DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR
2SK3366

SWITCHING
N-CHANNEL POWER MOS FET

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

★ ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3366	TO-251 (MP-3)
2SK3366-Z	TO-252 (MP-3Z)

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC)	$I_{D(DC)}$	±20	A
Drain Current (Pulse) Note	$I_{D(pulse)}$	±80	A
Total Power Dissipation (T_C = 25 °C)	P_T	30	W
Total Power Dissipation (T_A = 25 °C)	P_T	1.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to + 150	°C

Note PW ≤ 10 μs, Duty cycle ≤ 1 %

THERMAL RESISTANCE

Channel to case Thermal Resistance	$R_{th(ch-C)}$	4.17	°C/W
Channel to ambient Thermal Resistance	$R_{th(ch-A)}$	125	°C/W

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

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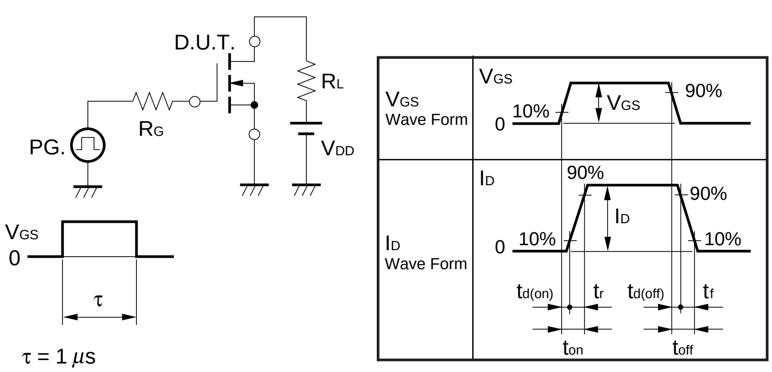
The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

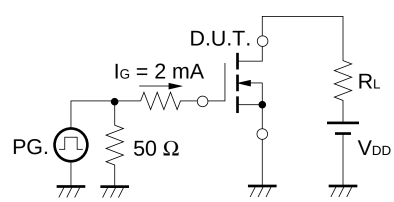
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 10 A		17.2	21	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 10 A		26	33	mΩ
	$R_{DS(on)3}$	V_{GS} = 4.0 V, I_D = 10 A		33	43	mΩ
Gate to Source Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance	$\| y_{fs} \|$	V_{DS} = 10 V, I_D = 10 A	5	10		S
Drain Leakage Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			10	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Input Capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		730		pF
Output Capacitance	C_{oss}			250		pF
Reverse Transfer Capacitance	C_{rss}			120		pF
Turn-on Delay Time	$t_{d(on)}$	I_D = 10 A, V_{GS} = 10 V, V_{DD} = 15 V,		28		ns
Rise Time	t_r	R_G = 10 Ω		420		ns
Turn-off Delay Time	$t_{d(off)}$			47		ns
Fall Time	t_f			64		ns
Total Gate Charge	Q_G	I_D = 20 A, V_{DD} = 24 V, V_{GS} = 10 V		15		nC
Gate to Source Charge	Q_{GS}			2.8		nC
Gate to Drain Charge	Q_{GD}			4.1		nC
Body Diode forward Voltage	$V_{F(S-D)}$	I_F = 20 A, V_{GS} = 0 V		1.0		V
Reverse Recovery Time	t_{rr}	I_F = 20 A, V_{GS} = 0 V		30		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		26		nC

