

MOS FIELD EFFECT TRANSISTOR

2SK2139

SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

DESCRIPTION

The 2SK2139 is N-Channel Power MOS Field Effect Transistor designed for high voltage switching applications.

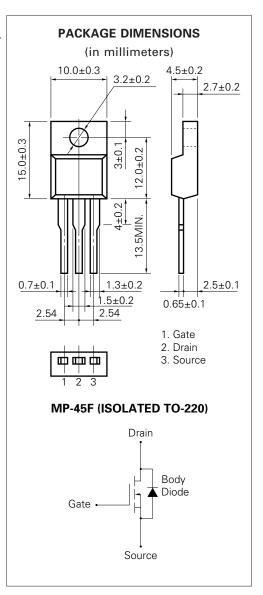
FEATURES

- Low On-Resistance
 - $R_{DS(on)} = 1.5 \Omega MAX. (V_{GS} = 10 V, I_{D} = 2.5 A)$
- Low Ciss Ciss = 930 pF TYP.
- High Avalanche Capability Ratings
- Isolate TO-220 (MP-45F) Package

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

Drain to Source Voltage	VDSS	600	V
Gate to Source Voltage	Vgss	±30	V
Drain Current (DC)	ID(DC)	±5.0	Α
Drain Current (pulse)*	ID(pulse	±20	Α
Total Power Dissipation (Tc = 25 °C)	P _{T1}	35	W
Total Power Dissipation (T _A = 25 °C)	P _{T2}	2.0	W
Channel Temperature	T_ch	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C
Single Avalanche Current**	las	5.0	Α
Single Avalanche Energy**	Eas	8.3	mJ

- * PW \leq 10 μ s, Duty Cycle \leq 1 %
- ** Starting Tch = 25 °C, Rg = 25 Ω , Vgs = 20 V \rightarrow 0



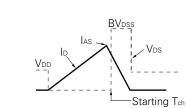


ELECTRICAL CHARACTERISTICS (TA = 25 °C)

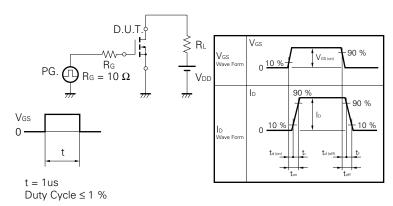
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-state Resistance	RDS(on)		1.1	1.5	Ω	Vgs = 10 V, ID = 2.5 A
Gate to Source Cutoff Voltage	V _{GS(off)}	2.5		3.5	٧	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance	l y _{fs} l	1.5			S	V _{DS} = 10 V, I _D = 2.5 A
Drain Leakage Current	IDSS			100	μΑ	V _{DS} = 600 V, V _{GS} = 0
Gate to Source Leakage Current	Igss			±100	nA	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0$
Input Capacitance	Ciss		930		pF	V _{DS} = 10 V
Output Capacitance	Coss		200		pF	V _G S = 0
Reverse Transfer Capacitance	Crss		40		pF	f = 1 MHz
Turn-On Delay Time	td(on)		20		ns	V _{GS} = 10 V
Rise Time	tr		10		ns	V _{DD} = 150 V
Turn-Off Delay Time	td(off)		60		ns	I_D = 2.5 A, R_G = 10 Ω
Fall Time	tf		12		ns	$R_L = 60 \Omega$
Total Gate Charge	QG		30		nC	V _G S = 10 V
Gate to Source Charge	Qgs		6.0		nC	ID = 5.0 V
Gate to Drain Charge	Q _{GD}		15		nC	V _{DD} = 450 V
Diode Forward Voltage	V _{F(S-D)}		1.0		V	IF = 5.0 A, VGS = 0
Reverse Recovery Time	trr		320		ns	IF = 5.0 A
Reverse Recovery Charge	Qrr		1.4		μC	di/dt = 50 A/μs

Test Circuit 1 Avalanche Capability

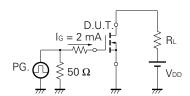
$R_{G} = 25 \Omega$ $V_{GS} = 20 - 0 V$ $V_{GS} = 20 - 0 V$ $V_{GS} = 20 - 0 V$ $V_{GS} = 20 - 0 V$



Test Circuit 2 Switching Time

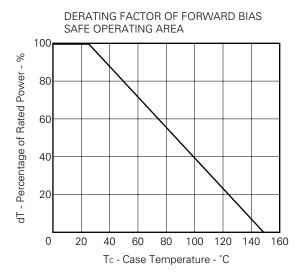


Test Circuit 3 Gate Charge

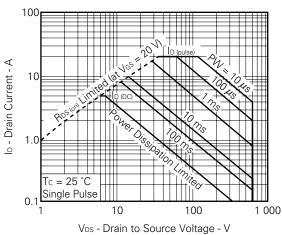


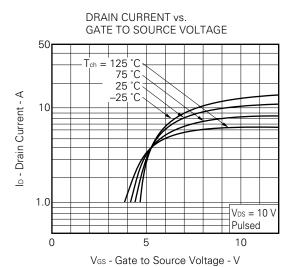
The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

