

# NSL12AWT1G

## High Current Surface Mount PNP Silicon Low $V_{CE(sat)}$ Transistor for Battery Operated Applications

### Features

- High Current Capability (3 A)
- High Power Handling (Up to 650 mW)
- Low  $V_{CE(s)}$  (170 mV Typical @ 1 A)
- Small Size
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Benefits

- High Specific Current and Power Capability Reduces Required PCB Area
- Reduced Parasitic Losses Increases Battery Life

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

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	$V_{CEO}$	-12	Vdc
Collector-Base Voltage	$V_{CBO}$	-12	Vdc
Emitter-Base Voltage	$V_{EBO}$	-5.0	Vdc
Collector Current – Continuous – Peak	$I_C$ $I_{CM}$	-2.0 -3.0	Adc
Electrostatic Discharge	ESD	HBM Class 3 MM Class C	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 1)	450 3.6	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 1)	275	$^\circ\text{C}/\text{W}$
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$ (Note 2)	650 5.2	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$ (Note 2)	192	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Lead 6	$R_{\theta JL}$	105	$^\circ\text{C}/\text{W}$
Total Device Dissipation (Single Pulse < 10 sec.)	$P_D$ Single	1.4	W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

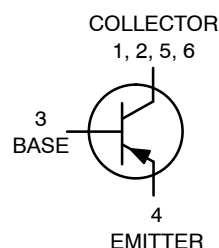
1. FR-4, Minimum Pad, 1 oz Coverage
2. FR-4, 1" Pad, 1 oz Coverage



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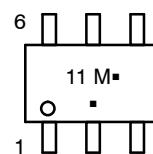
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**12 VOLTS  
3.0 AMPS  
PNP TRANSISTOR**



**SC-88/SOT-363  
CASE 419B  
STYLE 20**

### MARKING DIAGRAM



M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NSL12AWT1G

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage, ( $I_C = -10\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CEO}$	-12	-15	–	Vdc
Collector–Base Breakdown Voltage, ( $I_C = -0.1\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	-12	-25	–	Vdc
Emitter–Base Breakdown Voltage, ( $I_E = -0.1\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-5.0	-7.0	–	Vdc
Collector Cutoff Current, ( $V_{CB} = -12\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	-0.02	-0.1	$\mu\text{Adc}$
Collector–Emitter Cutoff Current, ( $V_{CES} = -12\text{ Vdc}$ , $I_E = 0$ )	$I_{CES}$	–	-0.03	-0.1	$\mu\text{Adc}$
Emitter Cutoff Current, ( $V_{CES} = -5.0\text{ Vdc}$ , $I_E = 0$ )	$I_{EBO}$	–	-0.03	-0.1	$\mu\text{Adc}$

## ON CHARACTERISTICS

DC Current Gain (Note 3) ( $I_C = -0.5\text{ A}$ , $V_{CE} = -1.5\text{ V}$ ) ( $I_C = -0.8\text{ A}$ , $V_{CE} = -1.5\text{ V}$ ) ( $I_C = -1.0\text{ A}$ , $V_{CE} = -1.5\text{ V}$ )	$h_{FE}$	100 100 100	180 165 160	– 300 –	
Collector–Emitter Saturation Voltage (Note 3) ( $I_C = -0.5\text{ A}$ , $I_B = -10\text{ mA}$ ) ( $I_C = -0.8\text{ A}$ , $I_B = -16\text{ mA}$ ) ( $I_C = -1.0\text{ A}$ , $I_B = -20\text{ mA}$ )	$V_{CE(sat)}$	– – –	-0.10 -0.14 -0.17	-0.160 -0.235 -0.290	V
Base–Emitter Saturation Voltage (Note 3) ( $I_C = -1.0\text{ A}$ , $I_B = -20\text{ mA}$ )	$V_{BE(sat)}$	–	-0.84	-0.95	V
Base–Emitter Turn–on Voltage (Note 3) ( $I_C = -1.0\text{ A}$ , $V_{CE} = -1.5\text{ V}$ )	$V_{BE(on)}$	–	-0.81	-0.95	V
Cutoff Frequency ( $I_C = -100\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ , $f = 100\text{ MHz}$ )	$f_T$	–	100	–	MHz
Output Capacitance ( $V_{CB} = -1.5\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	50	65	pF

3. Pulsed Condition: Pulse Width < 300  $\mu\text{sec}$ , Duty Cycle < 2%

## ORDERING INFORMATION

Device	Package	Shipping†
NSL12AWT1G	SOT-363 (Pb-Free)	3000 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.

