

# MOS FIELD EFFECT TRANSISTOR 2SK3793

# **SWITCHING N-CHANNEL POWER MOS FET**

## **DESCRIPTION**

The 2SK3793 is N-channel MOS Field Effect Transistor designed for high current switching applications.

# ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3793	Isolated TO-220

# **FEATURES**

• Super low on-state resistance

 $R_{DS(on)1} = 125 \text{ m}\Omega \text{ MAX.} \text{ (VGS} = 10 \text{ V, ID} = 6 \text{ A)}$ 

 $R_{DS(on)2}$  = 148 m $\Omega$  MAX. (Vgs = 4.5 V, ID = 6 A)

- Low Ciss: Ciss = 900 pF TYP.
- Built-in gate protection diode

(Isolated TO-220)



# ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Drain to Source Voltage (Vgs = 0 V)	VDSS	100	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	Vgss	±20	V
Drain Current (DC) (Tc = 25°C)	ID(DC)	±12	Α
Drain Current (pulse) Note1	D(pulse)	±22	Α
Total Power Dissipation (Tc = 25°C)	P <sub>T1</sub>	20	W
Total Power Dissipation (T <sub>A</sub> = 25°C)	P <sub>T2</sub>	2.0	W
Channel Temperature	Tch	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C
Single Avalanche Current Note2	las	10	Α
Single Avalanche Energy Note2	Eas	10	mJ

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

2. Starting T<sub>ch</sub> = 25°C, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25  $\Omega$ , V<sub>GS</sub> = 20  $\rightarrow$  0 V

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# **ELECTRICAL CHARACTERISTICS (TA = 25°C)**

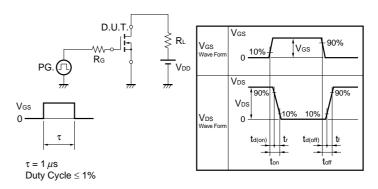
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	IDSS	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V			10	μΑ
Gate Leakage Current	Igss	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μΑ
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance Note	<b>y</b> fs	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 6 A	5.0	10.3		S
Drain to Source On-state Resistance Note	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A		89	125	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 6 A		96	148	mΩ
Input Capacitance	Ciss	V <sub>DS</sub> = 10 V		900		pF
Output Capacitance	Coss	V <sub>GS</sub> = 0 V		110		pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		50		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 6 A		9		ns
Rise Time	tr	V <sub>GS</sub> = 10 V		5		ns
Turn-off Delay Time	td(off)	R <sub>G</sub> = 0 Ω		30		ns
Fall Time	tr			4		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 80 V		21		nC
Gate to Source Charge	Qgs	V <sub>GS</sub> = 10 V		3.0		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 12 A		6.2		nC
Body Diode Forward Voltage Note	V <sub>F(S-D)</sub>	I <sub>F</sub> = 12 A, V <sub>GS</sub> = 0 V		0.89	1.5	V
Reverse Recovery Time	trr	I <sub>F</sub> = 12 A, V <sub>GS</sub> = 0 V		52		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/μs		94		nC

Note Pulsed

# **TEST CIRCUIT 1 AVALANCHE CAPABILITY**

# $V_{GS} = 20 \rightarrow 0 \text{ V}$ $V_{DD}$ $V_{DD}$ $V_{DD}$ $V_{DD}$ $V_{DD}$ $V_{DD}$ $V_{DD}$ $V_{DD}$

# TEST CIRCUIT 2 SWITCHING TIME

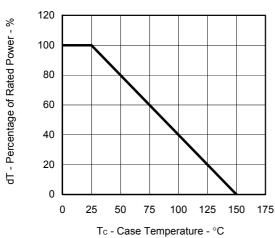


# **TEST CIRCUIT 3 GATE CHARGE**

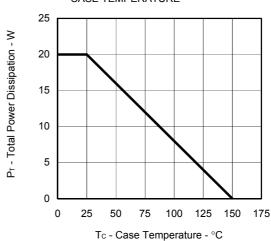
-Starting Tch

# TYPICAL CHARACTERISTICS (TA = 25°C)

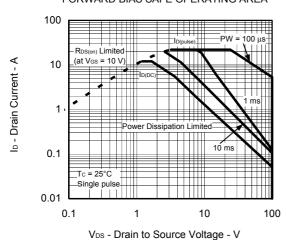


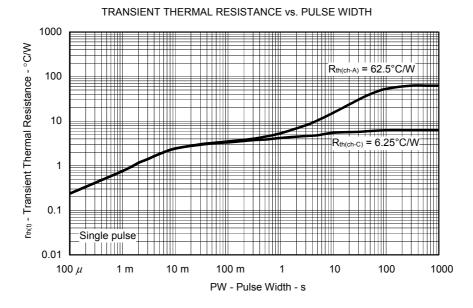


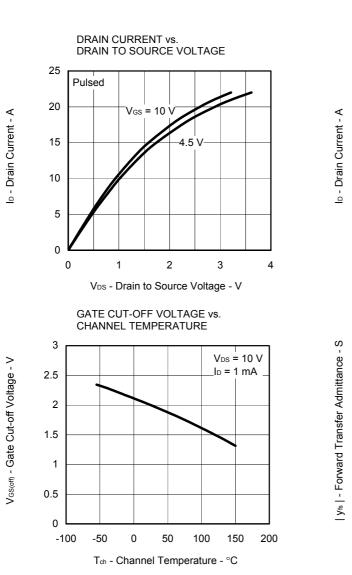
# TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



