2SK2225

Silicon N-Channel MOS FET

HITACHI

ADE-208-140
1st. Edition

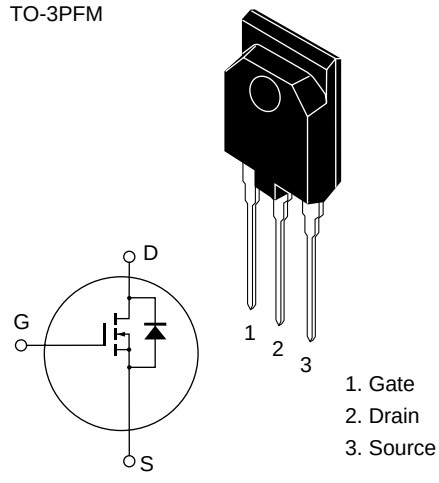
Application

High speed power switching

Features

- High breakdown voltage (V_{DSS} = 1500 V)
- High speed switching
- Low drive current
- No Secondary Breakdown
- Suitable for Switching regulator, DC-DC converter

Outline



Hitachi semiconductor

Absolute Maximum Ratings (Ta = 25°C)

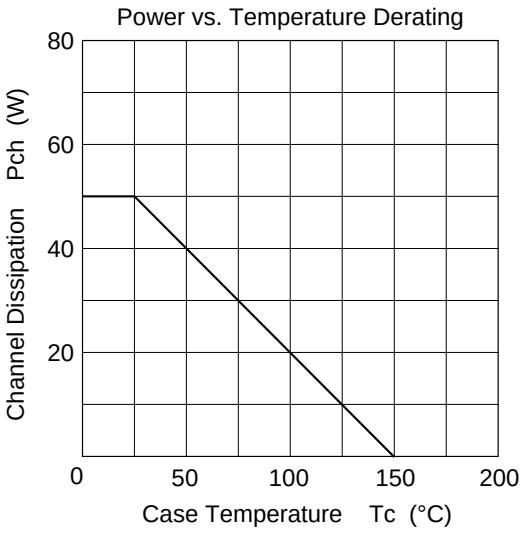
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	1500	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	2	A
Drain peak current	$I_{D(pulse)}$ *1	7	A
Body to drain diode reverse drain current	I_{DR}	2	A
Channel dissipation	Pch*2	50	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

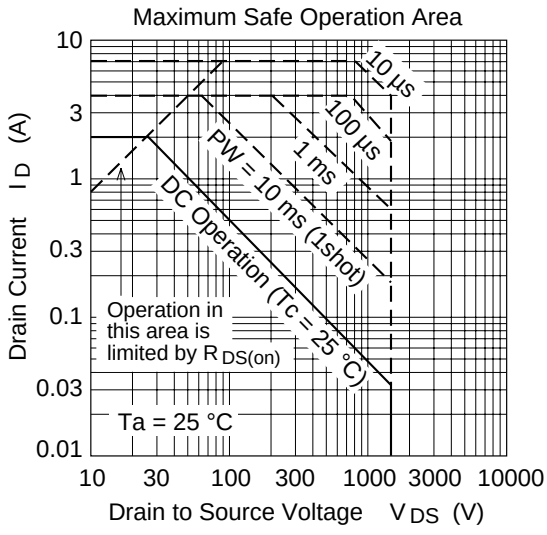
Notes 1. PW ≤ 10 µs, duty cycle ≤ 1 %
2. Value at Tc = 25 °C

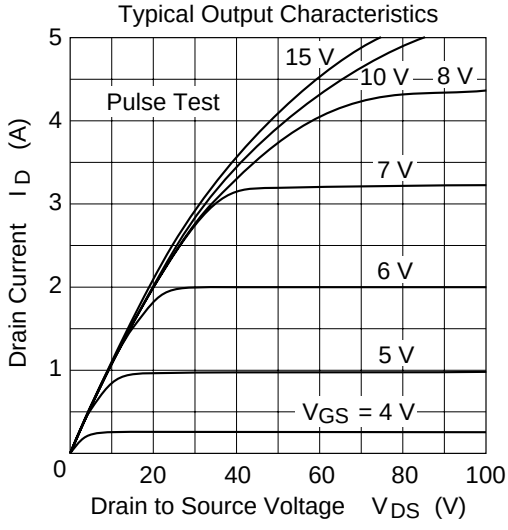
Electrical Characteristics (Ta = 25°C)

