

MOS FIELD EFFECT TRANSISTOR
2SK2413

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

DESCRIPTION

The 2SK2413 is N-Channel MOS Field Effect Transistor designed for high speed switching applications.

FEATURES

- Low On-Resistance
 $R_{DS(on)1} = 70 \text{ m}\Omega \text{ MAX. (@ } V_{GS} = 10 \text{ V, } I_D = 5.0 \text{ A)}$
 $R_{DS(on)2} = 95 \text{ m}\Omega \text{ MAX. (@ } V_{GS} = 4 \text{ V, } I_D = 5.0 \text{ A)}$
- Low C_{iss} $C_{iss} = 860 \text{ pF TYP.}$
- Built-in G-S Gate Protection Diodes
- High Avalanche Capability Ratings

QUALITY GRADE

Standard

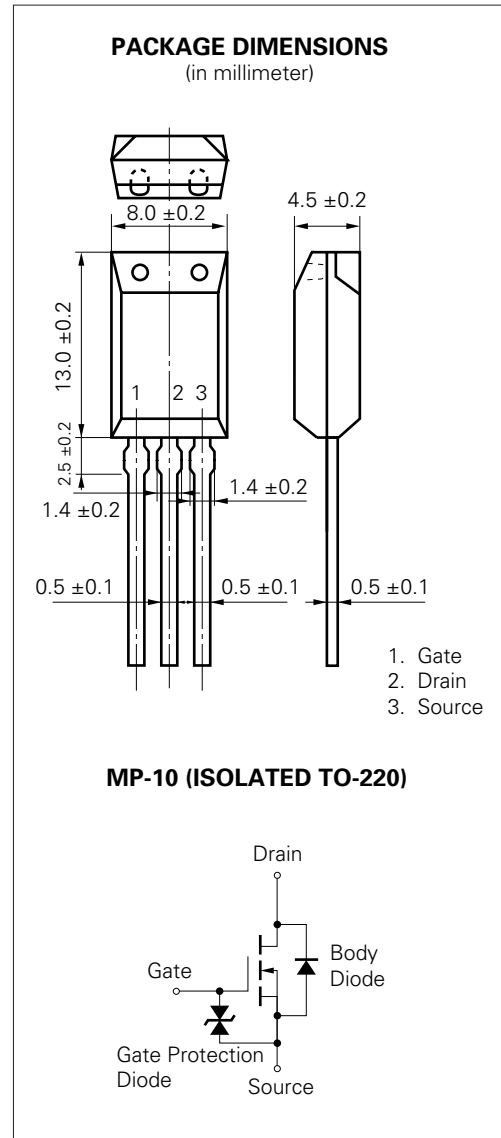
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

Drain to Source Voltage	V_{DSS}	60	V
Gate to Source Voltage	V_{GSS}	± 20	V
Drain Current (DC)	$I_{D(DC)}$	± 10	A
Drain Current (pulse)*	$I_{D(pulse)}$	± 40	A
Total Power Dissipation (TA = 25 °C)	P_T	1.8	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C
Single Avalanche Current**	I_{AS}	10	A
Single Avalanche Energy**	E_{AS}	10	mJ

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

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

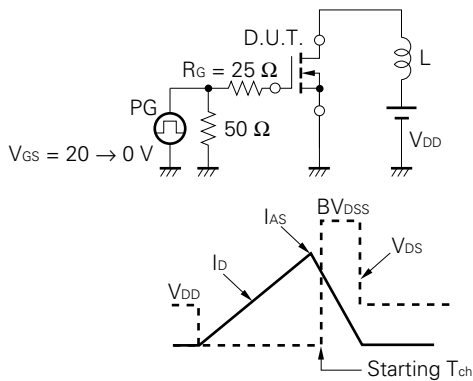


The information in this document is subject to change without notice.

