

# MOSFET – Power, N-Channel, SOT-23 200 mA, 50 V

## BSS138L, BVSS138L

Typical applications are DC–DC converters, power management in portable and battery–powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

### Features

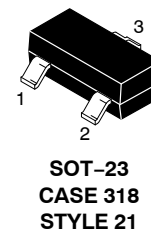
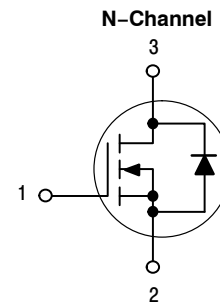
- Low Threshold Voltage ( $V_{GS(th)}$ : 0.85 V–1.5 V) Makes it Ideal for Low Voltage Applications
- Miniature SOT–23 Surface Mount Package Saves Board Space
- HBM Class 0A, MM Class M1A, CDM Class IV (Note 3)
- BVSS Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

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

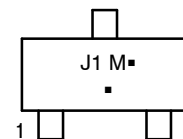
Rating	Symbol	Value	Unit
Drain–to–Source Voltage	$V_{DS}$	50	Vdc
Gate–to–Source Voltage – Continuous	$V_{GS}$	$\pm 20$	Vdc
Drain Current	$I_D$	200	mA
– Continuous @ $T_A = 25^\circ\text{C}$	$I_{DM}$	800	
– Pulsed Drain Current ( $t_p \leq 10 \mu\text{s}$ )			
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	225	mW
Operating and Storage Temperature Range	$T_J, T_{stg}$	– 55 to 150	$^\circ\text{C}$
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, for 10 seconds	$T_L$	260	$^\circ\text{C}$

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.

200 mA, 50 V  
 $R_{DS(on)} = 3.5 \Omega$



### MARKING DIAGRAM



J1 = Device Code  
M = Date Code\*  
▪ = Pb–Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
BSS138LT1G, BVSS138LT1G	SOT-23 (Pb–Free)	3,000 / Tape & Reel
BSS138LT7G	SOT-23 (Pb–Free)	3,500 / Tape & Reel
BSS138LT3G, BVSS138LT3G	SOT-23 (Pb–Free)	10,000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# BSS138L, BVSS138L

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\text{ }\mu\text{Adc}$ )	$V_{(BR)DSS}$	50	–	–	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $25^\circ\text{C}$ ) ( $V_{DS} = 50\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $25^\circ\text{C}$ ) ( $V_{DS} = 50\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $150^\circ\text{C}$ )	$I_{DSS}$	– – –	– – –	0.1 0.5 5.0	$\mu\text{Adc}$
Gate-Source Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	–	–	$\pm 0.1$	$\mu\text{Adc}$

### ON CHARACTERISTICS (Note 1)

Gate-Source Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 1.0\text{ mAdc}$ )	$V_{GS(th)}$	0.85	–	1.5	Vdc
Static Drain-to-Source On-Resistance ( $V_{GS} = 2.75\text{ Vdc}$ , $I_D < 200\text{ mAdc}$ , $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ ) ( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 200\text{ mAdc}$ )	$r_{DS(on)}$	– –	5.6 –	10 3.5	$\Omega$
Forward Transconductance ( $V_{DS} = 25\text{ Vdc}$ , $I_D = 200\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$g_{fs}$	100	–	–	mmhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	( $V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{iss}$	–	40	50	pF
Output Capacitance	( $V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{oss}$	–	12	25	
Transfer Capacitance	( $V_{DG} = 25\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{rss}$	–	3.5	5.0	

### SWITCHING CHARACTERISTICS (Note 2)

Turn-On Delay Time	(V <sub>DD</sub> = 30 Vdc, I <sub>D</sub> = 0.2 Adc.)	$t_{d(on)}$	–	–	20	ns
Turn-Off Delay Time		$t_{d(off)}$	–	–	20	

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.

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
2. Switching characteristics are independent of operating junction temperature.
3. ESD between the gate and source serves only, no gate overvoltage rating is implied.

