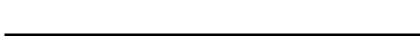
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## MOS FIELD EFFECT TRANSISTOR





# SWITCHING N-CHANNEL POWER MOS FET

#### **DESCRIPTION**

The 2SK3639 is N-channel MOS FET device that features a low on-state resistance and excellent switching characteristics, and designed for low voltage high current applications such as DC/DC converter with synchronous rectifier.

#### **FEATURES**

· Low on-state resistance

 $R_{DS(on)1}$  = 5.5 m $\Omega$  MAX. (Vgs = 10 V, Ip = 32 A)

 $R_{DS(on)2} = 8.5 \text{ m}\Omega \text{ MAX.}$  (Vgs = 4.5 V, ID = 32 A)

• Low Ciss: Ciss = 2400 pF TYP.

#### ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

	•		
Drain to Source Voltage (V <sub>GS</sub> = 0 V)	VDSS	20	٧
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	Vgss	±20	٧
Drain Current (DC) (Tc = 25°C)	I <sub>D(DC)</sub>	±64	Α
Drain Current (pulse) Note	I <sub>D(pulse)</sub>	±256	Α
Total Power Dissipation (Tc = 25°C)	P <sub>T1</sub>	40	W
Total Power Dissipation	P <sub>T2</sub>	1.0	W
Channel Temperature	Tch	150	°C
Storage Temperature	Tstg	-55 to +150	°C

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

#### ORDERING INFORMATION

PART NUMBER	PACKAGE		
2SK3639-ZK	TO-252 (MP-3ZK)		

(TO-252)



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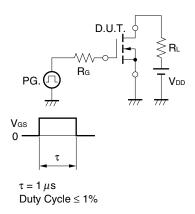


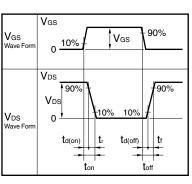
#### **ELECTRICAL CHARACTERISTICS (TA = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	IDSS	V <sub>DS</sub> = 20 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			±100	nA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5		2.5	V
Forward Transfer Admittance Note	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 32 A	19	39		S
Drain to Source On-state Resistance Note	RDS(on)1	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 32 A		4.4	5.5	mΩ
	RDS(on)2	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 32 A		5.8	8.5	mΩ
Input Capacitance	Ciss	V <sub>DS</sub> = 10 V		2400		pF
Output Capacitance	Coss	V <sub>GS</sub> = 0 V		970		pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		350		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, I <sub>D</sub> = 32 A		13		ns
Rise Time	tr	V <sub>GS</sub> = 10 V		14		ns
Turn-off Delay Time	t <sub>d(off)</sub>	$R_G = 10 \Omega$		71		ns
Fall Time	tf			22		ns
Total Gate Charge	QG	V <sub>DD</sub> = 16 V		45		nC
Gate to Source Charge	Qgs	V <sub>GS</sub> = 10 V		7.6		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 64 A		11		nC
Body Diode Forward Voltage Note	V <sub>F(S-D)</sub>	I <sub>F</sub> = 64 A, V <sub>GS</sub> = 0 V		0.96		V
Reverse Recovery Time	trr	IF = 64 A, VGS = 0 V		40		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/μs		35		nC

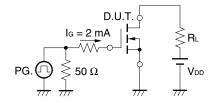
**Note** Pulsed: PW  $\leq$  350  $\mu$ s, Duty Cycle  $\leq$  2%

