

NTMFS08N004C

N-Channel Shielded Gate POWER trench[®] MOSFET

80 V, 126 A, 4.0 mΩ

General Description

This N-Channel MV MOSFET is produced using ON Semiconductor's advanced PowerTrench process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 4.0 mΩ at $V_{GS} = 10$ V, $I_D = 44$ A
- Max $r_{DS(on)}$ = 12.5 mΩ at $V_{GS} = 6$ V, $I_D = 22$ A
- 50% Lower Q_{rr} than Other MOSFET Suppliers
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested
- These Devices are Pb-Free and are RoHS Compliant

Applications

- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive
- Solar

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DS}	Drain to Source Voltage	80	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current: Continuous, $T_C = 25^\circ\text{C}$ (Note 5) Continuous, $T_C = 100^\circ\text{C}$ (Note 5) Continuous, $T_A = 25^\circ\text{C}$ (Note 1a) Pulsed (Note 4)	126 80 18 637	A
E_{AS}	Single Pulse Avalanche Energy (Note 3)	486	mJ
P_D	Power Dissipation: $T_C = 25^\circ\text{C}$ $T_A = 25^\circ\text{C}$ (Note 1a)	125 2.5	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

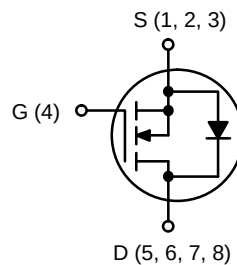
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



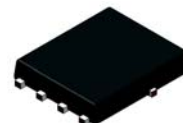
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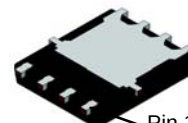
V_{DS}	$R_{DS(on)}$ MAX	I_D MAX
80 V	4.0 mΩ @ 10 V	126 A
	12.5 mΩ @ 6 V	



N-CHANNEL MOSFET



Top



Bottom

Power 56
(PQFN8)
CASE 483AE

MARKING DIAGRAM



\$Y = ON Semiconductor Logo
&Z = Assembly Plant Code
&3 = Numeric Date Code
&K = Lot Code
NTMFS08N004C = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	80			V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C		40		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64\ \text{V}$, $V_{GS} = 0\ \text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	2.0	3.1	4.0	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C		-8.3		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 44\ \text{A}$		3.4	4.0	m Ω
		$V_{GS} = 6\ \text{V}$, $I_D = 22\ \text{A}$		5.2	12.5	
		$V_{GS} = 10\ \text{V}$, $I_D = 44\ \text{A}$, $T_J = 125^\circ\text{C}$		5.8	7.8	
g_{FS}	Forward Transconductance	$V_{DS} = 5\ \text{V}$, $I_D = 44\ \text{A}$		98		S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 40\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		3035	5100	pF
C_{oss}	Output Capacitance			940	1580	pF
C_{rss}	Reverse Transfer Capacitance			27	50	pF
R_g	Gate Resistance		0.1	1.1	2.3	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\ \text{V}$, $I_D = 44\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$		17	30	ns
t_r	Rise Time			6	12	ns
$t_{d(off)}$	Turn-Off Delay Time			25	40	ns
t_f	Fall Time			4	10	ns
Q_g	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$, $V_{DD} = 40\ \text{V}$, $I_D = 44\ \text{A}$		39	66	nC
		$V_{GS} = 0\ \text{V}$ to $6\ \text{V}$, $V_{DD} = 40\ \text{V}$, $I_D = 44\ \text{A}$		25	41	nC
Q_{gs}	Gate to Source Charge	$V_{DD} = 40\ \text{V}$, $I_D = 44\ \text{A}$		13		nC
Q_{gd}	Gate to Drain "Miller" Charge	$V_{DD} = 40\ \text{V}$, $I_D = 44\ \text{A}$		7		nC
Q_{oss}	Output Charge	$V_{DD} = 40\ \text{V}$, $V_{GS} = 0\ \text{V}$		55		nC
Q_{sync}	Total Gate Charge Sync.	$V_{DS} = 0\ \text{V}$, $I_D = 44\ \text{A}$		35		nC

