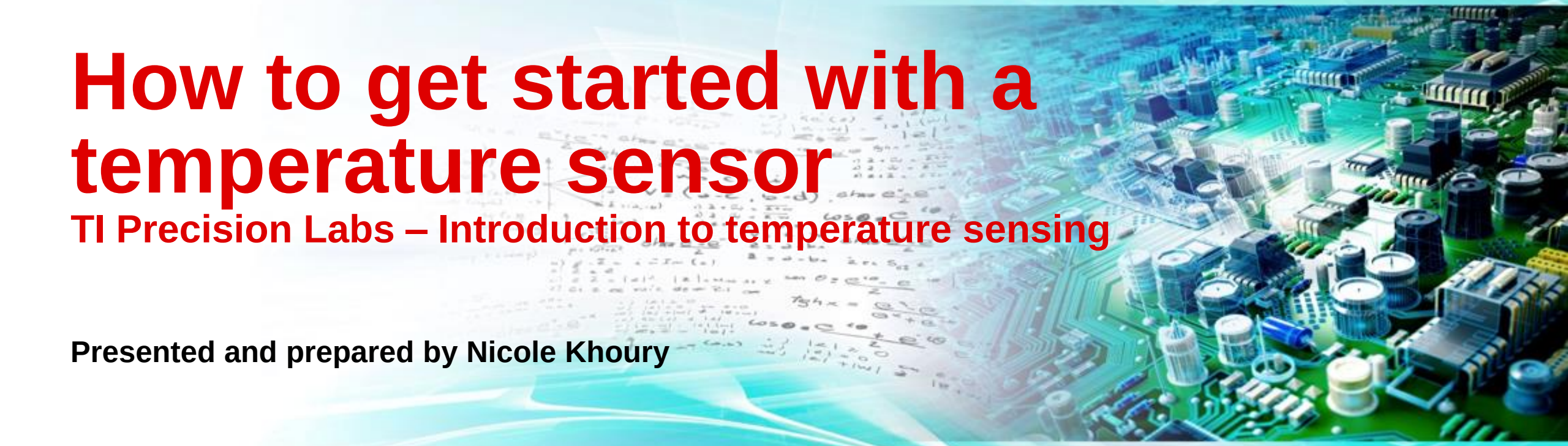
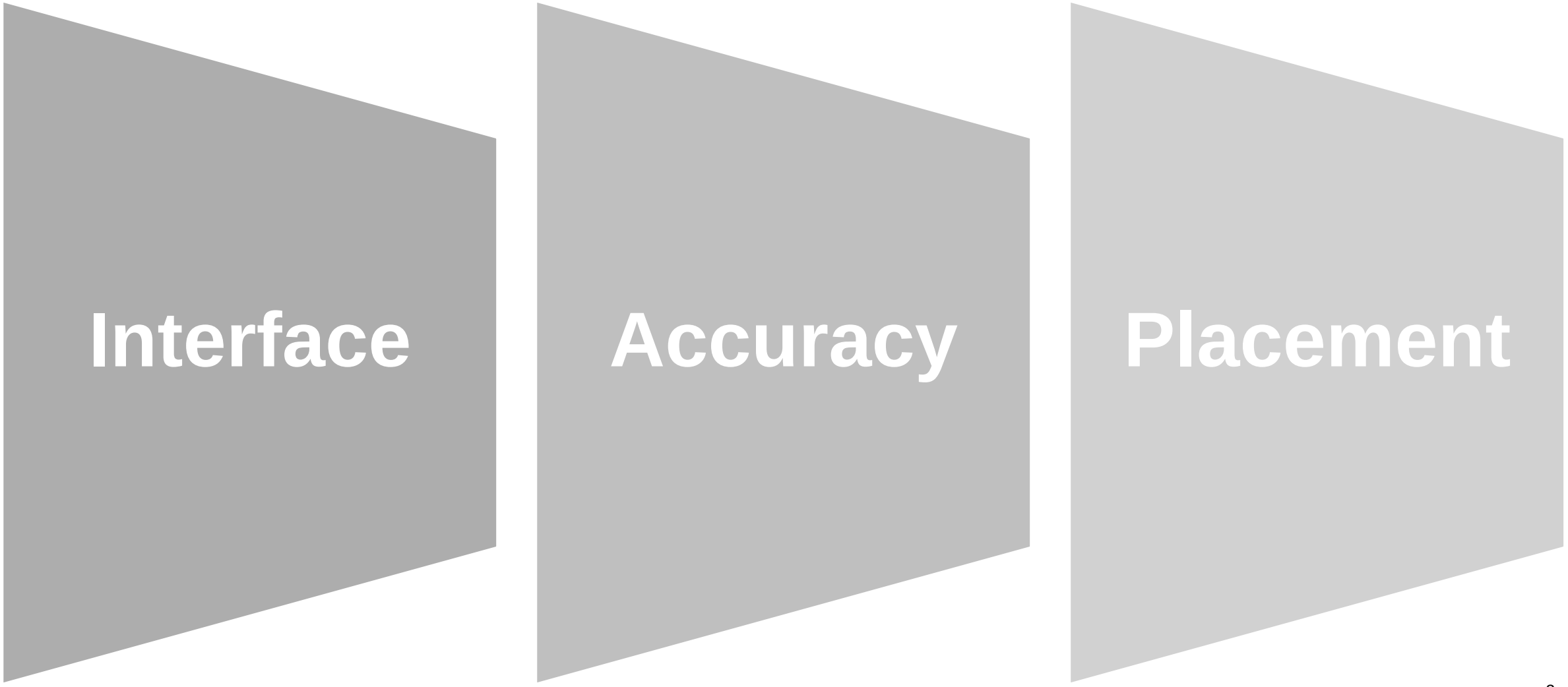
How to get started with a temperature sensor

