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DATA SHEET



MOS FIELD EFFECT TRANSISTOR 2SK3943

SWITCHING N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3943 is N-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3943-ZP	TO-263 (MP-25ZP)

FEATURES

• Super low on-state resistance $R_{DS(on)1} = 3.5 \ m\Omega \ MAX. \ (V_{GS} = 10 \ V, \ I_{D} = 41 \ A)$

• Low Ciss: Ciss = 5800 pF TYP.

(TO-263)



ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Drain to Source Voltage (Vgs = 0 V)	VDSS	40	V
Gate to Source Voltage (Vps = 0 V)	Vgss	±20	V
Drain Current (DC) (Tc = 25°C)	I _{D(DC)}	±82	Α
Drain Current (pulse) Note1	$I_{D(pulse)}$	±328	Α
Total Power Dissipation (Tc = 25°C)	P _{T1}	104	W
Total Power Dissipation (T _A = 25°C)	P _{T2}	1.5	W
Channel Temperature	Tch	150	°C
Storage Temperature	Tstg	-55 to +150	°C
Single Avalanche Energy Note2	Eas	185	mJ
Repetitive Avalanche Current Note3	lar	43	Α
Repetitive Avalanche Energy Note3	Ear	185	mJ

Notes 1. PW \leq 10 μ s, Duty Cycle \leq 1%

2. Starting T_{ch} = 25°C, V_{DD} = 20 V, R_G = 25 Ω , V_{GS} = 20 \rightarrow 0 V, L = 100 μ H

3. $T_{ch(peak)} \le 150^{\circ}C$, $R_G = 25 \Omega$

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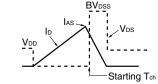
ELECTRICAL CHARACTERISTICS (TA = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	IDSS	V _{DS} = 40 V, V _{GS} = 0 V			1.0	μА
Gate Leakage Current	Igss	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μА
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	2.0	2.5	3.0	V
Forward Transfer Admittance Note	yfs	V _{DS} = 10 V, I _D = 41 A	21	43		S
Drain to Source On-state Resistance Note	RDS(on)1	Vgs = 10 V, ID = 41 A		2.9	3.5	mΩ
	RDS(on)2	Vgs = 5.5 V, ID = 41 A		3.8	5.6	mΩ
Input Capacitance	Ciss	V _{DS} = 10 V		5800		pF
Output Capacitance	Coss	V _G S = 0 V		860		pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		510		pF
Turn-on Delay Time	td(on)	VDD = 20 V, ID = 41 A		29		ns
Rise Time	tr	Vgs = 10 V		10		ns
Turn-off Delay Time	td(off)	$R_G = 0 \Omega$		69		ns
Fall Time	tr			12		ns
Total Gate Charge	Qg	VDD = 32 V		93		nC
Gate to Source Charge	Qgs	V _{GS} = 10 V		28		nC
Gate to Drain Charge	Q _{GD}	ID = 82 A		28		nC
Body Diode Forward Voltage Note	VF(S-D)1	IF = 60 A, VGS = 0 V		0.88	1.2	٧
	VF(S-D)2	IF = 82 A, VGS = 0 V		0.92	1.5	٧
Reverse Recovery Time	trr	IF = 82 A, Vgs = 0 V		40		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/μs		49		nC

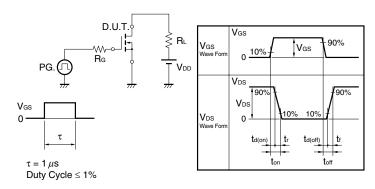
Note Pulsed

TEST CIRCUIT 1 AVALANCHE CAPABILITY

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



TEST CIRCUIT 2 SWITCHING TIME



TEST CIRCUIT 3 GATE CHARGE

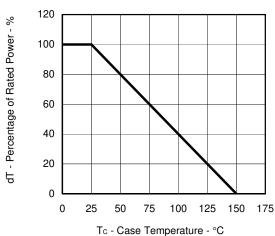
$$\begin{array}{c|c} D.U.T. \\ \hline I_G = 2 \text{ mA} \\ \hline W. & W. \end{array}$$

$$\begin{array}{c|c} PG. \square \\ \hline > 50 \Omega \\ \hline \end{array}$$

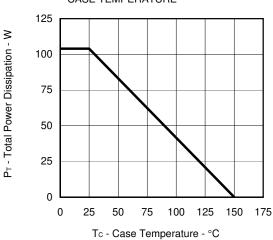
$$\begin{array}{c|c} V_{DD} \\ \hline \end{array}$$

TYPICAL CHARACTERISTICS (TA = 25°C)

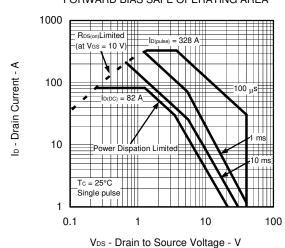
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



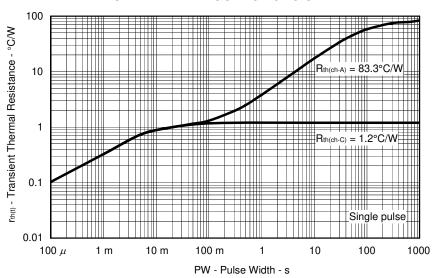
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

