

IC Design for Extreme Conditions

Agency for Science, Technology and Research (A*STAR) Technical Capabilities

Radiation-Hardened ICs	RISC-V Compute Core	• 50 MHz RISC-V Controller • Cache memory: 16 KB • On-chip memory: 128 KB SRAM • Interface: SDIO, SPI, I2C, UART • Max clock speed: 50 MHz • Process: 55 nm BCD-Lite • Foundry: GlobalFoundries
	Test and Characterisation	• SEU & SEFI radiation event: 15 MeV/mg/cm² • Max error rate for execution: 1% • Single-event-latchup SEL: 60 MeV-cm²/mg
mmWave ICs	Beamformer	K/Ka Band BFIC • Min Tx P1dB: 11 dBm • Max Rx Noise Figure: 2.5 dB • Max Gain/Phase RMS Error: 0.3 / 2 dB° • Max Rx/Tx Power/Ch: 40 / 90 mW • Process: 130 nm SiGe • Foundry: GlobalFoundries K-Q/V Band BFIC • Min Tx P1dB: 11 dBm • Max Rx Noise Figure: 4.7 dB • Max Gain/Phase RMS Error: 0.3 / < 2 dB° • Max Rx/Tx Power/Ch: 65 / 100 mW • Process: 130 nm SiGe • Foundry: GlobalFoundries
	Power Amplifier	Ku-Band 10 W PA • Min PAE at P_{SAT}: 25% • Process: 0.1 µm GaN-on-Si • Foundry: Macom Ku-Band 18 W PA • Min PAE at P_{SAT}: 35% • Process: 0.15 µm GaN-on-SiC • Foundry: UMS X-Band 1 W PA • Min PAE at P_{SAT}: 28% • Process: 0.25 µm GaAs • Foundry: WIN Semi

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mmWave ICs	Test and Characterisation	• Max PA output power: 20 W • Temperature range: -40 to 85 °C • Max single sweep RF characterisation up to 67 GHz, extender up to 300 GHz • Wafer probe station
Cryogenic ICs	Control and Readout	• Cryo-aware SPICE modelling and mixed-signal IP design • 20-bit DAC for DC biasing • Arbitrary microwave pulse generator (< 10 mW) • 100 MHz RISC-V controller • FPGA-based qubit state recognition • Real-time surface code error decoder (distance d < 21) • Process: 40 nm CMOS / 28 nm CMOS / 22 nm FDSOI • Foundry: UMC / TSMC / GlobalFoundries
	Test and Characterisation	• Max DC current resolution: 1 pA • Max noise voltage down to 4 K: 1 uV • Temperature range: 1 to 300 K • Close-loop continuous measurement system • Signal bandwidth from DC to 60 GHz



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