

MOS FIELD EFFECT TRANSISTOR

2SK3204

SWITCHING

N-CHANNEL POWER MOS FET

INDUSTRIAL USE

DESCRIPTION

The 2SK3204 is N-Channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3204	MP-10

FEATURES

- Low on-state resistance :
 $R_{DS(on)1} = 34 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 10 \text{ V}$, $I_D = 8 \text{ A}$)
 $R_{DS(on)2} = 50 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 4 \text{ V}$, $I_D = 8 \text{ A}$)
- Low C_{iss} : $C_{iss} = 940 \text{ pF TYP.}$
- Built-in gate protection diode.

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	60	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	$V_{GSS(AC)}$	± 20	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	$V_{GSS(DC)}$	+20, -10	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 15	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 45	A
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_T	1.8	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Single Avalanche Current ^{Note2}	I_{AS}	15	A
Single Avalanche Energy ^{Note2}	E_{AS}	22.5	mJ

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

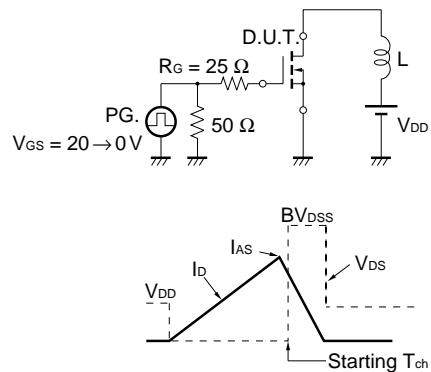
★ **2.** Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 30 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20 \rightarrow 0 \text{ V}$

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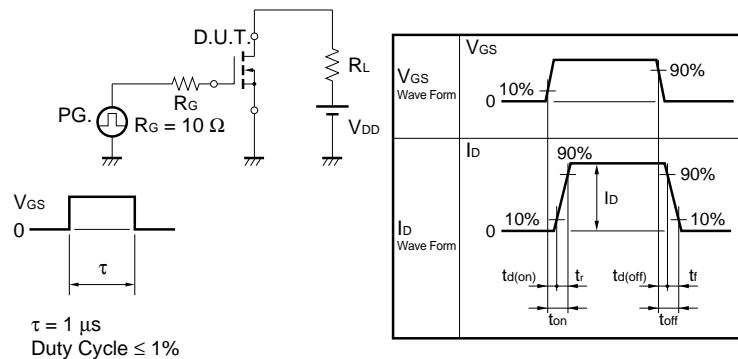
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

PARAMETERS	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_{GS}	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA
Gate Cut-off Voltage	$V_{GS(\text{off})}$	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	1.0	1.5	2.0	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 8\text{ A}$	8.0	14		S
Drain to Source On-state Resistance	$R_{DS(\text{on})1}$	$V_{GS} = 10\text{ V}$, $I_D = 8\text{ A}$		25	34	$\text{m}\Omega$
	$R_{DS(\text{on})2}$	$V_{GS} = 4\text{ V}$, $I_D = 8\text{ A}$		35	50	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}$		940		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$		290		pF
	C_{rss}	$f = 1\text{ MHz}$		120		pF
Turn-on Delay Time	$t_{d(\text{on})}$	$V_{DD} = 30\text{ V}$, $I_D = 8\text{ A}$		17		ns
Rise Time	t_r	$V_{GS} = 10\text{ V}$		150		ns
Turn-off Delay Time	$t_{d(\text{off})}$	$R_G = 10\Omega$		58		ns
Fall Time	t_f			52		ns
Total Gate Charge	Q_G	$V_{DD} = 48\text{ V}$		25		nC
Gate to Source Charge	Q_{GS}	$V_{GS(\text{on})} = 10\text{ V}$		2.9		nC
Gate to Drain Charge	Q_{GD}	$I_D = 15\text{ A}$		7.5		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 15\text{ A}$, $V_{GS} = 0\text{ V}$		0.92		V
Reverse Recovery Time	t_{rr}	$I_F = 15\text{ A}$, $V_{GS} = 0\text{ V}$		45		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{ A}/\mu\text{s}$		81		nC

