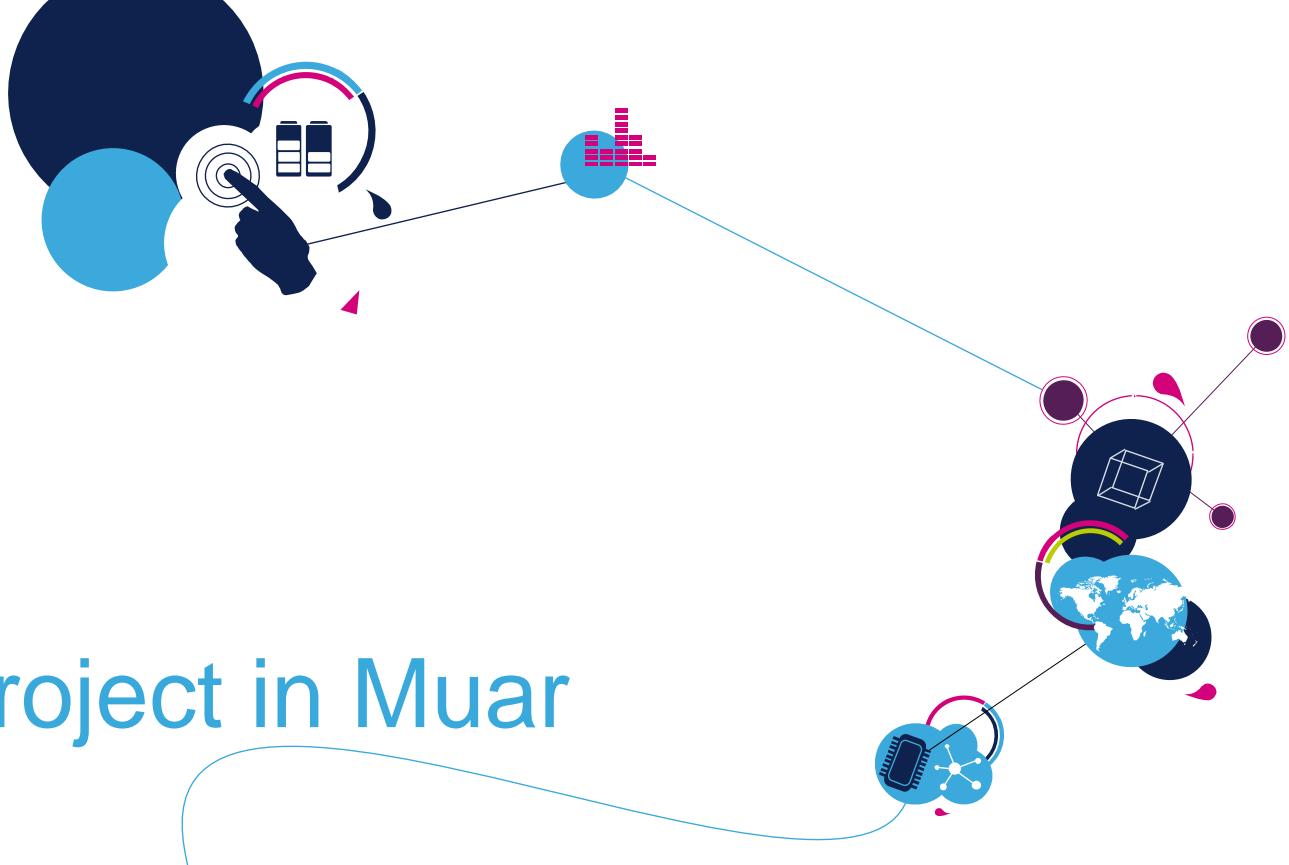


PRODUCT/PROCESS CHANGE NOTIFICATION

SUBJECT SO-20 Products (Gold wire): Migration to SO20 IDF (Inter Digit Frame) line with new BOM and matte Tin plating process

