

### SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

The 2SK3366 is N-Channel MOS Field Effect Transistor designed for DC/DC converter application of notebook computers.

#### FEATURES

- Low on-resistance  
 $R_{DS(on)1} = 21 \text{ m}\Omega$  (MAX.) ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 10 \text{ A}$ )  
 $R_{DS(on)2} = 33 \text{ m}\Omega$  (MAX.) ( $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 10 \text{ A}$ )  
 $R_{DS(on)3} = 43 \text{ m}\Omega$  (MAX.) ( $V_{GS} = 4.0 \text{ V}$ ,  $I_D = 10 \text{ A}$ )
- Low  $C_{iss}$  :  $C_{iss} = 730 \text{ pF}$  (TYP.)
- Built-in gate protection diode

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3366	TO-251
2SK3366-Z	TO-252

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

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 20$	A
Drain Current (Pulse) <sup>Note</sup>	$I_{D(pulse)}$	$\pm 80$	A
Total Power Dissipation ( $T_c = 25 \text{ }^\circ\text{C}$ )	$P_T$	30	W
Total Power Dissipation ( $T_A = 25 \text{ }^\circ\text{C}$ )	$P_T$	1.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to + 150	$^\circ\text{C}$

**Note**  $PW \leq 10 \text{ } \mu\text{s}$ , Duty cycle  $\leq 1 \%$

#### THERMAL RESISTANCE

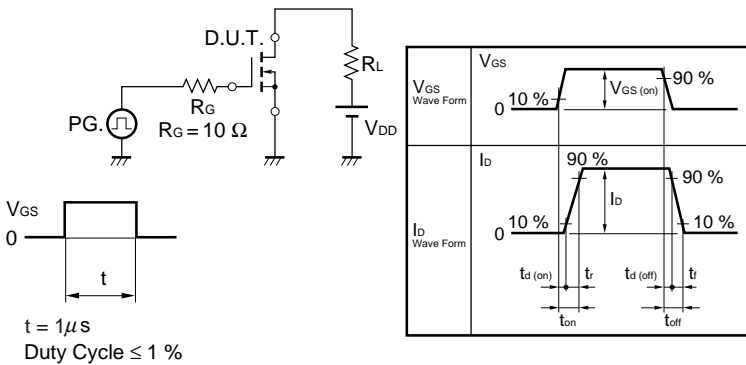
Channel to case	$R_{th(ch-C)}$	4.17	$^\circ\text{C/W}$
Channel to ambient	$R_{th(ch-A)}$	125	$^\circ\text{C/W}$

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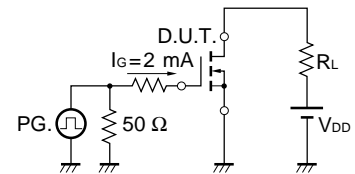
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		17.2	21	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		26	33	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 10 A		33	43	mΩ
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 A	5	10		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iSS</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		730		pF
Output Capacitance	C <sub>oSS</sub>			250		pF
Reverse Transfer Capacitance	C <sub>rSS</sub>			120		pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 10 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 15 V, R <sub>G</sub> = 10 Ω		28		ns
Rise Time	t <sub>r</sub>			420		ns
Turn-off Delay Time	t <sub>d(off)</sub>			47		ns
Fall Time	t <sub>f</sub>			64		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 20 A, V <sub>DD</sub> = 24 V, V <sub>GS</sub> = 10 V		15		nC
Gate to Source Charge	Q <sub>GS</sub>			2.8		nC
Gate to Drain Charge	Q <sub>GD</sub>			4.1		nC
Body Diode forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		1.0		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V di/dt = 100 A/μs		30		ns
Reverse Recovery Charge	Q <sub>rr</sub>			26		nC

