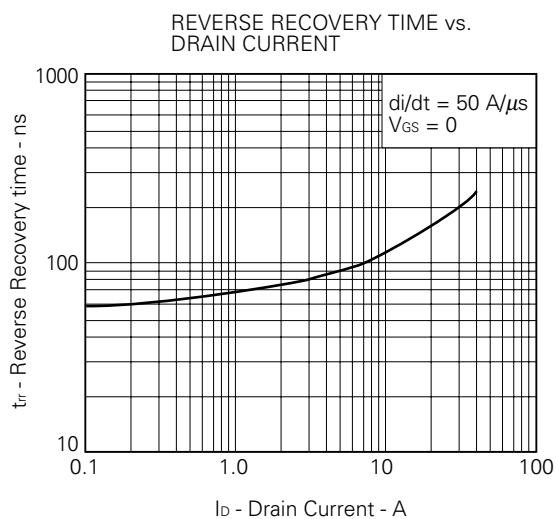
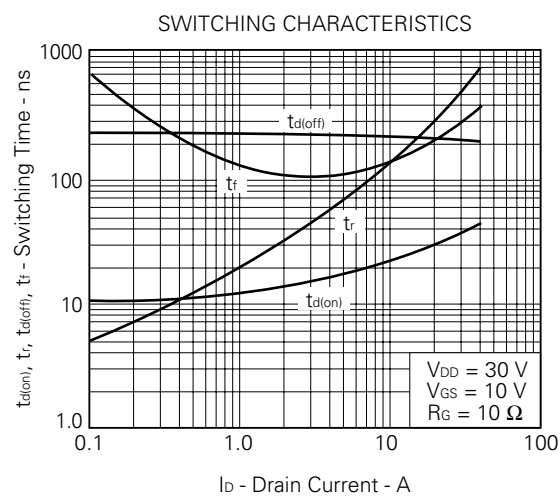
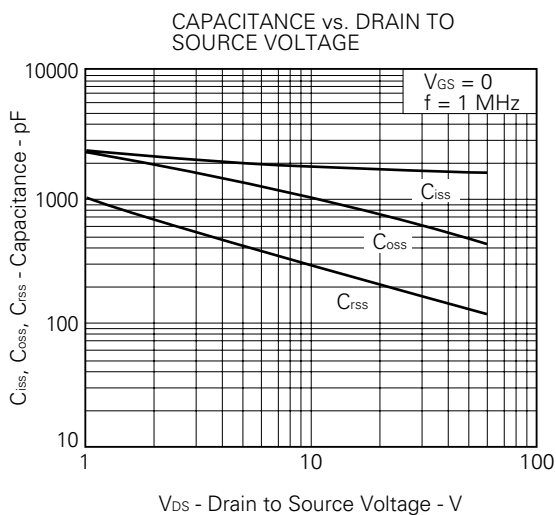
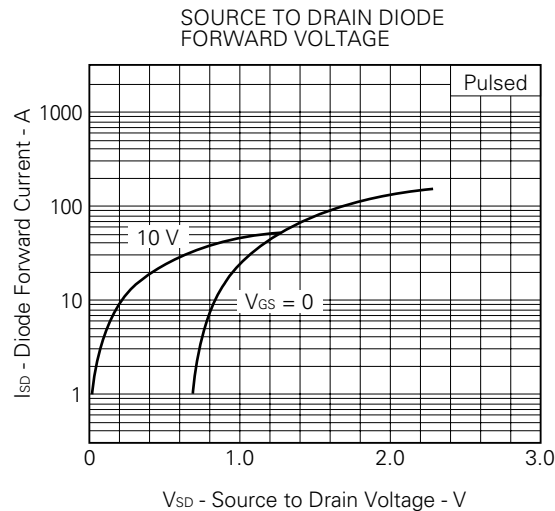
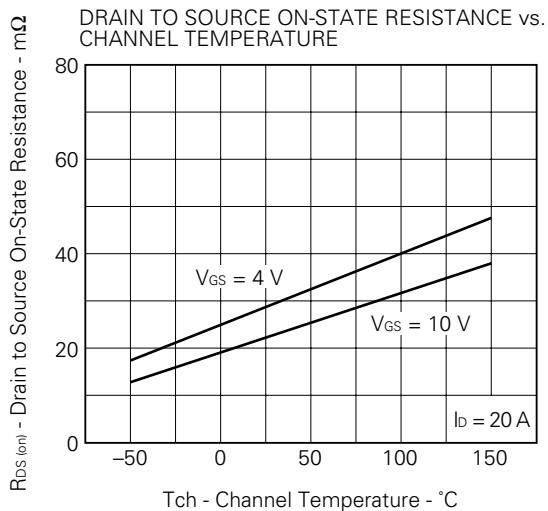


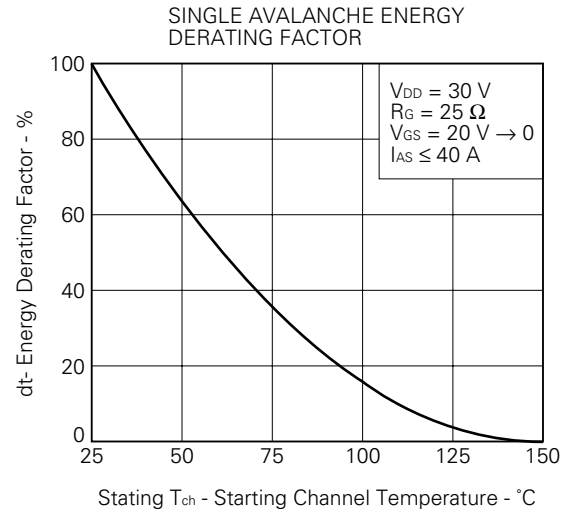
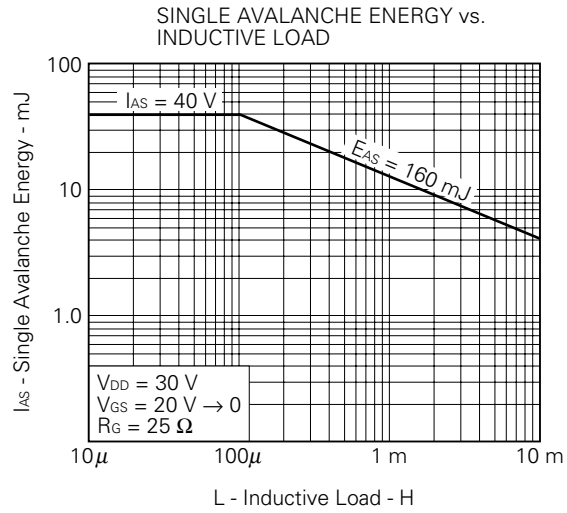
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE







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

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Standard: Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tools, Industrial robots, Audio and Visual equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.