IMPACTED PRODUCTS	ST Commercial Products: <table border="1"> <tr><td>L9333MD</td><td>L9380-TR-LF</td><td>TDA7418</td><td>MAR9125013TR-E</td></tr> <tr><td>MAR9108TR-E</td><td>TDA7418TR</td><td>L9339</td><td>MAR9144TR</td></tr> <tr><td>L93PI</td><td>L9339-TR</td><td>L9380-LF</td><td>E-L9338MD/TR</td></tr> <tr><td>L9333MD-TR</td><td>MAR9134013TR</td><td>E-L9338MD</td><td></td></tr> </table>	L9333MD	L9380-TR-LF	TDA7418	MAR9125013TR-E	MAR9108TR-E	TDA7418TR	L9339	MAR9144TR	L93PI	L9339-TR	L9380-LF	E-L9338MD/TR	L9333MD-TR	MAR9134013TR	E-L9338MD	
L9333MD	L9380-TR-LF	TDA7418	MAR9125013TR-E														
MAR9108TR-E	TDA7418TR	L9339	MAR9144TR														
L93PI	L9339-TR	L9380-LF	E-L9338MD/TR														
L9333MD-TR	MAR9134013TR	E-L9338MD															
IMPACTED MANUFACTURING STEPS	Assembly																
INVOLVED PLANTS	ST Muar (Malaysia)																
CHANGE REASON	Company Road Map																
CHANGE DESCRIPTION	<p>Migration to Inter Digit Frame line. Below summary of changes:</p> <ul style="list-style-type: none"> From Pre-Plated Frame (PPF) to Matte Tin Plating Process Copper frame (SpAg/RgAg/SelAg) with ME2 treatment for rough surface Resin Sumitomo EME-G633CA Glue Loctite Ablestik ABP8302 <p>No Changes Bonding Wire Material and Diameter</p> <p>Details included below</p>																
TRACEABILITY	Dedicated Finished Good Code:																
REPORTS	11215 Validation SO20IDF.pdf																



SO20 IDF Project in Muar

- Migration to IDF line and new BOM introduction
- From Pre-Plated Frame (PPF) to Matte Tin Plating Process

November, 2018

Change description

Migration from SO20 Matrix to High Density Line IDF (Inter Digit Frame)

New Bill of Material (BOM)

- Copper frame (SpAg/RgAg/SelAg) with ME2 treatment for rough surface
- Resin Sumitomo EME-G633CA
- Glue Loctite Ablestik ABP8302

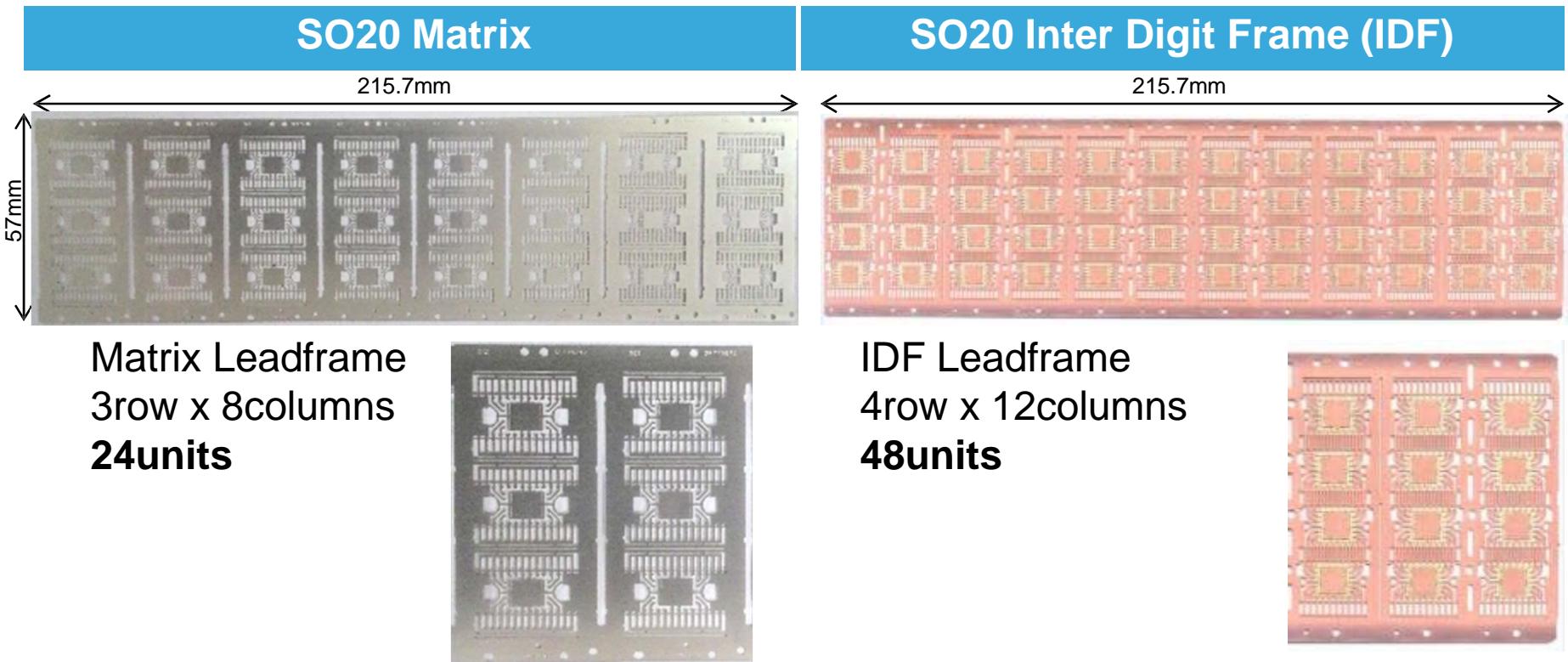
No Changes Bonding Wire Material and Diameter

