

Regulated Converters

- 2:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 87%
- Fixed Operating Frequency
- Six-Sided Continuous Shield



RP10-E

10 Watt

2" x 1"

Single & Dual Output



Description

The RP10-E series DC/DC converters are certified to UL 60950-1 and cUL 60950-1. This makes them ideal for all telecom and industrial applications where approved safety standards are required. The industry standard 2" x 1" package meets military standards for thermal shock and vibration tolerance and is available with an optional remote on/off control pin. This series is also available with the /M1 and /M2 option which is particularly suitable for extended temperature range applications.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input ⁽¹⁾ Current [mA]	Efficiency ⁽¹⁾ typ. [%]	Max. Capacitive Load ⁽²⁾ [μF]
RP10-123.3SE ^(3,4)	9-18	3.3	2000	688	80	6800
RP10-1205SE ^(3,4)	9-18	5	2000	1029	81	4700
RP10-1212SE ^(3,4)	9-18	12	830	988	84	690
RP10-1215SE ^(3,4)	9-18	15	670	997	84	470
RP10-243.3SE ^(3,4)	18-36	3.3	2000	344	80	6800
RP10-2405SE ^(3,4)	18-36	5	2000	508	82	4700
RP10-2412SE ^(3,4)	18-36	12	830	494	84	690
RP10-2415SE ^(3,4)	18-36	15	670	499	84	470
RP10-483.3SE ^(3,4)	36-75	3.3	2000	172	80	6800
RP10-4805SE ^(3,4)	36-75	5	2000	248	84	4700
RP10-4812SE ^(3,4)	36-75	12	830	241	86	690
RP10-4815SE ^(3,4)	36-75	15	670	241	87	470
RP10-1205DE ^(3,4)	9-18	±5	±1000	992	84	±680
RP10-1212DE ^(3,4)	9-18	±12	±416	1002	83	±330
RP10-1215DE ^(3,4)	9-18	±15	±333	991	84	±110
RP10-2405DE ^(3,4)	18-36	±5	±1000	502	83	±680
RP10-2412DE ^(3,4)	18-36	±12	±416	489	85	±330
RP10-2415DE ^(3,4)	18-36	±15	±333	496	84	±110
RP10-4805DE ^(3,4)	36-75	±5	±1000	248	84	±680
RP10-4812DE ^(3,4)	36-75	±12	±416	242	86	±330
RP10-4815DE ^(3,4)	36-75	±15	±333	245	85	±110

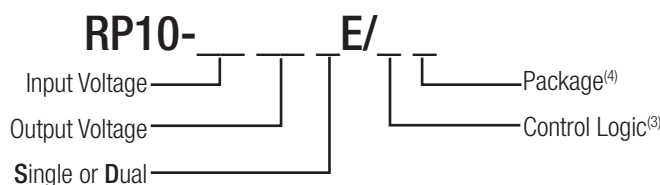
Notes:

Note1: Maximum value at nominal input voltage and full load.

Note2: Test by minimum V_{in} and constant resistor load.



Model Numbering



Ordering Examples:

RP10-1205SE/P = 12V Input, 5V Output, Standard Temp. Range, Positive Logic CTRL pin fitted

RP10-4805DE/M1-HC = 48V Input, 5V Output, Extended Temp. Range, No CTRL pin, Heat-sink fitted

Notes:

Note3: add suffix "M1" for higher efficiencies and extended temperature range

add suffix "P" for CTRL function with Positive Logic (1=ON, 0=OFF)

add suffix "N" for CTRL function with Negative Logic (0=ON, 1=OFF)

Note4: add suffix -HC for premounted Heat-sink and clips



UL[®]
C **UL** US
E196683

UL60950-1 Certified

Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

BASIC CHARACTERISTICS

Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range	nom. Vin = 12V nom. Vin = 24V nom. Vin = 48V	9VDC 18VDC 36VDC	12VDC 24VDC 48VDC	18VDC 36VDC 75VDC
Under Voltage Lockout (UVLO)				none
Input Filter				Pi-Type
Input Reflected Ripple Current ⁽⁵⁾	nominal Vin and full load		30mA _{p-p}	
Input Surge Voltage	12V input, 100ms max. 24V input, 100ms max. 48V input, 100ms max.			36VDC 50VDC 100VDC
Start-up time	nominal Vin and constant resistor load Power up		20ms	
Operating Frequency Range		270kHz	300kHz	330kHz
Minimum Load ⁽⁶⁾	of full load	10%		
Ripple and Noise	measured by 20MHz bandwidth	Single Dual	50mV _{p-p} 75mV _{p-p}	
Remote ON/OFF ⁽⁷⁾	Positive Logic	DC-DC ON DC-DC OFF	Open or $3.5\text{V} < V_r < 12\text{V}$ Short or $0\text{V} < V_r < 1.2\text{V}$	
	Negative Logic	DC-DC ON DC-DC OFF	Short or $0\text{V} < V_r < 1.2\text{V}$ Open or $3.5\text{V} < V_r < 12\text{V}$	
Input current of Remote pin (CTRL)		DC-DC OFF	20mA	
		DC-DC ON	-0.5mA	+1.0mA