TI Precision Labs – Introduction to temperature sensing

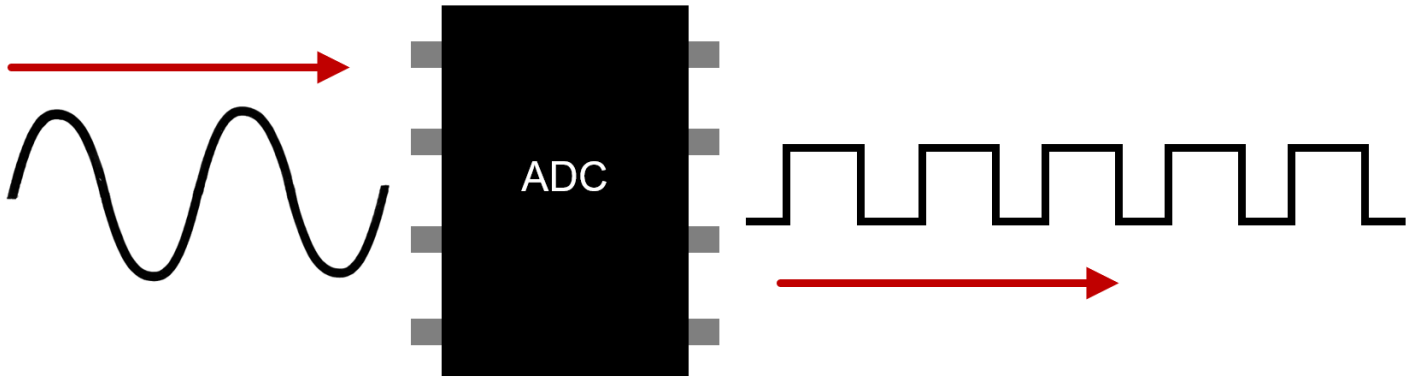


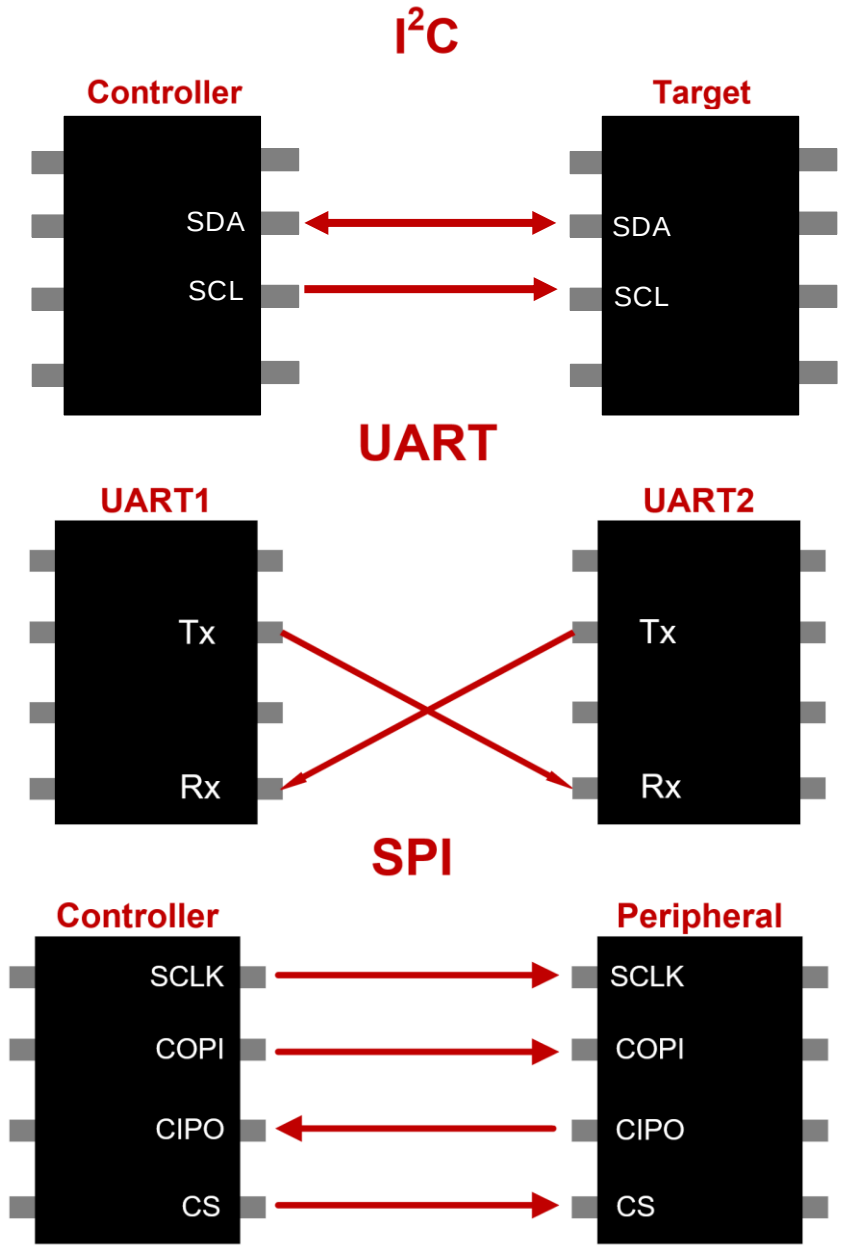
Presented and prepared by Nicole Khoury

Temperature fundamentals



Interface





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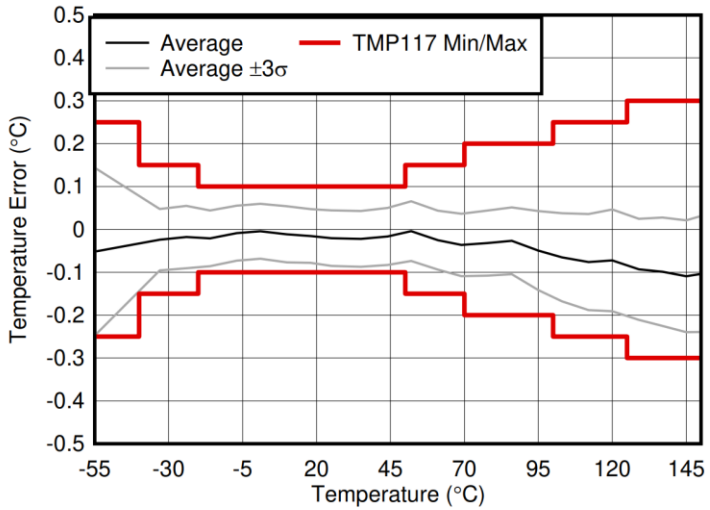
Accuracy

6.5 Electrical Characteristics

Over free-air temperature range and V+ = 1.7 V to 5.5 V for T_A = -55 °C to 70 °C, or V+ = 1.8 V to 5.5 V for T_A = -55 °C to 150 °C (unless otherwise noted) Typical specifications are at T_A = 25 °C and V+ = 3.3 V (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
TEMPERATURE TO DIGITAL CONVERTER								
	Temperature accuracy	TMP117	-20 °C to 50 °C	8 averages 1-Hz conversion cycle Thermal Pad unsoldered (DRV Package) I^2C Input voltages: $V_{IL} \le 0.05 * V+$, $V_{IH} \ge 0.95 * V+$	-0.1	±0.05	0.1	°C
			-40 °C to 70 °C		-0.15	±0.05	0.15	
			-40 °C to 100 °C		-0.2	±0.1	0.2	
			-55 °C to 125 °C		-0.25	±0.1	0.25	
			-55 °C to 150 °C		-0.3	±0.1	0.3	
		TMP117M	25 °C to 50 °C		-0.1	±0.05	0.1	
			0°C to 70 °C		-0.15	±0.05	0.15	
			0 °C to 85 °C		-0.2	±0.1	0.2	
		TMP117N	-40 °C to 100 °C		-0.2	±0.1	0.2	
			-55 °C to 125 °C		-0.25	±0.1	0.25	
			-55 °C to 150 °C		-0.3	±0.1	0.3	