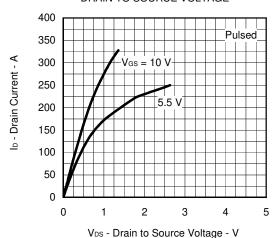


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

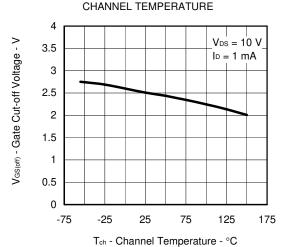


3

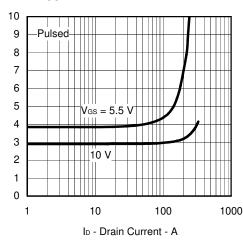
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



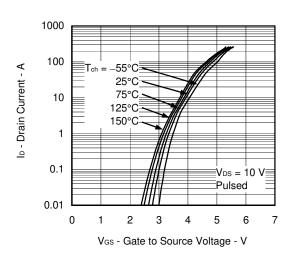
GATE CUT-OFF VOLTAGE vs.



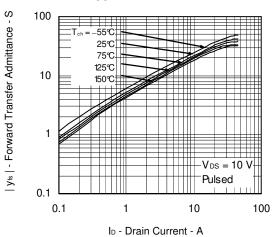
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



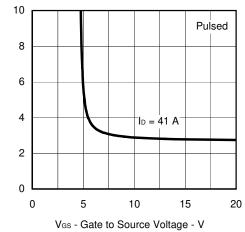
FORWARD TRANSFER CHARACTERISTICS



FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

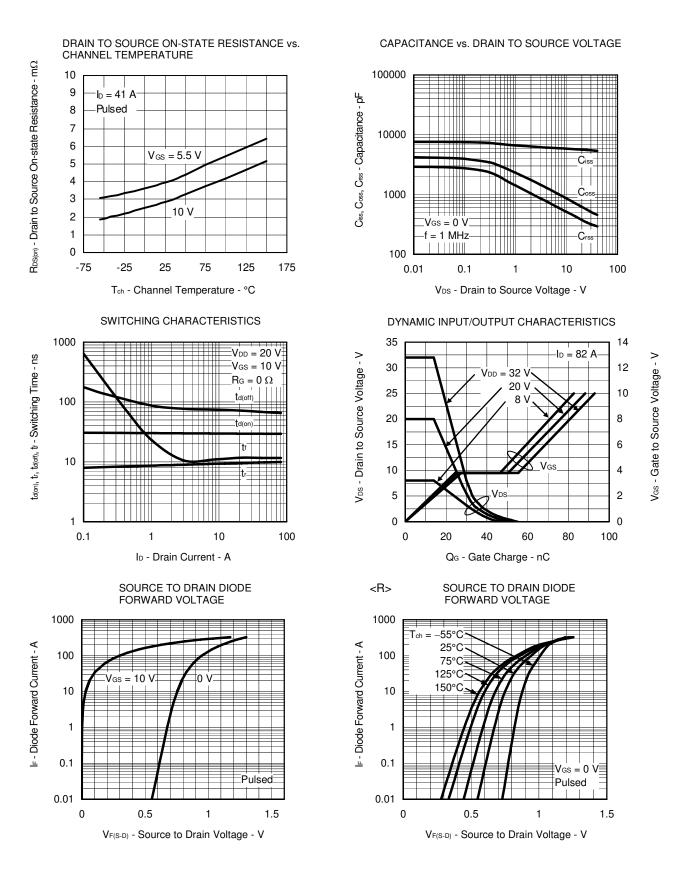


DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

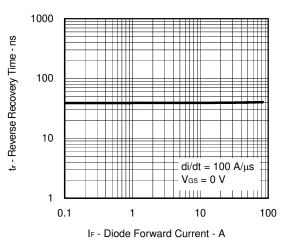


RDS(on) - Drain to Source On-state Resistance - mΩ

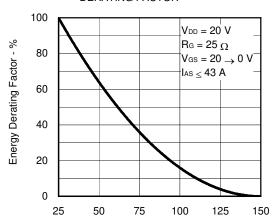
RDS(on) - Drain to Source On-state Resistance - mΩ



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

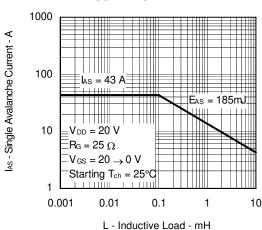


SINGLE AVALANCHE ENERGY DERATING FACTOR



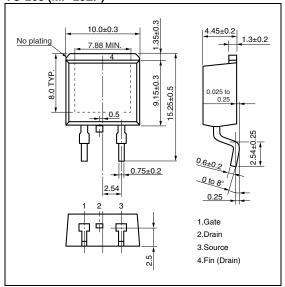
Starting T $_{\text{ch}}$ - Starting Channel Temperature - $^{\circ}\text{C}$

SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

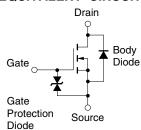


PACKAGE DRAWING (Unit: mm)

TO-263 (MP-25ZP)



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.

Data Sheet D17188EJ2V0DS 7

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