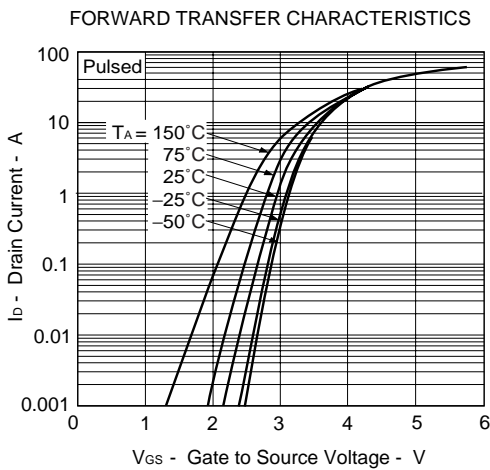
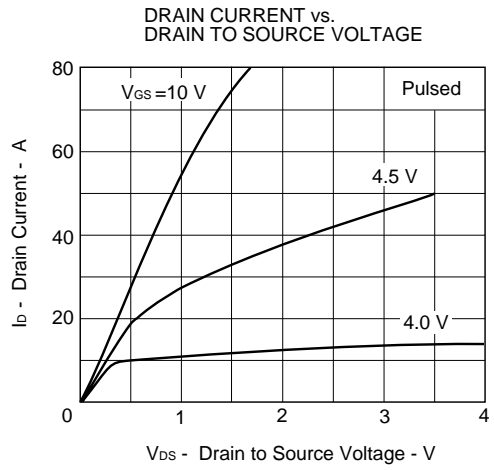
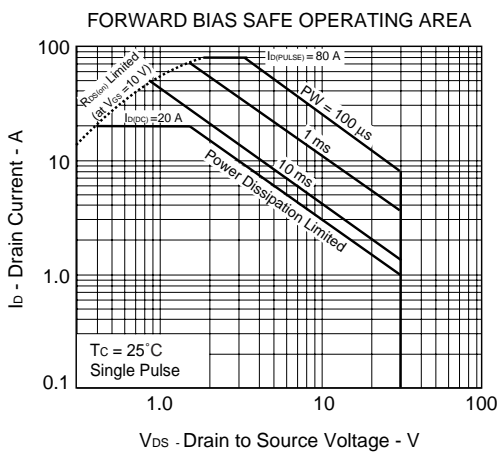
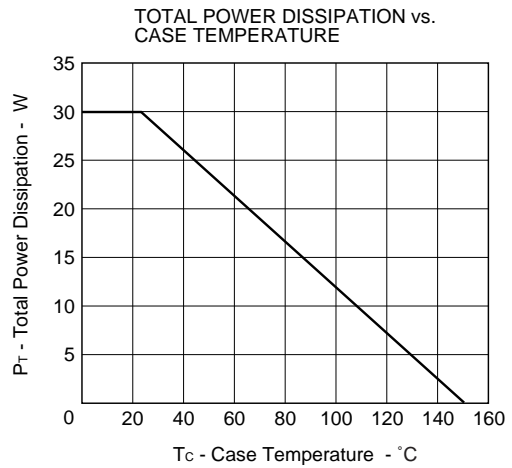
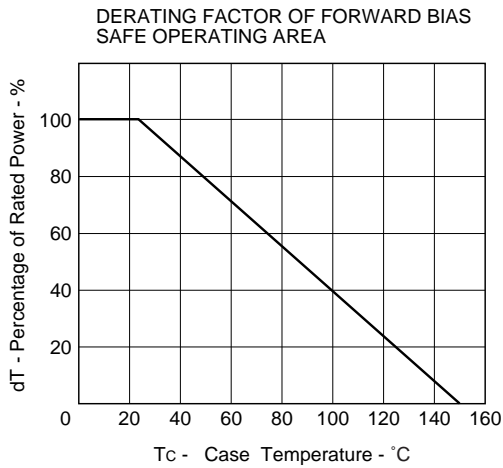
**TEST CIRCUIT 1 SWITCHING TIME**



