

# NTBG080N120SC1

Product Preview

## N-Channel Silicon Carbide MOSFET

1200 V, 80.6 mΩ, 56.4 A



ON Semiconductor®

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	1200	V
Gate-to-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current R <sub>θJC</sub>	I <sub>DC</sub>	56.4	A
Power Dissipation R <sub>θJC</sub>			
Continuous Drain Current R <sub>θJC</sub>	I <sub>DC</sub>	39.9	A
Power Dissipation R <sub>θJC</sub>			
Continuous Drain Current R <sub>θJA</sub>	I <sub>DA</sub>	TBD	A
Power Dissipation R <sub>θJA</sub>			
Continuous Drain Current R <sub>θJA</sub>	I <sub>DA</sub>	TBD	A
Power Dissipation R <sub>θJA</sub>			
Pulsed Drain Current R <sub>θJC</sub>	I <sub>DM</sub>	238	A
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Source Current (Body Diode)	I <sub>S</sub>	82.3	A
Single Pulse Avalanche Energy (T <sub>J</sub> = 25°C, V <sub>GS</sub> = 20 V, I <sub>LPK</sub> = 1 A, L = 0.1 mH, R <sub>G</sub> = 25 Ω)	E <sub>AS</sub>	TBD	mJ
Lead Temperature for Soldering Purposes	T <sub>L</sub>	TBD	°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.

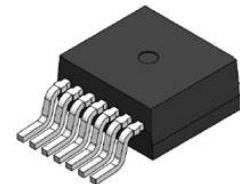
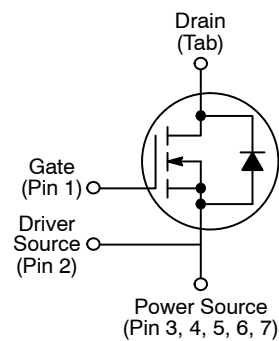
### THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	0.38	°C/W
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	TBD	

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
1200 V	80.6 mΩ @ 20 V	56.4 A

### N-CHANNEL MOSFET



D2PAK-7L  
CASE 418AY

### ORDERING INFORMATION

Device	Package	Shipping
NTBG080N120SC1	D2PAK	TBD

# NTBG080N120SC1

## ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_C = 25^\circ\text{C}$	1200	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}T_J$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_{Jmax} = 175^\circ\text{C}$	-	0.25	-	V/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$T_C = 25^\circ\text{C}$	-	-	10.0	$\mu\text{A}$
		$T_C = 175^\circ\text{C}$	-	-	250	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_G = 20\text{ V}, V_D = 0\text{ V}$	-	-	250	nA

### ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_G = 20\text{ V}, I_D = 20.1\text{ A}$	-	80.6	-	m $\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_G = V_D, I_D = 5.04\text{e} - 03\text{A}$	-	2.83	-	V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(th)}/T_J$		-	-5.37	-	mV/°C
Forward Transconductance	$g_{FS}$	$V_D = 10.0\text{ V}, I_D = 20.1\text{ A}$	-	8.04	-	S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Gate Resistance	$R_G$	$V_G = 0\text{ V}, V_D = 1000\text{ V}$	-	3.29	-	$\Omega$
Input Capacitance	$C_{ISS}$		-	1285	-	pF
Reverse Transfer Capacitance	$C_{RSS}$		-	3.90	-	
Output Capacitance	$C_{OSS}$		-	74.9	-	
Effective Output Capacitance	$C_{OSSef}$	$V_{DS} = 0\text{ to }1000\text{ V}, V_G = 0\text{ V}$	-	122	-	
Energy Related Output Capacitance	$C_{OSSer}$		-	89.9	-	$\mu\text{J}$
Coss Stored Energy	$E_{OSS}$		-	44.9	-	
Total Gate Charge	$Q_{G(tot)}$	$V_D = 800\text{ V}, I_D = 10.1\text{ A}, V_G = 20\text{ V}$	-	46.6	-	nC
Gate-to-Source Charge	$Q_{GS}$		-	11.0	-	
Gate-to-Drain Charge	$Q_{GD}$		-	11.6	-	

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_G = -5/20\text{ V}, I_D = 20.1\text{ A}, V_D = 800\text{ V}, R_G = 2\text{ }\Omega$	-	11.5	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	13.2	-	
Rise Time	$t_r$		-	3.04	-	
Fall Time	$t_f$		-	7.15	-	
Turn-On Switching Loss	$E_{ON}$			-	0.15	-
Turn-Off Switching Loss	$E_{OFF}$		-	0.03	-	
Total Switching Loss	$E_{TOT}$		-	0.18	-	