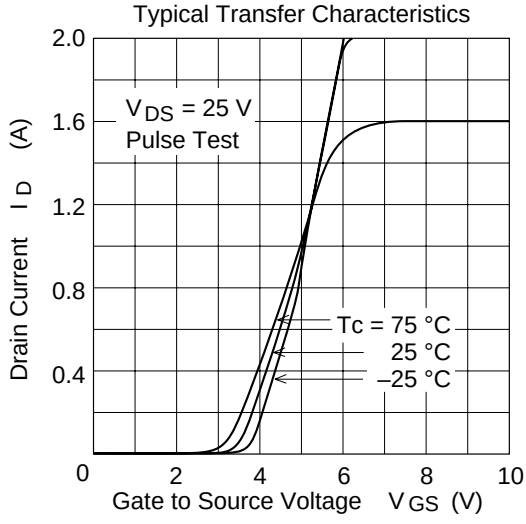
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	1500	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source leak current	I_{GSS}	—	—	±1	µA	V_{GS} = ±20 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	500	µA	V_{DS} =1200 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	2.0	—	4.0	V	I_D = 1 mA, V_{DS} = 10 V
Static drain to source on state resistance	$R_{DS(on)}$	—	9	12	Ω	I_D = 1 A V_{GS} = 15 V*1
Forward transfer admittance	$\|y_{fs}\|$	0.45	0.75	—	S	I_D = 1 A V_{DS} = 20 V*1
Input capacitance	Ciss	—	990	—	pF	V_{DS} = 10 V
Output capacitance	Coss	—	125	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	60	—	pF	f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	17	—	ns	I_D = 1 A
Rise time	t_r	—	50	—	ns	V_{GS} = 10 V
Turn-off delay time	$t_{d(off)}$	—	150	—	ns	R_L = 30 Ω
Fall time	t_f	—	50	—	ns	
Body to drain diode forward voltage	V_{DF}	—	0.9	—	V	I_F = 2 A, V_{GS} = 0
Body to drain diode reverse recovery time	t_{rr}	—	1750	—	ns	I_F = 20 A, V_{GS} = 0, di_F / dt = 100 A / µs

Note 1. Pulse Test

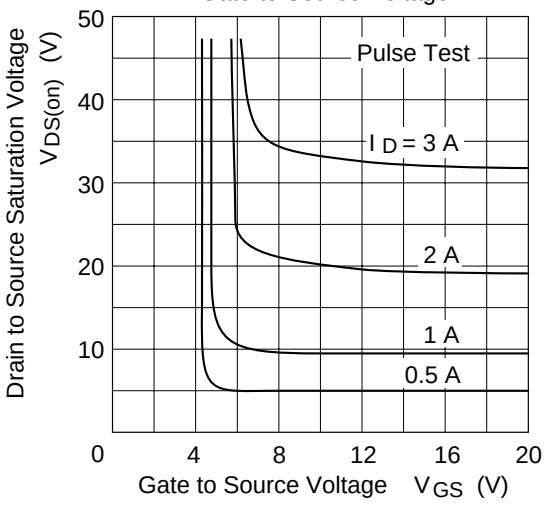

Power vs. Temperature Derating
Channel Dissipation Pch (W)
80
60
40
20
0
50
100
150
200
Case Temperature Tc (°C)


Maximum Safe Operation Area
Drain Current I D (A)
10
3
1
0.3
0.1
0.03
0.01
10 µs
100 µs
1 ms
PW = 10 ms (1shot)
DC Operation (Tc = 25 °C)
Operation in
this area is
limited by R DS(on)
Ta = 25 °C
10
30
100
300
1000
3000
10000
Drain to Source Voltage V DS (V)

