

N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY		
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)
20	0.0027 at V _{GS} = 4.5 V	25
	0.0042 at V _{GS} = 2.5 V	22

FEATURES

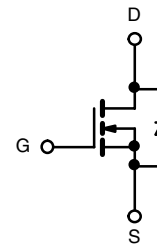
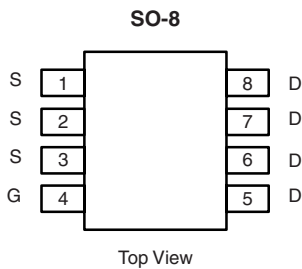
- Halogen-free According to IEC 61249-2-21 Available
- Ultra Low On-Resistance Using High Density TrenchFET[®] Gen II Power MOSFET Technology
- Q_g Optimized
- 100 % R_g Tested



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Synchronous Rectification
- Point-Of-Load



N-Channel MOSFET

Ordering Information: Si4378DY-T1-E3 (Lead (Pb)-free)
Si4378DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	V _{DS}	20		V	
Gate-Source Voltage	V _{GS}	± 12			
Continuous Drain Current (T _J = 150 °C) ^a	I _D	T _A = 25 °C	25	19	A
		T _A = 70 °C	20	13	
Pulsed Drain Current (10 μs Pulse Width)	I _{DM}	70			
Continuous Source Current (Diode Conduction) ^a	I _S	2.9	1.3		
Avalanche Current	I _{AS}	L = 0.1 mH	40		
Maximum Power Dissipation ^a		T _A = 25 °C	3.5	1.6	W
	T _A = 70 °C	2.2	1		
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	t ≤ 10 s	R _{thJA}	29	35	°C/W
	Steady State		67	80	
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	13	16	

Notes:

a. Surface Mounted on 1" x 1" FR4 board.



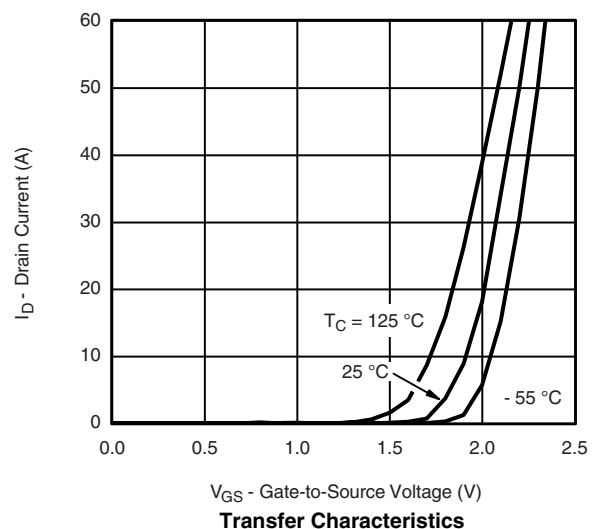
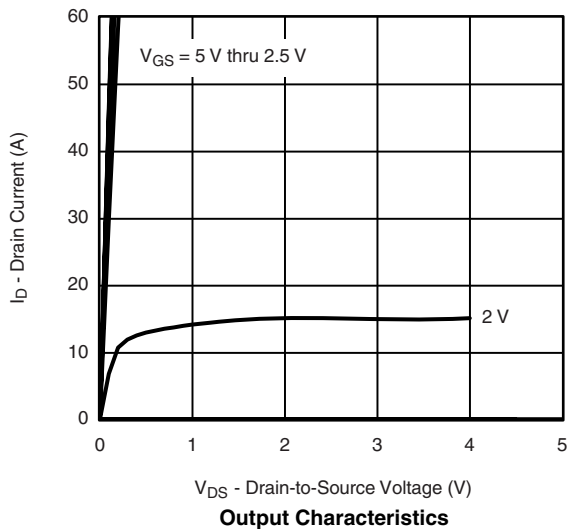
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	0.6		1.8	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 12\ \text{V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}$			1	μA
		$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$			5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\ \text{V}, V_{GS} = 4.5\ \text{V}$	30			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\ \text{V}, I_D = 25\ \text{A}$		0.0022	0.0027	Ω
		$V_{GS} = 2.5\ \text{V}, I_D = 22\ \text{A}$		0.0034	0.0042	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\ \text{V}, I_D = 25\ \text{A}$		150		S
Diode Forward Voltage ^a	V_{SD}	$I_S = 2.9\ \text{A}, V_{GS} = 0\ \text{V}$		0.72	1.1	V
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$		8500		μF
Output Capacitance	C_{oss}			1250		
Reverse Transfer Capacitance	C_{rss}			650		
Total Gate Charge	Q_g	$V_{DS} = 10\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 25\ \text{A}$		55		nC
Gate-Source Charge	Q_{gs}			16		
Gate-Drain Charge	Q_{gd}			10		
Gate Resistance	R_g		0.8	1.3	2.0	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 4.5\ \text{V}, R_g = 6\ \Omega$		85	130	ns
Rise Time	t_r			65	100	
Turn-Off Delay Time	$t_{d(off)}$			140	210	
Fall Time	t_f			50	80	
Source-Drain Reverse Recovery Time	t_{rr}		$I_F = 2.9\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		50	