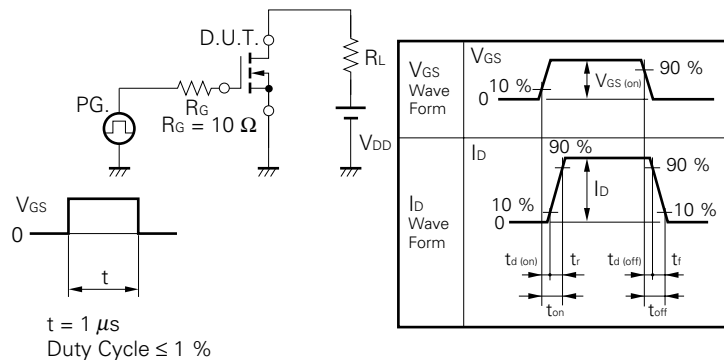
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-Resistance	R _{DS(on)1}		50	70	mΩ	V _{GS} = 10 V, I _D = 5.0 A
Drain to Source On-Resistance	R _{DS(on)2}		70	95	mΩ	V _{GS} = 4 V, I _D = 5.0 A
Gate to Source Cutoff Voltage	V _{GS(off)}	1.0	1.6	2.0	V	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance	y _{fs}	7.0	12		S	V _{DS} = 10 V, I _D = 5.0 A
Drain Leakage 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}		860		pF	V _{DS} = 10 V
Output Capacitance	C _{oss}		440		pF	V _{GS} = 0
Reverse Transfer Capacitance	C _{rss}		110		pF	f = 1 MHz
Turn-On Delay Time	t _{d(on)}		15		ns	I _D = 5.0 A
Rise Time	t _r		90		ns	V _{GS(on)} = 10 V
Turn-Off Delay Time	t _{d(off)}		75		ns	V _{DD} = 30 V
Fall Time	t _f		30		ns	R _G = 10 Ω
Total Gate Charge	Q _G		24		nC	I _D = 20 A
Gate to Source Charge	Q _{GS}		3.0		nC	V _{DD} = 48 V
Gate to Drain Charge	Q _{GD}		6.0		nC	V _{GS} = 10 V
Body Diode Forward Voltage	V _{F(S-D)}		1.0		V	I _F = 10 A, V _{GS} = 0
Reverse Recovery Time	t _{rr}		95		ns	I _F = 10 A, V _{GS} = 0
Reverse Recovery Charge	Q _{rr}		250		nC	di/dt = 100 A/μs

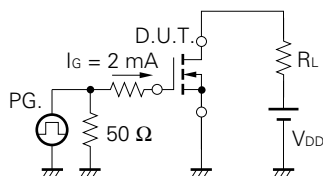
Test Circuit 1 Avalanche Capability



Test Circuit 2 Switching Time

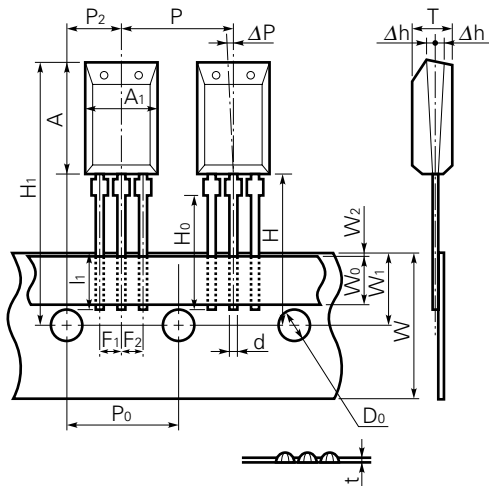


Test Circuit 3 Gate Charge



The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

Radial Tape Specification

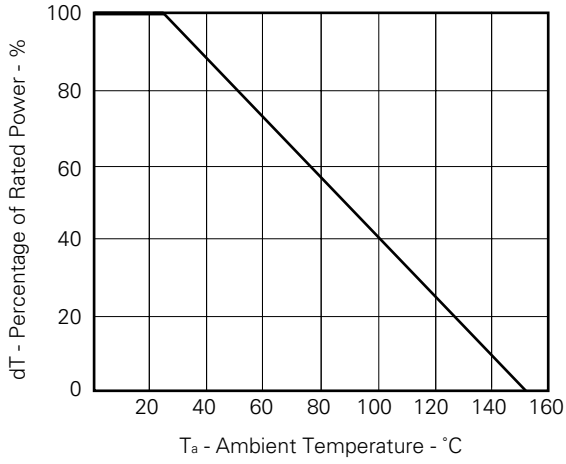


Dimension (unit: mm)