Notes:

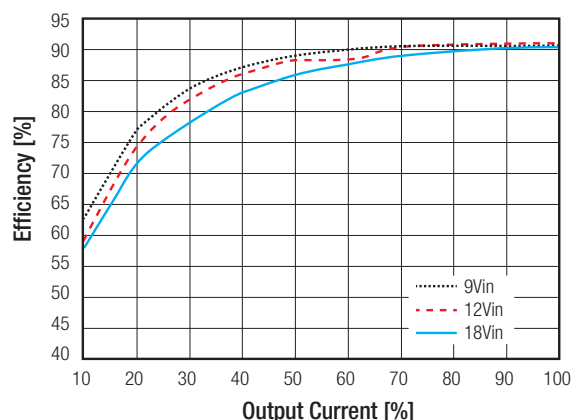
Note5: Simulated source impedance of 12 μH . 12 μH inductor in series with +Vin.

Note6: The RP10 (W) series required a minimum 10% loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.

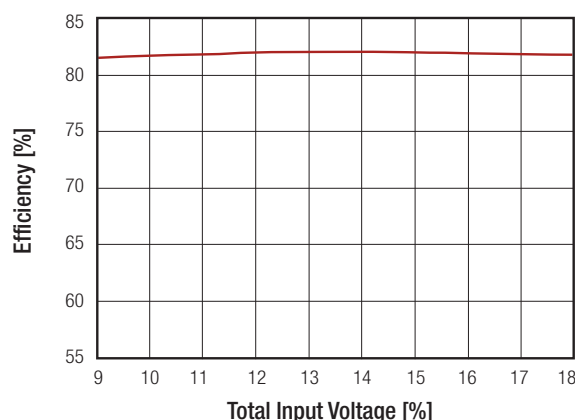
Note7: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin. If no suffix is specified, the control pin will be omitted.

RP10-1205SE

Efficiency vs. Output Current



Efficiency vs. Input Voltage

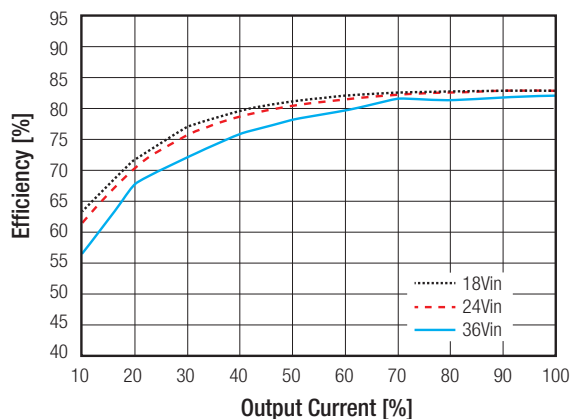


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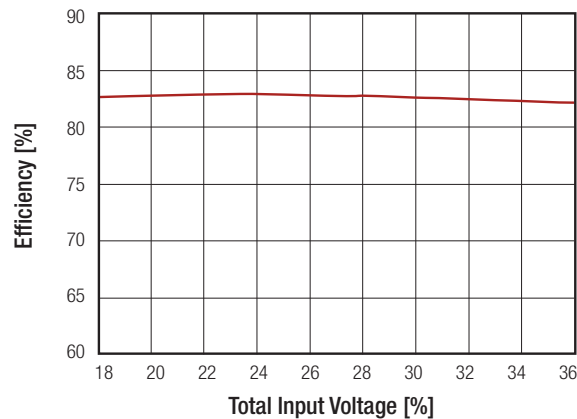
Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

