

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.

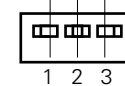
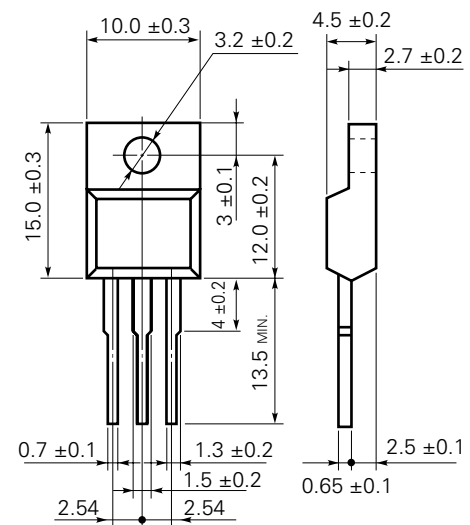
ABSOLUTE MAXIMUM RATINGS ($T_a = 25 \text{ }^\circ\text{C}$)

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 ($T_a = 25 \text{ }^\circ\text{C}$)	P_{T1}	2.0	W
Total Power Dissipation ($T_c = 25 \text{ }^\circ\text{C}$)	P_{T2}	35	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Single Avalanche Current	I_{AS}^{**}	40	A
Single Avalanche Energy	E_{AS}^{**}	160	mJ

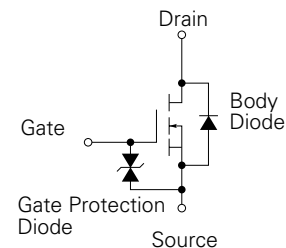
* $PW \leq 10 \text{ } \mu\text{s}$, Duty Cycle $\leq 1 \%$

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

PACKAGE DIMENSION (in millimeters)



MP-45F (ISOLATED TO-220)

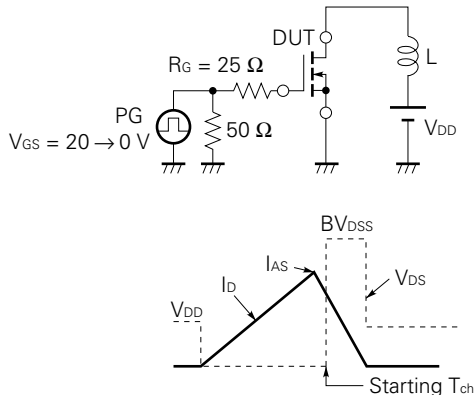


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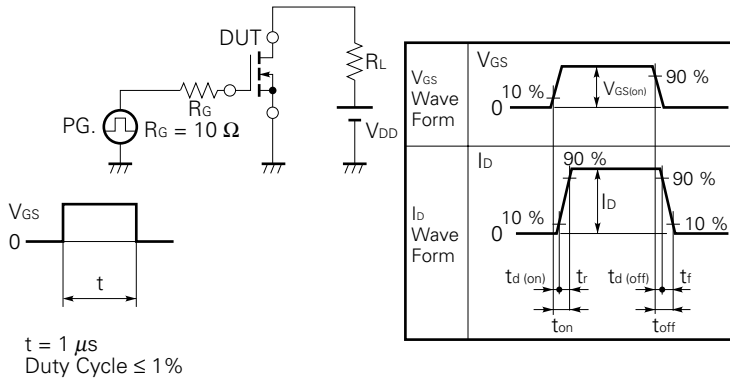
ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-State Resistance	R _{DS(on)1}		22	27	mΩ	V _{GS} = 10 V, I _D = 20 A
Drain to Source On-State Resistance	R _{DS(on)2}		30	40	mΩ	V _{GS} = 4 V, I _D = 20 A
Gate to Source Cutoff Voltage	V _{GS(off)}	1.0	1.5	2.0	V	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance	y _{fs}	20	35		S	V _{DS} = 10 V, I _D = 20 A
Drain Cutoff Current	I _{bss}			10	μA	V _{DS} = 60 V, V _{GS} = 0
Gate to Source Leakage Current	I _{GSS}			±10	μA	V _{GS} = ±20 V, V _{DS} = 0
Input Capacitance	C _{iss}		2040		pF	V _{DS} = 10 V
Output Capacitance	C _{oss}		1080		pF	V _{GS} = 0
Reverse Transfer Capacitance	C _{rss}		300		pF	f = 1 MHz
Turn-On Delay Time	t _{d(on)}		30		ns	I _D = 20 A
Rise Time	t _r		350		ns	V _{GS(on)} = 10 V
Turn-Off Delay Time	t _{d(off)}		210		ns	V _{DD} = 30 V
Fall Time	t _f		260		ns	R _G = 10 Ω
Total Gate Charge	Q _G		72		nC	I _D = 40 A
Gate to Source Charge	Q _{GS}		6.0		nC	V _{DD} = 48 V
Gate to Drain Charge	Q _{GD}		24		nC	V _{GS} = 10 V
Body Diode Forward Voltage	V _{F(S-D)}		1.1		V	I _F = 40 A, V _{GS} = 0
Reverse Recovery Time	t _{rr}		110		ns	I _F = 40 A, V _{GS} = 0
Reverse Recovery Charge	Q _{rr}		360		nC	di/dt = 100 A/μs

