

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

DESCRIPTION

The 2SK3307 is N-channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Super low on-state resistance:
 $R_{DS(on)1} = 9.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 35 \text{ A)}$
 $R_{DS(on)2} = 14 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 35 \text{ A)}$
- Low C_{iss} : $C_{iss} = 4650 \text{ pF TYP.}$
- Built-in gate protection diode

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage	V_{DSS}	60	V
Gate to Source Voltage	$V_{GSS(AC)}$	±20	V
Drain Current (DC)	$I_{D(DC)}$	±70	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	±280	A
Total Power Dissipation (T _C = 25°C)	P_{T1}	120	W
Total Power Dissipation (T _A = 25°C)	P_{T2}	3.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C
Single Avalanche Current ^{Note2}	I_{AS}	45	A
Single Avalanche Energy ^{Note2}	E_{AS}	202	mJ

Notes 1. $PW \leq 10 \mu\text{s}$, Duty cycle $\leq 1\%$

2. Starting $T_{ch} = 25^\circ\text{C}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

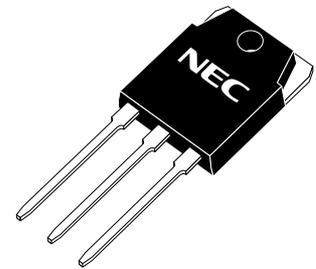
THERMAL RESISTANCE

Channel to Case	$R_{th(ch-C)}$	1.04	°C/W
Channel to Ambient	$R_{th(ch-A)}$	41.7	°C/W

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3307	TO-3P

(TO-3P)

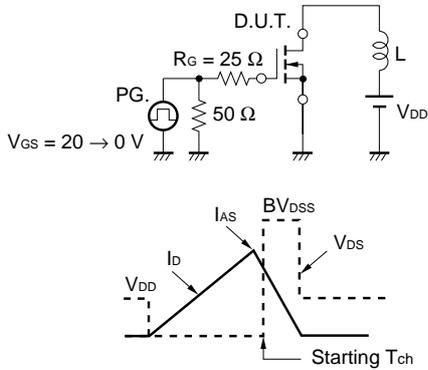


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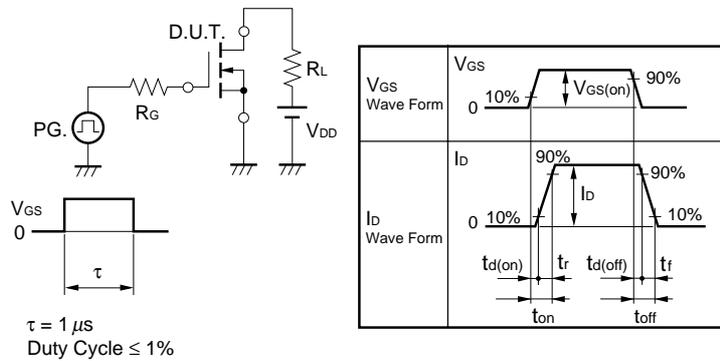
ELECTRICAL CHARACTERISTICS (TA = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			10	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5	2.0	2.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 35\text{ A}$	30	47		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 35\text{ A}$		7.5	9.5	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.0\text{ V}, I_D = 35\text{ A}$		10.5	14	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		4650		pF
Output Capacitance	C_{oss}			780		pF
Reverse Transfer Capacitance	C_{rss}			380		pF
Turn-on Delay Time	$t_{d(on)}$	$I_D = 35\text{ A}, V_{GS(on)} = 10\text{ V}, V_{DD} = 30\text{ V},$ $R_G = 10\ \Omega$		90		ns
Rise Time	t_r			1260		ns
Turn-off Delay Time	$t_{d(off)}$			270		ns
Fall Time	t_f			370		ns
Total Gate Charge	Q_G	$I_D = 70\text{ A}, V_{DD} = 48\text{ V}, V_{GS} = 10\text{ V}$		90		nC
Gate to Source Charge	Q_{GS}			14		nC
Gate to Drain Charge	Q_{GD}			24		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 70\text{ A}, V_{GS} = 0\text{ V}$		1.0		V
Reverse Recovery Time	t_{rr}	$I_F = 70\text{ A}, V_{GS} = 0\text{ V},$		60		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{ A}/\mu\text{s}$		110		nC