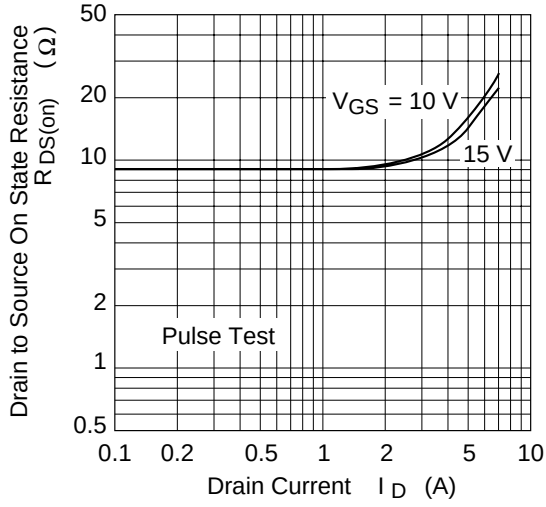

Typical Output Characteristics
Drain Current I D (A)
5
4
3
2
1
0
15 V
10 V
8 V
Pulse Test
7 V
6 V
5 V
VGS = 4 V
20
40
60
80
100
Drain to Source Voltage V DS (V)


Typical Transfer Characteristics
Drain Current I D (A)
2.0
1.6
1.2
0.8
0.4
0
V DS = 25 V
Pulse Test
Tc = 75 °C
25 °C
–25 °C
2
4
6
8
10
Gate to Source Voltage V GS (V)

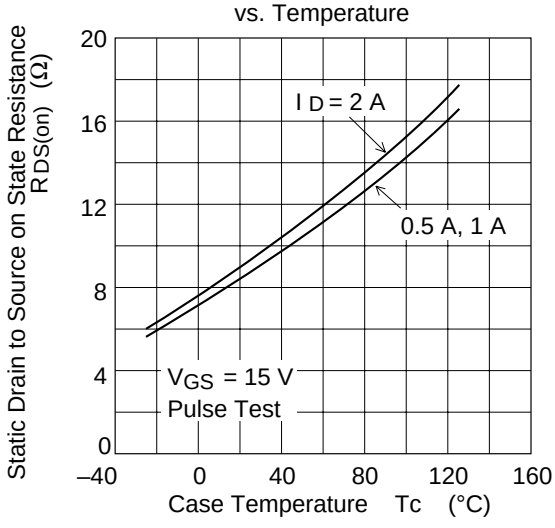
Drain to Source Saturation Voltage vs. Gate to Source Voltage



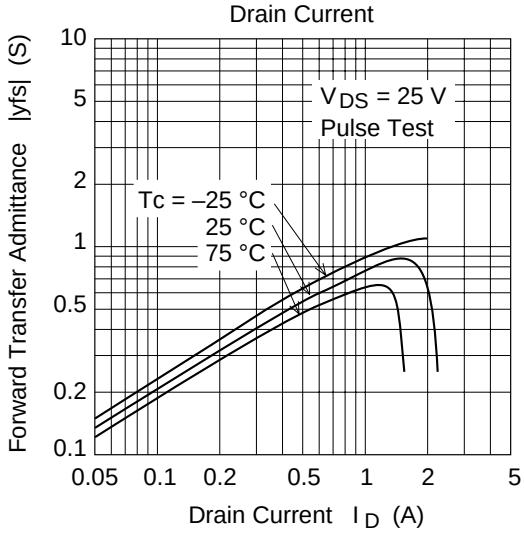
Static Drain to Source State Resistance vs. Drain Current