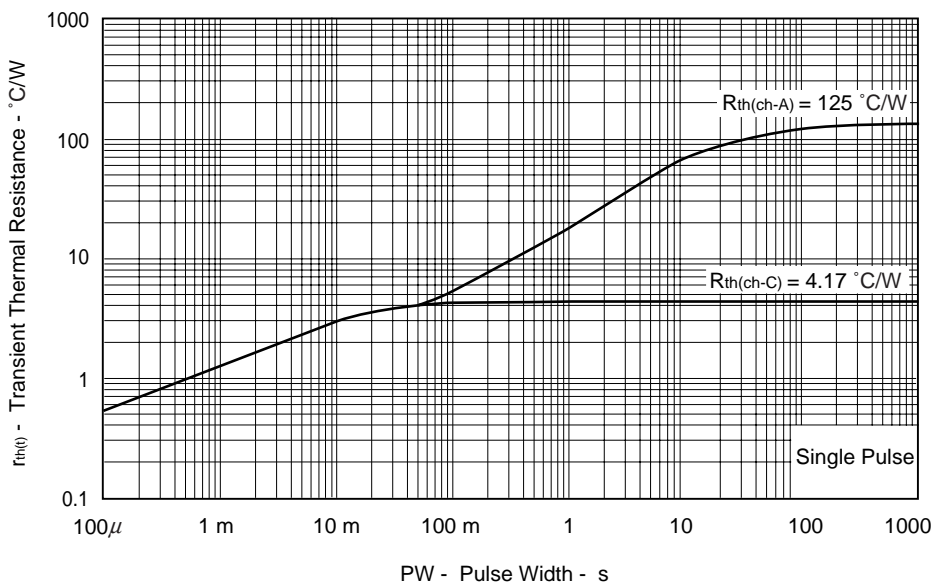
**TEST CIRCUIT 2 GATE CHARGE**



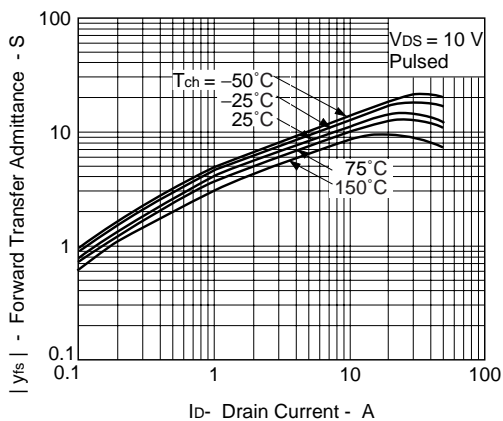
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)



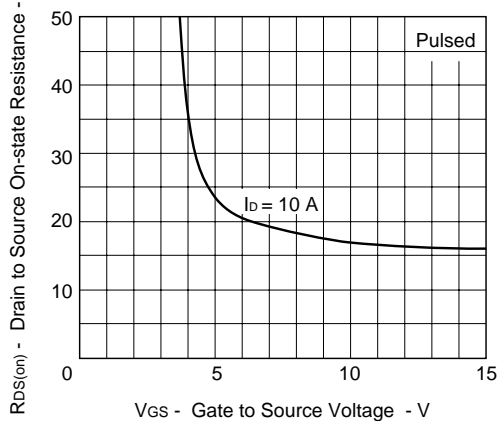
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



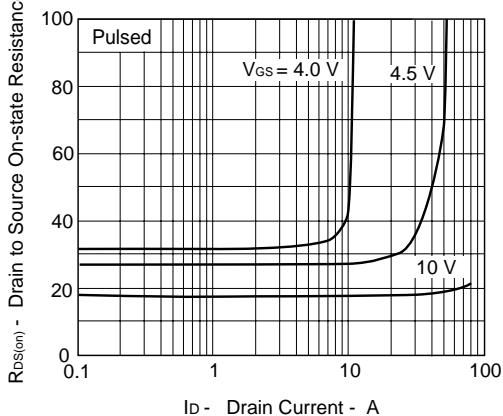
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