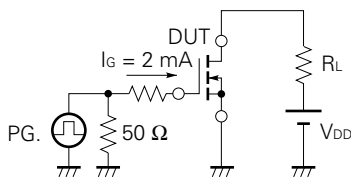
Test Circuit 1 Avalanche Capability



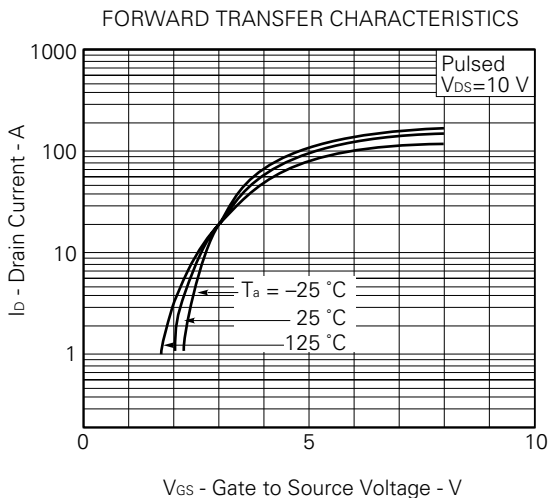
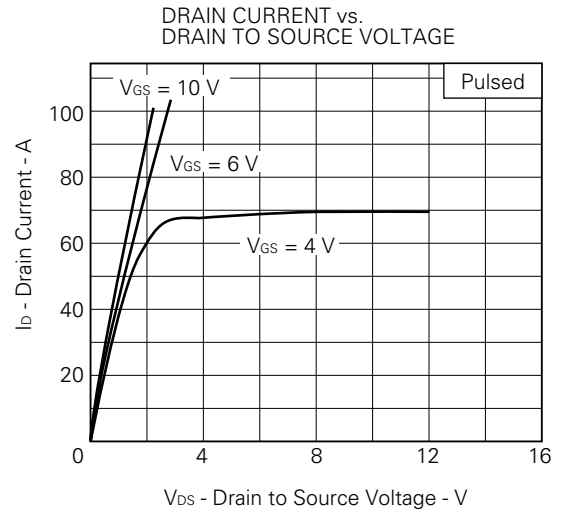
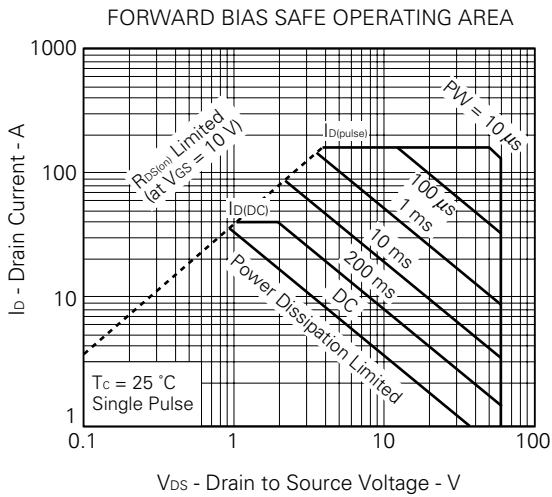
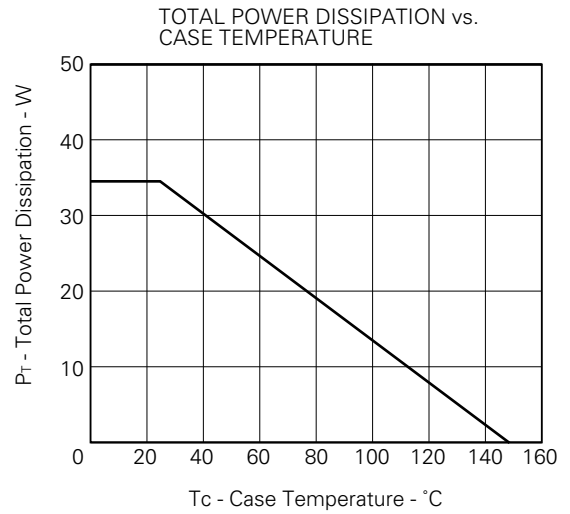
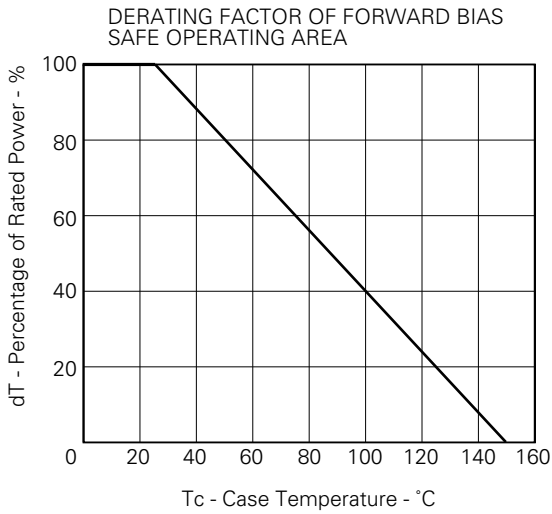
Test Circuit 2 Switching Time