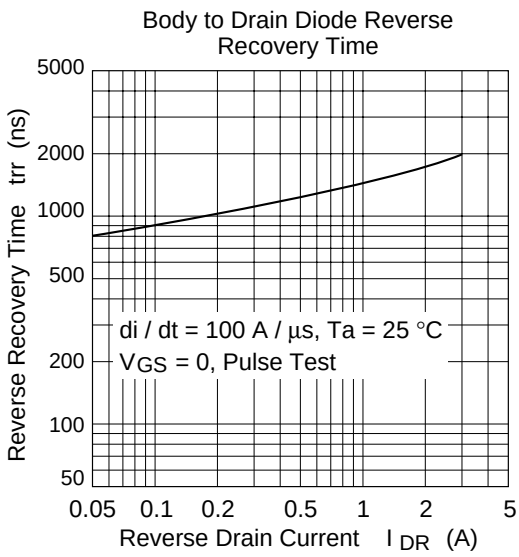


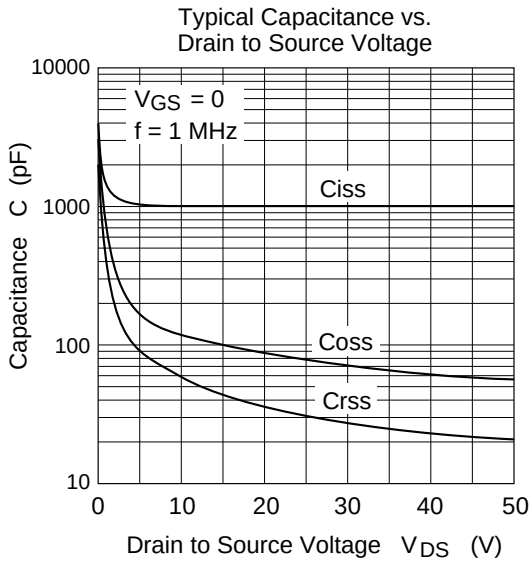
Static Drain to Source on State Resistance vs. Temperature

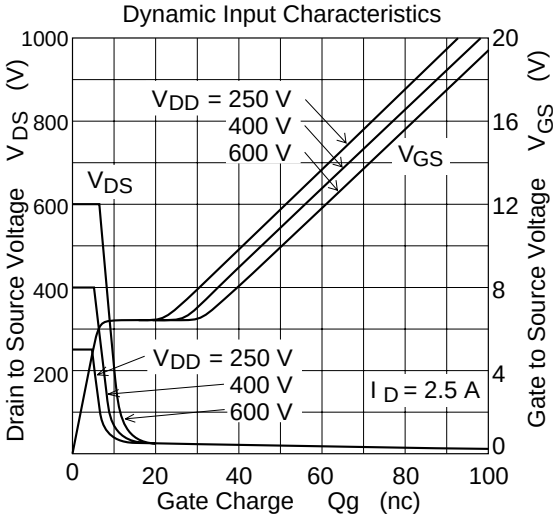


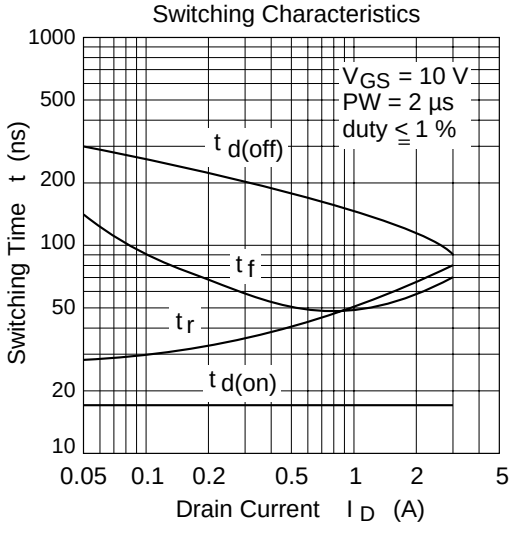
Forward Transfer Admittance vs. Drain Current