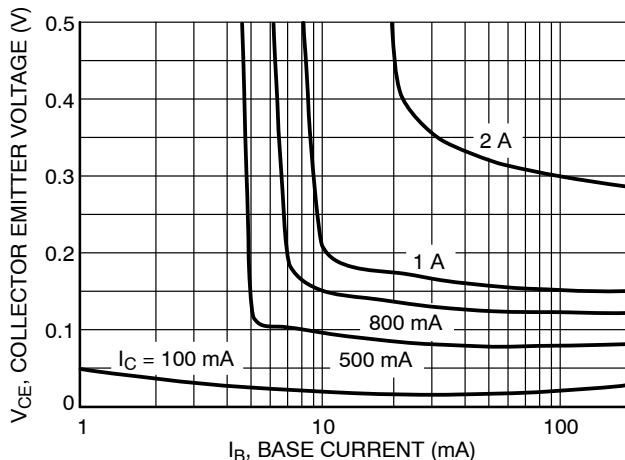


Figure 1. Collector Emitter Voltage vs Base Current

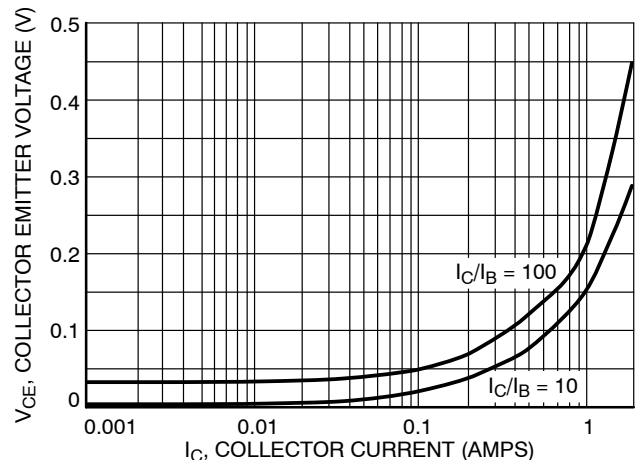
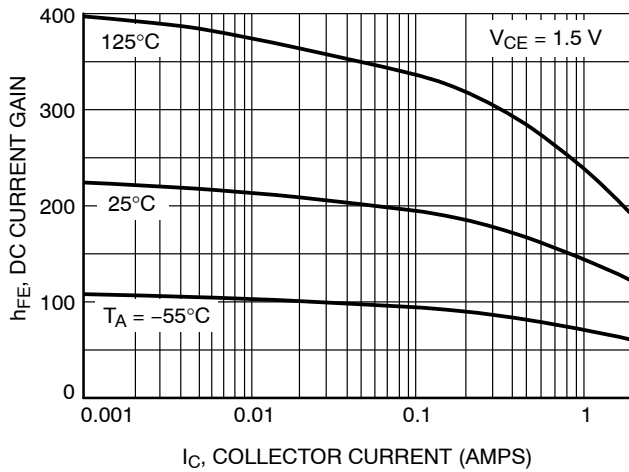
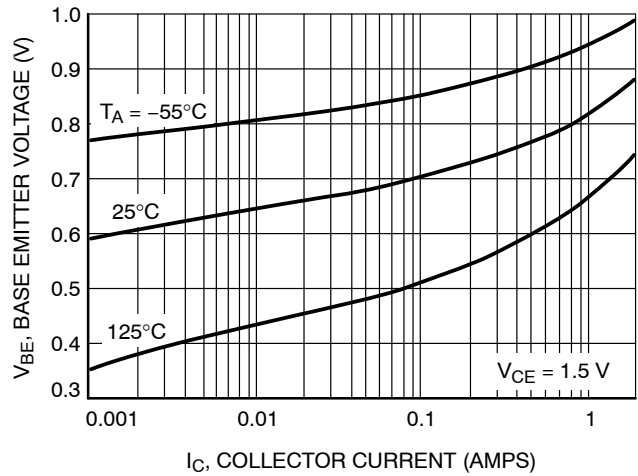