TEST CIRCUIT 1 SWITCHING TIME



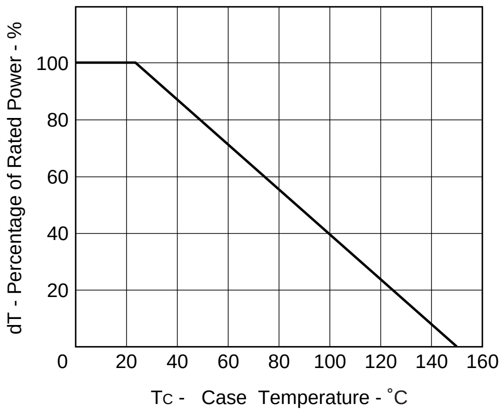
τ = 1 μs
Duty Cycle ≤ 1%

TEST CIRCUIT 2 GATE CHARGE

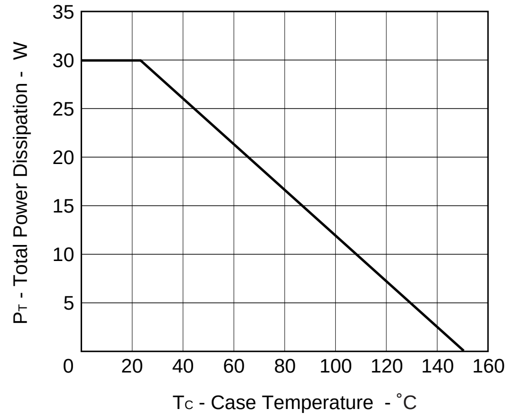


TYPICAL CHARACTERISTICS (T_A = 25 °C)

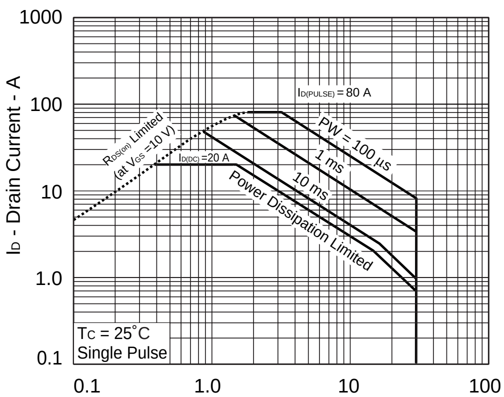
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



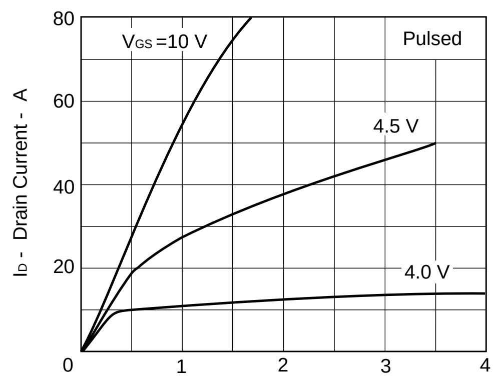
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