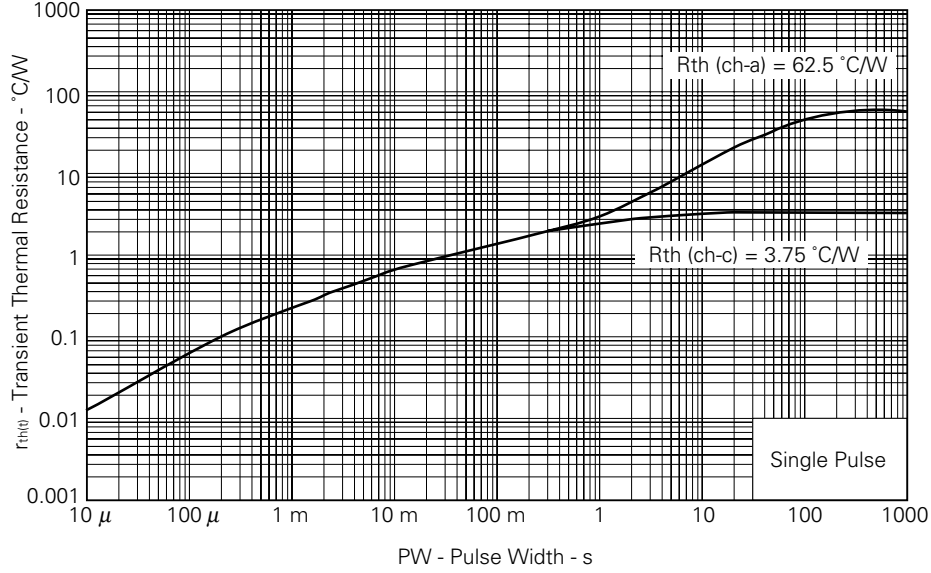
Test Circuit 3 Gate Charge



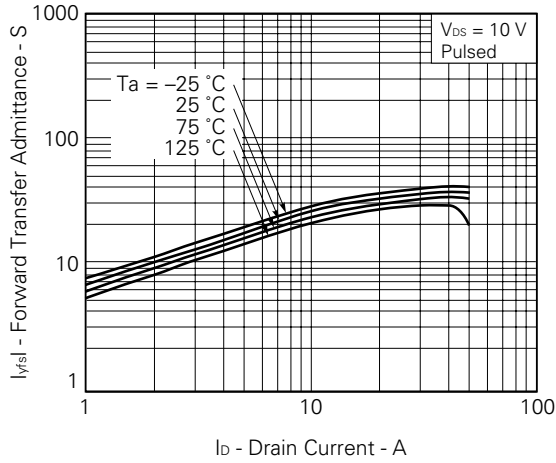
TYPICAL CHARACTERISTICS (T_a = 25 °C)



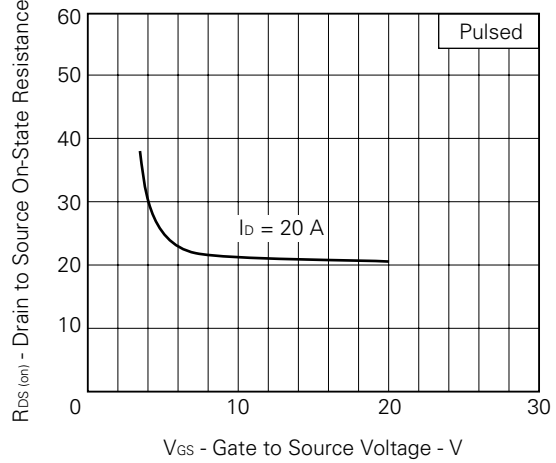
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



