



**P-Channel 20V (D-S) MOSFET With Schottky Diode**

**General Description**

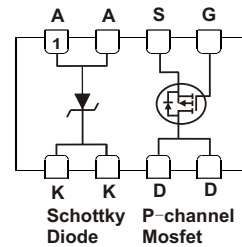
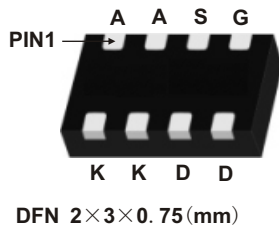
This miniature surface mount MOSFET uses advanced Trench process, low  $R_{DS(on)}$  assures minimal power loss and energy conversion, which makes this device ideal for use in power management circuit.

**Features**

- MOSFET
- $V_{DS} (V) = -20V$
  - $I_D (A) = -3.9A$  ( $V_{GS} = -4.5V$ )
  - $R_{DS(on)} = 110 m\Omega @ V_{GS} = -4.5V$
  - $R_{DS(on)} = 145 m\Omega @ V_{GS} = -2.5V$
  - $R_{DS(on)} = 175 m\Omega @ V_{GS} = -1.8V$
- Schottky Diode
- $V_R (V) = 20V$
  - $I_F (A) = 1.5A$
  - $V_F (TYP) = 0.41 V @ 0.5A$

**Applications**

Charging Switch For Portable Devices



**Absolute Maximum Ratings (TA = 25°C Unless Otherwise Noted)**

Parameter	Value	Units	
Drain-Source Voltage (MOSFET)	-20	V	
Reverse Voltage (Schottky)	20		
Gate-Source Voltage (MOSFET)	±8		
Continuous Drain Current (T <sub>J</sub> =150°C)(MOSFET) <sup>a</sup>	TA=25°C	A	
	TA=70°C		-3.1
Pulsed Drain Current (MOSFET)	-16		
Continuous Source Current (MOSFET Diode Conduction) <sup>a</sup>	-3.0		
Average Forward Current (Schottky) <sup>a</sup>	1.5		
Pulsed Forward Current (Schottky) <sup>a</sup>	6.0		
Maximum Power Dissipation (MOSFET) <sup>a</sup> Power dissipation for single operation	TA=25°C		W
	TA=70°C	1.45	
Maximum Power Dissipation (Schottky) <sup>a</sup> Power dissipation for single operation	TA=25°C	1.4	
	TA=70°C	0.9	
Operating Junction and Storage Temperature Range	-55 to 150	°C	
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>	260		

Notes

- a. Surface Mounted on 1"x1" FR4 Board.
- b. The SlimFET is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the regulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- c. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.



**Package Outlines and Ordering Information**

Device	Device Marking	Reel Size	Tape Width	Quantity
MF5853CS	D801 .XXXX	7"	8mm	3000 units

**Thermal Resistance Ratings**

Parameter	Device	Symbol	Typical	Maximum	Units
Junction-to-Ambient <sup>a</sup>	T ≤ 10 sec	MOSFET	45	55	°C/W
		Schottky	70	88	
	Steady State	MOSFET	80	89	
		Schottky	100	125	
Junction-to-Foot	Steady State	MOSFET	30	40	
		Schottky	33	40	

**MOSFET Specifications (T<sub>J</sub>=25°C Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-20			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250 μ A	-0.45	-0.60	-0.9	V
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V			-1.0	μA
		V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C			-10	
On-State Drain Current <sup>d</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -5.0V, V <sub>GS</sub> = -4.5 V	-16			A
Drain-Source On-State Resistance <sup>d</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>b</sub> = -3.6 A		100	110	mΩ
		V <sub>GS</sub> = -2.5 V, I <sub>b</sub> = -2.0 A		130	145	
		V <sub>GS</sub> = -1.8 V, I <sub>b</sub> = -1.0 A		160	175	
Forward Transconductance <sup>d</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -5 V, I <sub>b</sub> = -3.6 A		7		S
Diode Forward Voltage <sup>d</sup>	V <sub>SD</sub>	I <sub>S</sub> = -1.0 A, V <sub>GS</sub> = 0 V			-1.2	V