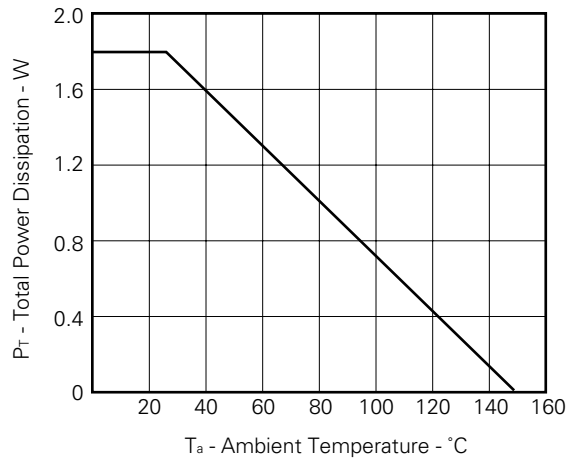
Item		
Component Body Length along Tape	A_1	8.0 ± 0.2
Component Body Height	A	13.0 ± 0.2
Component Body Width	T	4.5 ± 0.2
Component Lead Width Dimension	d	0.5 ± 0.1
Lead Wire Enclosure	l_1	2.5 MIN.
Component Center Pitch	P	12.7 ± 1.0
Feedhole Pitch	P_0	12.7 ± 0.3
Feedhole Center to Center Lead	P_2	6.35 ± 0.5
Component Lead Pitch	F_1, F_2	$2.5 \begin{matrix} +0.4 \\ -0.1 \end{matrix}$
Deflection Front or Rear	Δh	± 1.0
Deflection Left or Right	ΔP	± 1.3
Carrier Strip Width	W	$18.0 \begin{matrix} +1.0 \\ -0.5 \end{matrix}$
Adhesive Tape Width	W_0	5.0 MIN.
Feedhole Location	W_1	9.0 ± 0.5
Adhesive Tape Position	W_2	0.7 MIN.
Height of Seating Plane	H_0	16.0 ± 0.5
Feedhole to upper of Component	H_1	32.2 MAX.
Feedhole to Bottom of Component	H	20.0 MAX.
Tape Feedhole Diameter	D_0	4.0 ± 0.2
Overall Taped Package Thickness	t	0.7 ± 0.2

TYPICAL CHARACTERISTICS (T_A = 25 °C)

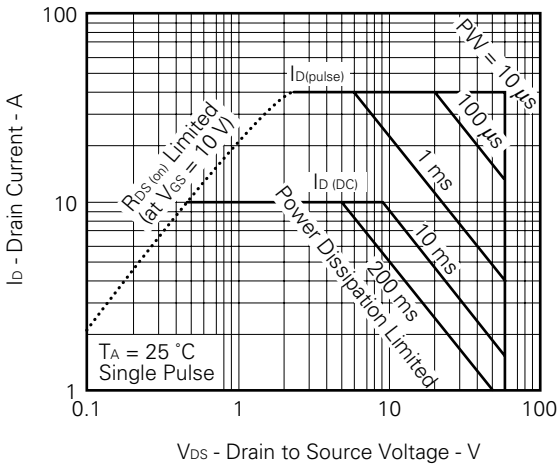
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



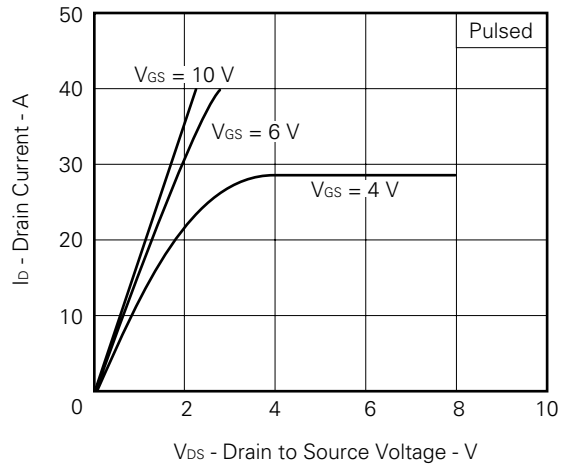
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