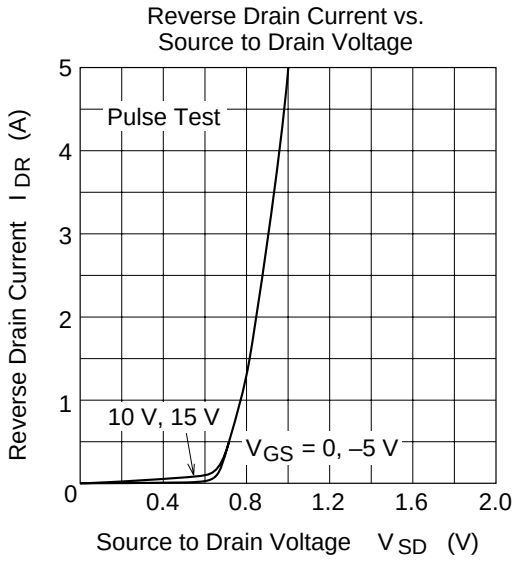


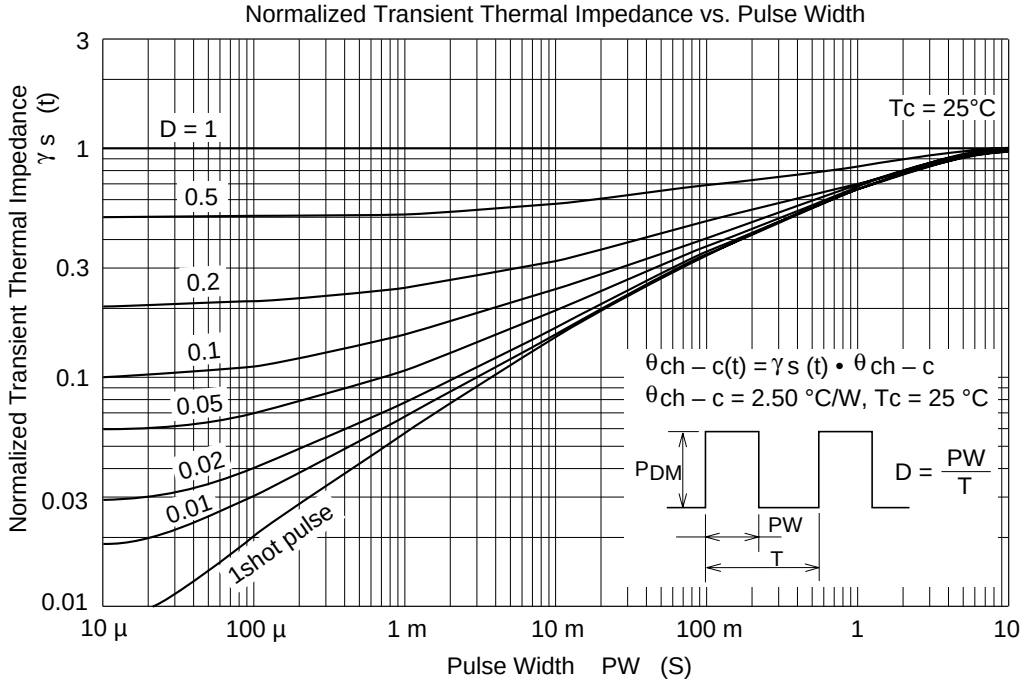

Body to Drain Diode Reverse Recovery Time
Reverse Recovery Time trr (ns)
5000
2000
1000
500
200
100
50
di / dt = 100 A / µs, Ta = 25 °C
VGS = 0, Pulse Test
0.05 0.1 0.2 0.5 1 2 5
Reverse Drain Current I DR (A)


Typical Capacitance vs. Drain to Source Voltage
Capacitance C (pF)
10000
1000
100
10
VGS = 0
f = 1 MHz
Ciss
Coss
Crss
0 10 20 30 40 50
Drain to Source Voltage V DS (V)

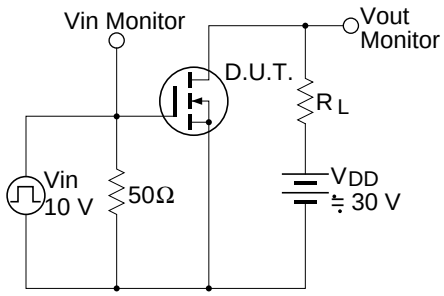

Dynamic Input Characteristics
Drain to Source Voltage V DS (V)
1000
800
600
400
200
Gate to Source Voltage VGS (V)
20
16
12
8
4
0
VDD = 250 V
400 V
600 V
VGS
VDS
VDD = 250 V
400 V
600 V
I D = 2.5 A
0 20 40 60 80 100
Gate Charge Qg (nc)


Switching Characteristics
Switching Time t (ns)
1000
500
200
100
50
20
10
VGS = 10 V
PW = 2 µs
duty ≦ 1 %
t d(off)
t f
t r
t d(on)
0.05 0.1 0.2 0.5 1 2 5
Drain Current I D (A)