**Dynamic <sup>e</sup>**

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V, I <sub>b</sub> = -3.6 A		6.0		nC
Gate-Source Charge	Q <sub>gs</sub>			0.8		
Gate-Drain Charge	Q <sub>gd</sub>			1.3		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -10V, R <sub>G</sub> = 6 ohm I <sub>D</sub> = -1 A, V <sub>GEN</sub> = -4.5 V		6.5	25	ns
Rise Time	t <sub>r</sub>			20	60	
Turn-Off Delay Time	t <sub>d(off)</sub>			31	70	
Fall Time	t <sub>f</sub>			21	60	
Source-Drain Reverse Recovery Time	t <sub>rr</sub>		I <sub>F</sub> = -0.9 A, di/dt = 100 A/s		20	

Notes

d.Pulse test; pulse width ≤ 300us, duty cycle ≤ 2%.

e.Guaranteed by design, not subject to production testing.

**SCHOTTKY Specifications (T<sub>J</sub>=25°C Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Forward Voltage Drop	V <sub>F</sub>	I <sub>F</sub> = 0.1 A		220	320	mV
		I <sub>F</sub> = 0.5 A		410	430	
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>r</sub> = 250μA	23			V
Maximum Reverse Leakage Current	I <sub>R</sub>	V <sub>r</sub> = 10 V			10	μA
		V <sub>r</sub> = 20 V			50	
Junction Capacitance	C <sub>T</sub>	V <sub>r</sub> = 10 V		31		pF