TYPICAL ELECTRICAL CHARACTERISTICS

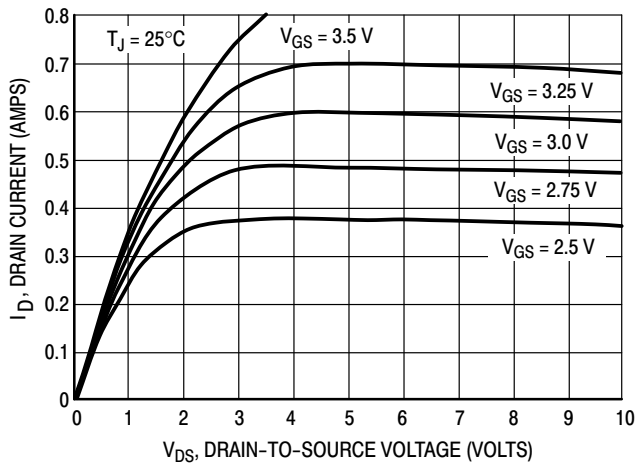


Figure 1. On-Region Characteristics

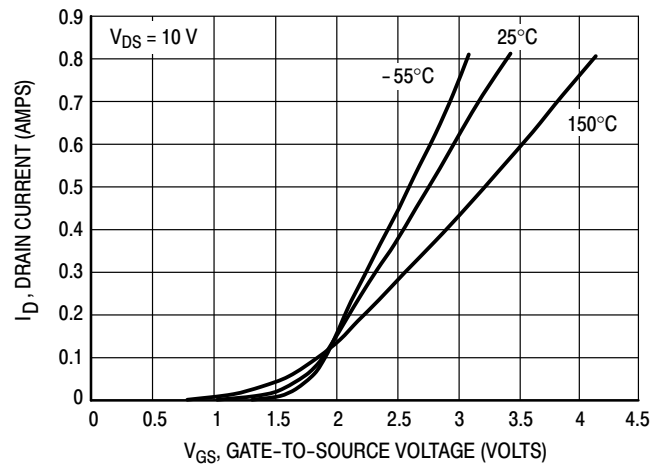


Figure 2. Transfer Characteristics

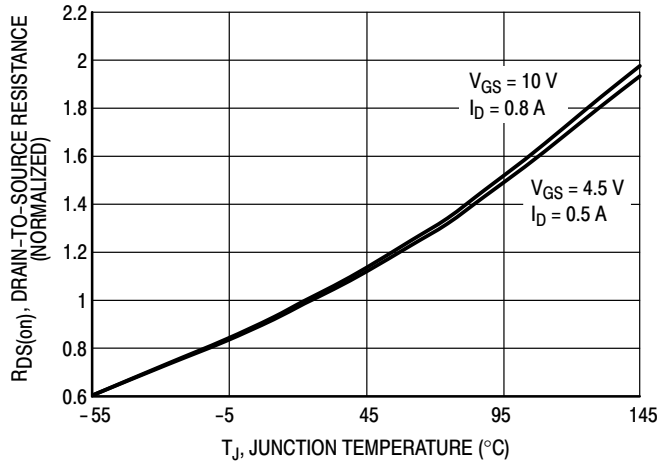


Figure 3. On-Resistance Variation with Temperature

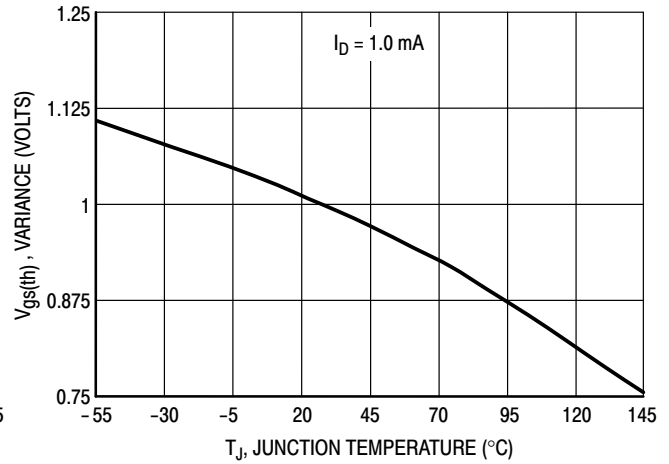


Figure 4. Threshold Voltage Variation with Temperature

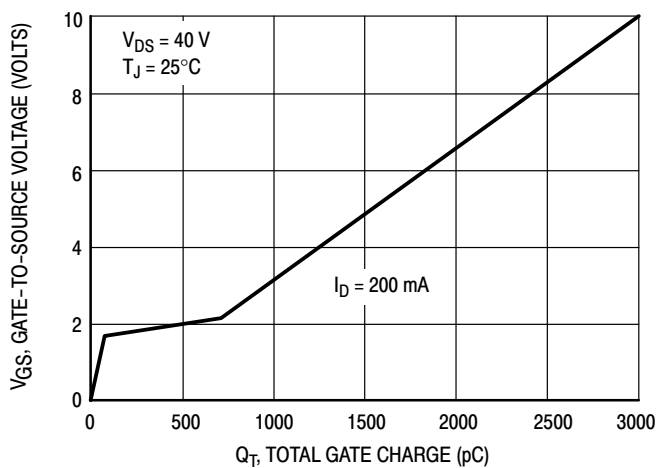


Figure 5. Gate Charge

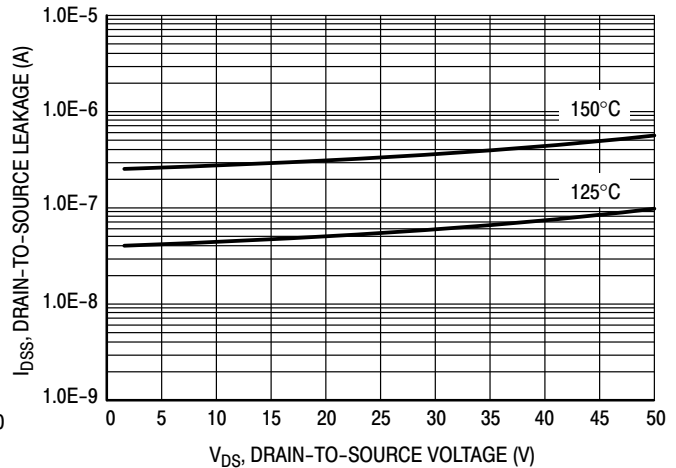


Figure 6. IDSS

TYPICAL ELECTRICAL CHARACTERISTICS

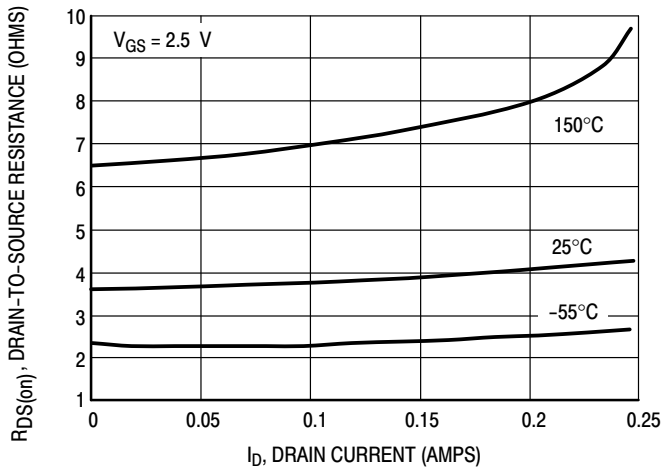


Figure 7. On-Resistance versus Drain Current

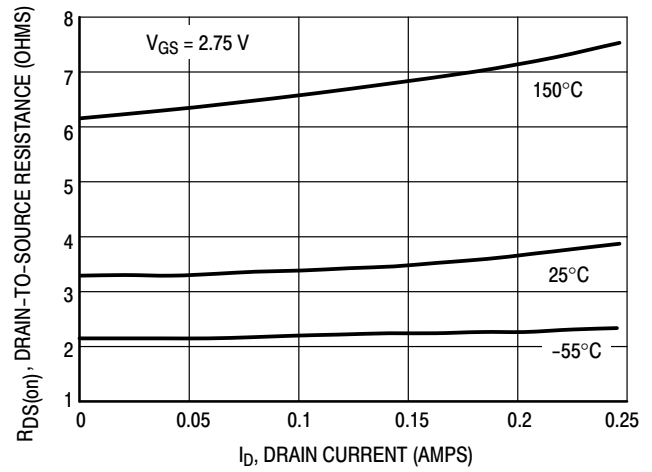


Figure 8. On-Resistance versus Drain Current