RP10-2405SE

Efficiency vs. Output Current

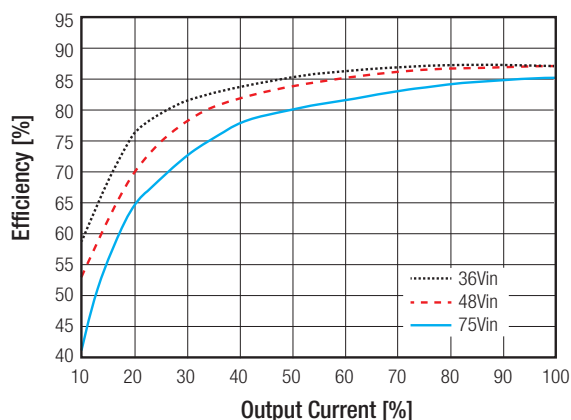


Efficiency vs. Input Voltage

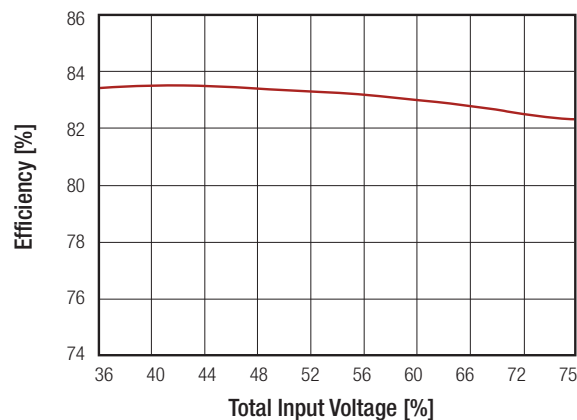


RP10-4805SE

Efficiency vs. Output Current



Efficiency vs. Input Voltage



REGULATIONS

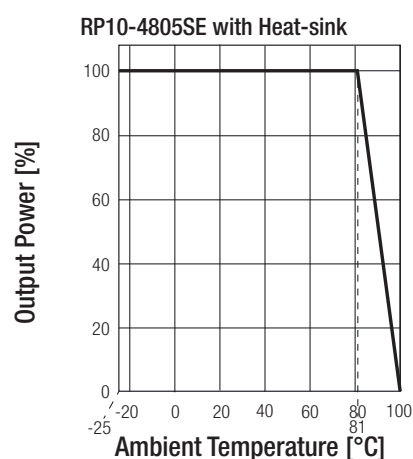
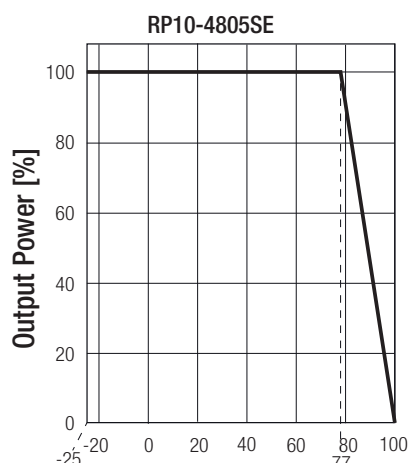
Parameter	Condition		Value
Output Voltage Accuracy			$\pm 1\%$
Line Voltage Regulation	low line to high line		$\pm 0.2\%$
Load Voltage Regulation	0% to 100% load	Single	$\pm 0.5\%$
		Dual	$\pm 1.0\%$
Cross Regulation	asymmetrical 25% <-> 100% load		$\pm 5\%$
Transient Response recovery time	25% load step change		250 μs typ.

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

PROTECTIONS		
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Over Voltage Protection (OVP)	Zener Diode Clamp 3.3Vout 5Vout 12Vout 15Vout	3.9VDC typ. 6.2VDC typ. 15VDC typ. 18VDC typ.
Over Load Protection (OLP)	% of Iout rated	150% max.
Isolation Voltage	I/P to O/P I/P (O/P) to case	1.6kVDC/1 minute 1.6kVDC/1 minute
Isolation Resistance	500VDC	1GΩ min.
Isolation Capacitance		300pF max.
Notes: Note8: This power module is not internally fused. An input line fuse must always be used.		

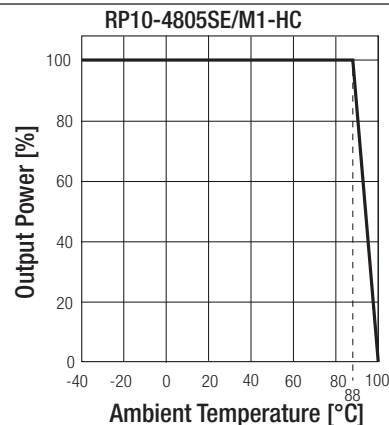
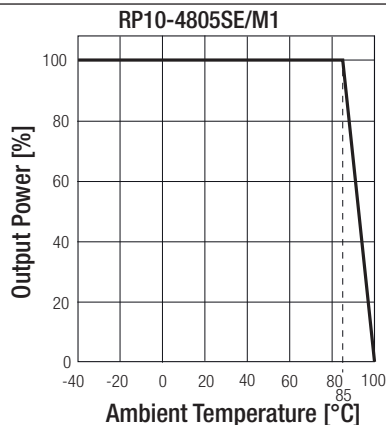
ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range (Reference Derating Curve) ⁽⁹⁾	Standard M1	-25°C to +100°C -40°C to +85°C
Maximum Case Temperature		+105°C
Temperature Coefficient		±0.02%/°C max.
Thermal Impedance	vertical direction by natural convection (20LFM) without Heat-Sink with Heat-Sink	12°C/Watt 10°C/Watt
Operating Humidity	non-condensing	5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF ⁽¹⁰⁾	MIL-HDBK-217F, Full Load	3342 x10 ³ hours