Typical Electrical and Thermal Characteristics

Typical P-Channel Performance Curves

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

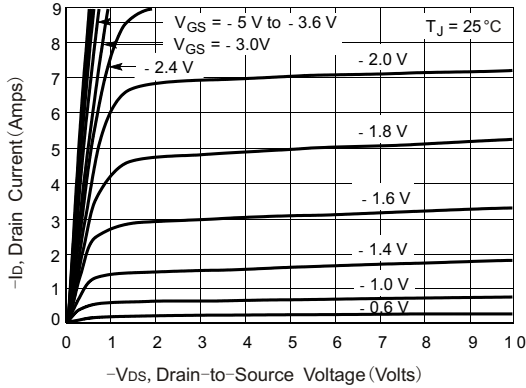


Figure 1. On - Region Characteristics

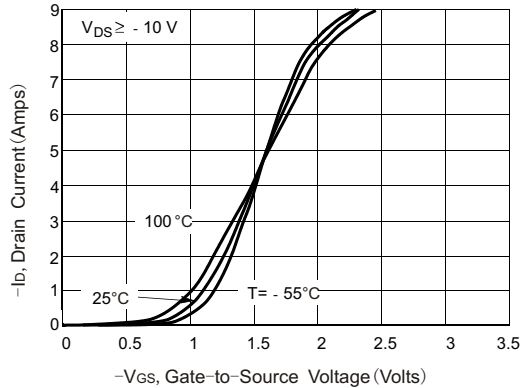


Figure 2. Transfer Characteristics

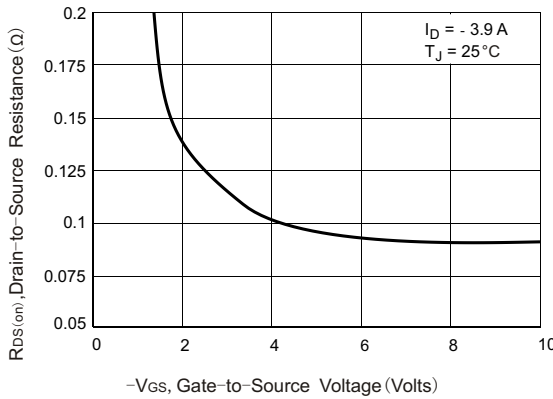


Figure 3. On - Resistance vs. Gate - to - Source Voltage

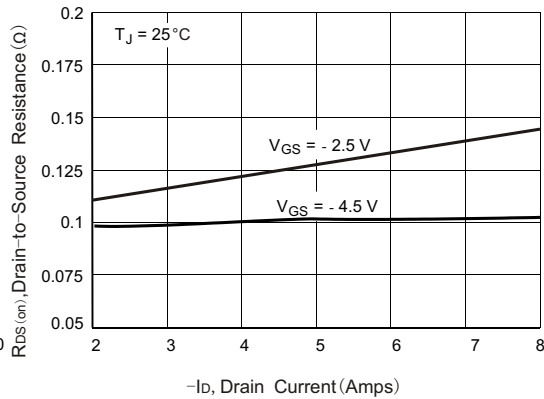


Figure 4. On - Resistance vs. Drain Current and Gate Voltage

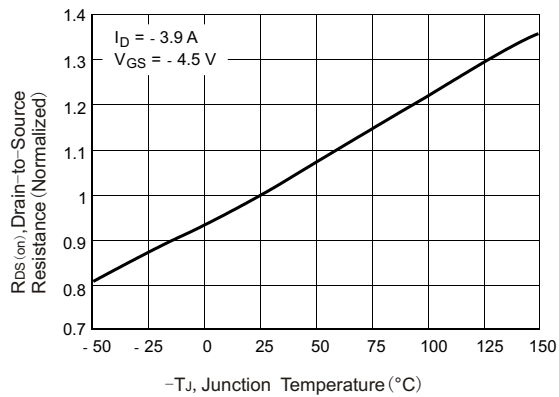


Figure 5. On - Resistance Variation with Temperature

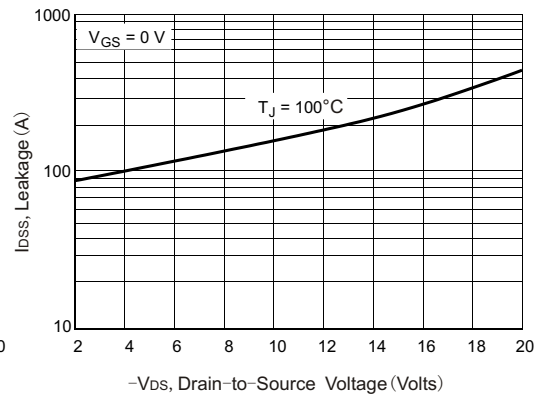


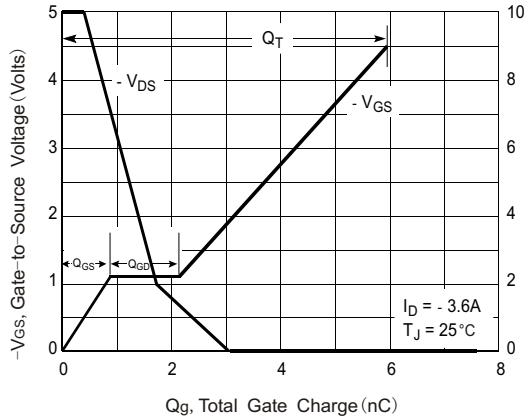
Figure 6. Drain - to - Source Leakage Current vs. Voltage



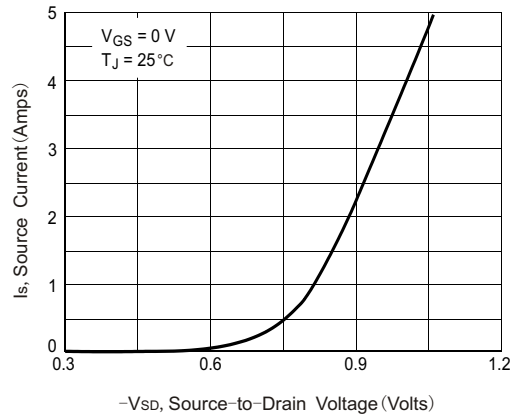
**Typical Electrical and Thermal Characteristics**