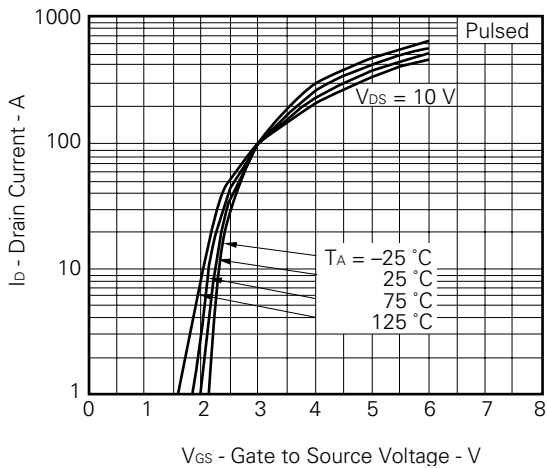
FORWARD BIAS SAFE OPERATING AREA



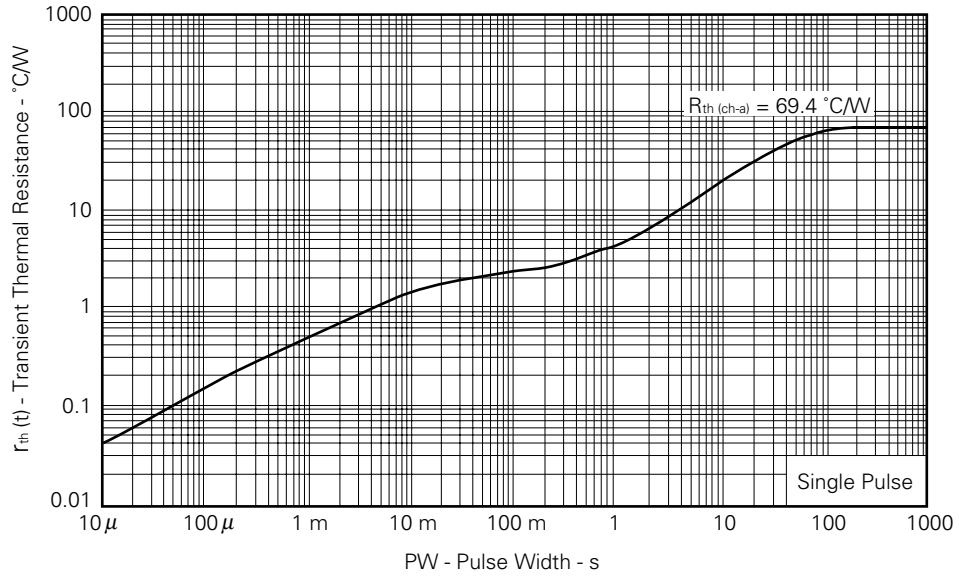
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



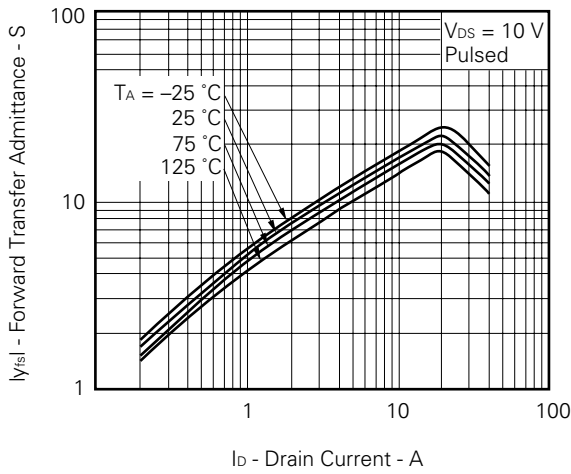
FORWARD TRANSFER CHARACTERISTICS



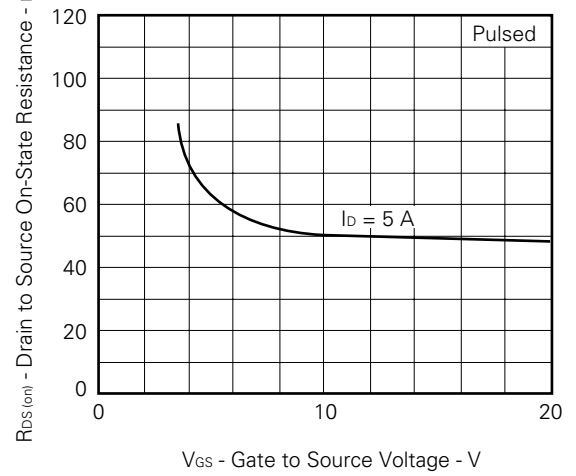
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



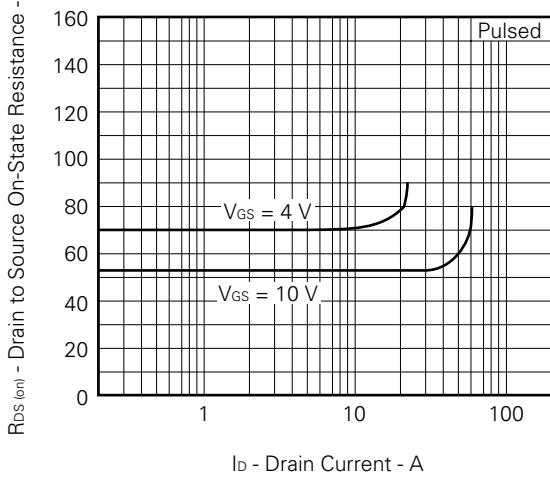
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