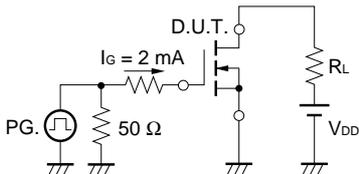
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

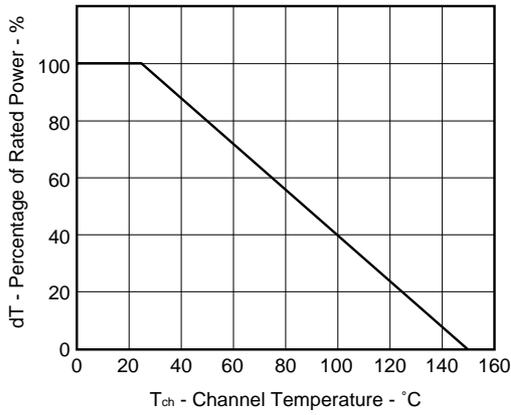


TEST CIRCUIT 3 GATE CHARGE

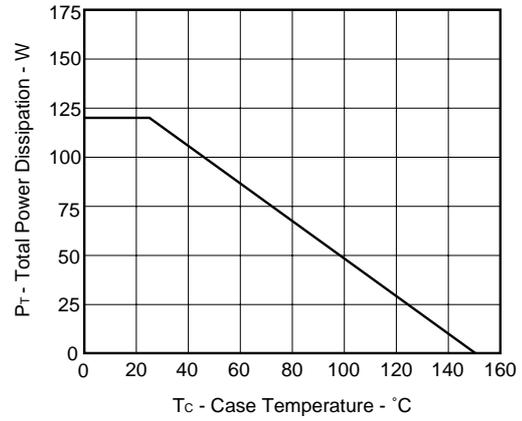


TYPICAL CHARACTERISTICS (T_A = 25°C)

DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

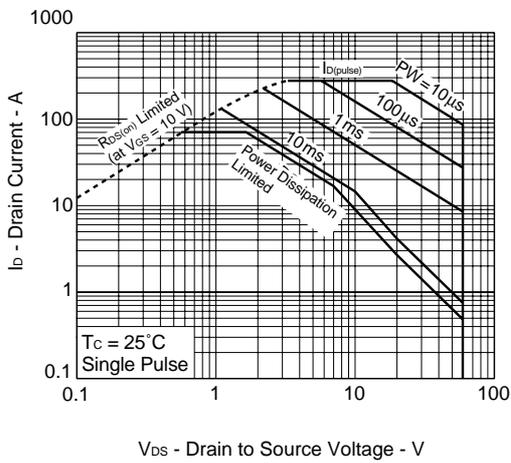


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

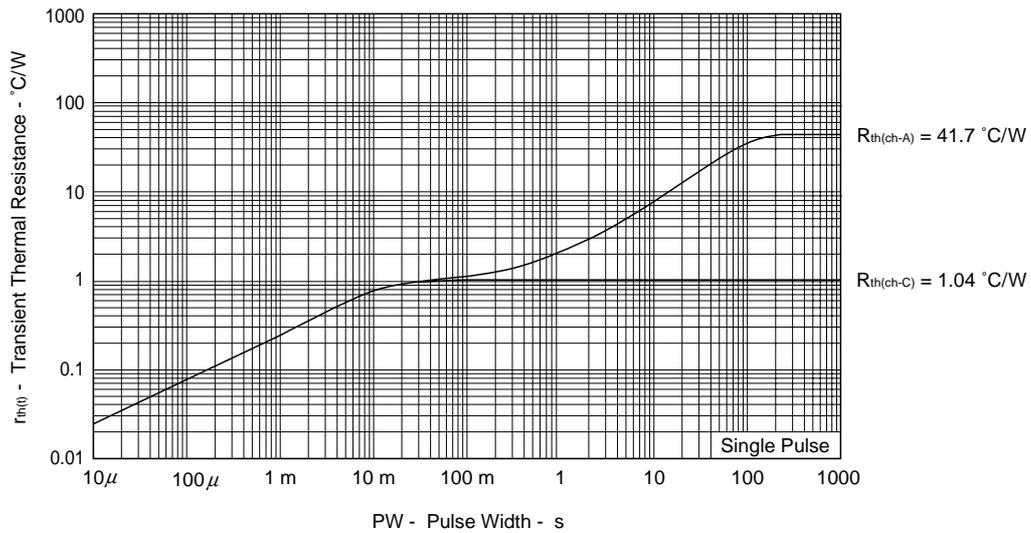


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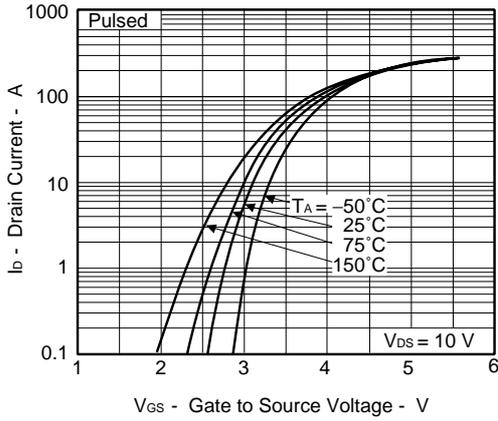
FORWARD BIAS SAFE OPERATING AREA



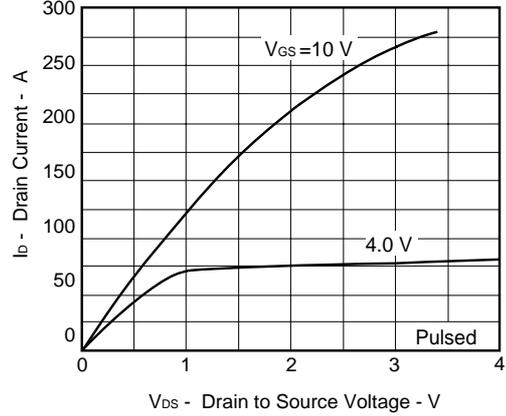
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



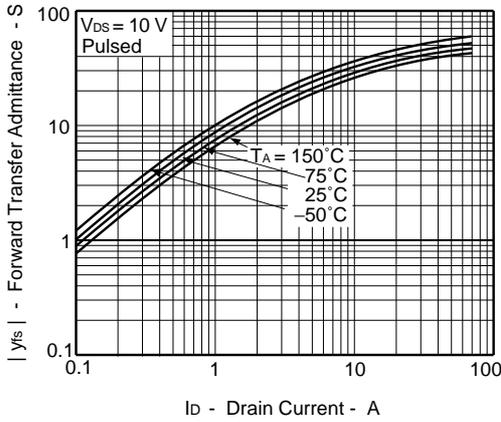
FORWARD TRANSFER CHARACTERISTICS



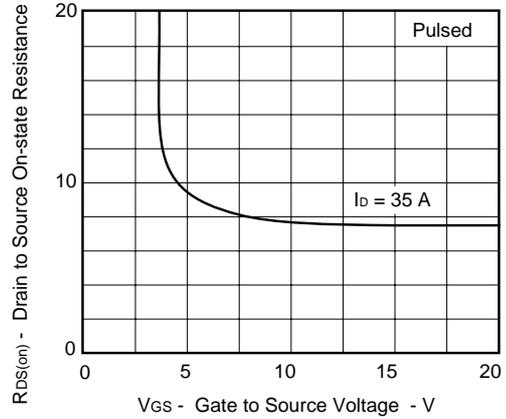
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



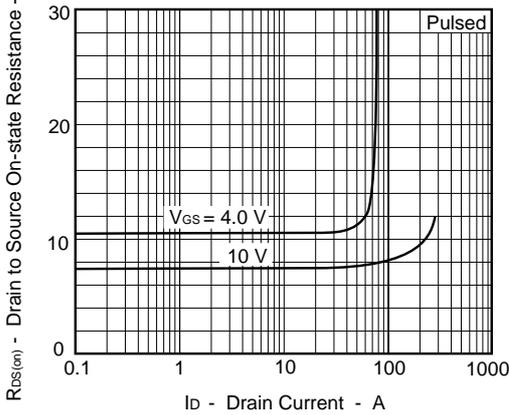
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



