

NEC**MOS FIELD EFFECT TRANSISTOR
2SK3405****SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE****DESCRIPTION**

The 2SK3405 is N-Channel MOS FET device that features a low on-state resistance and excellent switching characteristics, designed for low voltage high current applications such as DC/DC converter with synchronous rectifier.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3405	TO-220AB
2SK3405-ZK	TO-263(MP-25ZK)
2SK3405-ZJ	TO-263(MP-25ZJ)

FEATURES

- 4.5-V drive available
- Low on-state resistance
 $R_{DS(on)1} = 9.0 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 24 \text{ A)}$
- Low gate charge
 $Q_G = 34 \text{ nC TYP. (} I_D = 48 \text{ A, } V_{DD} = 16 \text{ V, } V_{GS} = 10 \text{ V)}$
- Built-in gate protection diode
- Surface mount device available

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

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	20	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 48	A
Drain Current (Pulse) ^{Note}	$I_{D(pulse)}$	± 192	A
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T1}	1.5	W
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T2}	50	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

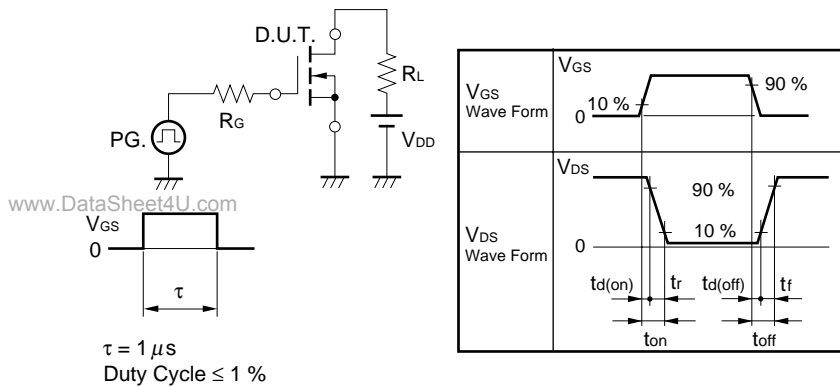
Note $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

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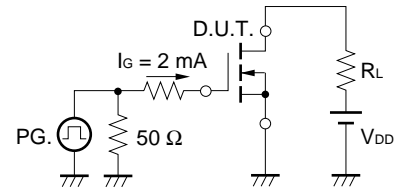
ELECTRICAL CHARACTERISTICS(T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Leakage Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	1.5		2.5	V
Forward Transfer Admittance	y _{fs}	V _{DS} = 10 V, I _D = 24 A	12.5			S
Drain to Source On-state Resistance	R _{DS(on)1}	V _{GS} = 10 V, I _D = 24 A		6.5	9.0	mΩ
	R _{DS(on)2}	V _{GS} = 4.5 V, I _D = 24 A		9.9	14.0	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		1800		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		770		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		400		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10 V, I _D = 24 A		21		ns
Rise Time	t _r	V _{GS(on)} = 10 V		13		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		64		ns
Fall Time	t _f			25		ns
Total Gate Charge	Q _G	V _{DD} = 16 V		34		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V		6.6		nC
Gate to Drain Charge	Q _{GD}	I _D = 48 A		11		nC
Diode Forward Voltage	V _{F(S-D)}	I _F = 48 A, V _{GS} = 0 V		1.0		V
Reverse Recovery Time	t _{rr}	I _F = 48 A, V _{GS} = 0 V		38		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		29		nC