**Typical P-Channel Performance Curves**

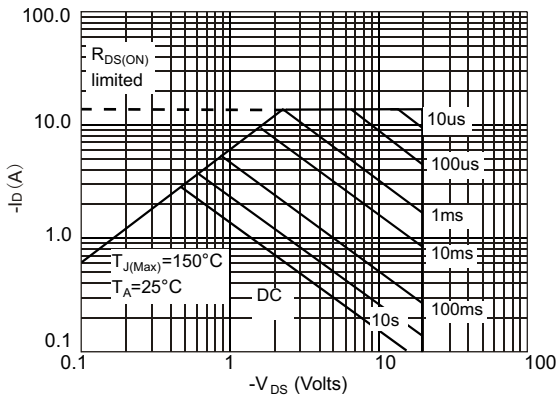
(T<sub>J</sub> = 25 °C unless otherwise noted)



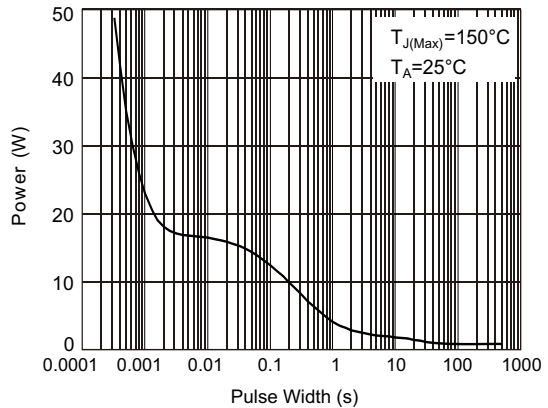
**Figure 7: Gate-to-Source and Drain-to-Source Voltage vs. Total Charge**



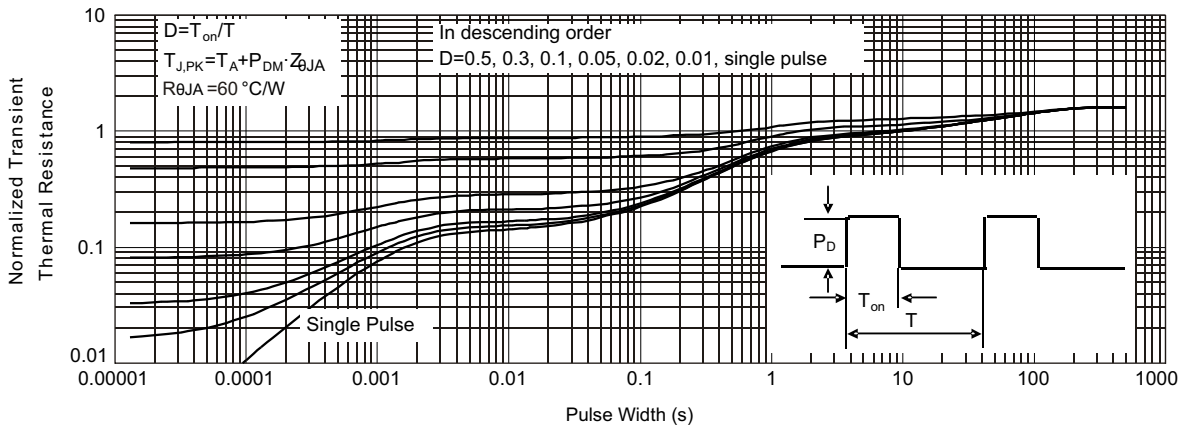
**Figure 8: Diode Forward Voltage vs. Current**



**Figure 9: Maximum Forward Biased Safe Operating Area (Note d)**



**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note d)**



**Figure 11: Normalized Maximum Transient Thermal Impedance**

Note d: These tests are performed with the device mounted on 1 in FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> = 25°C. The SOA curve provides a single pulse rating.