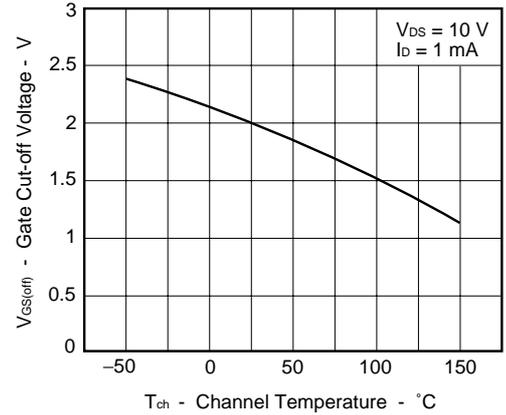
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



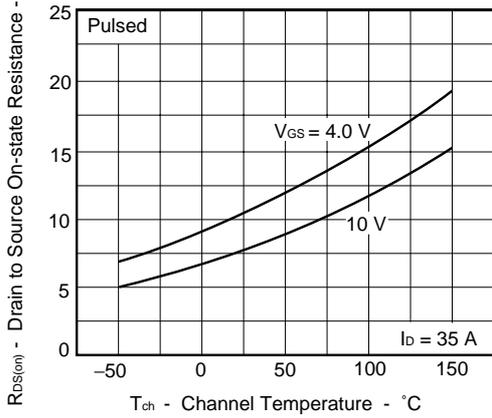
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



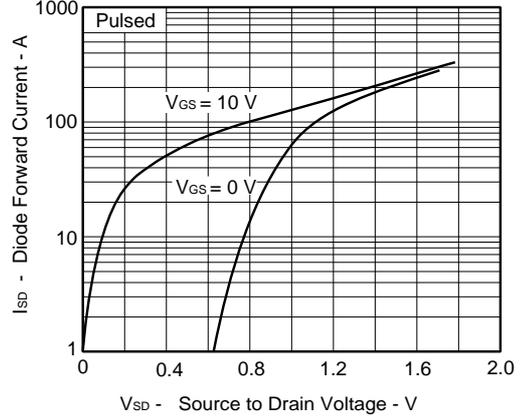
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



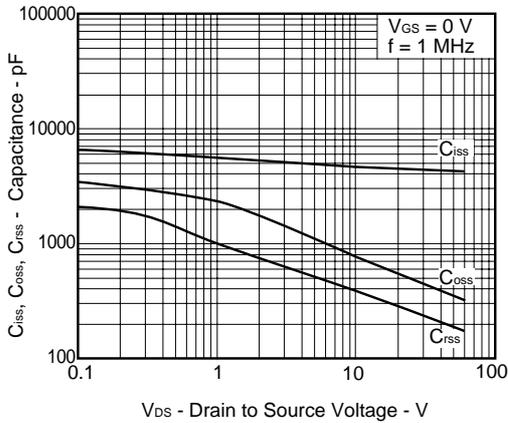
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



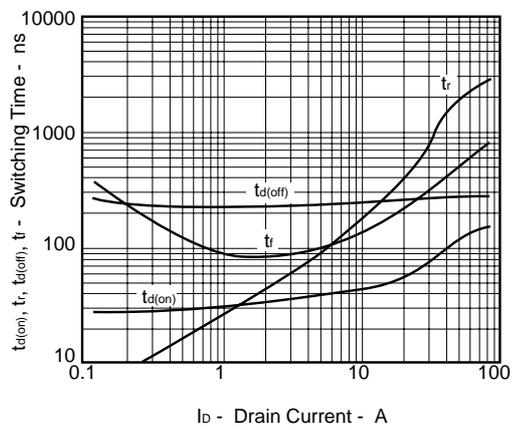
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



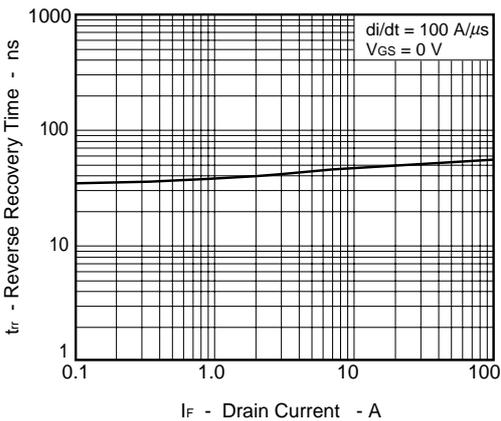
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



