DRAWING NO. 490081

B	ECN 45062 EAR Update per changes made to 400000	11/25/2008	PL
C	ECN 46643 EAR Update per changes made to 400000	11/5/2010	PL
D	ECN 47977 EAR Update per changes made to 400000	1/29/2013	PL
E	ECN 48455 JR Update per changes made to 400000	9/19/2013	PL
F	ECN 52207 Update per changes made to 400000 JA	12/1/2022	KC

MULTI-MIX®
ENGINEERING DESIGN GUIDELINES FOR CUSTOMERS

ALL SHEETS ARE THE SAME REVISION NUMBER

APPROVALS	
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CHECKED BY	
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Q/A	
N HOLDEN 08/03/07	

MERRIMAC INDUSTRIES, INC.
41 FAIRFIELD PLACE, WEST CALDWELL, NJ 07006

MULTI-MIX® ENGINEERING DESIGN GUIDELINES FOR CUSTOMERS

SIZE	CAGE CODE	DRAWING NUMBER	REVISION
A	12457	490081	F

SCALE	NONE	SHEET	1	OF	3

Multi-Mix® Technology

Part Sizes	
Part Size Diagonal	0.25" to 20.5"
Typical Total Part Thickness	0.005" to ≤ .250"
Advanced Total Part Thickness	>.250" (Feature Dependent)
Part Construction	
Laminate Materials	
Ceramic PTFE Composites	Rogers 3000 & 6000 Series (Ohmega-Ply if required)
Glass Reinforced Hydrocarbon/Ceramic	Rogers 4000 Series (Ohmega-Ply if required)
Polyimide	DuPont Pyralux AP
Metals	Aluminum, Copper, Brass
Typical Number of Layers	1 to ≤ 50
Surface Finish	Annealed Electrolytic Matte Tin Electrolytic Gold over Electrolytic Nickel Hot Air Solder Level Electrolytic Tin/Lead (outside service) Immersion Tin Electrolytic Silver
Fabrication Technology	
Drilling/Routing	Multi-Head High Speed X-Ray/Camera Alignment
Hole Preparation	Plasma Etching
Lamination	Dry Film
Exposure	Double Sided, Direct Imaging
Develop	Conveyor, Rotary
Material Plating	
Electrolytic	Copper, Tin, Nickel, Gold, Silver, Tin/Lead (Outside Service)
Electroless	Copper
Immersion	Tin
Etching	Ferric Chloride or Ammonium Chloride Conveyor, Rotary Ferric Chloride
Bonding	Primarily Fusion or Film in Autoclave
DC Continuity	Flying Probe Testing System
Via Fill	Non-Conductive Via Fill
Multi-Mix® Engineering Design Guidelines Attached	

DRAWING NO. 490081

	Multi-Mix Technology Design Guidelines	Typical	Advanced
		mils	
1	Min Line & Gap Width (≤ .7 mils Cu thickness to Etch)	6	4
2	Min Line & Gap Width (> .7 mils to < 2 mils Cu thickness to Etch)	10	6
3	Etch tolerance for ≤ 1.4 mils (2.1 mils oz. Feature Dependent)	±.5	±.5
4	Etch tolerance for > 2.1 mils. (Standard Panel Plating, Cu thickness dependent)	±1	±.75
5	Min Annular Ring Width for Via	10	5
6	Min Drilled & Plated Via Dia	10	8
7	Recessing of Circuit Features from Machined Edges	10	
8	Max Aspect Ratio (Layer Thickness/Via Dia)	4:1	
9	Max Aspect Ratio (Bonded Assembly Thickness/Via Dia)	4:1	≤10:1
10	Router, Min Internal Radius	10	
11	Via to Via Machining Accuracy	±2	
12	Finished Via Dia Machining Accuracy	±1	
13	Via to Pattern Machining Accuracy	±2	
14	Via edge concentricity from edge of Annular Ring	≥2	
15	Route to Pattern Machining Accuracy	±5	
16	Layer Front to Back Registration Accuracy	±1	±.5
17	Min Edge to Edge Via Spacing in Layer	20	
18	Min Edge to Edge Thru Ground Via Spacing in Bonded Assembly	30	
19	Layer to Layer Registration (9”x12”&12”x18” Layer)	6	
20	Current Largest Layer Size	12”x18”	
21	Min Depth of Castellation (Edge Wraps) into Edge of Unit	7	
22	Min Cavity Distance from Edge of Unit	60	
23	Min Thru Via Outer Dia Distance from Edge of Cavity	30	
24	Min Thru Via Outer Dia Distance from Edge of Unit/Layer Via Pad	15/30	
25	Min Distance: Layer Via Pad/Trace Edge from Unit/Cavity Edge	30	
26	Max Consecutive Via Stack-Ups ≤ 20/25-60 mils Thick Layers	3/2	
27	Max Unit Thickness w/Post Bonded Top & Bottom Features	250	500
28	Min Cu Via Wall Thickness	1	.59*
29	Max Cu Plating Thickness Variation on Layer Plated 9”X12”/12”X18” Layers	0.4	
30	Min Cu Thickness of Layers for Fusion Bonding	0.7	

***Applies to microvias per IPC-6018 Class 3**