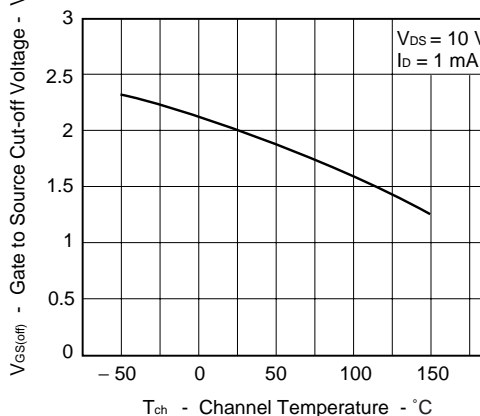
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



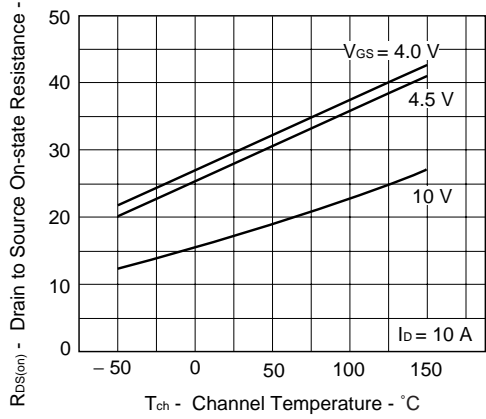
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



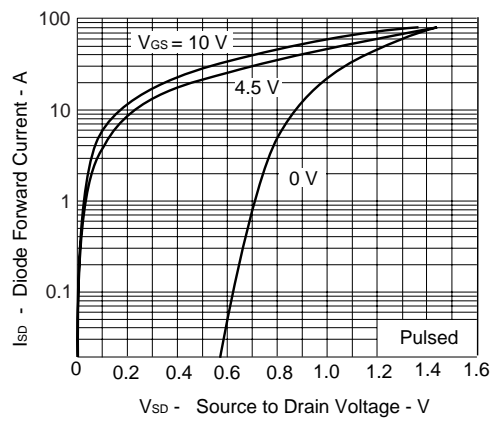
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



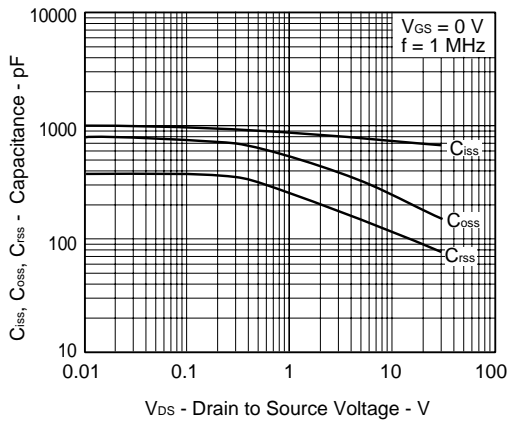
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



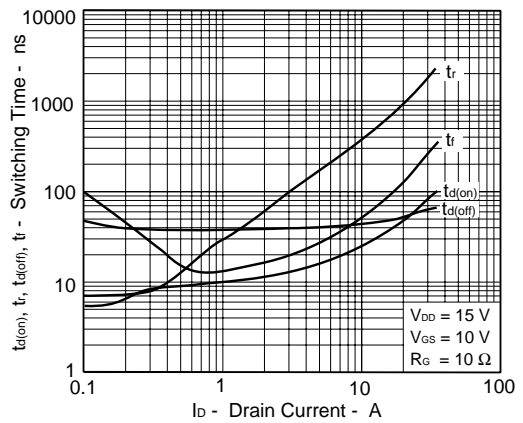
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



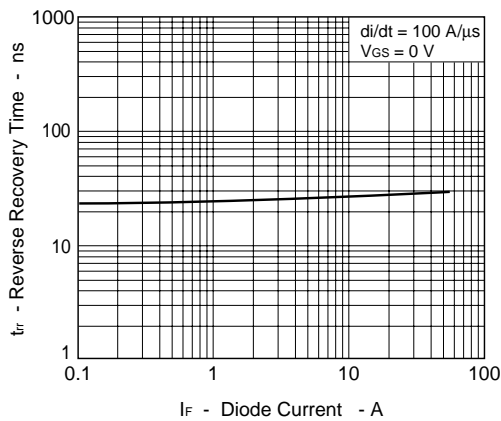
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