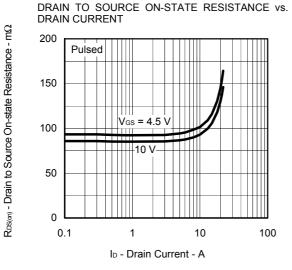
# FORWARD BIAS SAFE OPERATING AREA

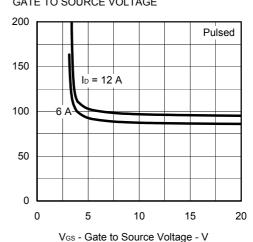




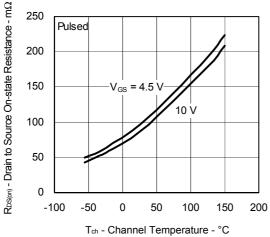


FORWARD TRANSFER CHARACTERISTICS 100 150°C 10 75°C 25°C -55°C 1 0.1 0.01  $V_{DS} = 10$ Pulsed 0.001 2 5 3 4 Vgs - Gate to Source Voltage - V FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT 100  $T_A = -55^{\circ}C$ 25°C 75°C 10 150°C 1 0.1 V<sub>DS</sub> = 10 V Pulsed 0.01 0.01 0.1 1 10 100 Ip - Drain Current - A DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE R<sub>DS(ση)</sub> - Drain to Source On-state Resistance - mΩ 200 Pulsed 150  $I_D = 12 A$ 100 50

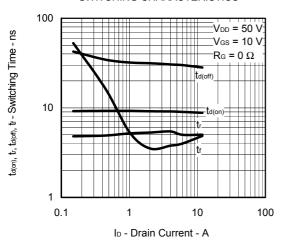




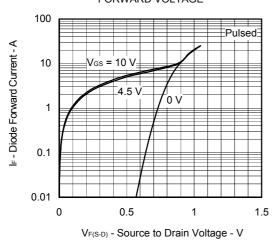




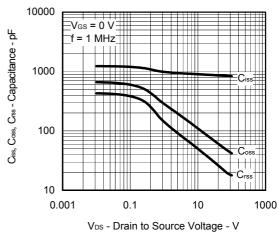
## SWITCHING CHARACTERISTICS



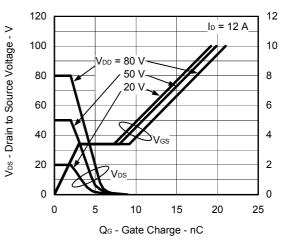
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



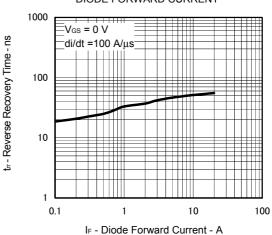
# CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



### DYNAMIC INPUT/OUTPUT CHARACTERISTICS

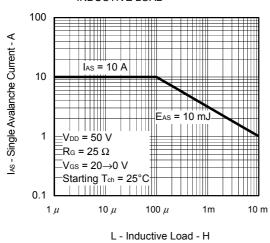


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

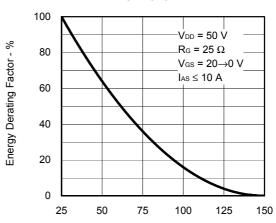


Vos - Gate to Source Voltage - V

# SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

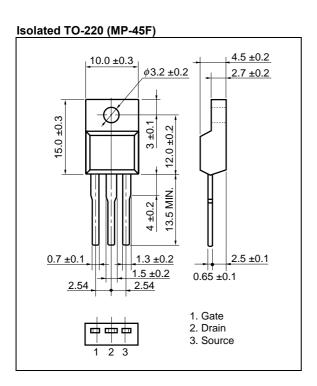


# SINGLE AVALANCHE ENERGY DERATING FACTOR

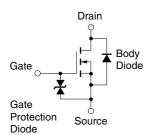


Starting T<sub>ch</sub> - Starting Channel Temperature -  $^{\circ}$ C

# PACKAGE DRAWING (Unit: mm)



# **EQUIVALENT CIRCUIT**



**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD.

When this device 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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