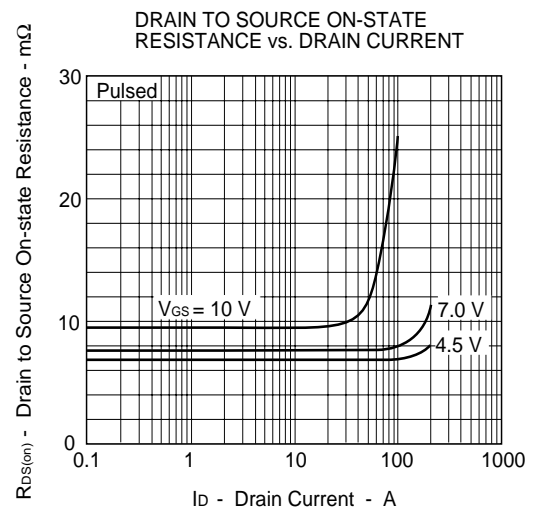
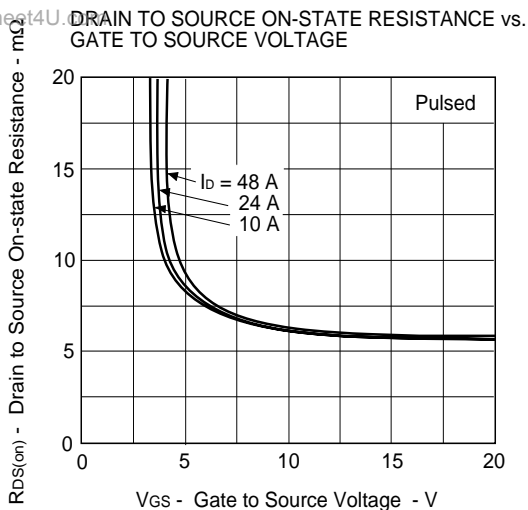
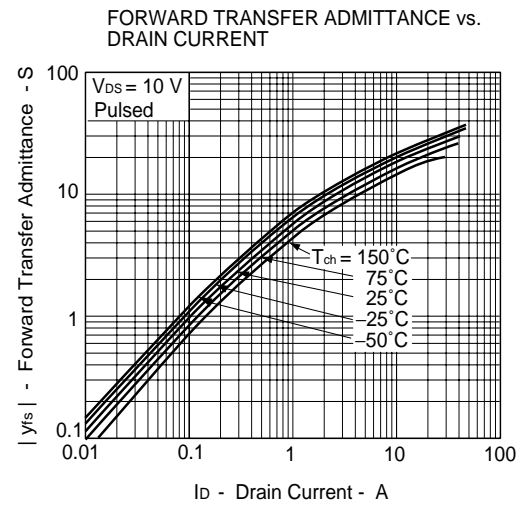
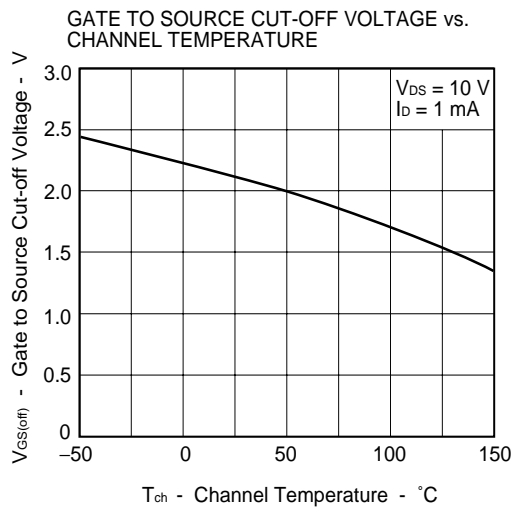
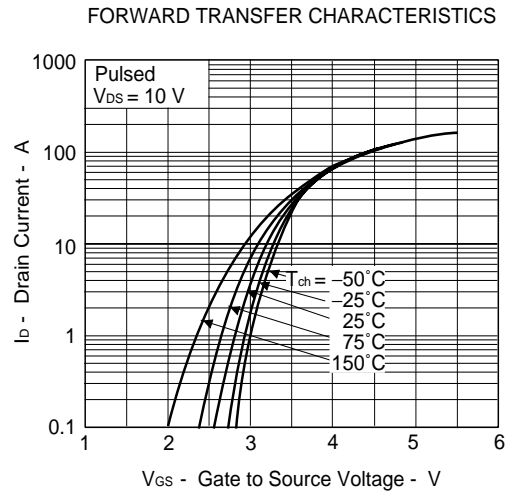
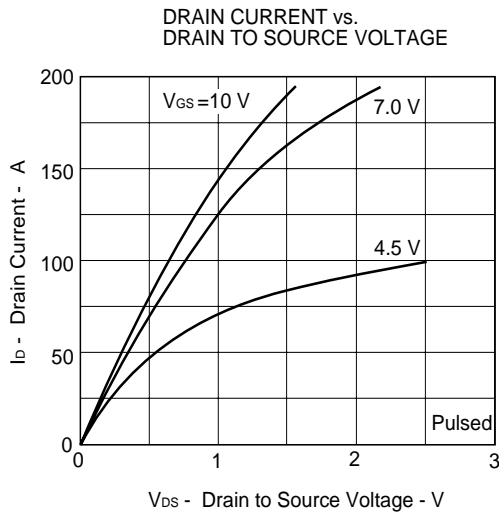
TEST CIRCUIT 1 SWITCHING TIME