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$I_D = 10.1\text{ A}$	-	3.86	-	V
Reverse Recovery Time	$t_{RR}$	$I_D = 20.1\text{ A}, dI/dt = 1000\text{ A}/\mu\text{s}, V_{DS} = 800\text{ V}, V_{GS} = -5/20\text{ V}$	-	40.0	-	ns
Reverse Recovery Charge	$Q_{RR}$		-	144	-	nC
Reverse Recovery Energy	$E_{REC}$		-	37.1	-	$\mu\text{J}$
Peak Reverse Recovery Current	$I_{RRM}$		-	6.68	-	A

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.

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## TYPICAL CHARACTERISTICS

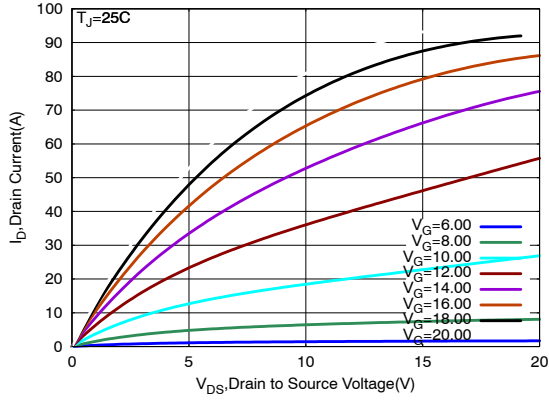


Figure 1. On-Region Characteristics

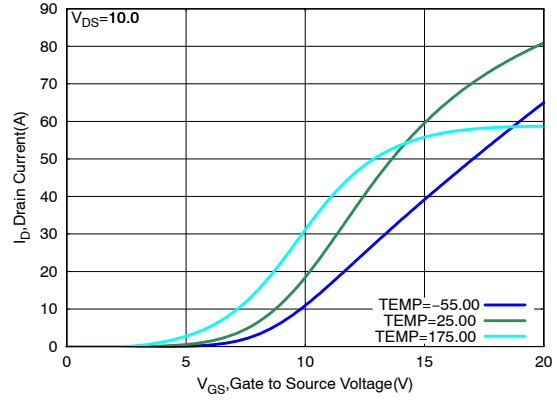


Figure 2. Transfer Characteristics

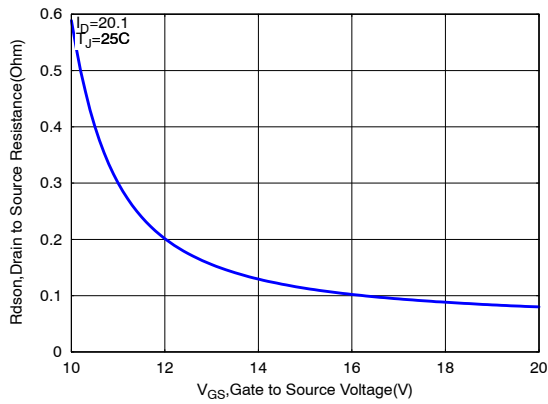


