

# HIGH DENSITY

## INTERCONNECT PACKAGING

WE BUILD **HIGH PERFORMANCE**

ELECTRICAL INTERCONNECTS WITH PROPRIETARY DESIGNS

ELECTRICAL PERFORMANCE

SUPERIOR HEAT DISSIPATION

TAILORED TO YOUR NEEDS

HIGH BANDWIDTH

DEVELOPMENT ASSEMBLY & TEST **PARTNER**



COLLABORATIVE & TECHNICAL **TEAM**

LONG-STANDING LEADERSHIP



INTEGRATION OF RF/ANALOG

OPTIMAL YIELD



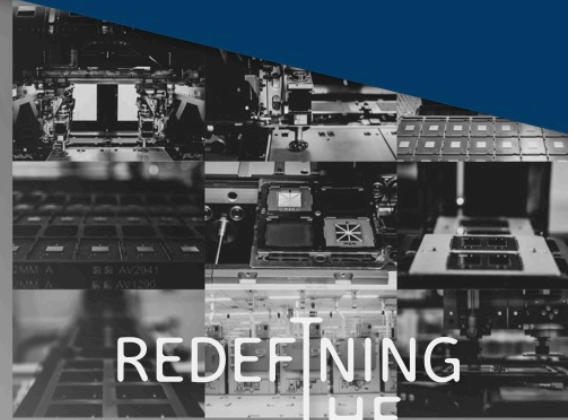
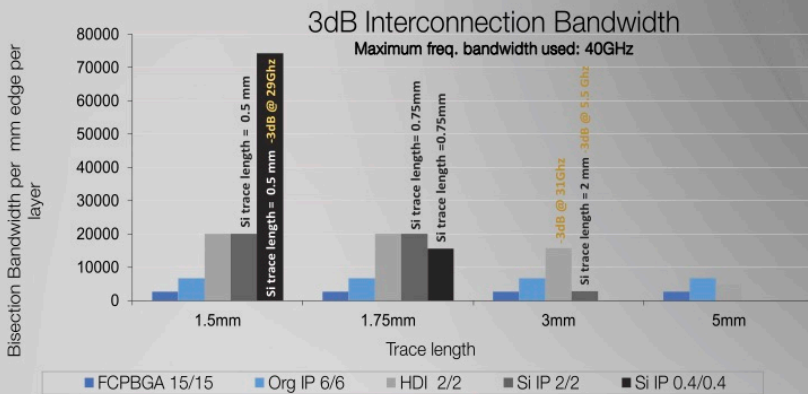
SIMPLIFIED DESIGNS

SIGNAL INTEGRITY

BENCHMARK FLIP-CHIP PROCESS



FOLLOWING DATA REFLECTS CURRENT TESTED ENVELOPE BUT **OFFERING IS NOT LIMITED TO THESE DESIGN**



REDEFINING THE LIMITS

PACKAGING AND TEST  
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Design rules	FCPBGA	Org interposer	HDI laminate	Si interposer	
lv/ls	15 / 15 $\mu$ m	6 / 6 $\mu$ m	2 / 2 $\mu$ m	2 / 2 $\mu$ m	0.4 / 0.4 $\mu$ m
Line / Dielectric Thickness	15 / 33 $\mu$ m	6 / 8 $\mu$ m	2 / 3-5 $\mu$ m	3 / 1 $\mu$ m	1 / 1 $\mu$ m
Die to die connections per mm <sup>2</sup> layer	33	83	250	250	1250
Die to die spacing	1 to 3 mm	1 to 3 mm	1 to 2 mm	~0.1 mm	~0.1 mm

ORG INTERPOSER    HDI LAMINATE    SI INTERPOSER

Wiring Layer needed	5-6	2	1
Die to HBM trace length	3 to 10 mm	3 to 5 mm	2 to 4 mm
MAX trace length (Jedec capacitance spec)	~ < 11.5 mm	~ < 14.0 mm	~ < 7.0 mm
Loss (dB/per mm) (@ 1GHz)	~ 0.15	~0.24	~ 0.33



DESIGN POINT	HDI LAYERS ON LAMINATE (2.1D)	HDI LAMINATE (2.1D)	ORGANIC INTERPOSER
Min Die pitch	40 $\mu$ m	40 $\mu$ m	40 $\mu$ m
Line Space/width	2/2 $\mu$ m	6/6 $\mu$ m	6/6 $\mu$ m
# of layers tested	4 layers thin film on standard laminate 5-2-6	7 -2-7 (all high density)	7 -2-7 (all high density)
Die size tested	23 x 28 mm + 4 HBMs	23 x 28 mm + 4 HBMs	23 x 28 mm
Laminate size	50 mm	50 mm	37.5 mm
Interposer/carrier pitch & thickness	NA	NA	185 $\mu$ m – 500 $\mu$ m
Core thickness	600 – 1200 $\mu$ m	600 – 1200 $\mu$ m	200 $\mu$ m
Thermal	Formed, coined lids < 2 mm thick for air cooled applications (150W)	Formed, coined lids < 2 mm thick for air cooled applications (150W)	Formed, coined lids < 2 mm thick for air cooled applications (150W)
Chip to chip spacing	200 $\mu$ m (mechanical), 500 $\mu$ m (recommended thermal)	200 $\mu$ m (mechanical), 500 $\mu$ m (recommended thermal)	200 $\mu$ m (mechanical), 500 $\mu$ m (recommended thermal)
Yield	Comparable to 2D	Comparable to 2D	Comparable to 2D
Warpage	Comparable to 2D	Comparable to 2D	Subassembly test option
Reliability	800 $\mu$ m and 1200 $\mu$ m core mech, DTC* 1000 cycles	800 $\mu$ m and 1200 $\mu$ m core mech, DTC* 1000 cycles	Better than Si interp.