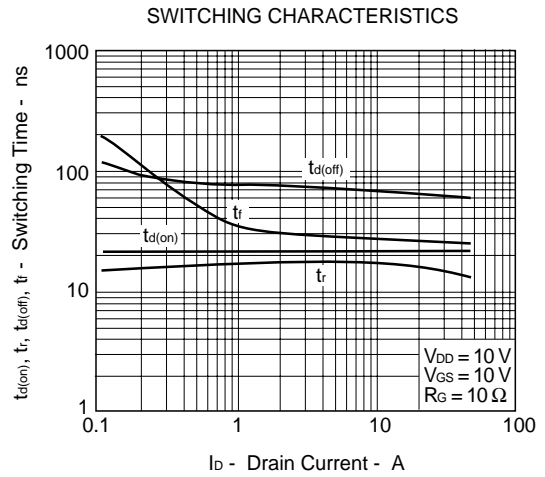
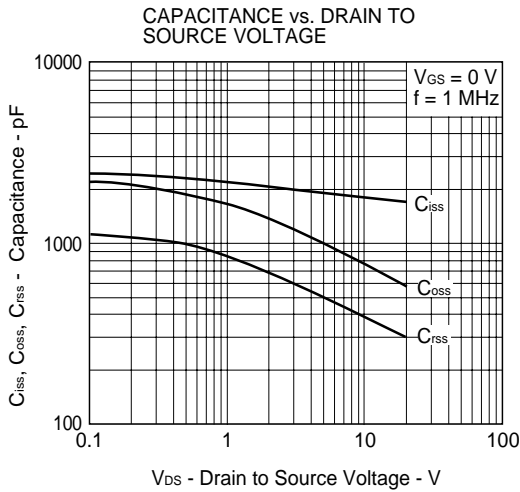
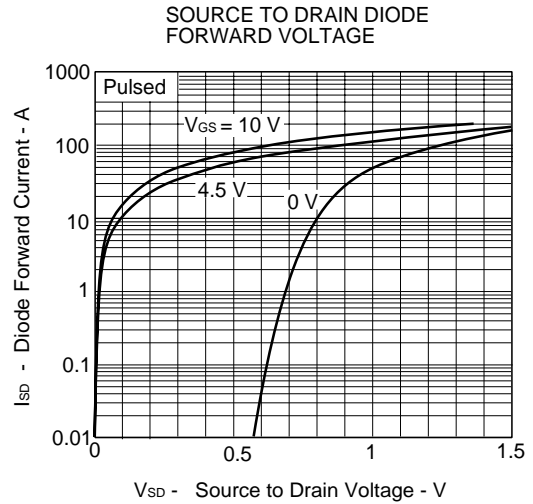
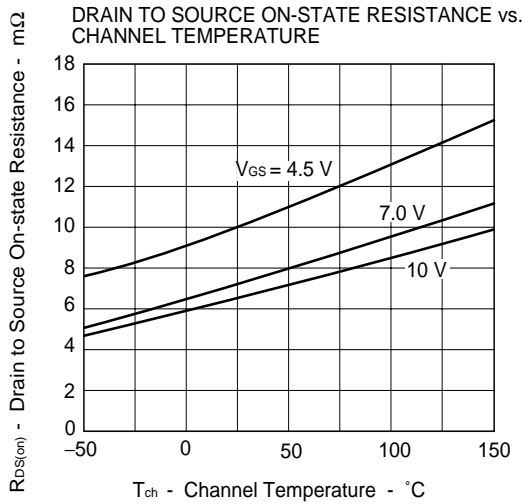


TEST CIRCUIT 2 GATE CHARGE

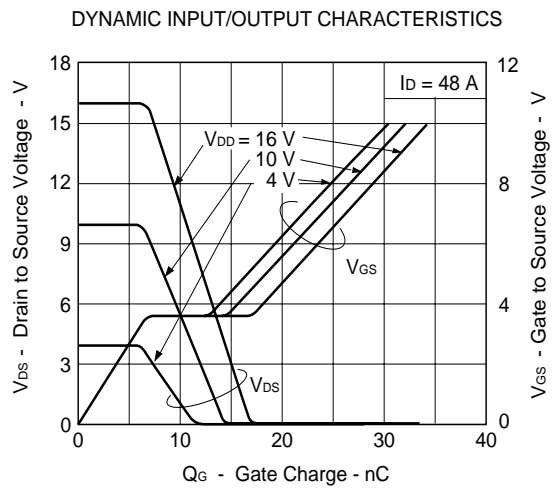
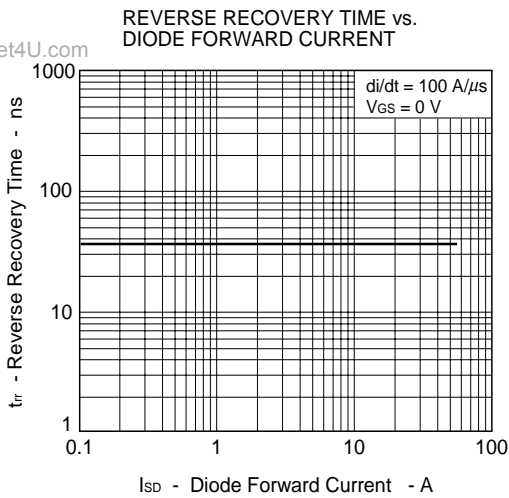