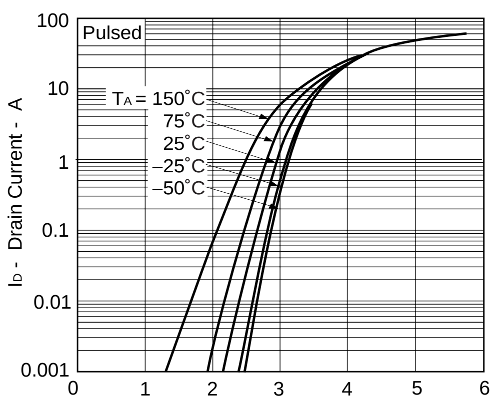
FORWARD BIAS SAFE OPERATING AREA

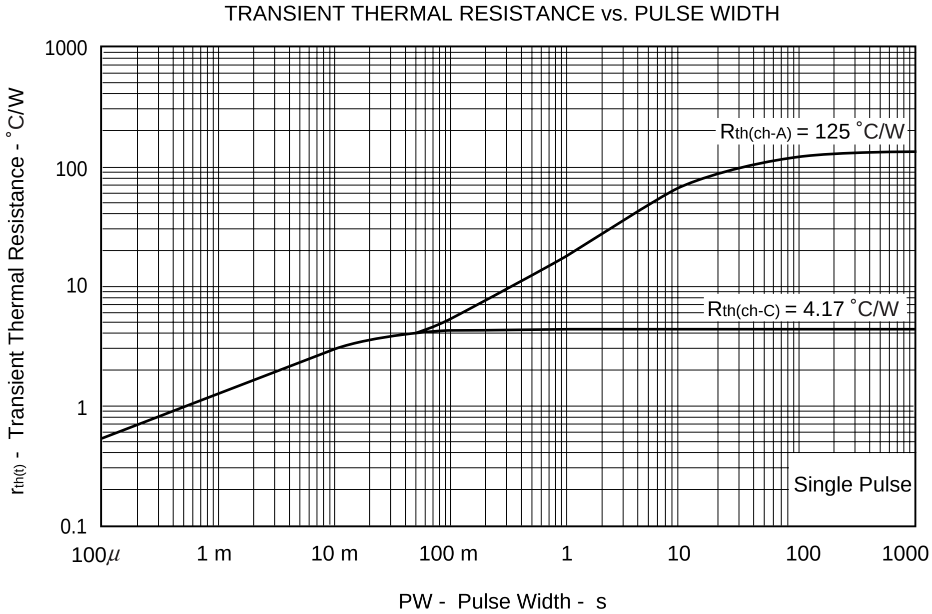


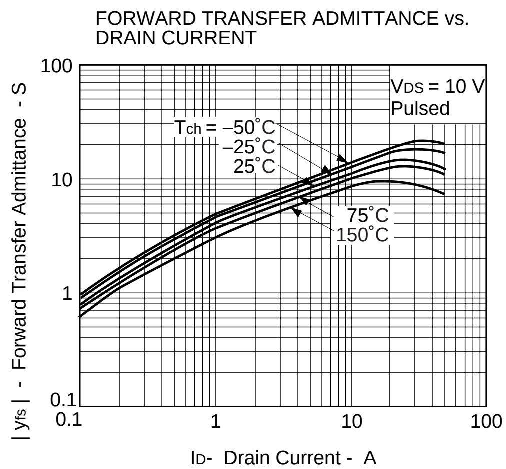
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

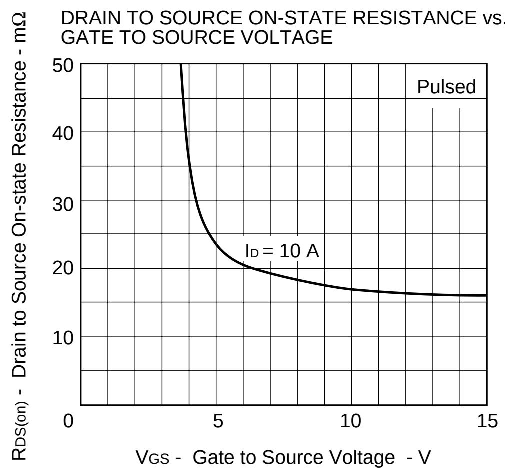


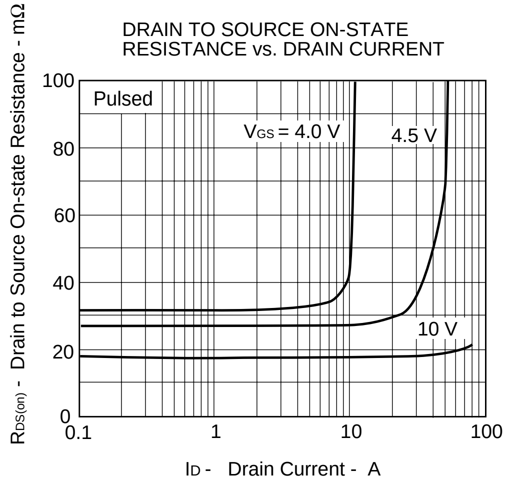
FORWARD TRANSFER CHARACTERISTICS

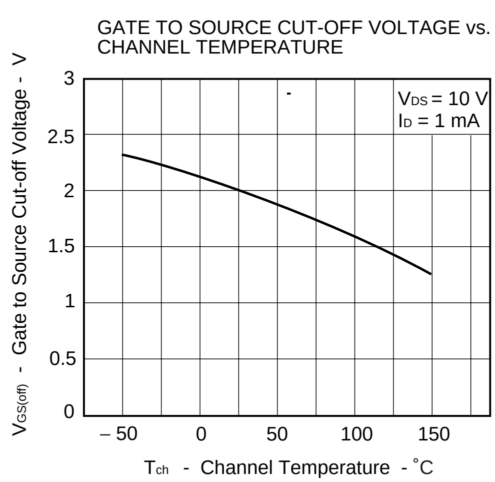



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH
rth(t) - Transient Thermal Resistance - °C/W
1000
100
10
1
0.1
Rth(ch-A) = 125 °C/W
Rth(ch-C) = 4.17 °C/W
Single Pulse
100μ
1 m
10 m
100 m
1
10
100
1000
PW - Pulse Width - s