Notes:

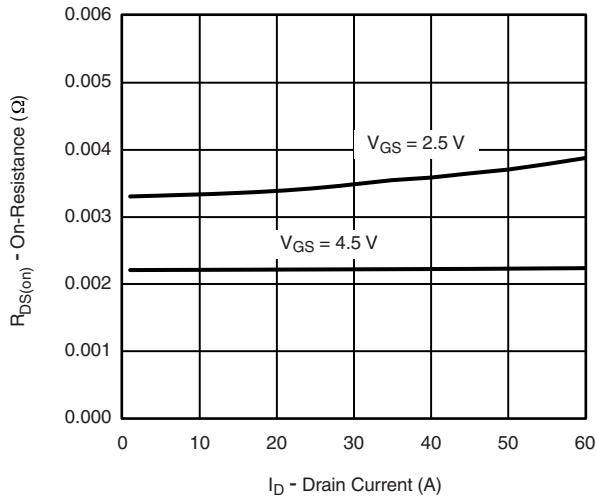
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

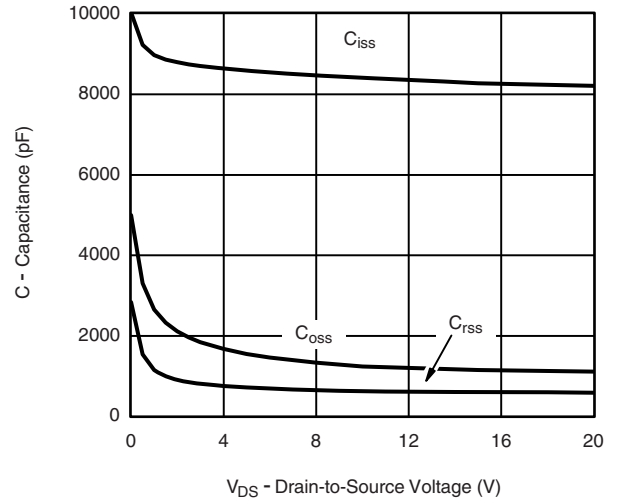
TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$, unless otherwise noted



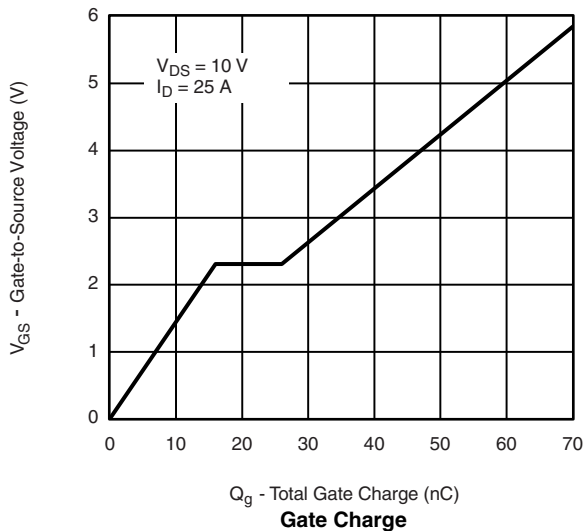
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