NTMFS08N004C

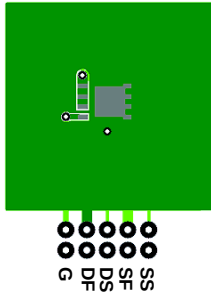
ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.1\text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 44\text{ A}$ (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 22\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$		26	41	ns
Q_{rr}	Reverse Recovery Charge			48	76	nC
t_{rr}	Reverse Recovery Time	$I_F = 22\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}$		19	31	ns
Q_{rr}	Reverse Recovery Charge			108	174	nC

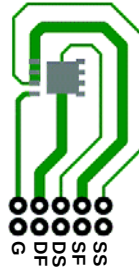
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



a) $50^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.



b) $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- E_{AS} of 486 mJ is based on starting $T_J = 25^\circ\text{C}$; N-ch: $L = 3\text{ mH}$, $I_{AS} = 18\text{ A}$, $V_{DD} = 80\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 57\text{ A}$.
- Pulsed I_d please refer to Figure 11 SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

PACKAGE MARKING AND ORDERING INFORMATION

Device	Marking	Package	Reel Size	Tape Width	Quantity
NTMFS08N004C	NTMFS08N004C	Power 56 (PQFN8) (Pb-Free / Halogen Free)	13"	12 mm	3000 units