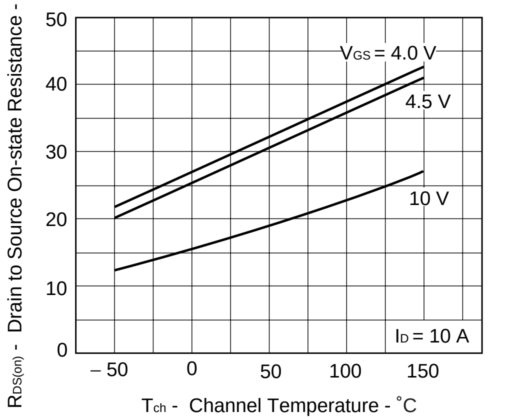

FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT
| yfs | - Forward Transfer Admittance - S
VDS = 10 V
Pulsed
Tch = –50°C
–25°C
25°C
75°C
150°C
100
10
1
0.1
0.1
1
10
100
ID- Drain Current - A


DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE
RDS(on) - Drain to Source On-state Resistance - mΩ
Pulsed
ID = 10 A
50
40
30
20
10
0
5
10
15
VGS - Gate to Source Voltage - V

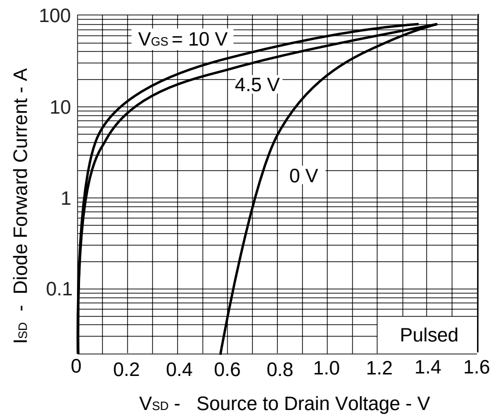

DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT
RDS(on) - Drain to Source On-state Resistance - mΩ
Pulsed
VGS = 4.0 V
4.5 V
10 V
100
80
60
40
20
0
0.1
1
10
100
ID - Drain Current - A


GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE
VGS(off) - Gate to Source Cut-off Voltage - V
VDS = 10 V
ID = 1 mA
3
2.5
2
1.5
1
0.5
0
– 50
0
50
100
150
Tch - Channel Temperature - °C

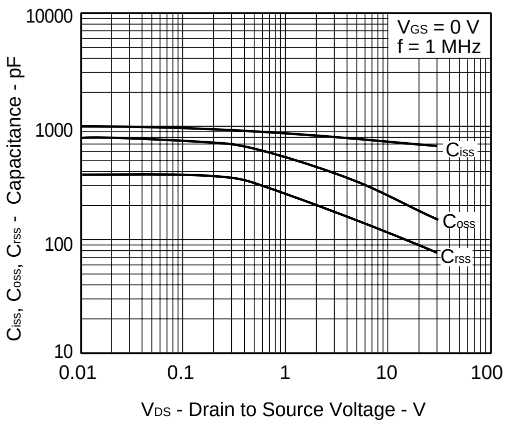
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



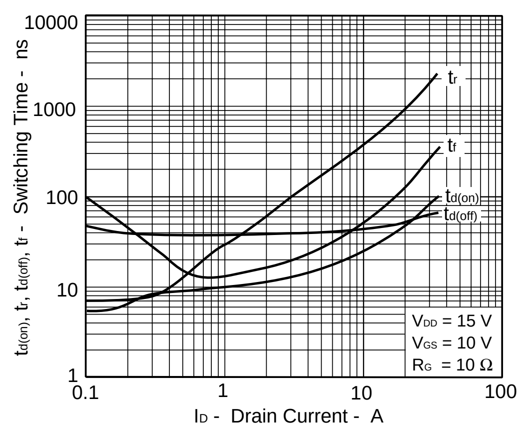
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