#### **TEST CIRCUIT 1 SWITCHING TIME**



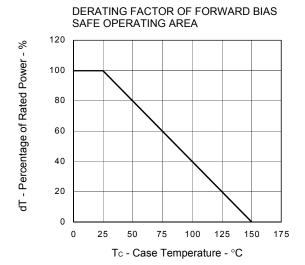


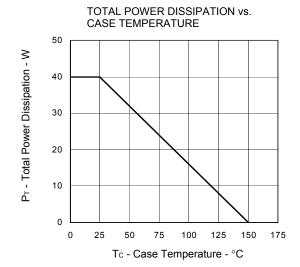
#### **TEST CIRCUIT 2 GATE CHARGE**



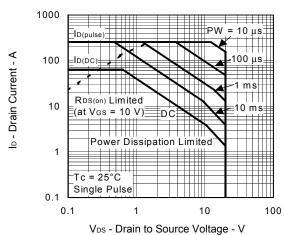


#### TYPICAL CHARACTERISTICS (TA = 25°C)

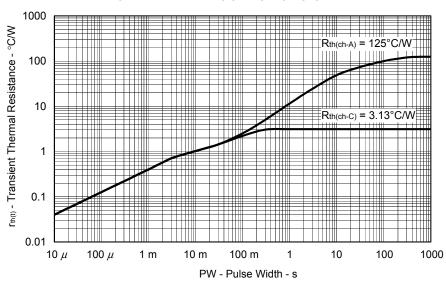




#### FORWARD BIAS SAFE OPERATING AREA

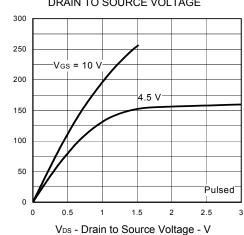


#### TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

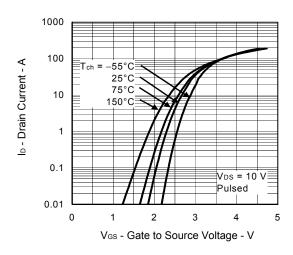


lo - Drain Current - A

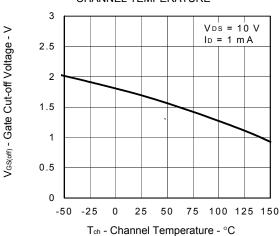
### DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



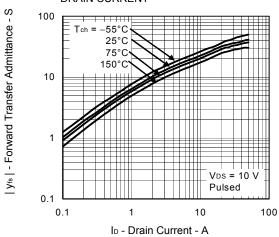
#### FORWARD TRANSFER CHARACTERISTICS



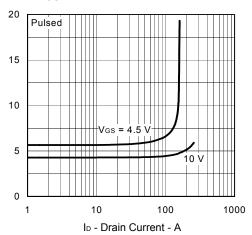
### GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



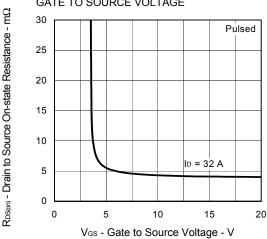
### FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



### DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



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



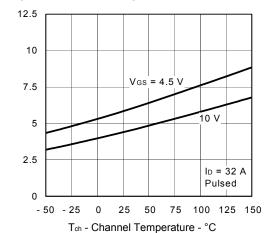
R<sub>DS(on)</sub> - Drain to Source On-state Resistance - mΩ



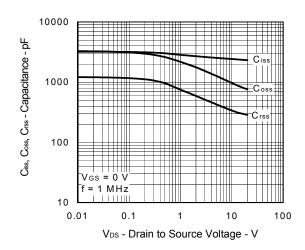
RDS(on) - Drain to Source On-state Resistance - m\Omega



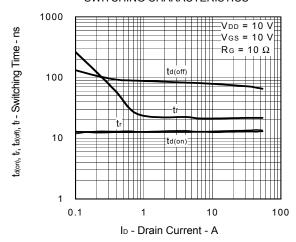
#### DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



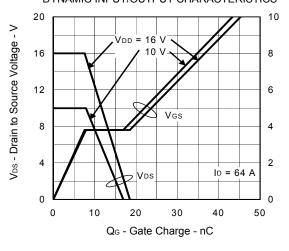
#### CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



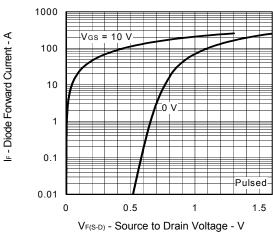
#### SWITCHING CHARACTERISTICS



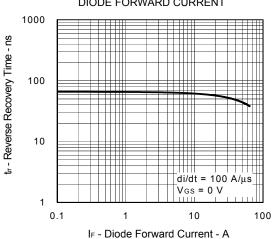
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



#### SOURCE TO DRAIN DIODE FORWARD VOLTAGE



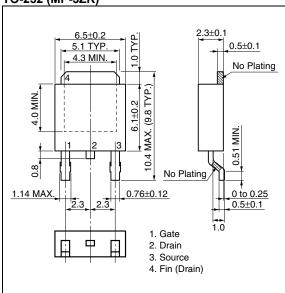
#### REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



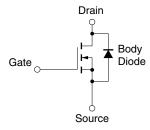
Ves - Gate to Source Voltage - V

#### **★ PACKAGE DRAWING (Unit: mm)**





#### **EQUIVALENT CIRCUIT**



**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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