Derating Graph^(9,11)



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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted



Notes:

- Note9: M1 version is more efficient, therefore, it can be operated in a more extensive temperature range than standard version.
 Note10: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C . (Ground fixed and controlled environment).
 Note11: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact our technical support service at techsupportAT@recom-power.com.

SAFETY AND CERTIFICATIONS

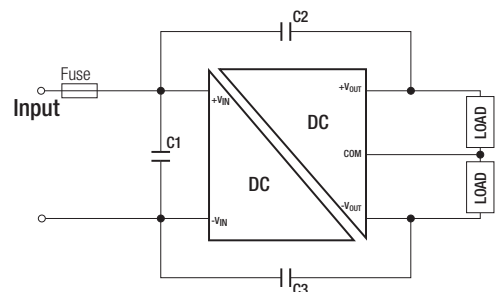
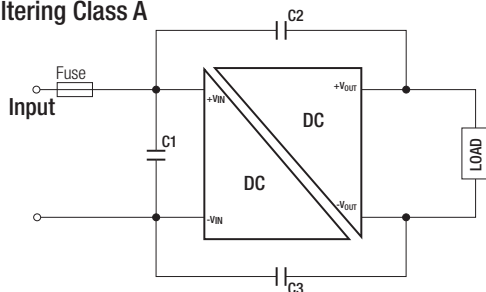
Certificate Type (Safety)	Report / File Number	Standard
UL General Safety	E196683	UL60950-1 1st Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003

EMC Compliance	Condition	Standard / Criterion
EMI Standard ⁽¹²⁾	with external filter	EN55022, Class A or B
ESD	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	EN61000-4-2, Criteria B
Radiated Immunity	10 V/m	EN61000-4-3, Criteria A
Fast Transient ⁽¹³⁾	$\pm 2\text{kV}$	EN61000-4-4, Criteria B
Surge ⁽¹³⁾	$\pm 2\text{kV}$	EN61000-4-5, Criteria B
Conducted Immunity	10 Vr.m.s	EN61000-4-6, Criteria A

Notes:

- Note12: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.
 Note13: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: Nippon chemi-con KY series, $220\mu\text{F}/100\text{V}$.

EMI Filtering Class A

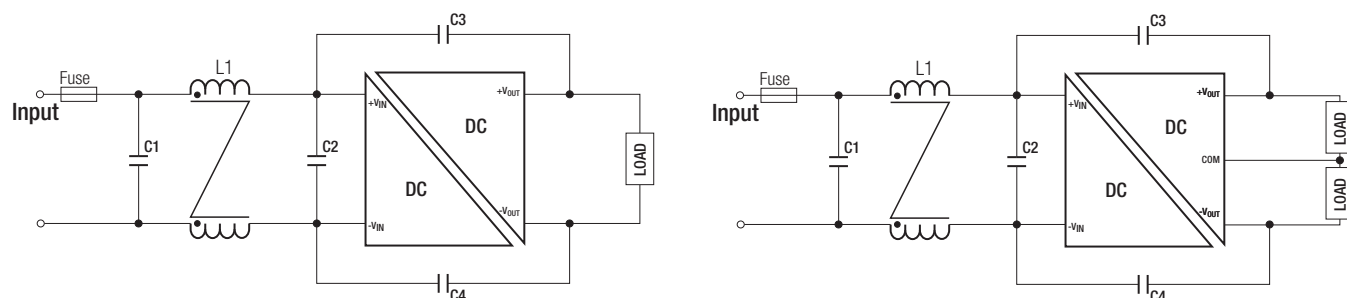


MODEL	C1	C2	C3
RP10-12xxS_DE	2.2 $\mu\text{F}/25\text{V}$ 1206 MLCC	1000pF/2kV 1808 MLCC	1000pF/2kV 1808 MLCC
RP10-24xxS_DE	N/A	1000pF/2kV 1808 MLCC	1000pF/2kV 1808 MLCC
RP10-48xxS_DE	N/A	1000pF/2kV 1808 MLCC	1000pF/2kV 1808 MLCC