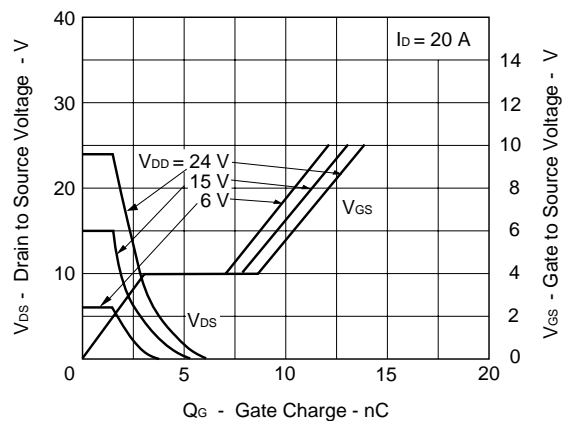
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT

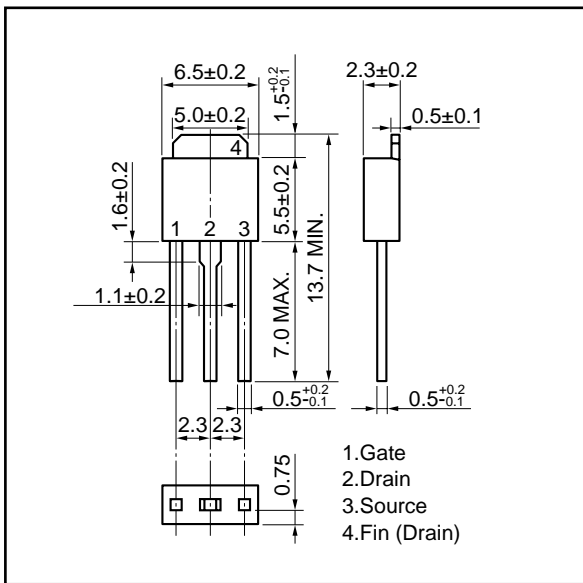


DYNAMIC INPUT/OUTPUT CHARACTERISTICS

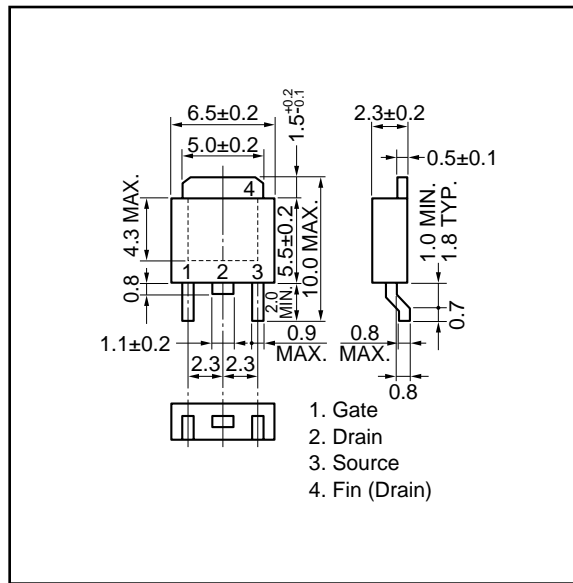


PACKAGE DRAWINGS (Unit : mm)

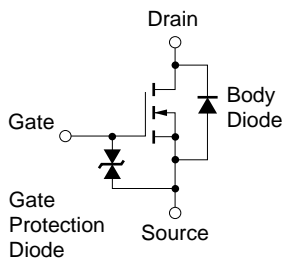
1) TO-251 (MP-3)



2) TO-252 (MP-3Z)



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.

[MEMO]

[MEMO]

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