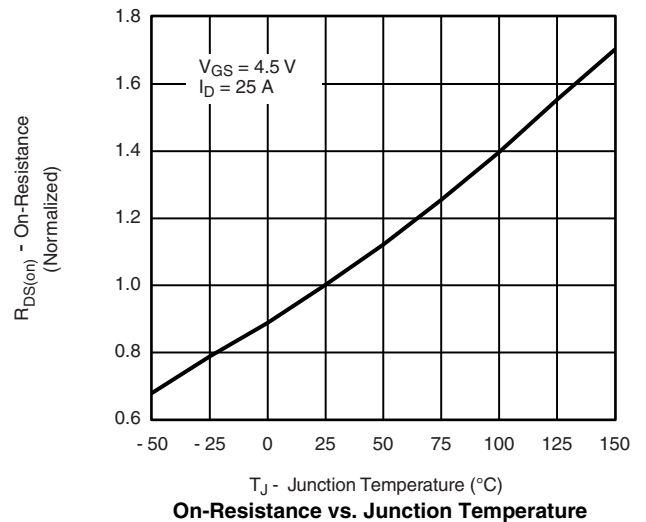
On-Resistance vs. Drain Current



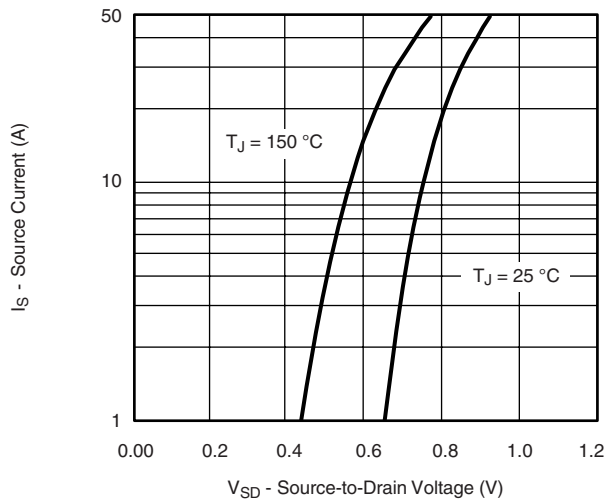
Capacitance



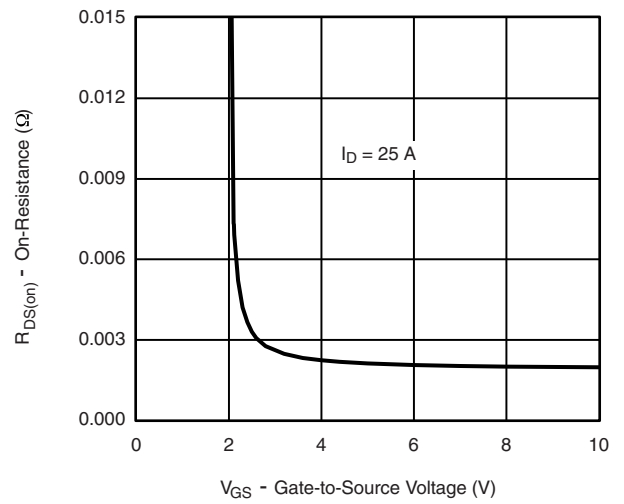
Gate Charge