TYPICAL CHARACTERISTICS (T_A = 25°C)

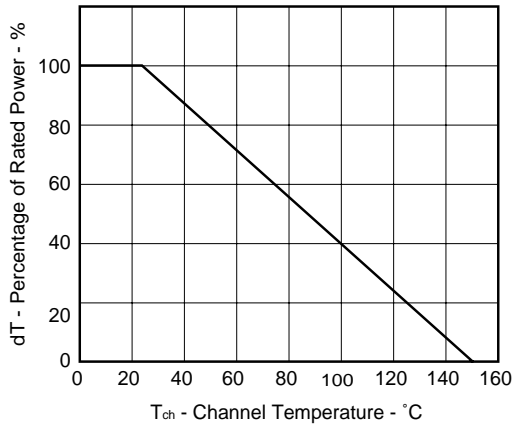




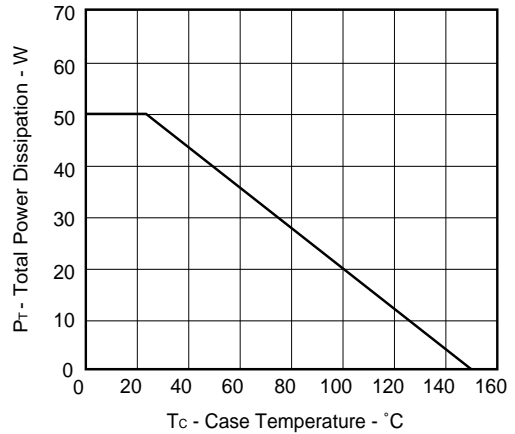
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DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