Typical Electrical and Thermal Characteristics

Typical Schottky Performance Curves

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

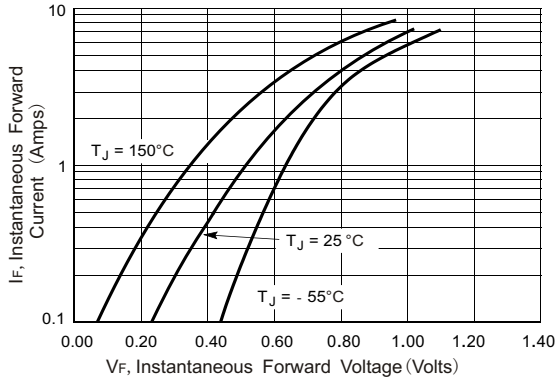


Figure 11. Typical Forward Voltage

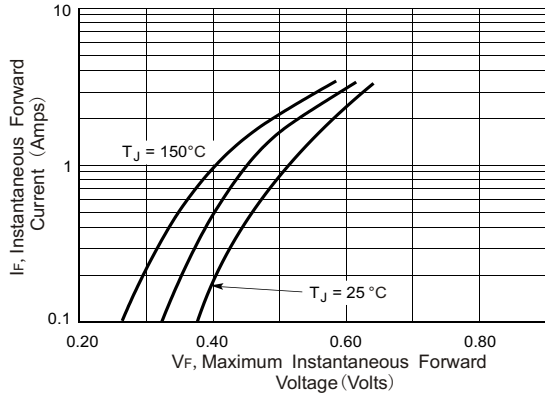


Figure 12. Maximum Forward Voltage

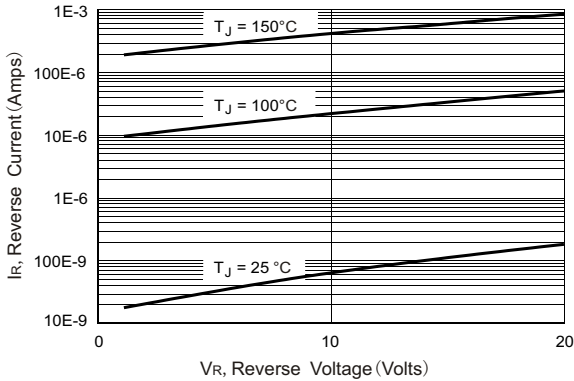


Figure 13. Typical Reverse Current

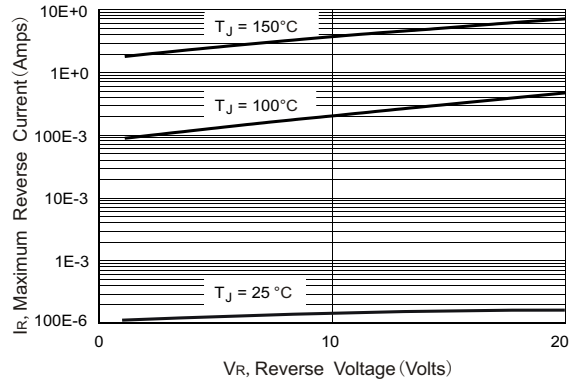


Figure 14. Maximum Reverse Current

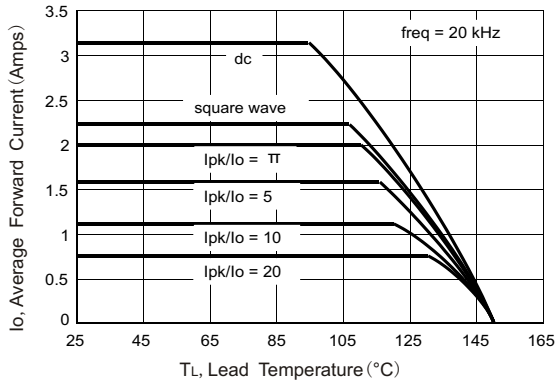


Figure 16. Current Derating

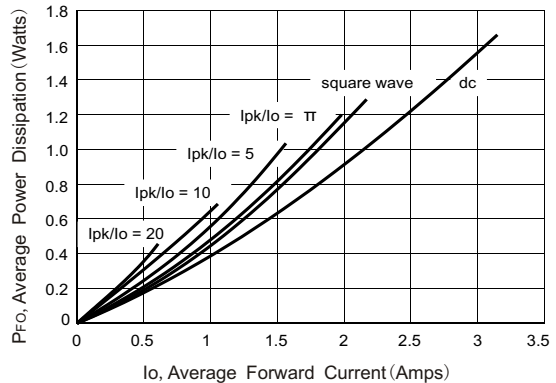