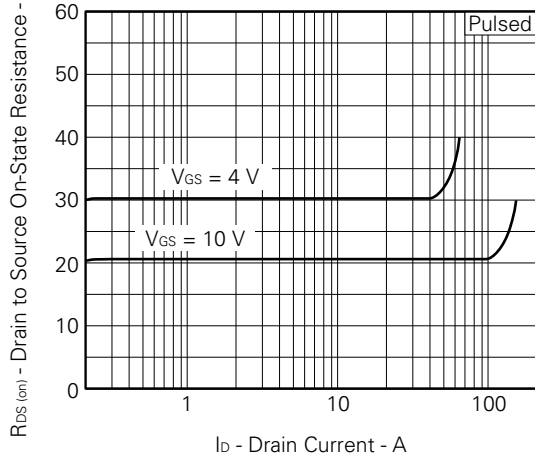
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



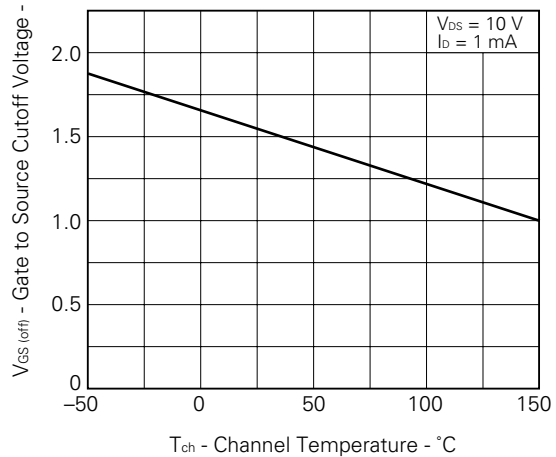
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