6.5 Electrical Characteristics

at T_A = 25°C and V^+ = 1.4 V to 3.6 V (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
TEMPERATURE INPUT					
Range		–40		125	°C
Accuracy (temperature error)	–10°C to 100°C, V^+ = 1.8 V	–2	0	2	°C
	–40°C to 125°C, V^+ = 1.8 V	–3	±1	3	
	vs supply	–0.5	±0.2	0.5	°C/V
Resolution			1		°C

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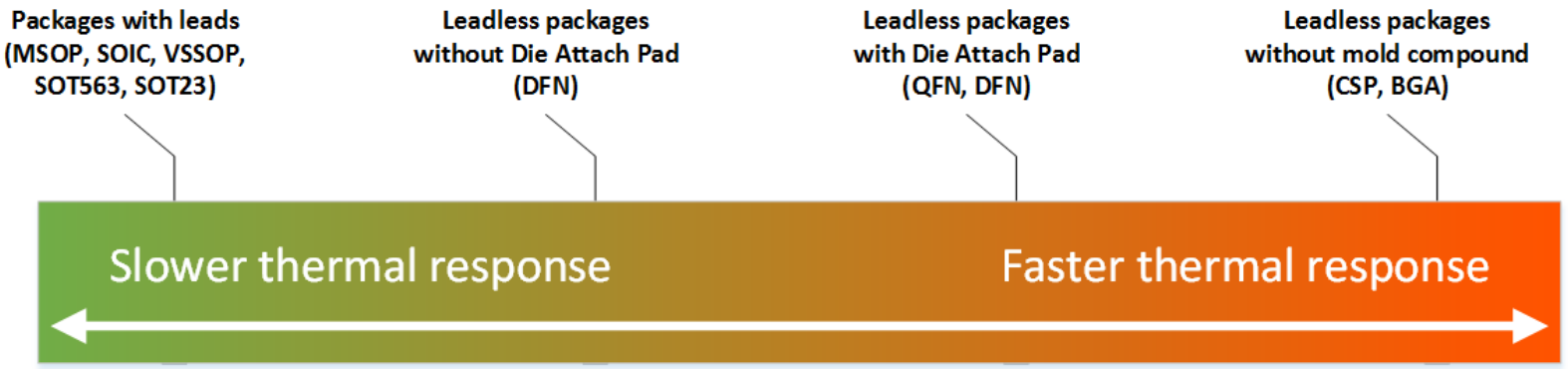
Placement and package type



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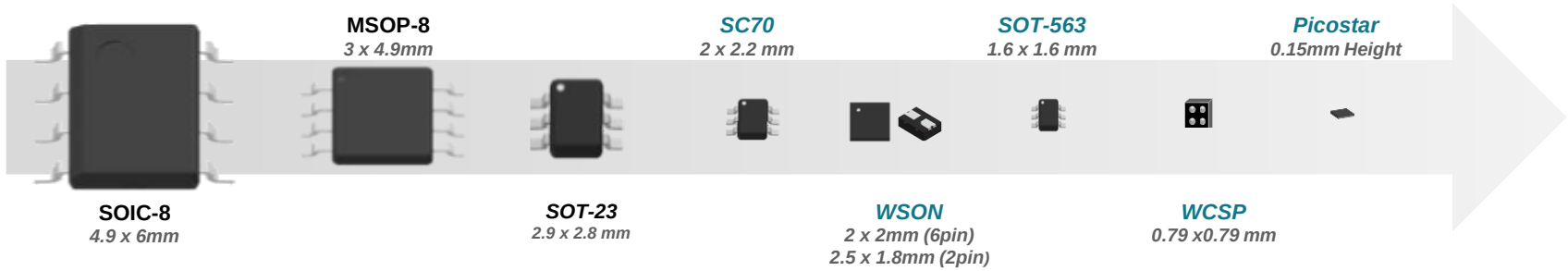