Figure 2. Collector Emitter Voltage vs Collector Current

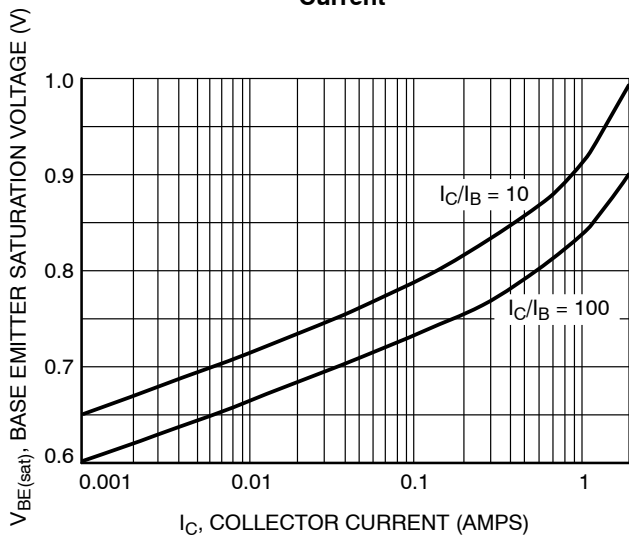
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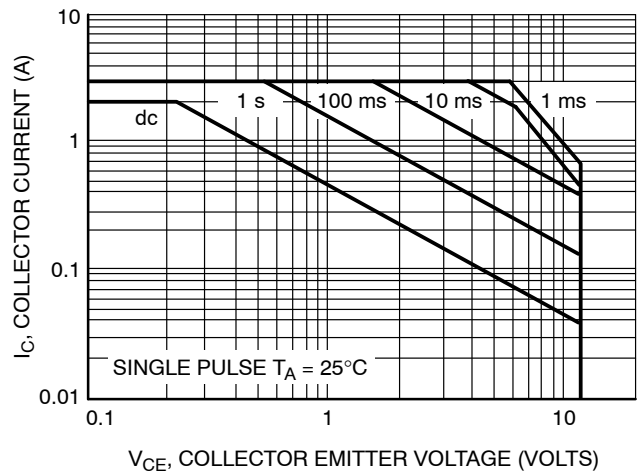
**Figure 3. DC Current Gain versus Collector Current**



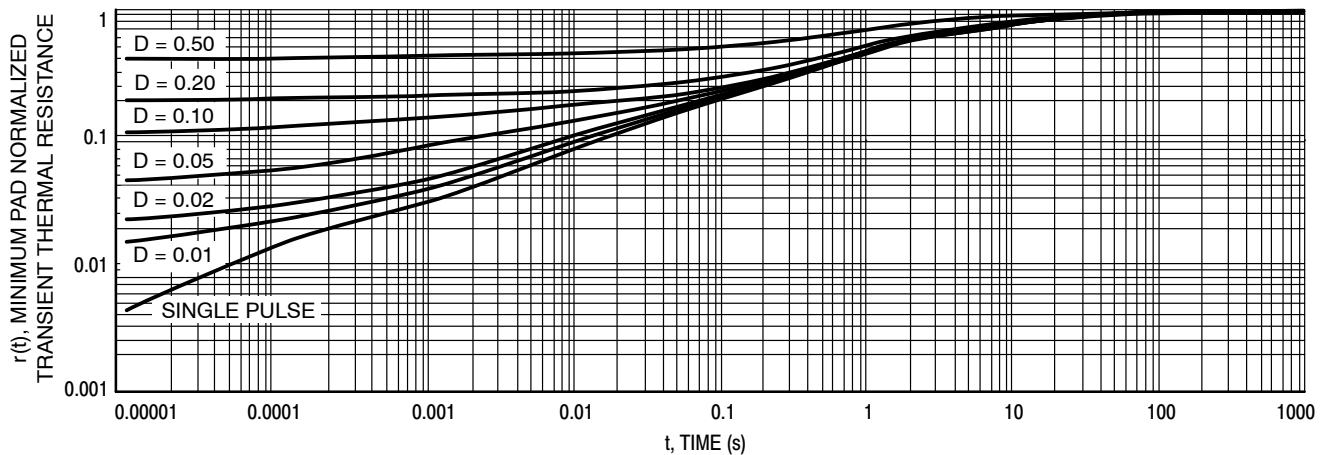
**Figure 4. Base Emitter Voltage versus Collector Current**