On-Resistance vs. Junction Temperature

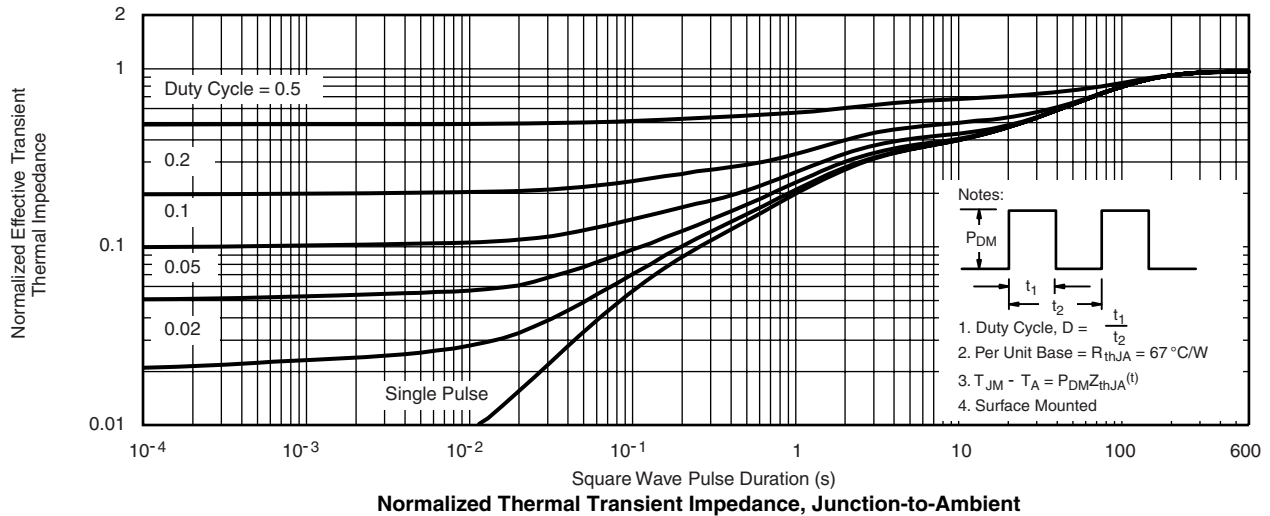
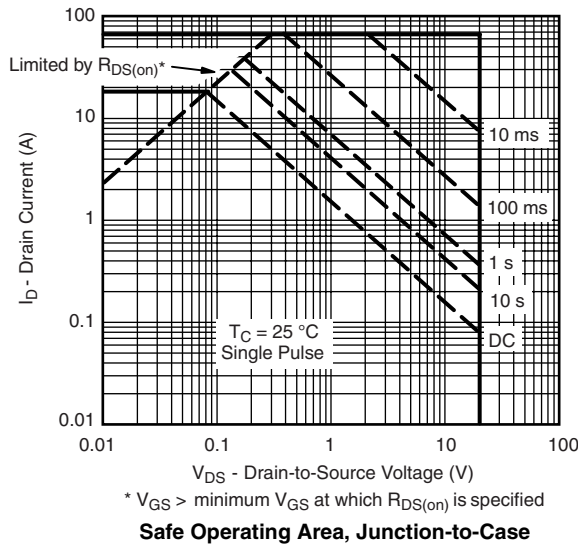
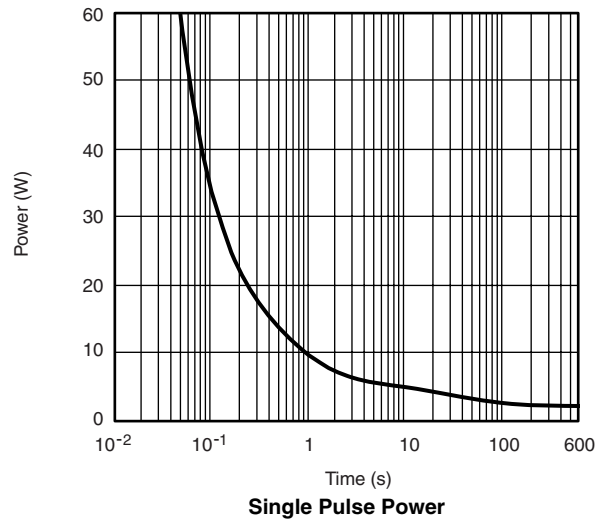
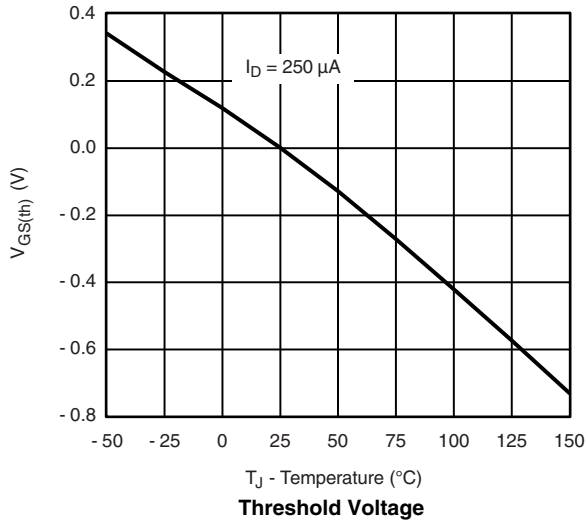