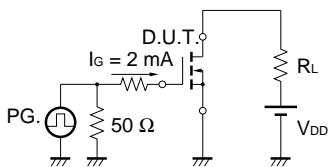
TEST CIRCUIT 1 AVALANCHE CAPABILITY

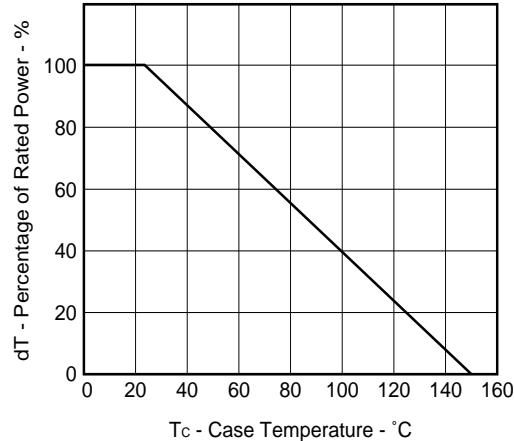
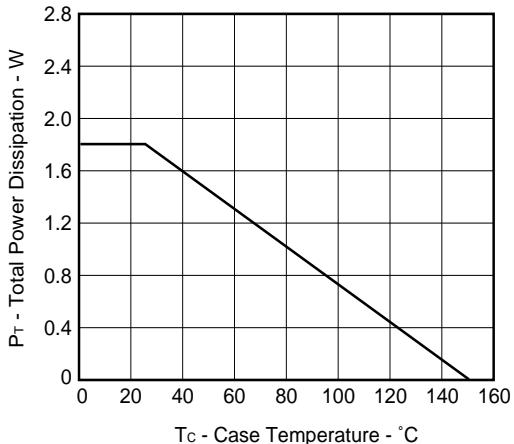


★ TEST CIRCUIT 2 SWITCHING TIME

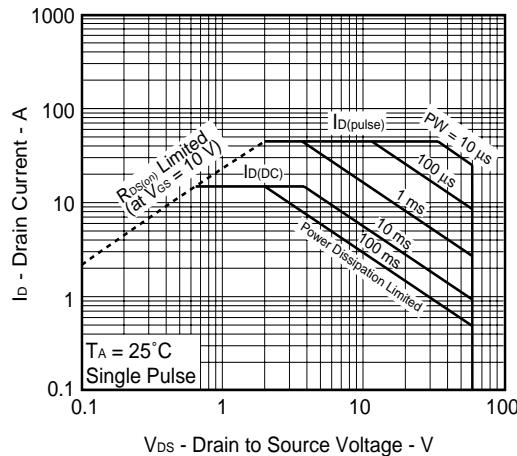


TEST CIRCUIT 3 GATE CHARGE

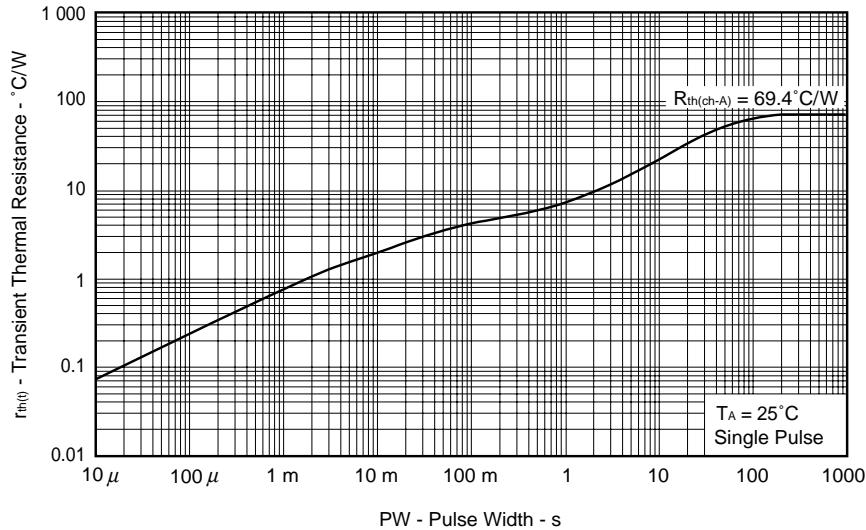


★ TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)DERATING FACTOR OF FORWARD BIAS
SAFE OPERATING AREATOTAL POWER DISSIPATION vs.
CASE TEMPERATURE