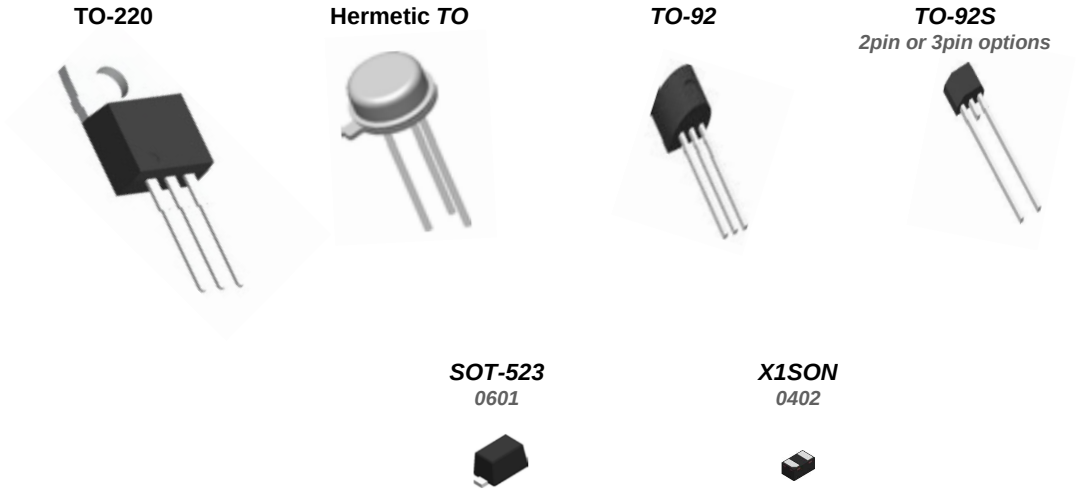

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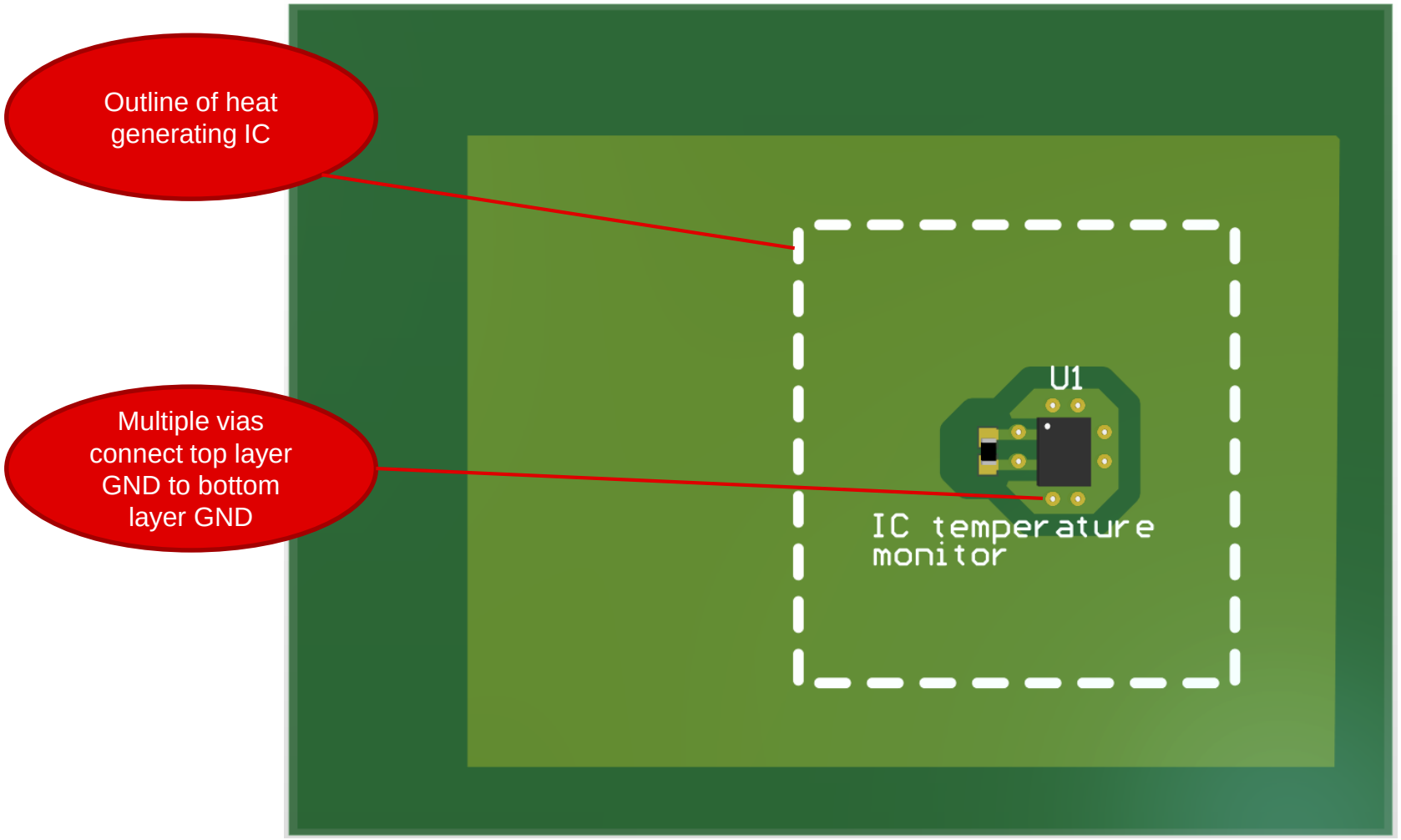
Component temperature monitoring