Figure 3. On-Resistance vs. VGS

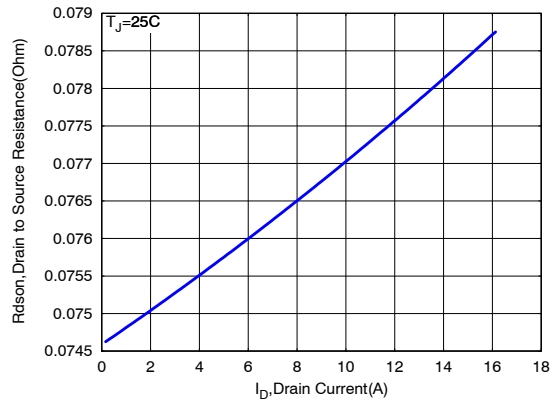


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

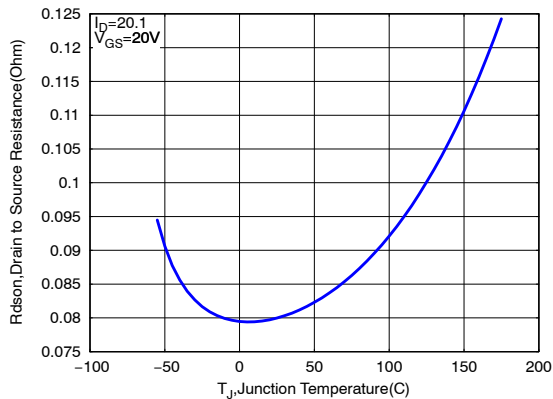


Figure 5. On-Resistance Variation with Temperature

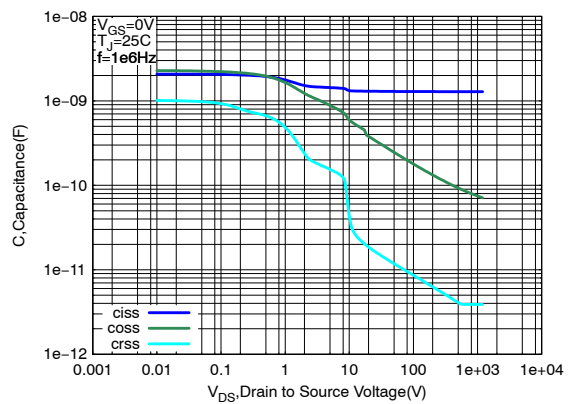


Figure 6. Capacitance Variation

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## TYPICAL CHARACTERISTICS

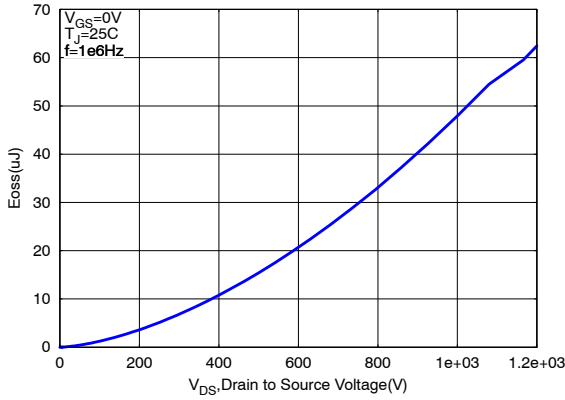


Figure 7. Eoss vs. Drain-to-Source Voltage

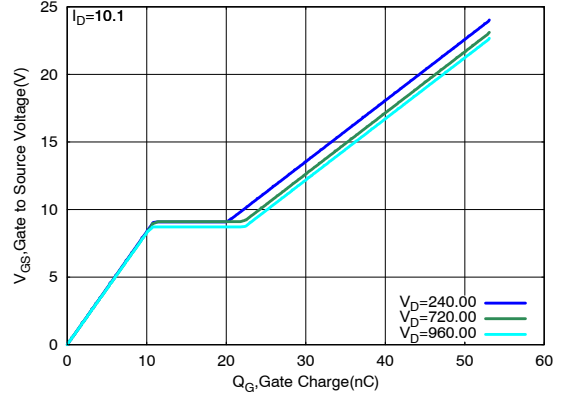


Figure 8. Gate-to-Source Voltage vs. Total Charge

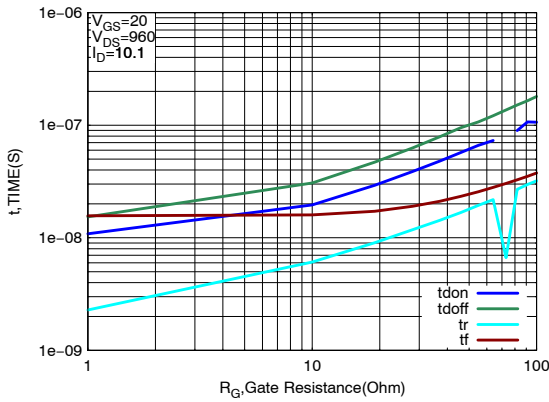


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

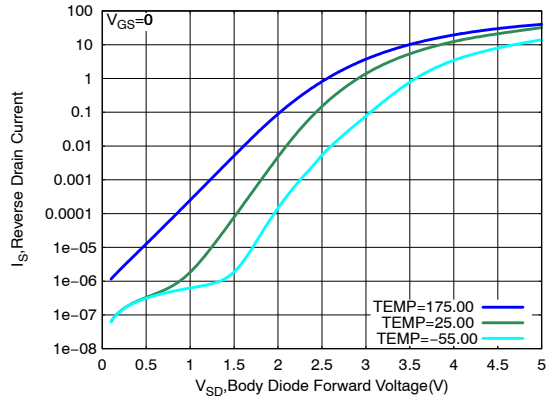