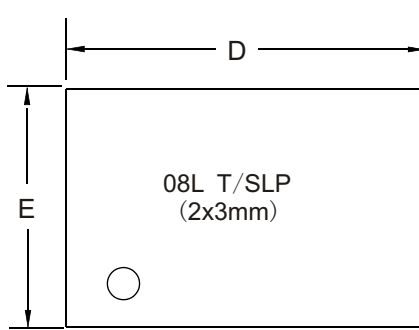


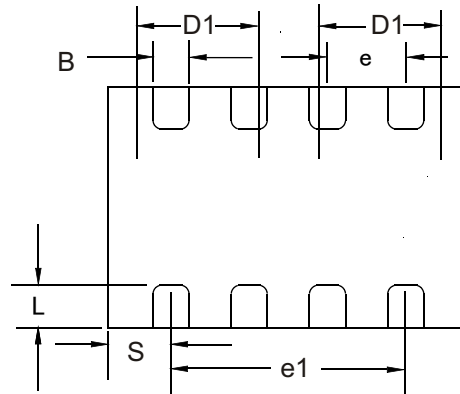
Figure 17. Forward Power Dissipation



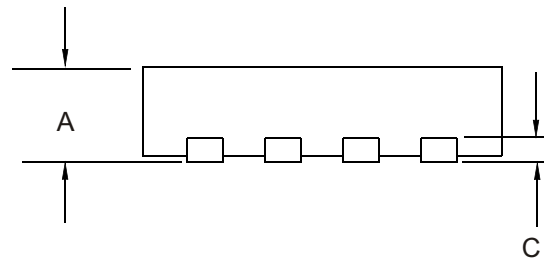
DFN 2x3x0.75 (mm) Package



TOP VIEW

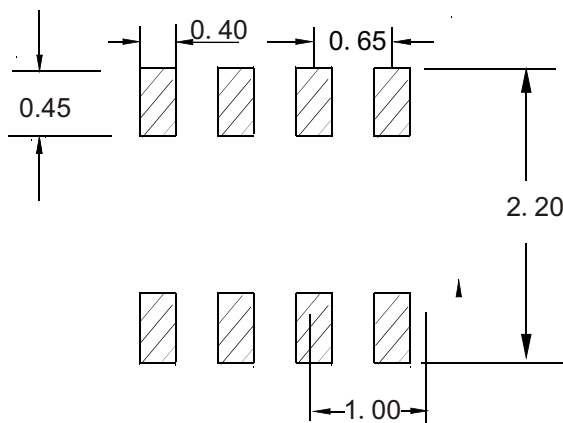


BOTTOM VIEW



SIDE VIEW

RECOMMENDED LAND PATTERN



UNIT:mm

Dim	MILLIMETERS		
	Min	Nom	Max
A	0.70	0.75	0.90
B	0.25	0.30	0.35
C	0.203Ref		
D	2.95	3.00	3.05
D1	0.75	1.00	1.05
E	1.95	2.00	2.05
e	0.65BSC		
e1	1.95Ref		
L	0.30	--	0.40
S	0.55BSC		

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