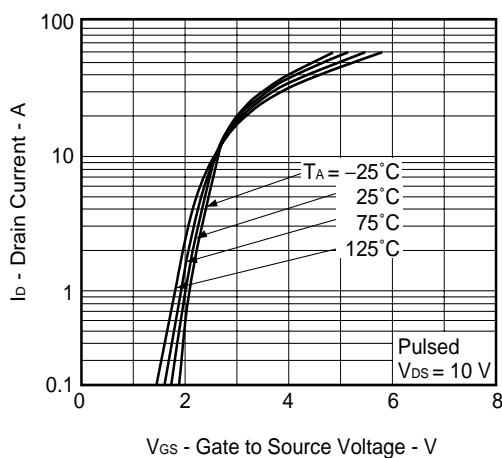
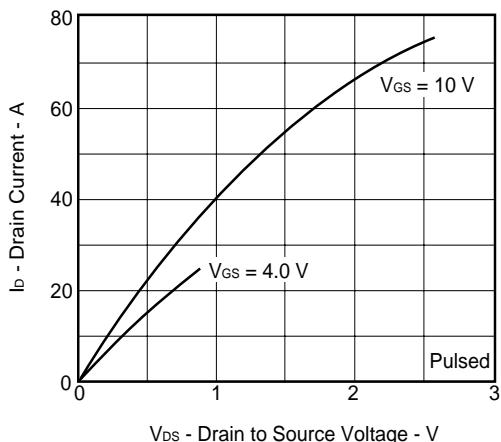
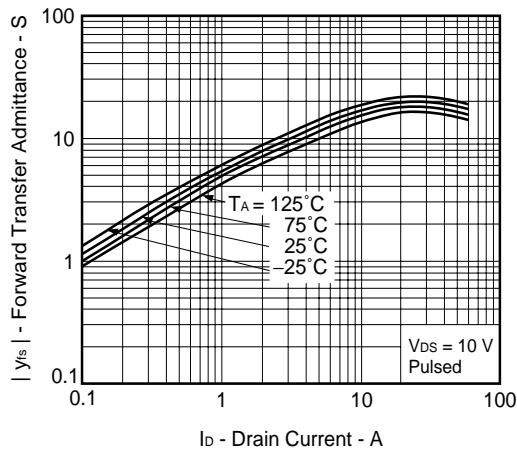
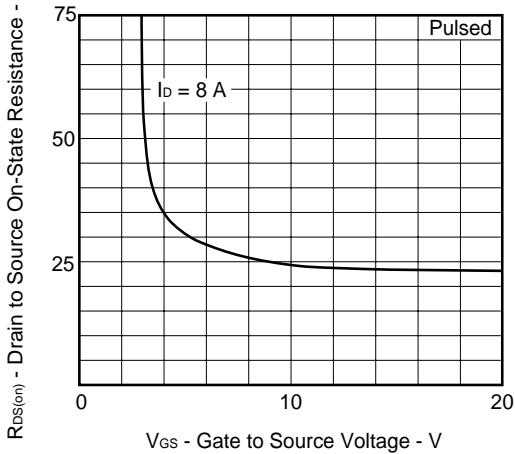
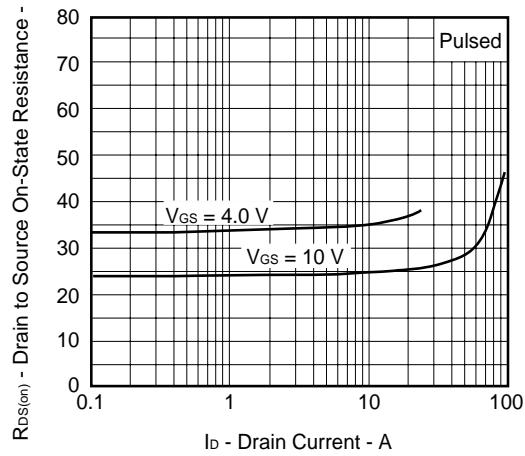
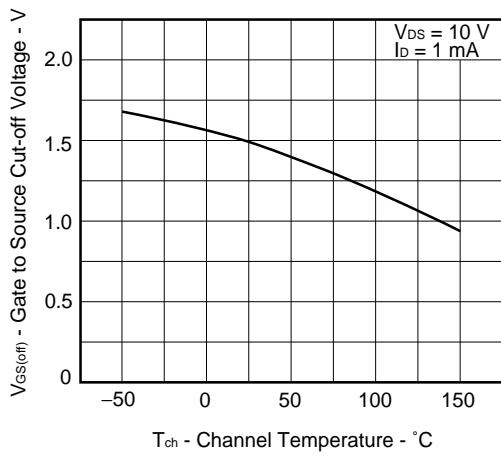
FORWARD BIAS SAFE OPERATING AREA