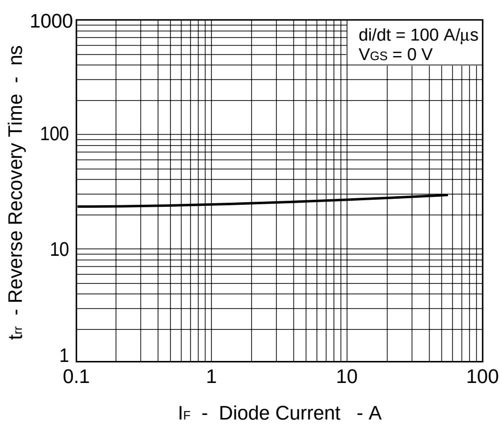
CAPACITANCE vs. DRAIN TO
SOURCE VOLTAGE



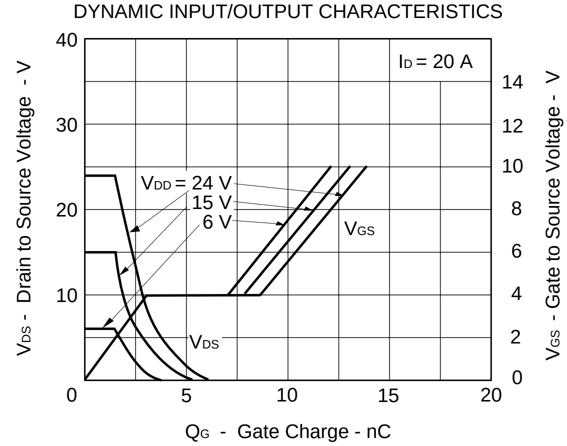
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs.
DRAIN CURRENT

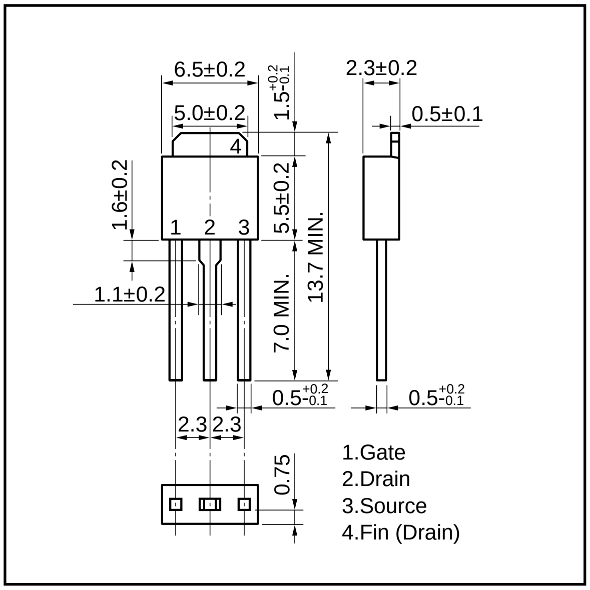


DYNAMIC INPUT/OUTPUT CHARACTERISTICS

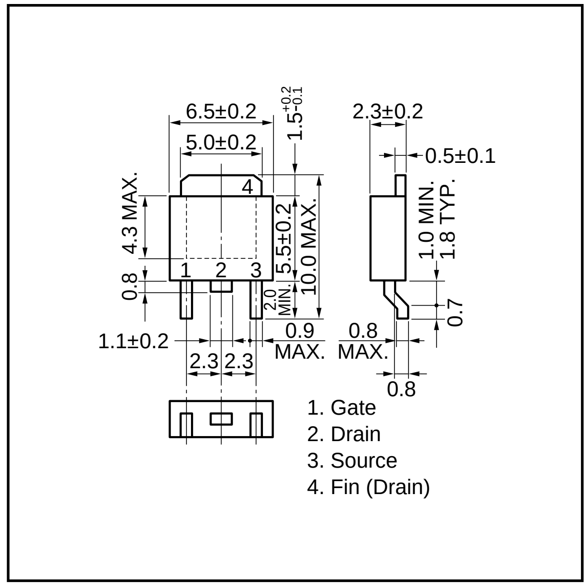


PACKAGE DRAWINGS (Unit : mm)

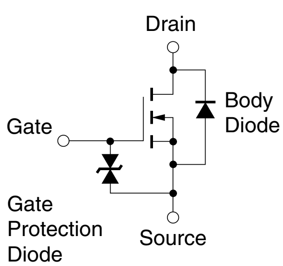
★ **1) TO-251 (MP-3)**



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.

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