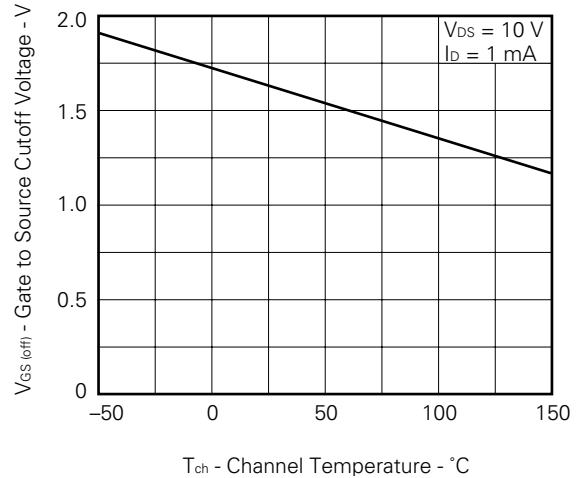
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



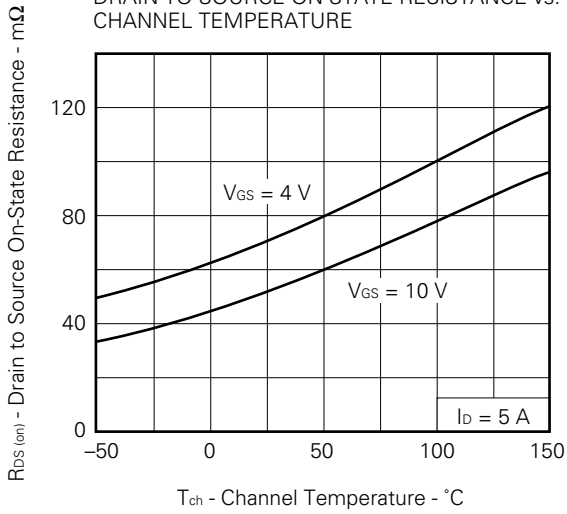
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



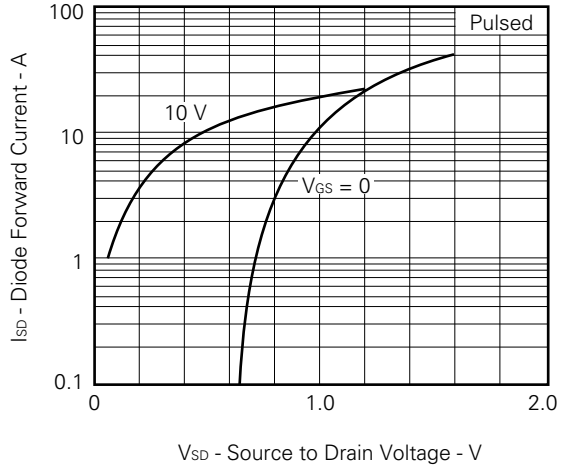
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



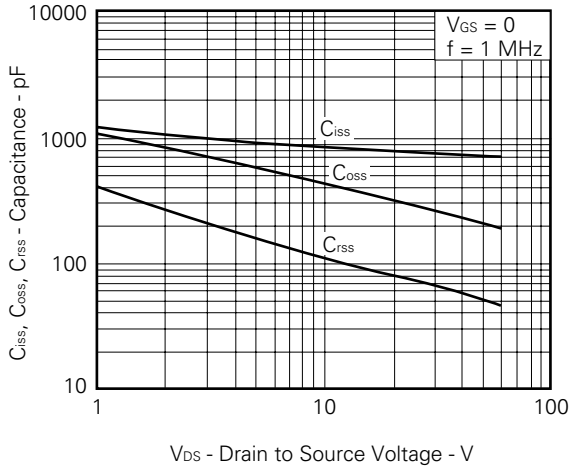
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



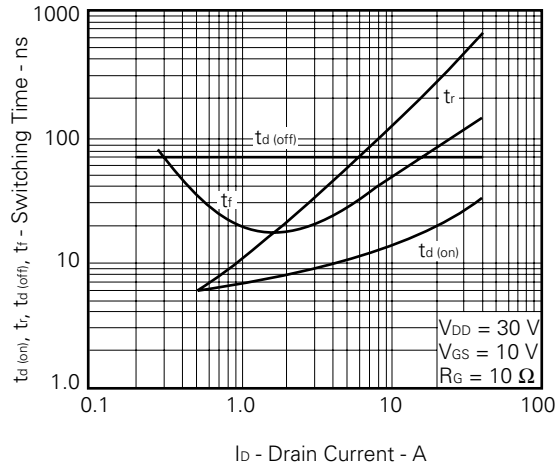
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