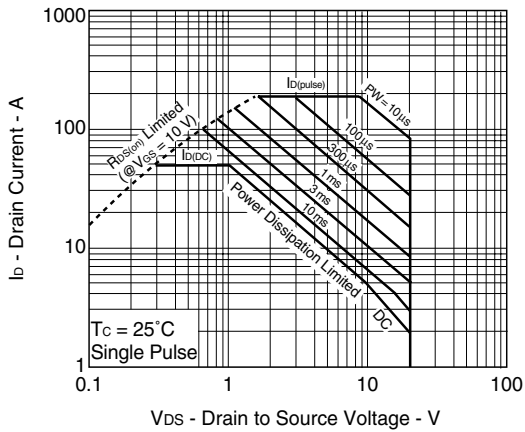


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

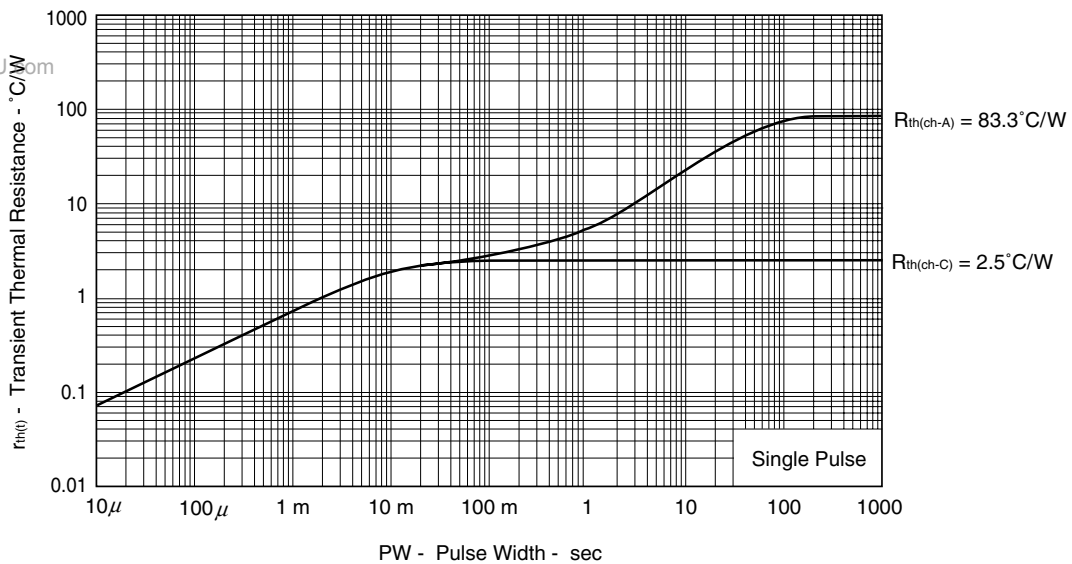


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FORWARD BIAS SAFE OPERATING AREA

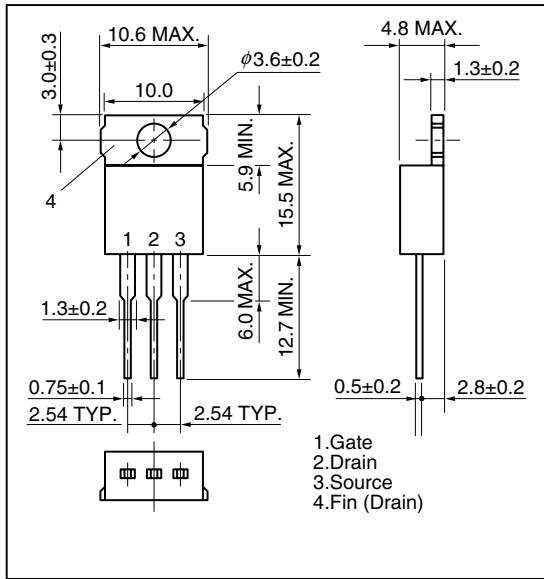


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

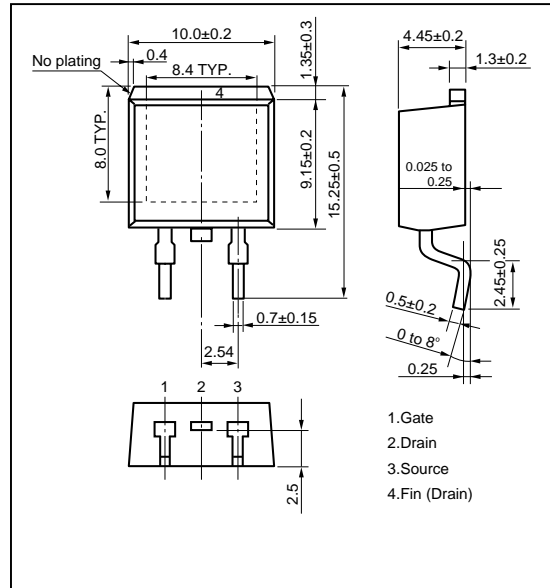


PACKAGE DRAWINGS (Unit: mm)

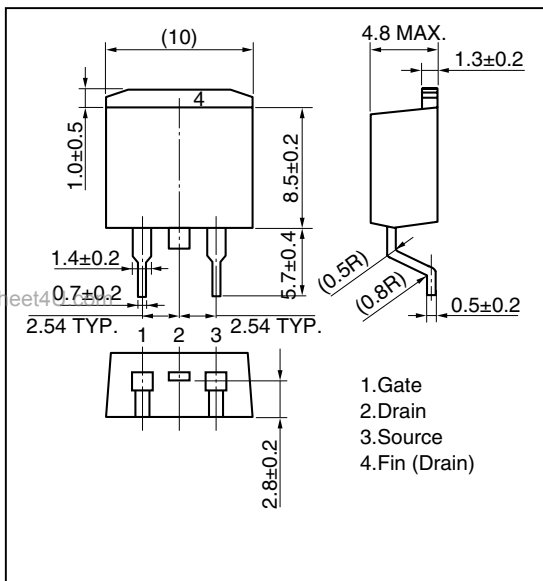
1) TO-220AB (MP-25)



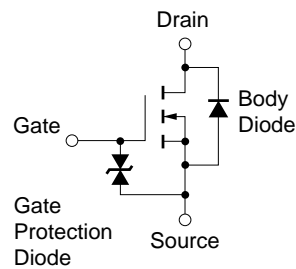
2) TO-263 (MP-25ZK)



3) TO-263 (MP-25ZJ)



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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