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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

EMI Filtering Class B

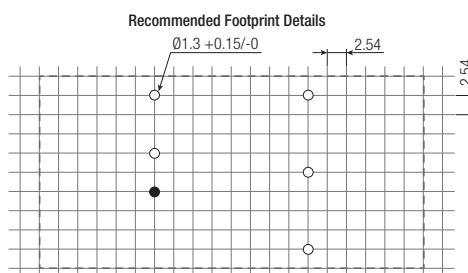
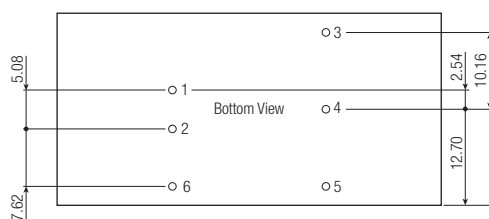
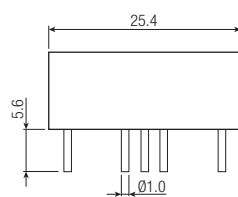
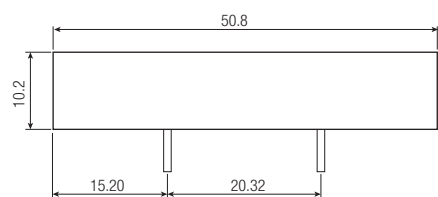
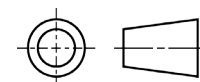


MODEL	C1	C2	C3/C4	L1
RP10-12xxS_DE	3.3 μF /50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 325 μH ref: WE 744290321 ref.: CMC-06
RP10-24xxS_DE	2.2 μF /50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 325 μH ref: WE 744290321 ref.: CMC-06
RP10-48xxS_DE	2.2 μF /100V 1812 MLCC	2.2 μF /100V 1812 MLCC	1000pF/2kV 1808 MLCC	CMC: 325 μH ref: WE 744290321 ref.: CMC-06

DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case Base Potting	Nickel coated copper Non-conductive black plastic Epoxy (UL94-V0)
Package Dimensions (LxWxH)	without Heat-sink with Heat-sink	50.8 x 25.4 x 10.2mm 56.8 x 25.4 x 16.8mm
Package Weight	without Heat-sink with Heat-sink	27g 37.89g

Dimension Drawing (mm)



Pin Connections

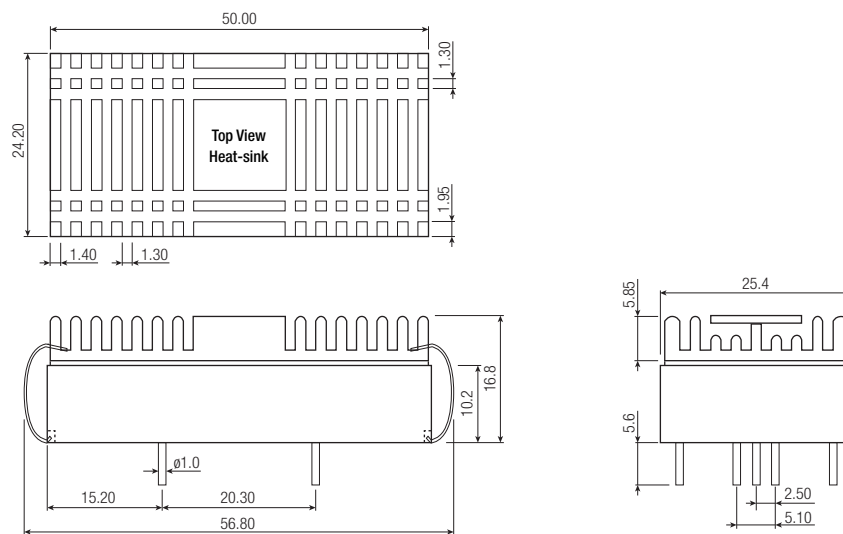
Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No Pin	Com
5	-Vout	-Vout
6	CTRL	CTRL

Pin Pitch Tolerance $\pm 0.25\text{mm}$
Pin dimension tolerance $\pm 0.1\text{mm}$
XX.X $\pm 0.5\text{mm}$
XX.XX $\pm 0.25\text{mm}$

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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

Dimension Drawing (mm) with Heat-sink



PACKAGING INFORMATION

Parameter	Type		Value
Packaging Quantity	without Heat-sink	Tube	9pcs.
	with Heat-sink	Tray	20pcs.
Storage Temperature Range			-55°C to $+125^\circ\text{C}$
Storage Humidity			5% - 95% RH

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