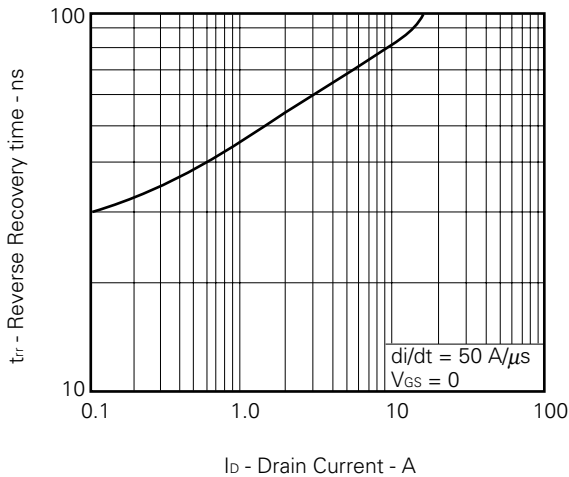
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



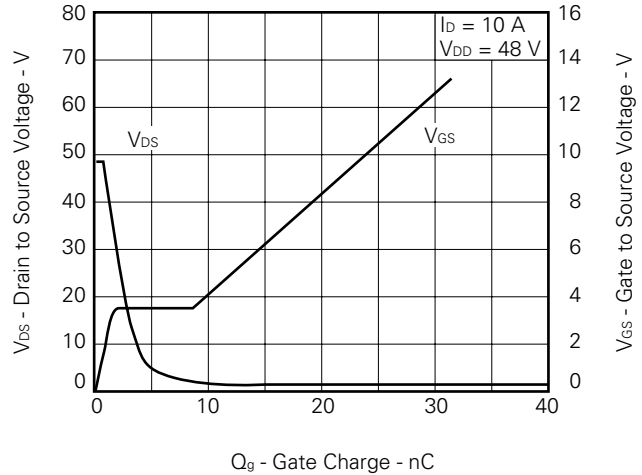
SWITCHING CHARACTERISTICS

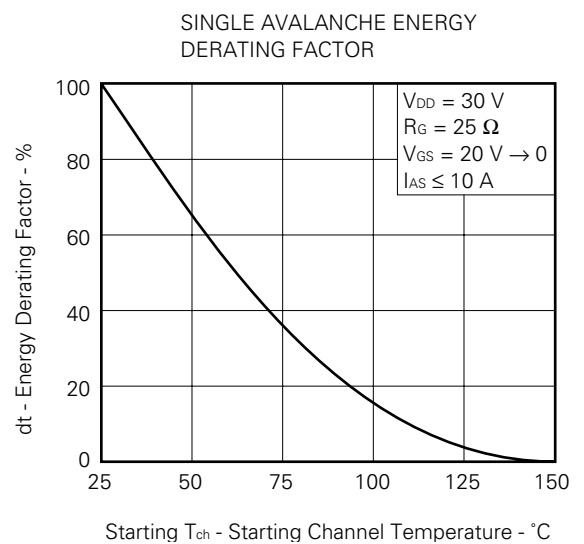
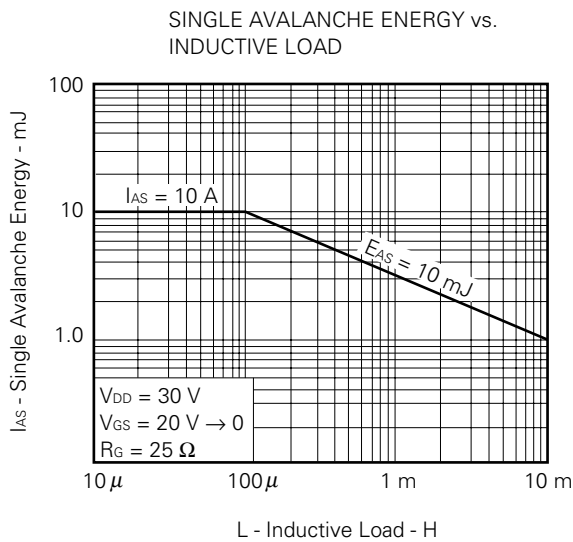


REVERSE RECOVERY TIME vs. DRAIN CURRENT



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

The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device is actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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



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