TYPICAL CHARACTERISTICS

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

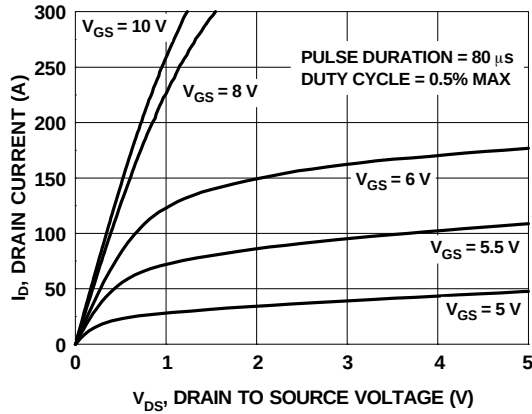


Figure 1. On Region Characteristics

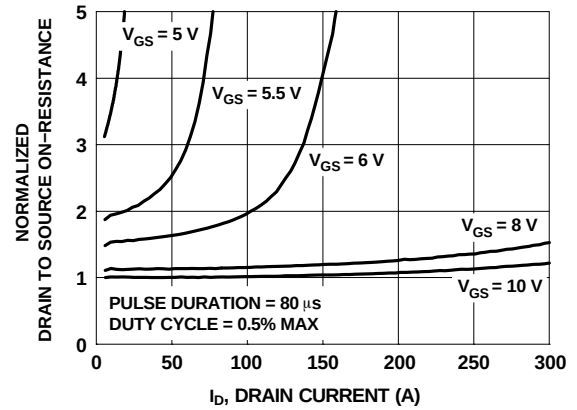


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

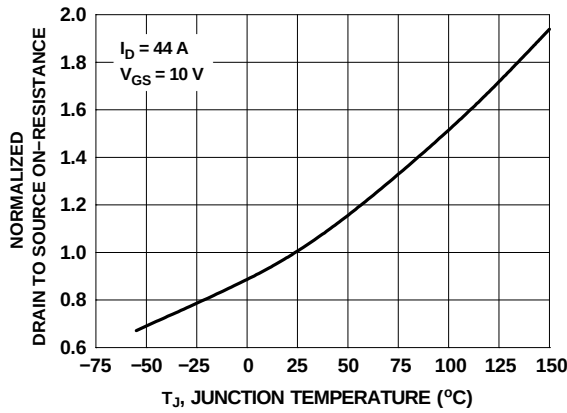


Figure 3. Normalized On-Resistance vs. Junction Temperature

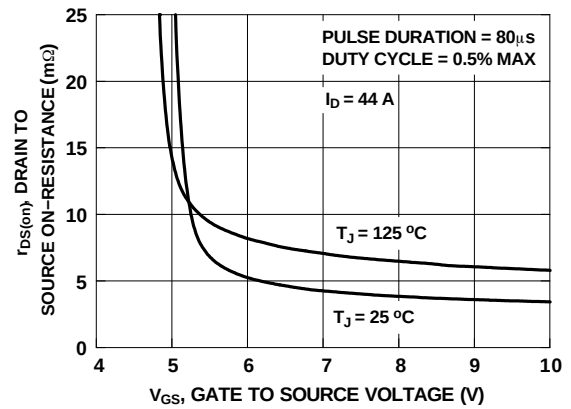


Figure 4. On-Resistance vs. Gate to Source Voltage

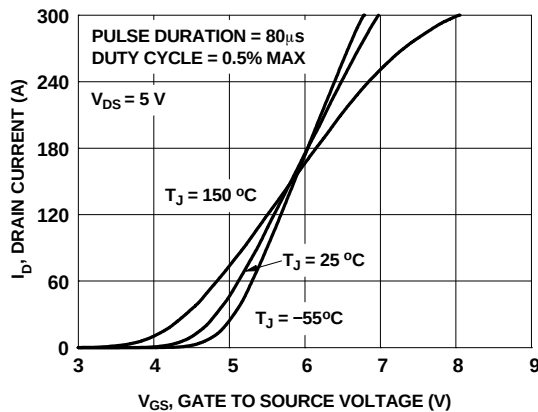


Figure 5. Transfer Characteristics

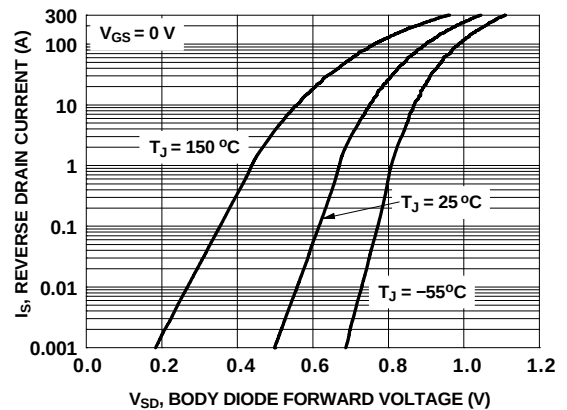


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS

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

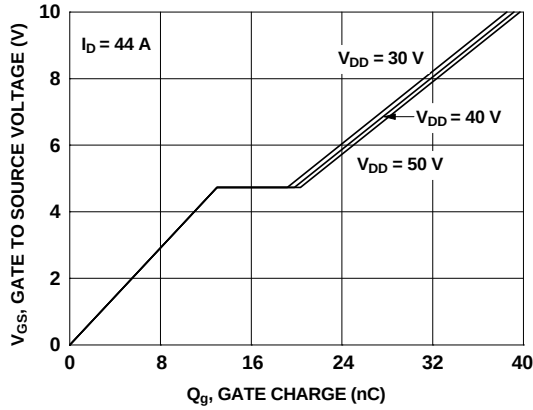


Figure 7. Gate Charge Characteristics

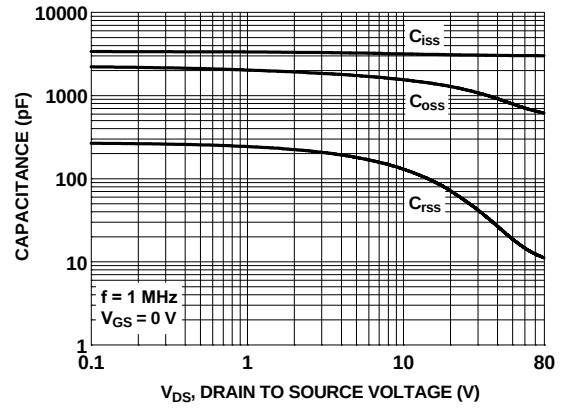


Figure 8. Capacitance vs. Drain to Source Voltage

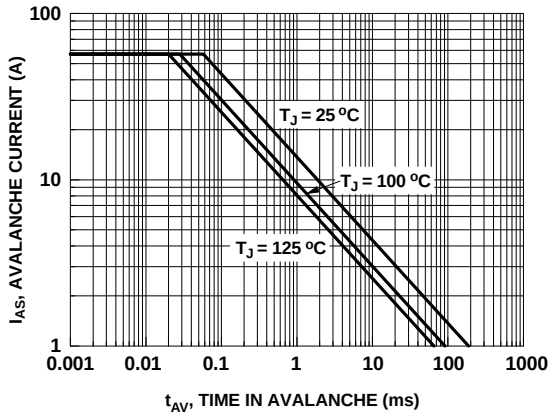