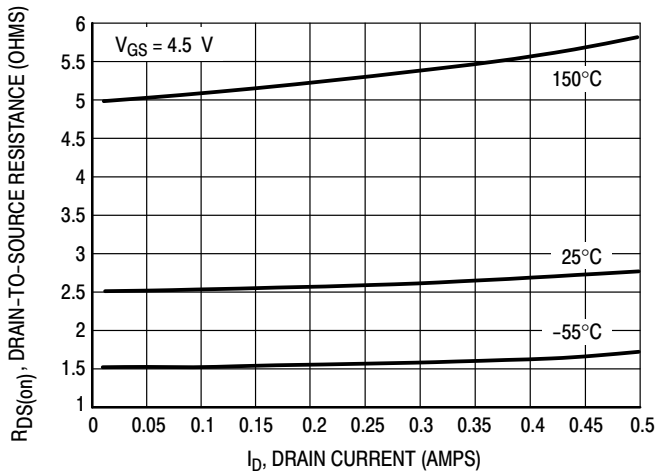


Figure 9. On-Resistance versus Drain Current

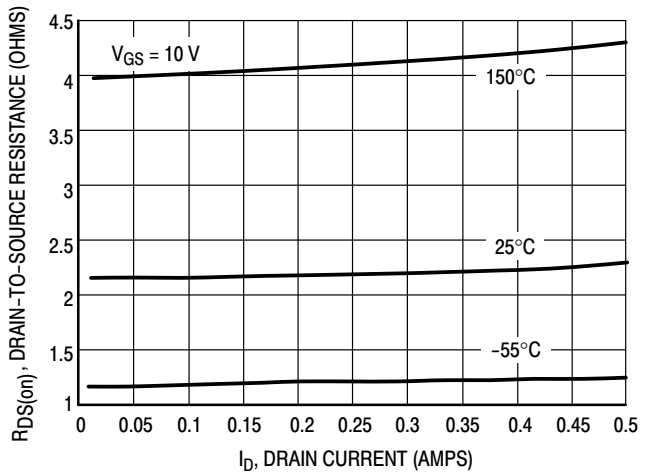


Figure 10. On-Resistance versus Drain Current

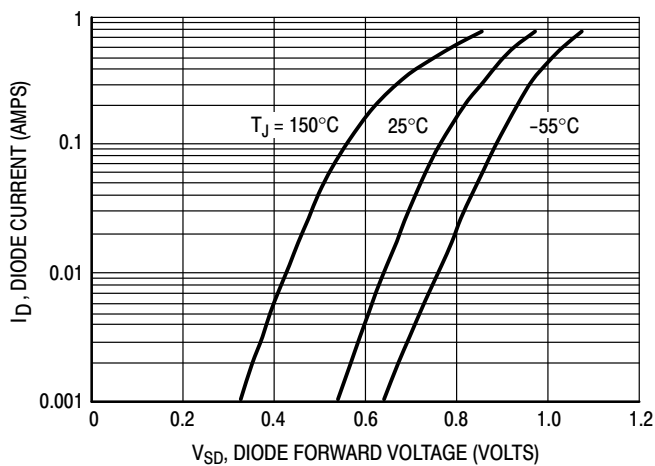


Figure 11. Body Diode Forward Voltage

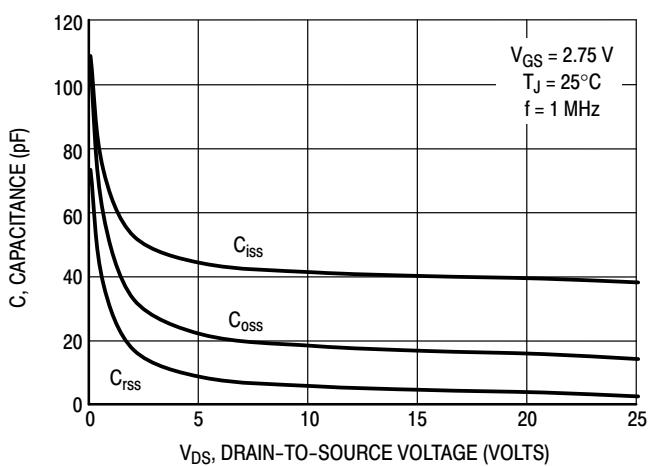


Figure 12. Capacitance

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## TYPICAL ELECTRICAL CHARACTERISTICS

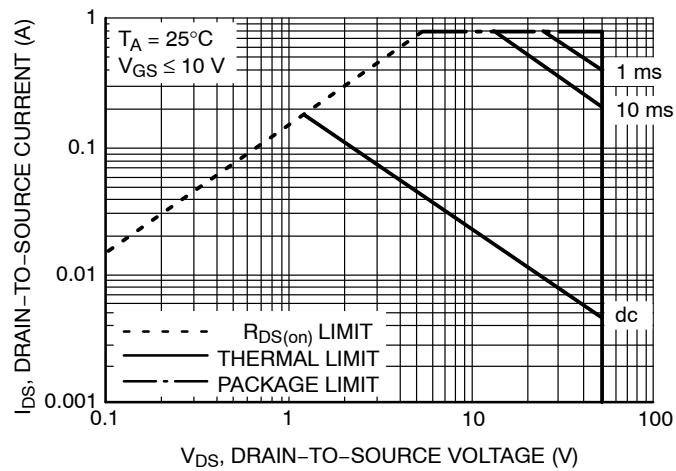


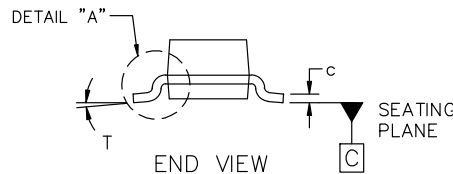
Figure 13. Safe Operating Area



SCALE 4:1

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ISSUE AU

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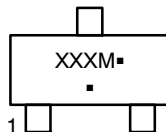


MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