Figure 10. Diode Forward Voltage vs. Current

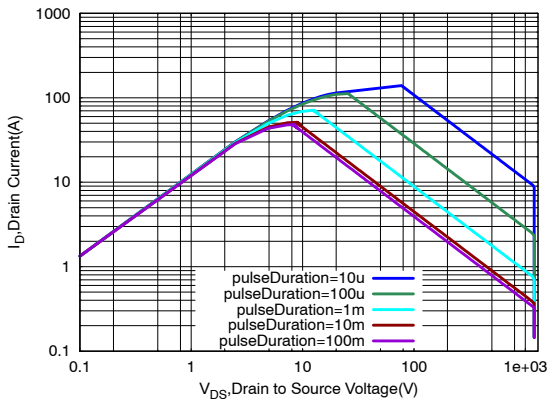


Figure 11. Maximum Rated Forward Biased Safe Operating Area

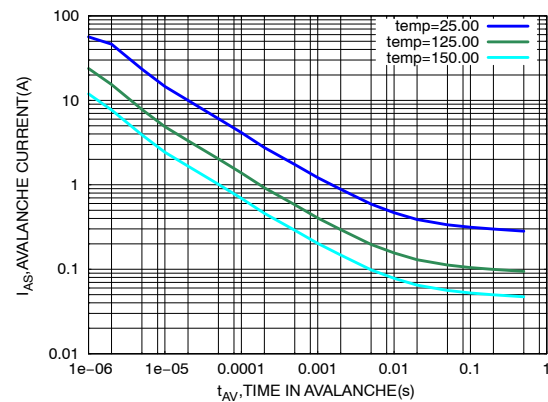


Figure 12. I\_peak vs. Time in Avalanche

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## TYPICAL CHARACTERISTICS

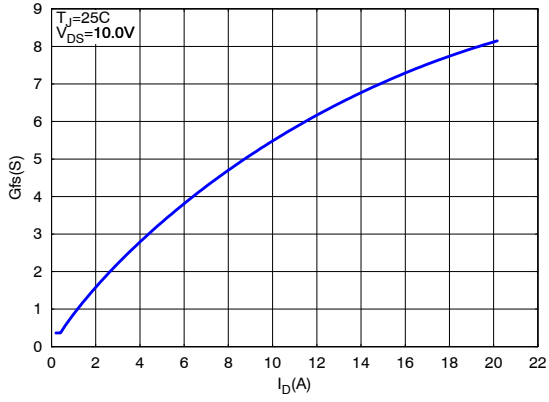


Figure 13. GFS vs. ID

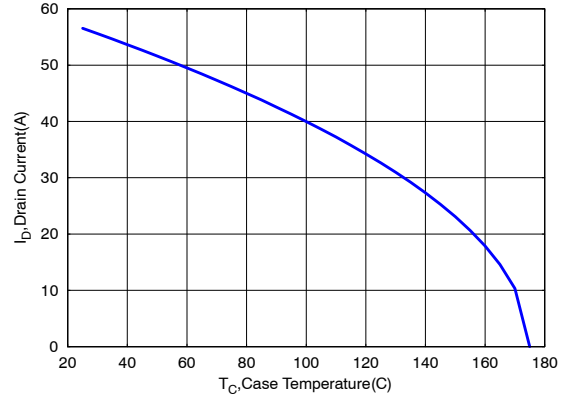


Figure 14. Maximum Current vs. Case Temperature

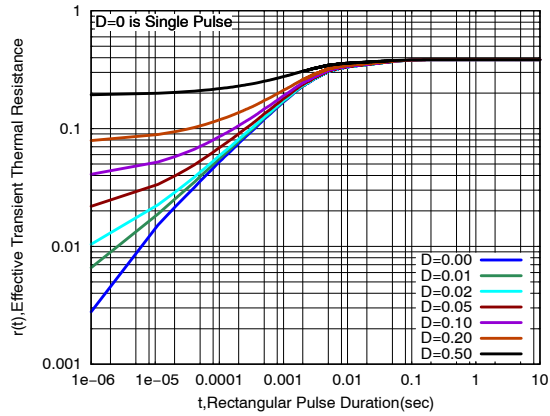
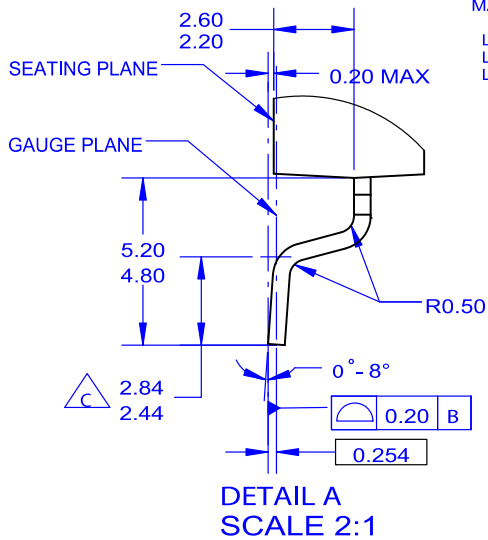
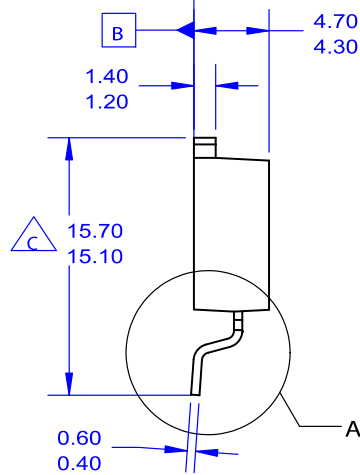
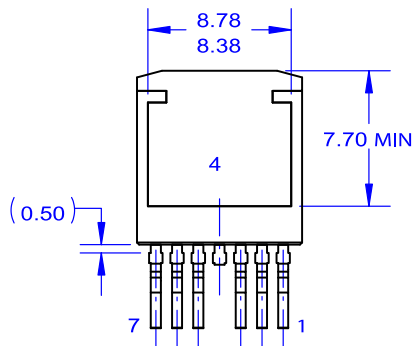
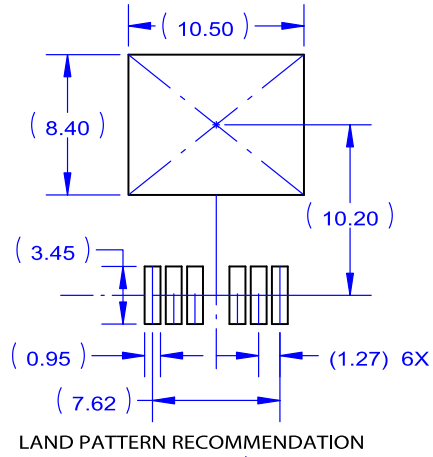