**Figure 5. Base Emitter Saturation Voltage versus Base Current**



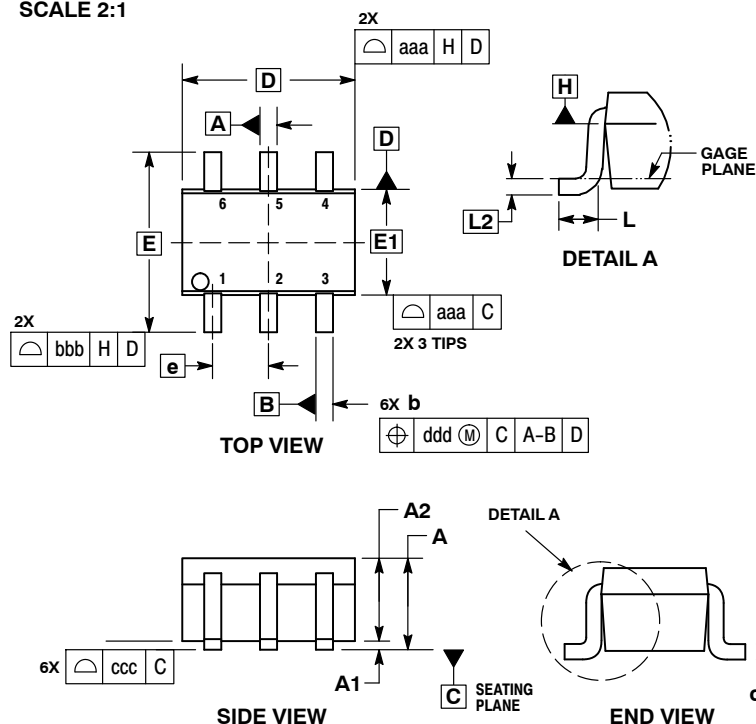
**Figure 6. Safe Operating Area**



**Figure 7. Normalized Thermal Response**

**ON**

DATE 11 DEC 2012

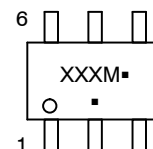


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
<b>A</b>	---	---	1.10	---	---	0.043
<b>A1</b>	0.00	---	0.10	0.000	---	0.004
<b>A2</b>	0.70	0.90	1.00	0.027	0.035	0.039
<b>b</b>	0.15	0.20	0.25	0.006	0.008	0.010
<b>C</b>	0.08	0.15	0.22	0.003	0.006	0.009
<b>D</b>	1.80	2.00	2.20	0.070	0.078	0.086
<b>E</b>	2.00	2.10	2.20	0.078	0.082	0.086
<b>E1</b>	1.15	1.25	1.35	0.045	0.049	0.053
<b>e</b>	0.65 BSC			0.026 BSC		
<b>L</b>	0.26	0.36	0.46	0.010	0.014	0.018
<b>L2</b>	0.15 BSC			0.006 BSC		
<b>aaa</b>	0.15			0.006		
<b>bbb</b>	0.30			0.012		
<b>ccc</b>	0.10			0.004		
<b>ddd</b>	0.10			0.004		

### GENERIC MARKING DIAGRAM\*



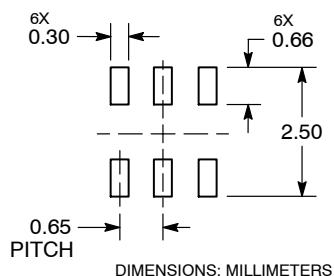
XXX = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

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

\*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 SOLDERING FOOTPRINT\*



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

## STYLES ON PAGE 2

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**SC-88/SC70-6/SOT-363**  
**CASE 419B-02**  
**ISSUE Y**

DATE 11 DEC 2012

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13: PIN 1. ANODE 2. N/C 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 14: PIN 1. VREF 2. GND 3. GND 4. IOUT 5. VEN 6. VCC	STYLE 15: PIN 1. ANODE 1 2. ANODE 2 3. ANODE 3 4. CATHODE 3 5. CATHODE 2 6. CATHODE 1	STYLE 16: PIN 1. BASE 1 2. EMITTER 2 3. COLLECTOR 2 4. BASE 2 5. EMITTER 1 6. COLLECTOR 1	STYLE 17: PIN 1. BASE 1 2. EMITTER 1 3. COLLECTOR 2 4. BASE 2 5. EMITTER 2 6. COLLECTOR 1	STYLE 18: PIN 1. VIN1 2. VCC 3. VOUT2 4. VIN2 5. GND 6. VOUT1
STYLE 19: PIN 1. IOUT 2. GND 3. GND 4. V CC 5. V EN 6. V REF	STYLE 20: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR	STYLE 21: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. N/C 6. CATHODE 1	STYLE 22: PIN 1. D1 (i) 2. GND 3. D2 (i) 4. D2 (c) 5. VBUS 6. D1 (c)	STYLE 23: PIN 1. Vn 2. CH1 3. Vp 4. N/C 5. CH2 6. N/C	STYLE 24: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE
STYLE 25: PIN 1. BASE 1 2. CATHODE 3. COLLECTOR 2 4. BASE 2 5. EMITTER 6. COLLECTOR 1	STYLE 26: PIN 1. SOURCE 1 2. GATE 1 3. DRAIN 2 4. SOURCE 2 5. GATE 2 6. DRAIN 1	STYLE 27: PIN 1. BASE 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. EMITTER 2 6. COLLECTOR 2	STYLE 28: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	STYLE 29: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE/ANODE 6. CATHODE	STYLE 30: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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