GENERIC  
MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED  
MOUNTING FOOTPRINT

\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

STYLES ON PAGE 2

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STYLE 1 THRU 5: CANCELLED	STYLE 6: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 7: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 8: PIN 1. ANODE 2. NO CONNECTION 3. CATHODE		
STYLE 9: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 10: PIN 1. DRAIN 2. SOURCE 3. GATE	STYLE 11: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE	STYLE 12: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 13: PIN 1. SOURCE 2. DRAIN 3. GATE	STYLE 14: PIN 1. CATHODE 2. GATE 3. ANODE
STYLE 15: PIN 1. GATE 2. CATHODE 3. ANODE	STYLE 16: PIN 1. ANODE 2. CATHODE 3. CATHODE	STYLE 17: PIN 1. NO CONNECTION 2. ANODE 3. CATHODE	STYLE 18: PIN 1. NO CONNECTION 2. CATHODE 3. ANODE	STYLE 19: PIN 1. CATHODE 2. ANODE 3. CATHODE-ANODE	STYLE 20: PIN 1. CATHODE 2. ANODE 3. GATE
STYLE 21: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 22: PIN 1. RETURN 2. OUTPUT 3. INPUT	STYLE 23: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 24: PIN 1. GATE 2. DRAIN 3. SOURCE	STYLE 25: PIN 1. ANODE 2. CATHODE 3. GATE	STYLE 26: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION
STYLE 27: PIN 1. CATHODE 2. CATHODE 3. CATHODE	STYLE 28: PIN 1. ANODE 2. ANODE 3. ANODE				

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