



N-CHANNEL MOS FIELD EFFECT POWER TRANSISTOR

2SK659

DESCRIPTION The 2SK659 is N-Channel MOS Field Effect Power Transistor designed for solenoid, motor and lamp driver.

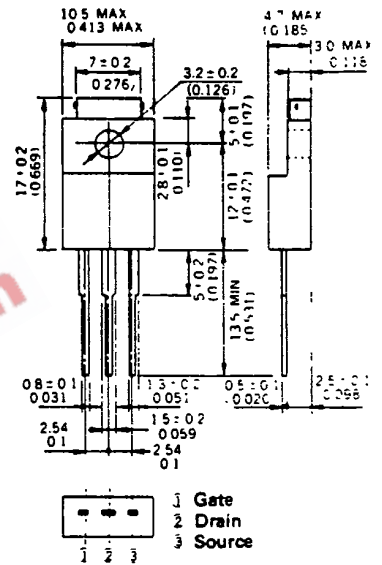
- FEATURES**
- 4 V Gate Drive – Logic level –
 - Low $R_{DS(on)}$
 - No Secondary Breakdown

PACKAGE DIMENSIONS
in millimeters (inches)

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures	
Storage Temperature	-55 to +150 °C
Channel Temperature	150 °C Maximum
Maximum Power Dissipations	
Total Power Dissipation ($T_a = 25\text{ °C}$)	2.0 W
Total Power Dissipation ($T_c = 25\text{ °C}$)	35 W
Maximum Voltages and Currents ($T_a = 25\text{ °C}$)	
V_{DS} Drain to Source Voltage	60 V
V_{GS} Gate to Source Voltage	±20 V
$I_{D(DC)}$ Drain Current (DC)	±12 A
$I_{D(pulse)}$ Drain Current (pulse)*	±60 A

* $PW \leq 300\ \mu s$, Duty Cycle $\leq 10\%$



ELECTRICAL CHARACTERISTICS ($T_a = 25\text{ °C}$)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
$R_{DS(on)}$	Drain to Source On-State Resistance			0.075	Ω	$V_{GS} = 10\text{ V}, I_D = 6\text{ A}$
$R_{DS(on)}$	Drain to Source On-State Resistance			0.095	Ω	$V_{GS} = 4\text{ V}, I_D = 6\text{ A}$
$V_{GS(off)}$	Gate to Source Cutoff Voltage	1		2.5	V	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$
$ y_{fs} $	Forward Transfer Admittance	5			S	$V_{DS} = 10\text{ V}, I_D = 6\text{ A}$
I_{DSS}	Drain Leakage Current			10	μA	$V_{DS} = 60\text{ V}, V_{GS} = 0$
I_{GSS}	Gate to Source Leakage Current			±100	nA	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0$
C_{iss}	Input Capacitance		1300		PF	$V_{DS} = 10\text{ V}$
C_{oss}	Output Capacitance		600		PF	$V_{GS} = 0$
C_{rss}	Reverse Transfer Capacitance		260		PF	$f = 1\text{ MHz}$
$t_d(on)$	Turn-On Delay Time		15		ns	
t_r	Rise Time		75		ns	$I_D = 6\text{ A}, V_{CC} = 30\text{ V}$
$t_d(off)$	Turn-Off Delay Time		80		ns	$R_L = 5\ \Omega, V_{GS(on)} = 10\text{ V}$
t_f	Fall Time		80		ns	$R_{in} = 10\ \Omega$

NEC cannot assume any responsibility for any circuits shown or represent that they are free from patent infringement.

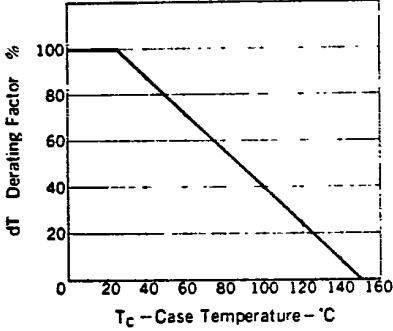
2SK659

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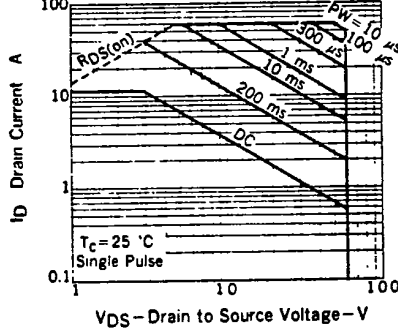
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TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

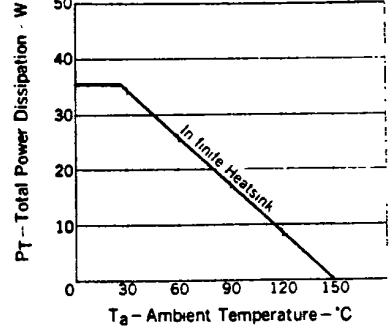
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