TYPICAL CHARACTERISTICS (TA = 25 °C)



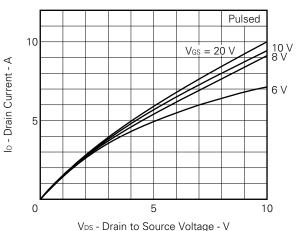


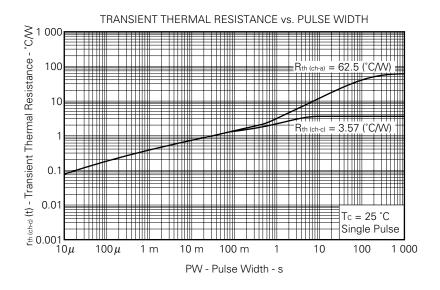


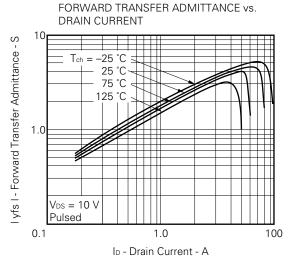


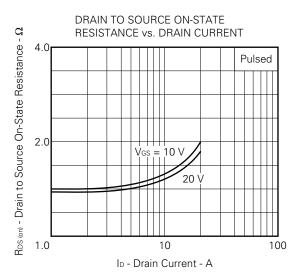
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE 80 P_T - Total Power Dissipation - W60 40 20 20 0 40 60 80 100 120 140 160 Tc - Case Temperature - °C

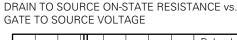
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

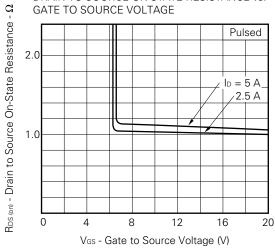




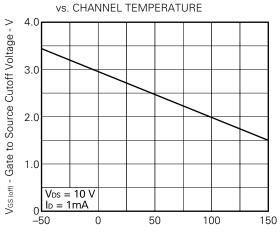


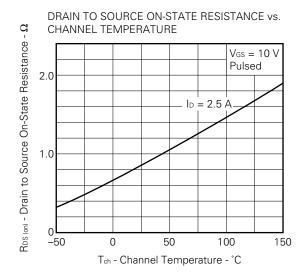


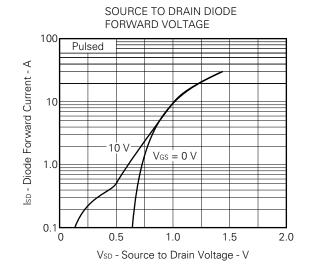


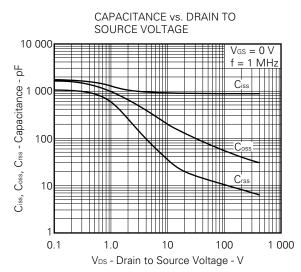


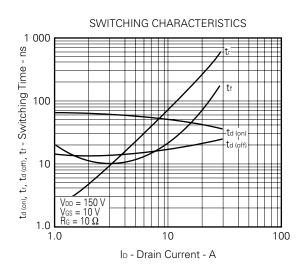
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE

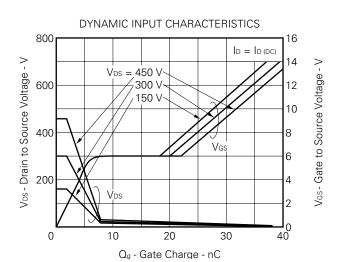


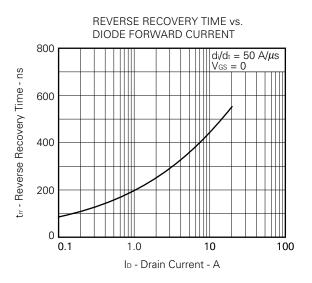








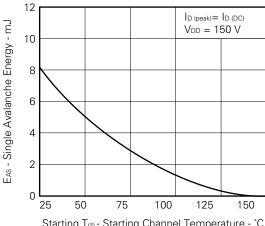






SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD 10 _las = 5A IAS - Single Avalanche Current - A 1.0 $R_G = 25 \Omega$ $V_{DD} = 150 V$ $V_{GS} = 20 \text{ V} \rightarrow 0$ Starting T_{ch} 0.1 100 μ 100 m 1 m 10 m L - Inductance - H

SINGLE AVALANCHE ENERGY vs. STARTING 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

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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Anti-radioactive design is not implemented in this product.