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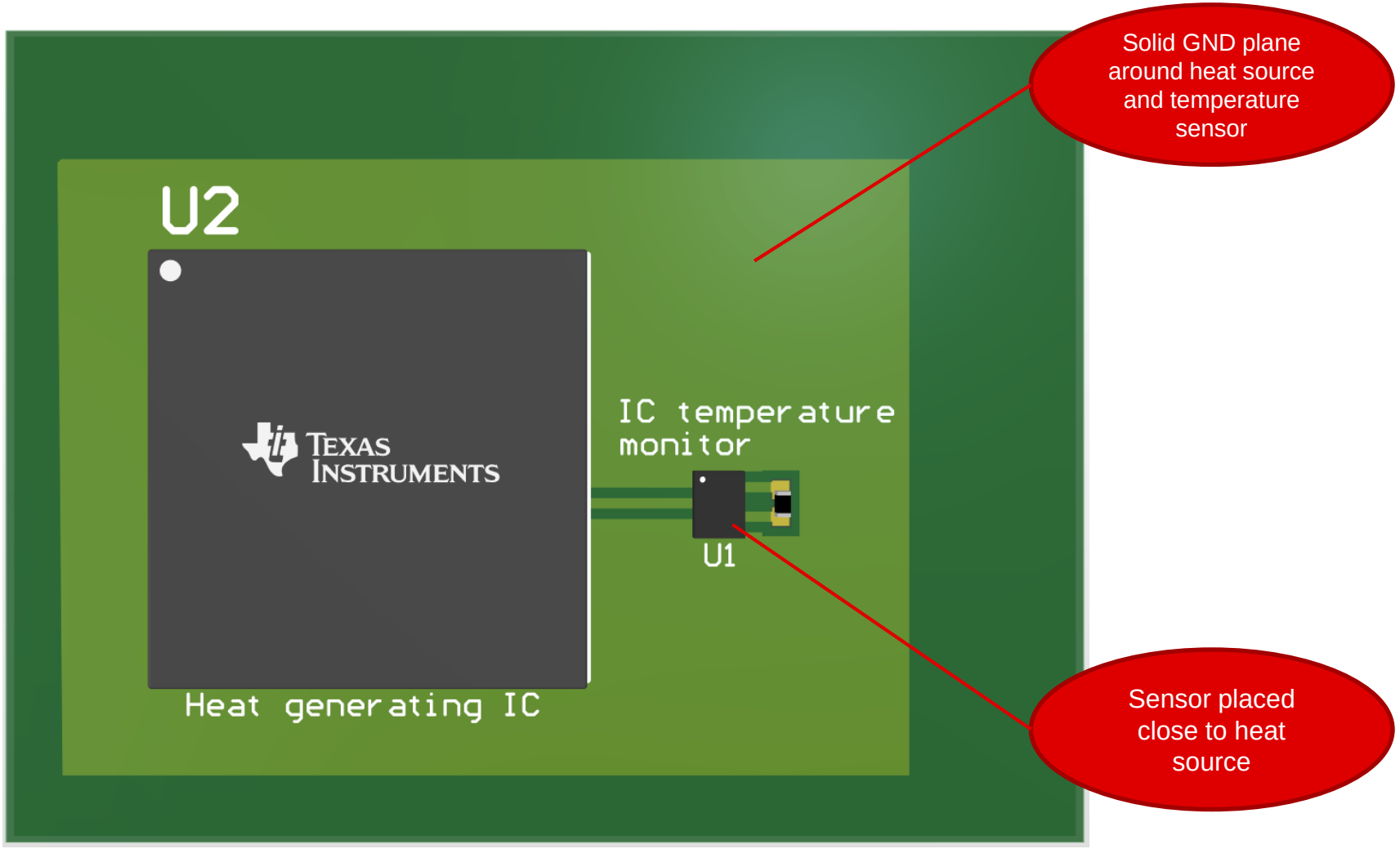
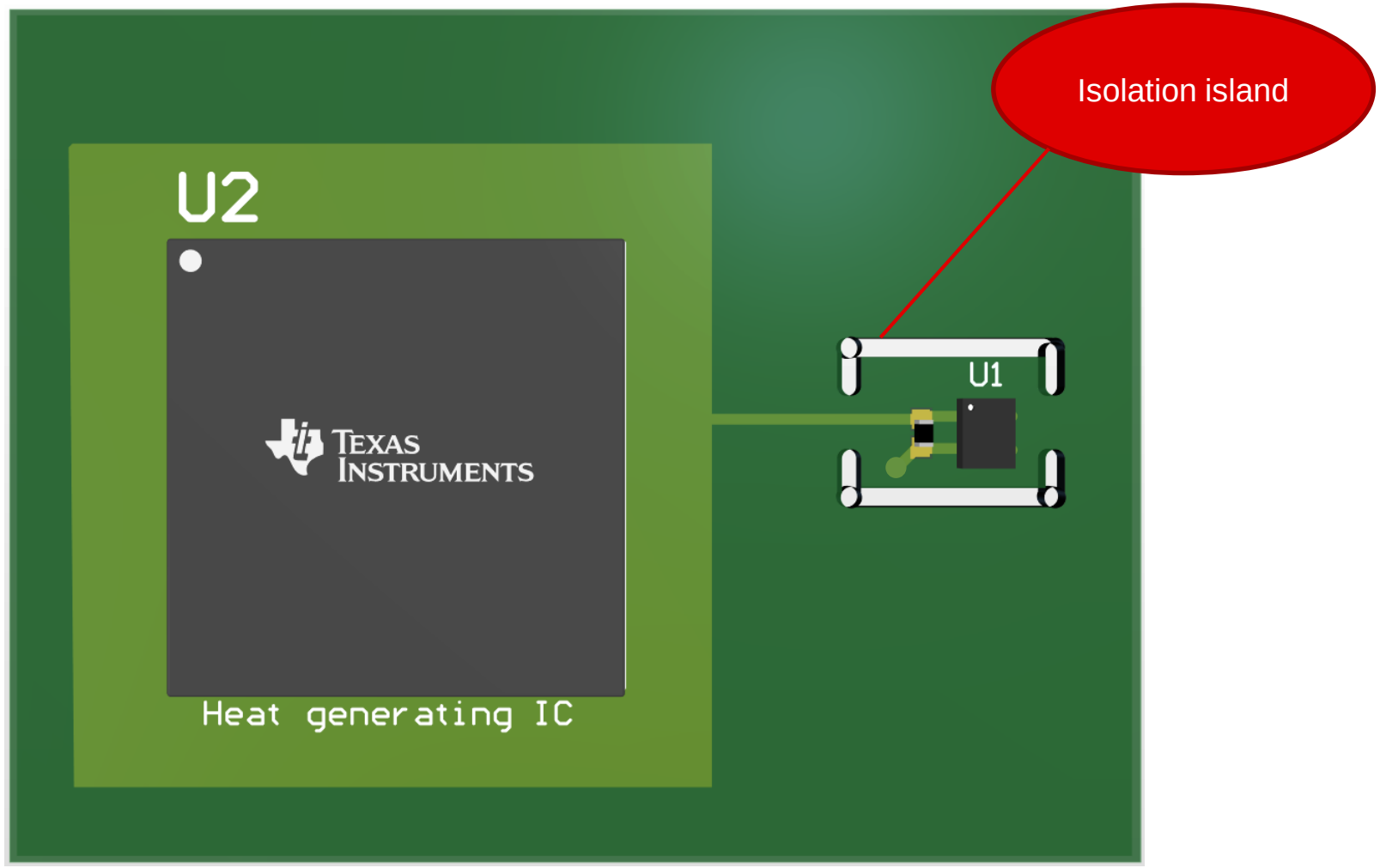
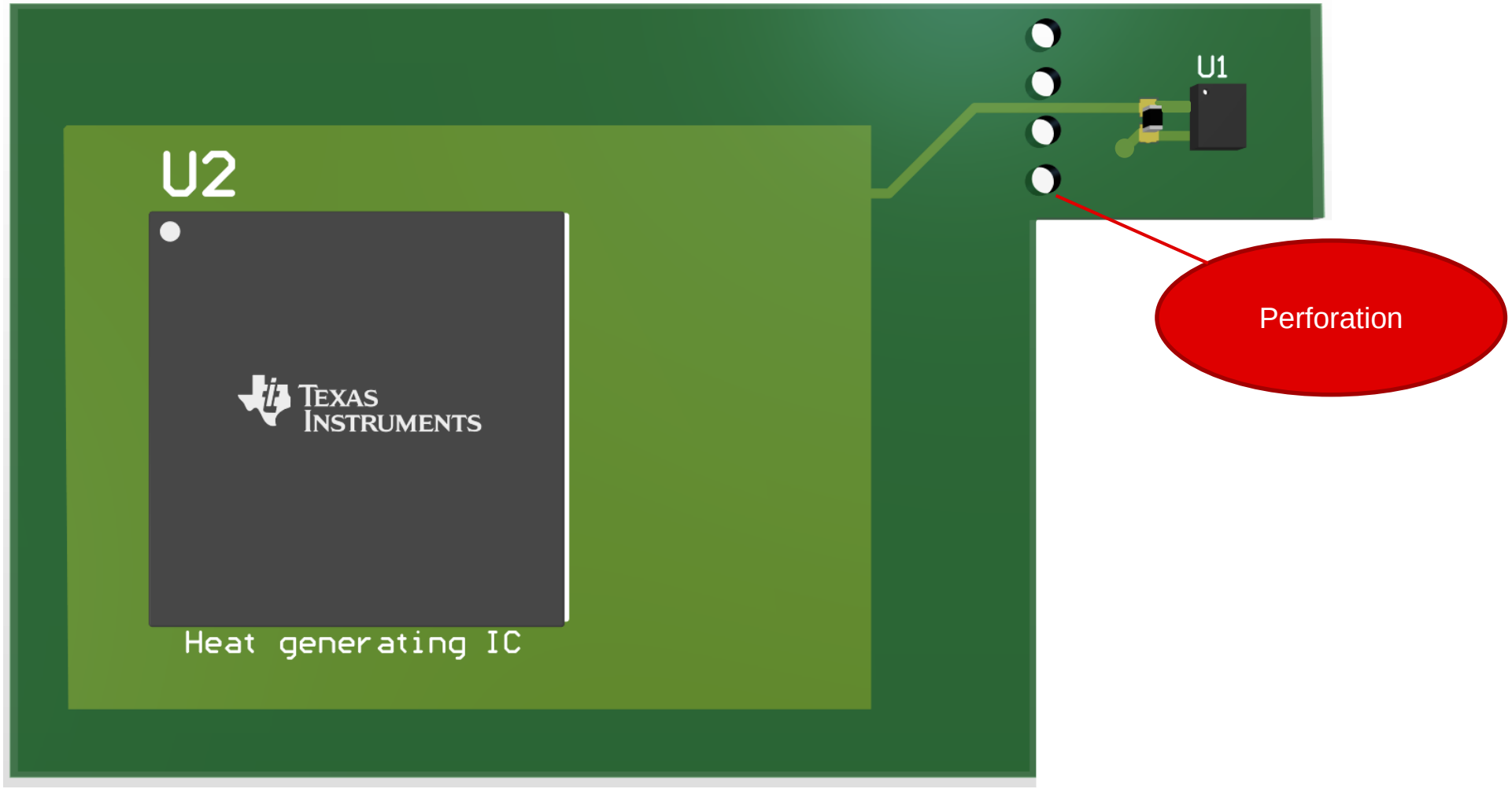
Component temperature monitoring



Ambient temperature monitoring



Ambient temperature monitoring



Summary

Interface

- Analog
- Digital

Accuracy

- Note system requirements
- Maximum and typical temperature error

Placement

- Package size
- Ambient or board temperature sensing

Thank you!

To find more temperature sensor resources and products, visit ti.com/temperature.

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