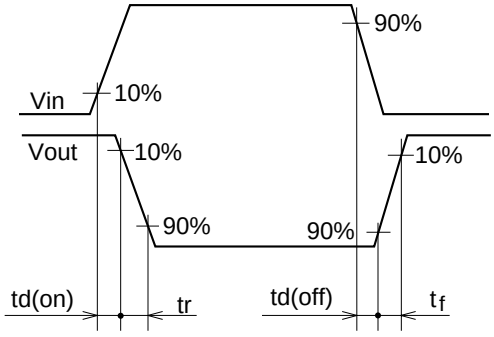

Reverse Drain Current vs.
Source to Drain Voltage
Pulse Test
10 V, 15 V
VGS = 0, –5 V
Reverse Drain Current IDR (A)
Source to Drain Voltage VSD (V)
0
1
2
3
4
5
0.4
0.8
1.2
1.6
2.0


Normalized Transient Thermal Impedance vs. Pulse Width
Tc = 25°C
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θch – c(t) = γs (t) • θch – c
θch – c = 2.50 °C/W, Tc = 25 °C
PDM
D = PW/T
PW
T
Normalized Transient Thermal Impedance γs (t)
Pulse Width PW (S)
3
1
0.3
0.1
0.03
0.01
10 µ
100 µ
1 m
10 m
100 m
1
10

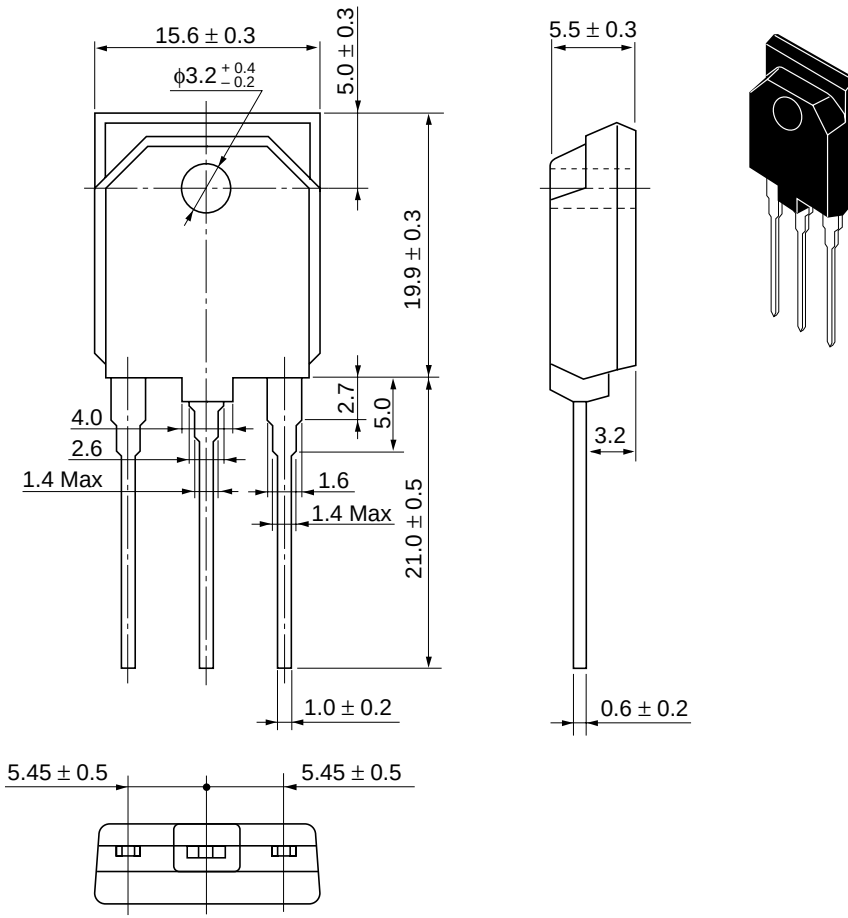
Switching Time Test Circuit



Waveform



Unit: mm



Hitachi Code	TO-3PFM
JEDEC	—
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Weight (reference value)	5.6 g

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