Figure 9. Unclamped Inductive Switching Capability

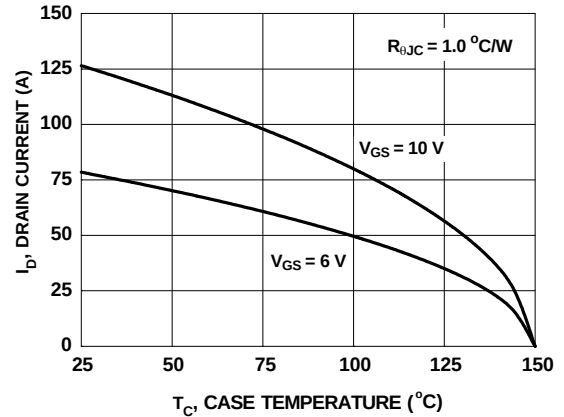


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

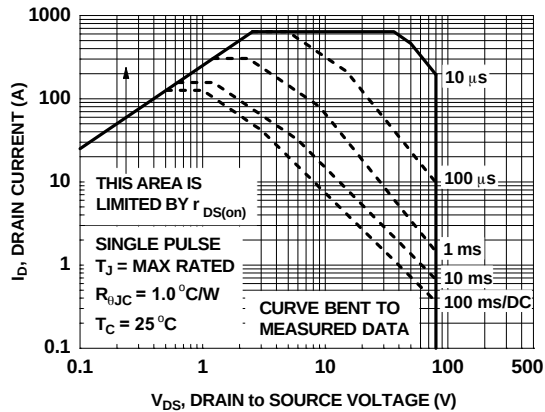


Figure 11. Forward Bias Safe Operating Area

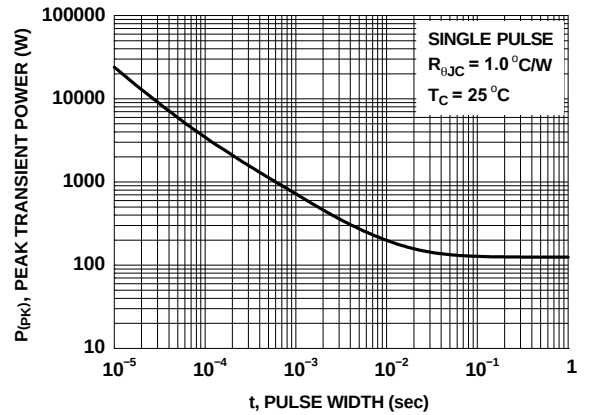


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS

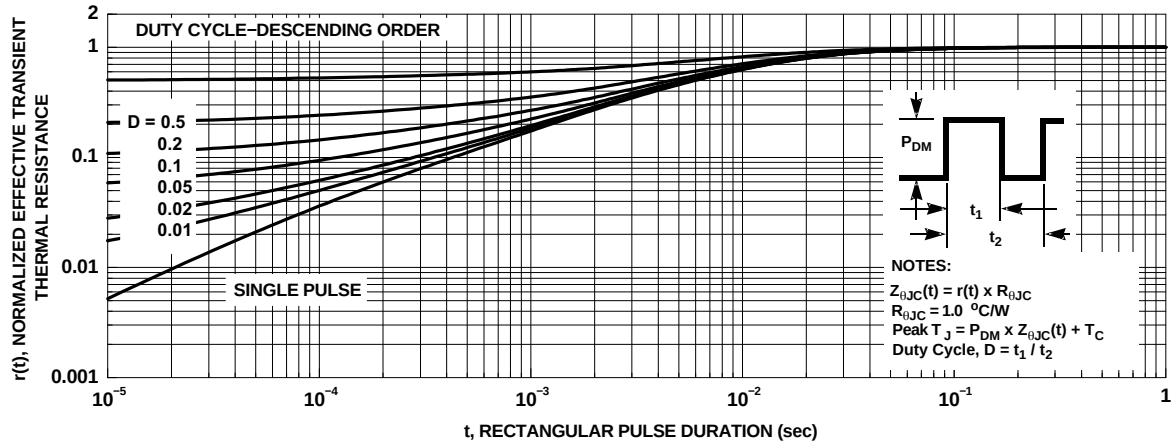
(T_J = 25°C unless otherwise noted)

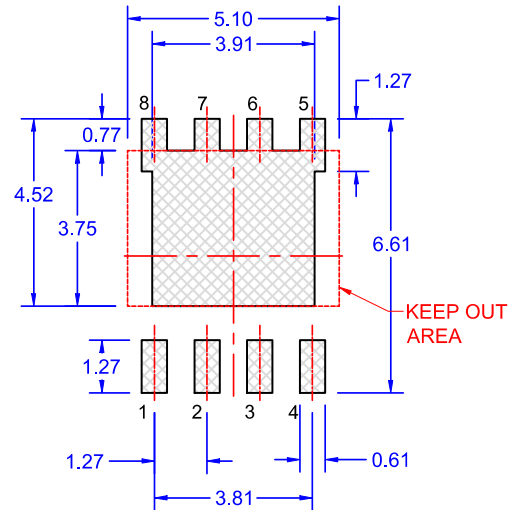
Figure 13. Junction-to-Case Transient Thermal Response Curve

PACKAGE DIMENSIONS

SEE DETAIL B

5.85

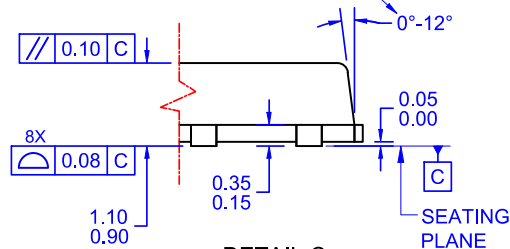
5.65



5.00
4.80

SEE
DETAIL C

OPTIONAL DRAFT
ANGLE MAY APPEAR
ON FOUR SIDES
OF THE PACKAGE



Technical drawing of a mechanical part with dimensions and a taper angle. The dimensions are: 0.35, 0.15, 0.30, 0.05, and a taper angle of $0^{\circ}-12^{\circ}$.

Technical drawing of a mechanical part, likely a bracket or base plate, showing dimensions and tolerances.

Key dimensions and tolerances:

- Overall width: 5.20 (4.80)
- Overall height: 6.25 (5.90)
- Top flange width: 3.81
- Top flange thickness: 1.27
- Top flange hole diameter: 0.10 (M) (Maximum Material Condition)
- Top flange hole position: 0.31 (8X)
- Top flange hole diameter tolerance: 0.51 (8X)
- Top flange hole position tolerance: 0.34
- Top flange hole diameter tolerance: 0.76 (0.51)
- Top flange hole position tolerance: 0.52
- Top flange hole diameter tolerance: 0.50
- Top flange hole position tolerance: 0.30 (2X)
- Top flange hole diameter tolerance: 0.20^{+0.10}_{-0.15} (8X)
- Top flange hole position tolerance: 0.44±0.10
- Top flange hole diameter tolerance: 3.96 (3.61)
- Top flange hole position tolerance: 3.48^{+0.30}_{-0.10}
- Top flange hole diameter tolerance: 0.44±0.10

E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

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