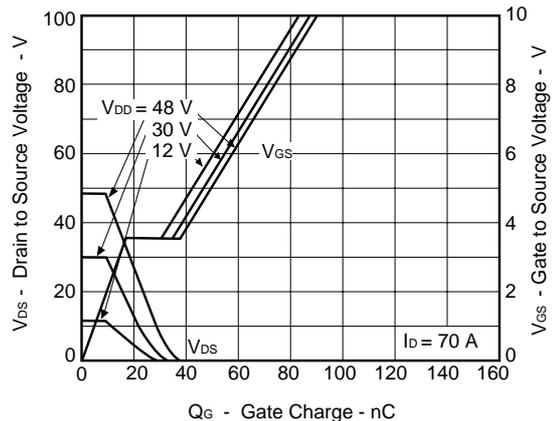
SWITCHING CHARACTERISTICS

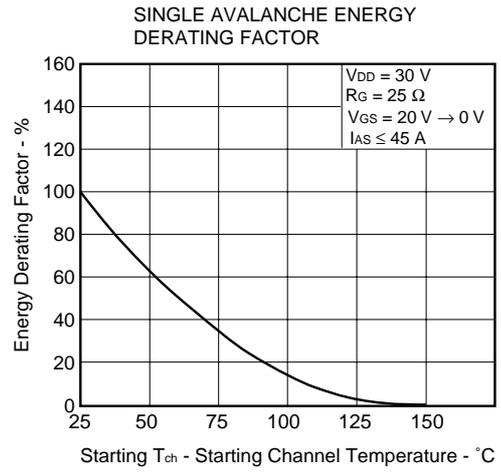
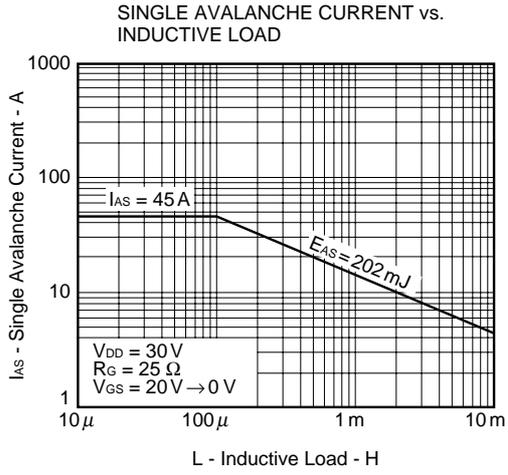


REVERSE RECOVERY TIME vs. DRAIN CURRENT



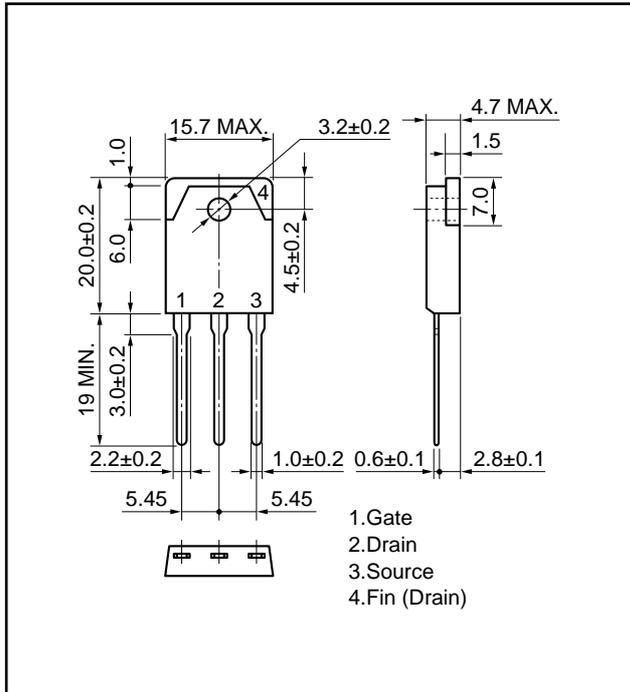
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



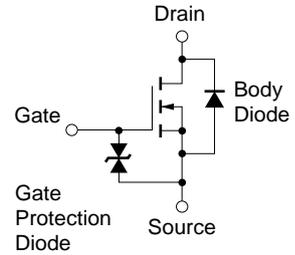


PACKAGE DRAWING (Unit: mm)

TO-3P (MP-88)



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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