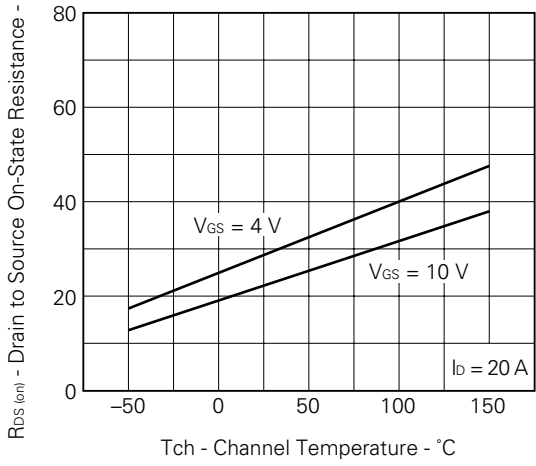
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



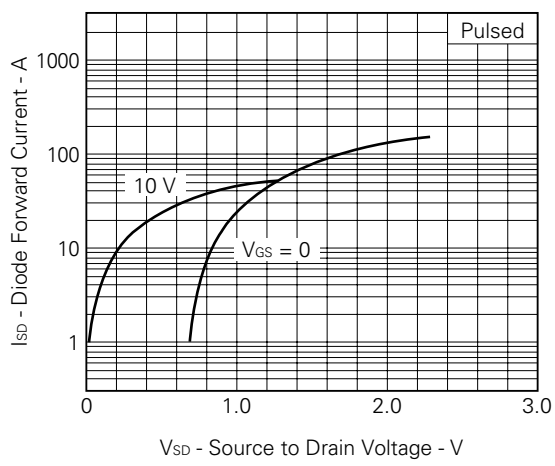
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



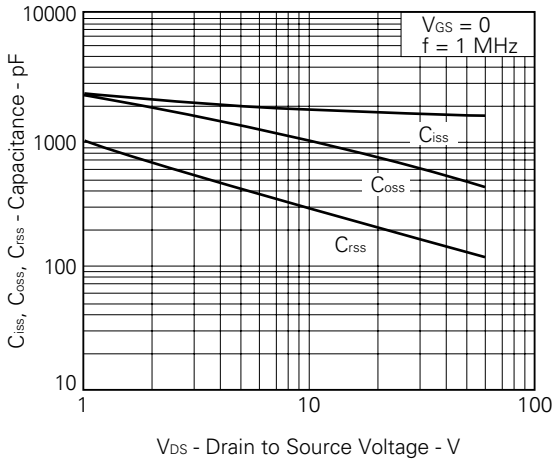
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



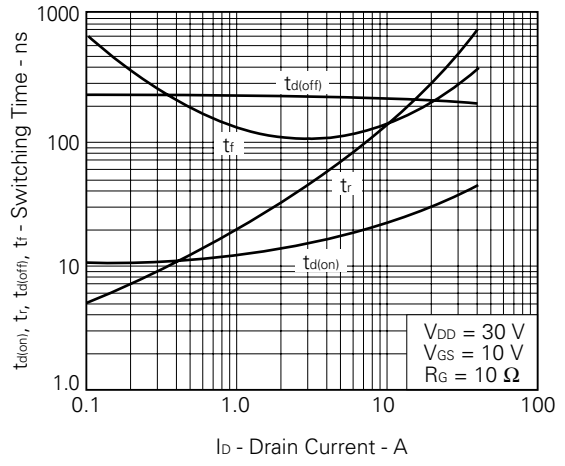
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