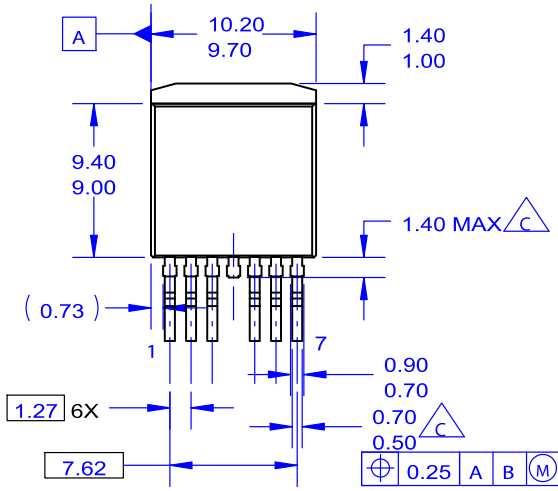


Figure 15. Thermal Response

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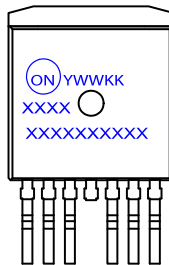
## PACKAGE DIMENSIONS

**D2PAK7 (TO-263 7 LD)**  
**CASE 418AY**  
**ISSUE A**



**MARKING:**

LINE 1 - LOGO & DATE CODE  
 LINE 2 - DEVICE MARKING  
 LINE 3 - DEVICE MARKING



PIN1 - GATE  
 PIN2 - SOURCE  
 PIN3 - SOURCE  
 PIN4 - DRAIN  
 PIN5 - SOURCE  
 PIN6 - SOURCE  
 PIN7 - SOURCE

**NOTES:**

- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. OUT OF JEDEC STANDARD VALUE.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- F. LAND PATTERN RECOMMENDATION PER IPC. TO127P1524X465-8N.

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