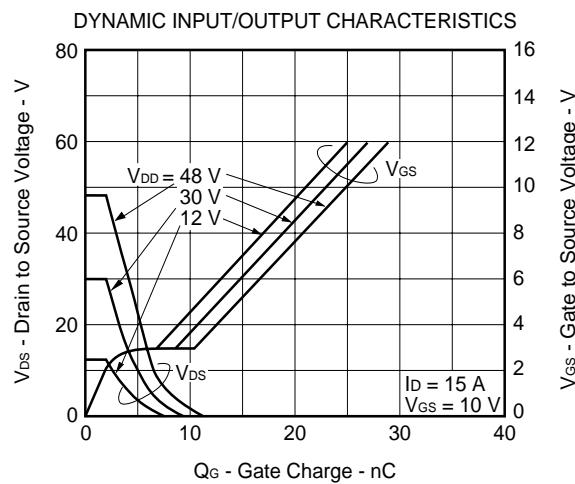
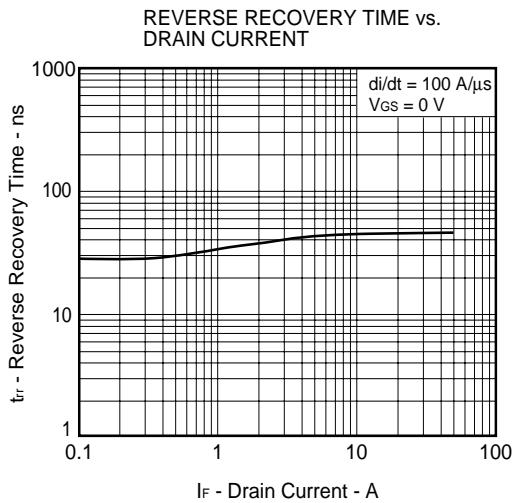
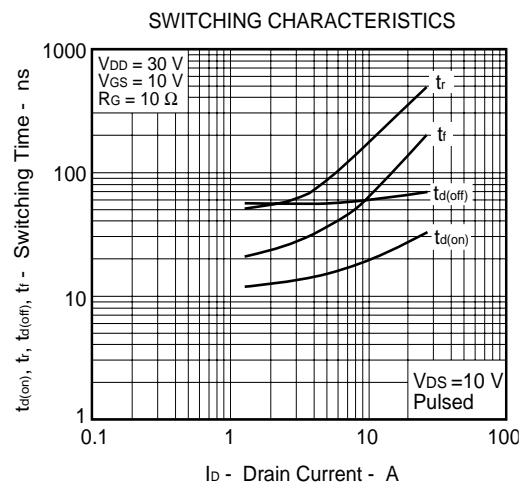
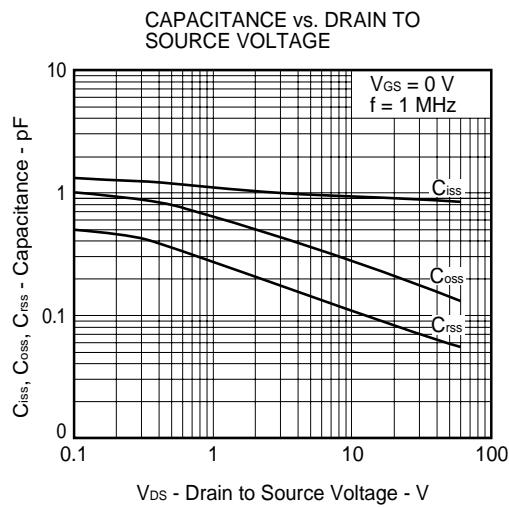
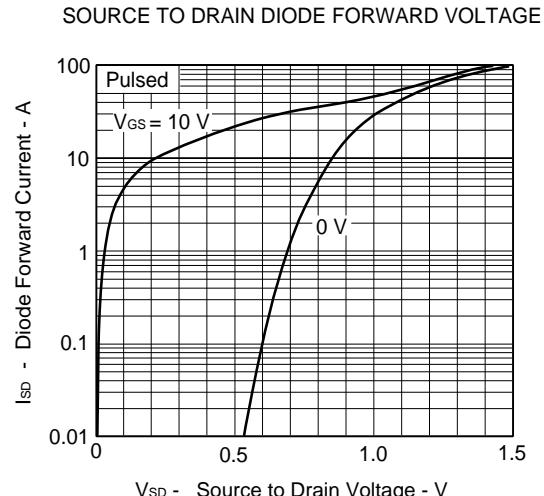
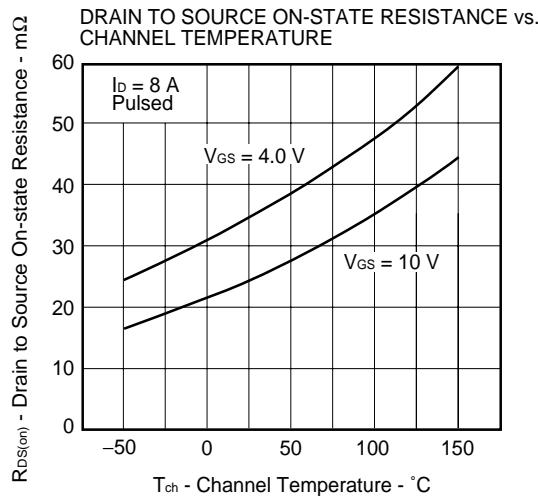