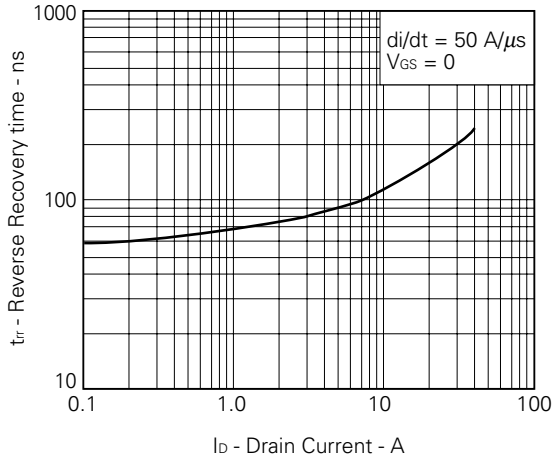
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



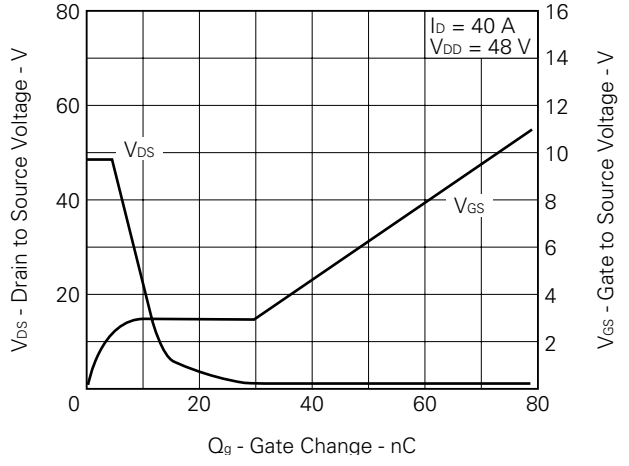
SWITCHING CHARACTERISTICS

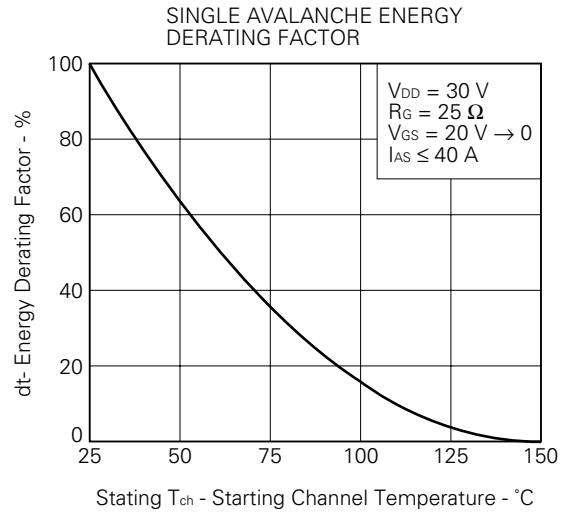
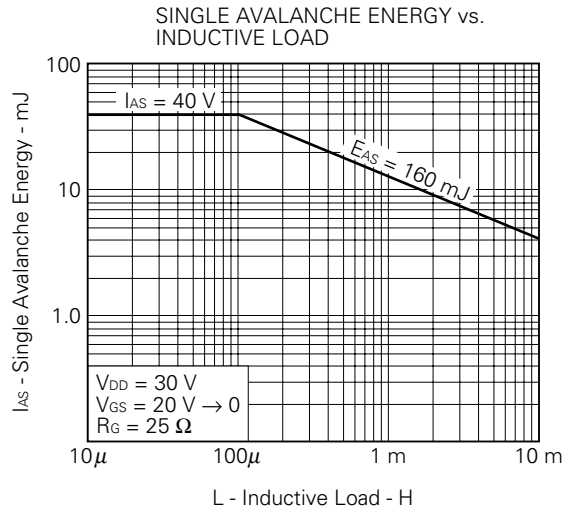


REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS





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