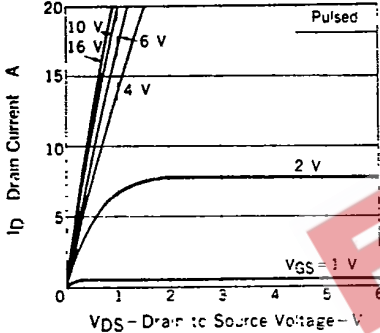
FORWARD BIAS SAFE OPERATING AREA



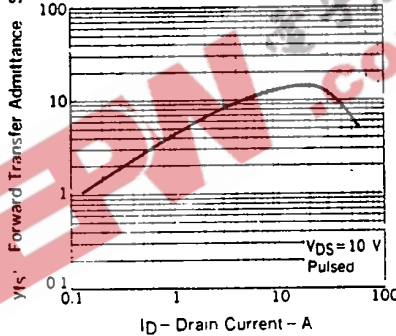
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



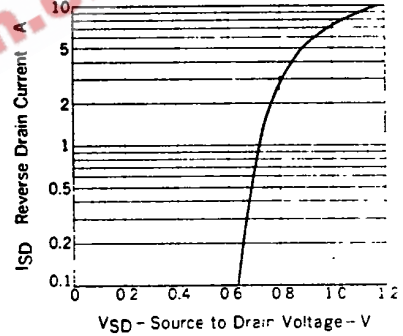
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



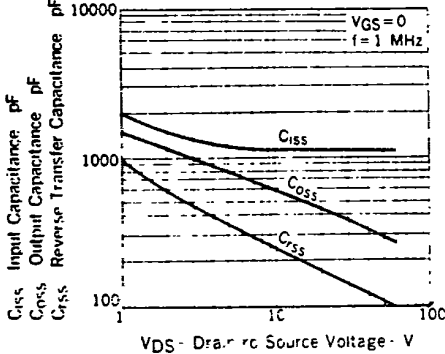
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



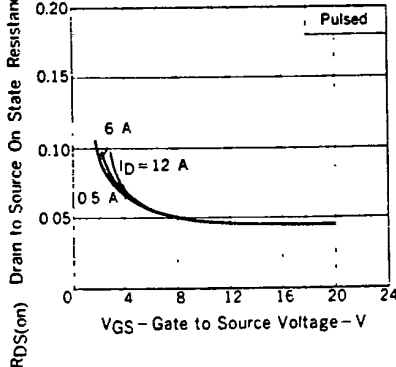
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



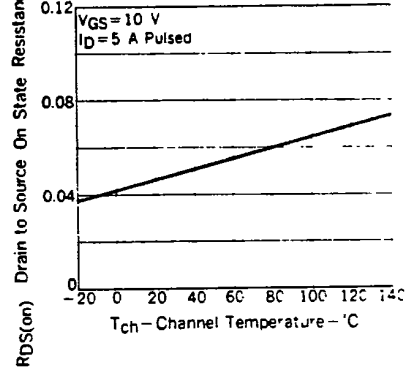
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

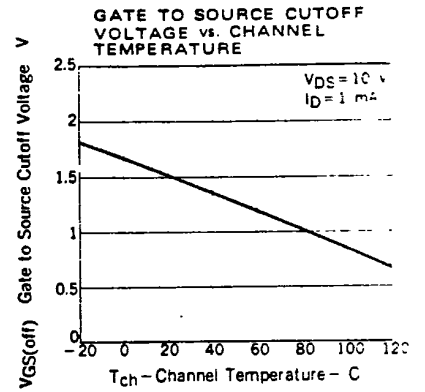
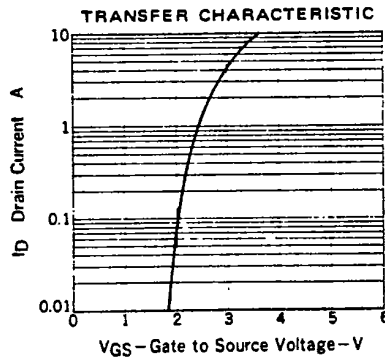
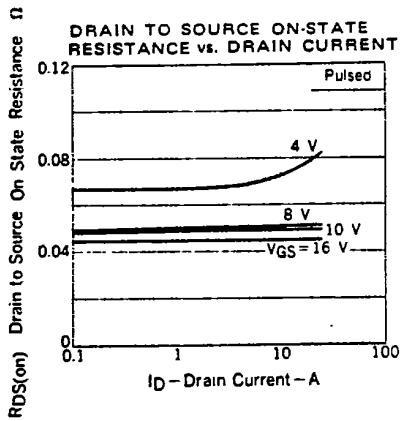


DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE





SWITCHING TIME TEST CIRCUIT