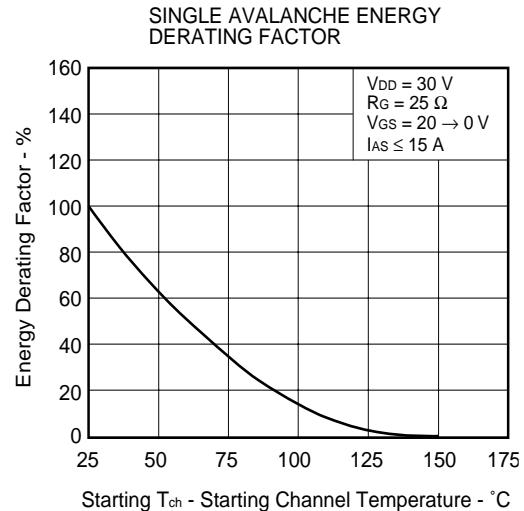
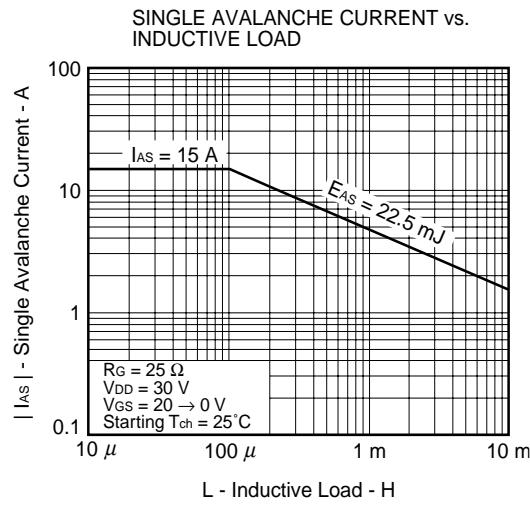
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



FORWARD TRANSFER CHARACTERISTICS

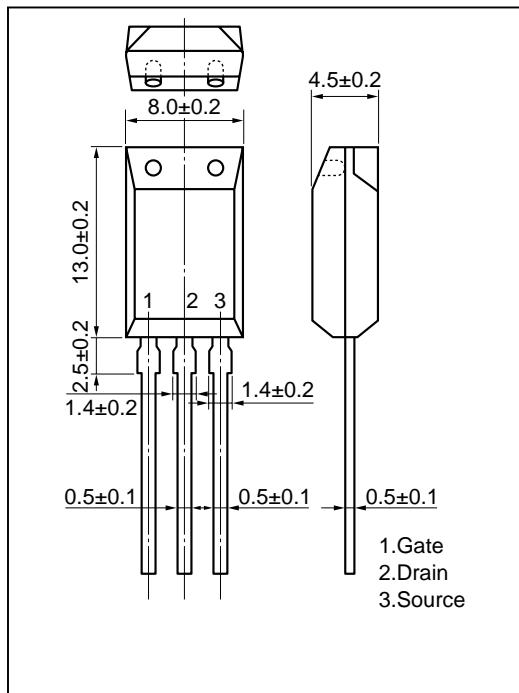
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGEFORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGEDRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENTGATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



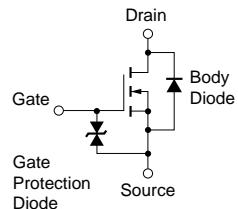


PACKAGE DRAWING (Unit: mm)

MP-10



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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