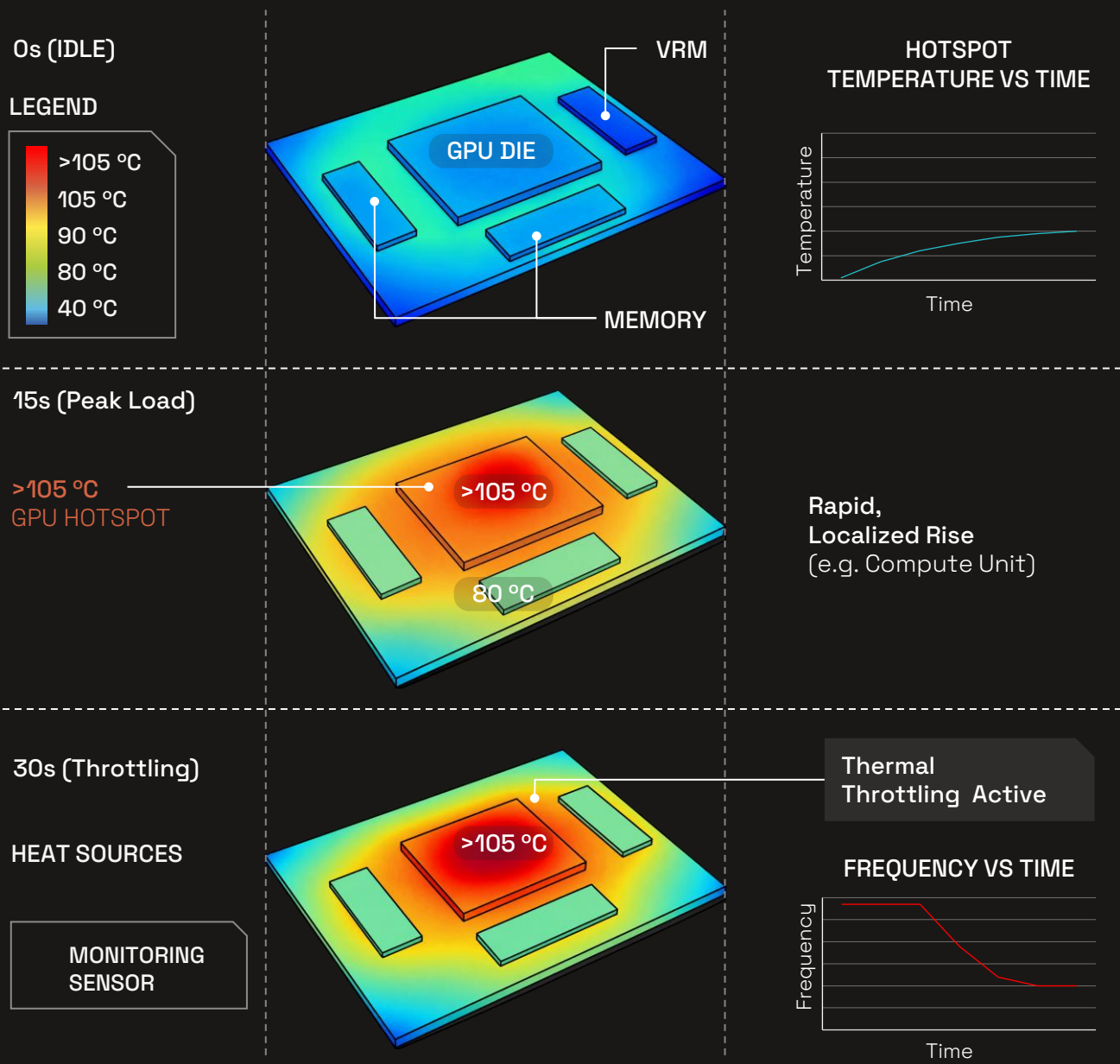
ANALYSIS OF HOTSPOT: TIME & FREQUENCY DOMAINS

TIME EVOLUTION

LOW FREQUENCY

Microprocessors: Planar Heat Spreading & Interfacial Decoupling
In microprocessors, heat generation is macroscopically heterogeneous-concentrated in compute engines, high-density cache banks, or execution units. The bottleneck is not just the immediate junction, but lateral thermal resistance across the package before heat enters the vapor chamber or cold plate. Diamond acts as a **super-lateral heat spreader**, flattening sharp temperature gradients across the die plane. The primary win is **mitigating thermal throttling**, reducing leakage power (which scales exponentially with localized peak temperature), and as a bonus lowering cross-die thermomechanical strain!