Source-Drain Diode Forward Voltage



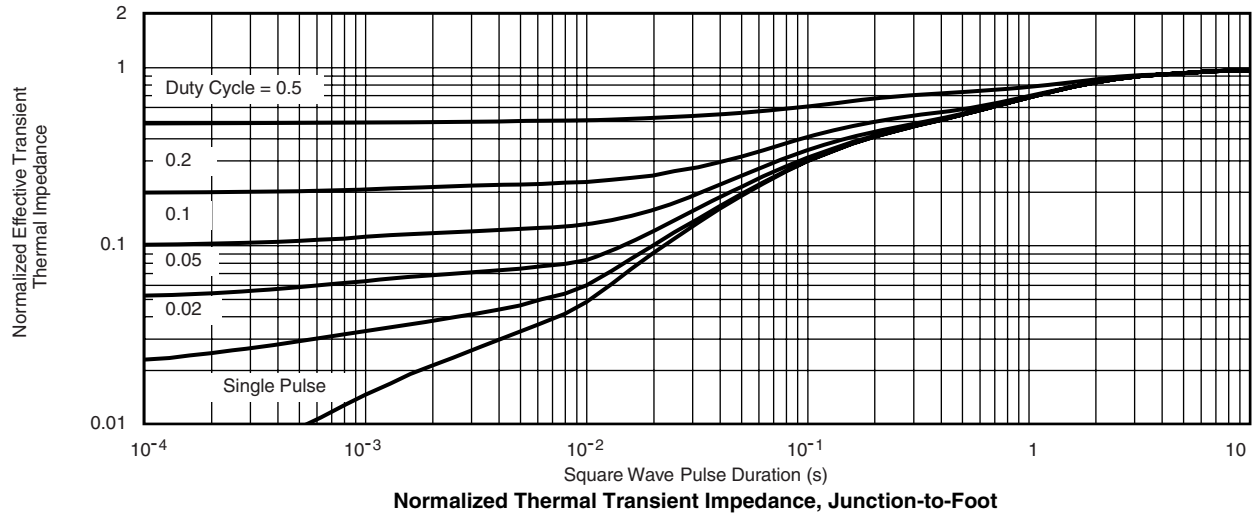
On-Resistance vs. Gate-to-Source Voltage

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted





TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

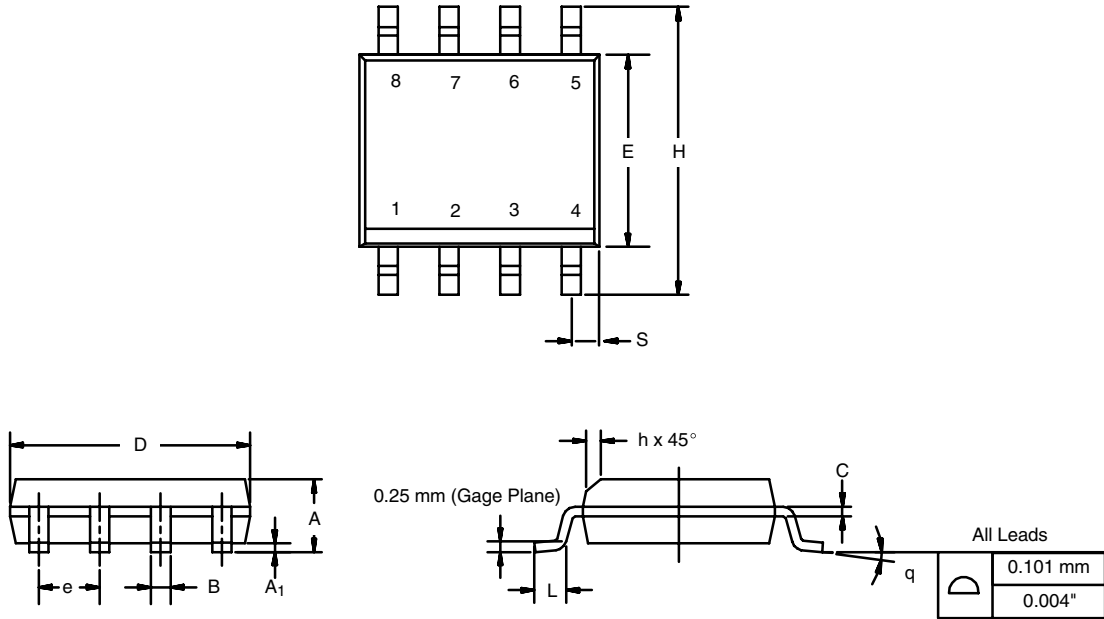


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SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06 DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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