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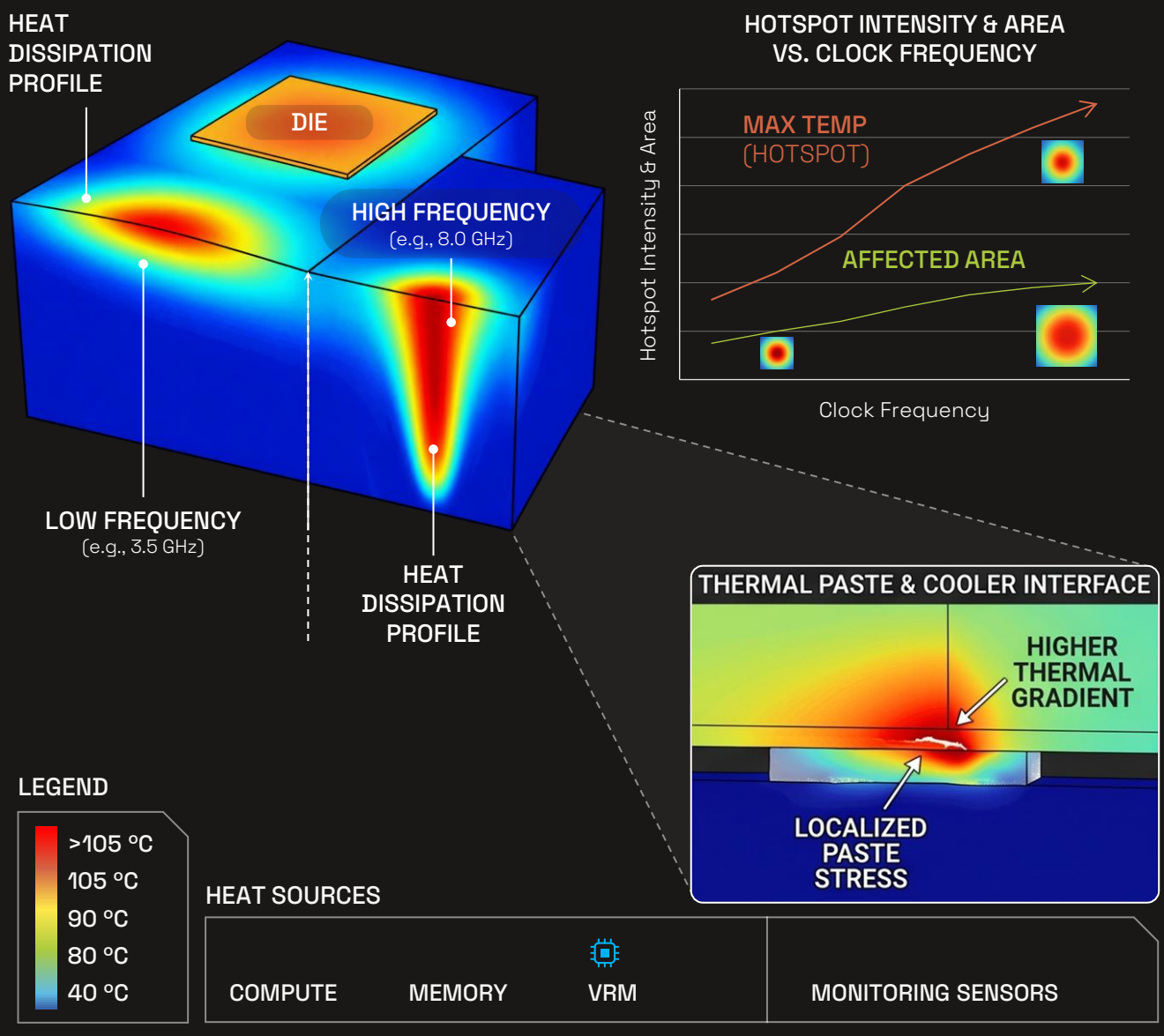
ANALYSIS OF HOTSPOT: TIME & FREQUENCY DOMAINS

FREQUENCY RESPONSE

HIGH FREQUENCY

GaN Power Amplifiers: Substrate-Level Thermal Extraction
In RF power amplifiers, heat is generated inside sub-micron 2DEG channels. Because the heat source dimensions are comparable to phonon mean free paths, bulk conduction never initiates unless the material directly under the channel has extreme thermal conductivity. Diamond acts as a near-junction substrate, eliminating the high thermal resistance of conventional SiC or sapphire. The technological win here is pure junction temperature reduction (), enabling higher breakdown voltages, higher RF power output density per millimeter of gate periphery, and vastly improved mean time to failure (MTTF).

THERMAL BEHAVIOR VS. OPERATIONAL FREQUENCY (Clock Speed)



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