ME2 treatment has been introduced in order to improve the die attach material adhesion to the lead frame die pad.

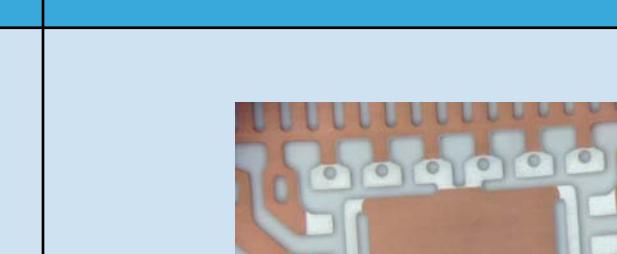


Matte Tin plating process introduction

SO20 IDF Line



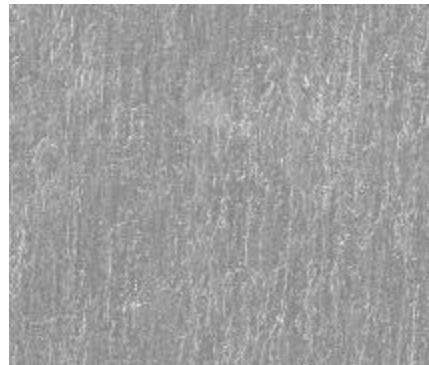
Existing frame vs ME2

Adv.Micro PPF	IDF + Cu pad (with ME2)
	

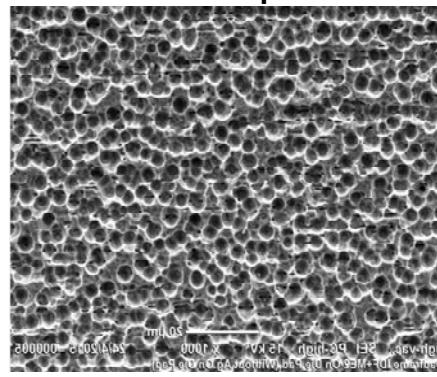
Lead tip



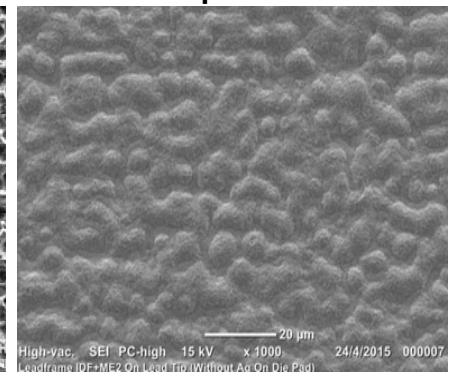
On die pad



On die pad



Lead tip

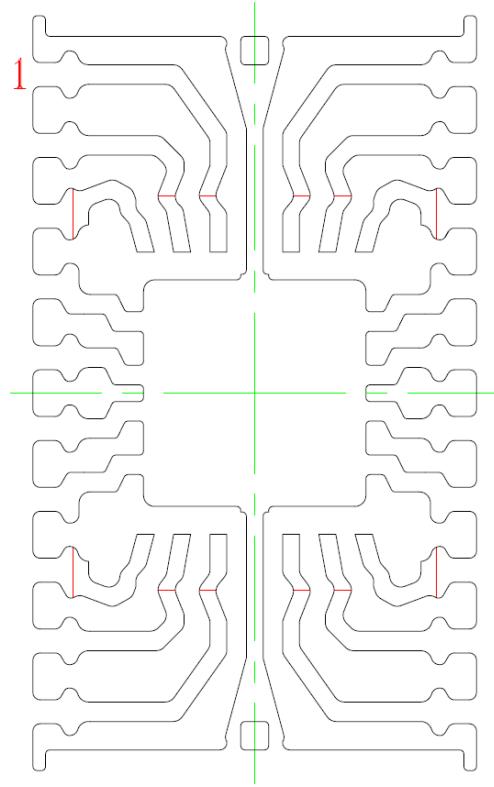


SEM images

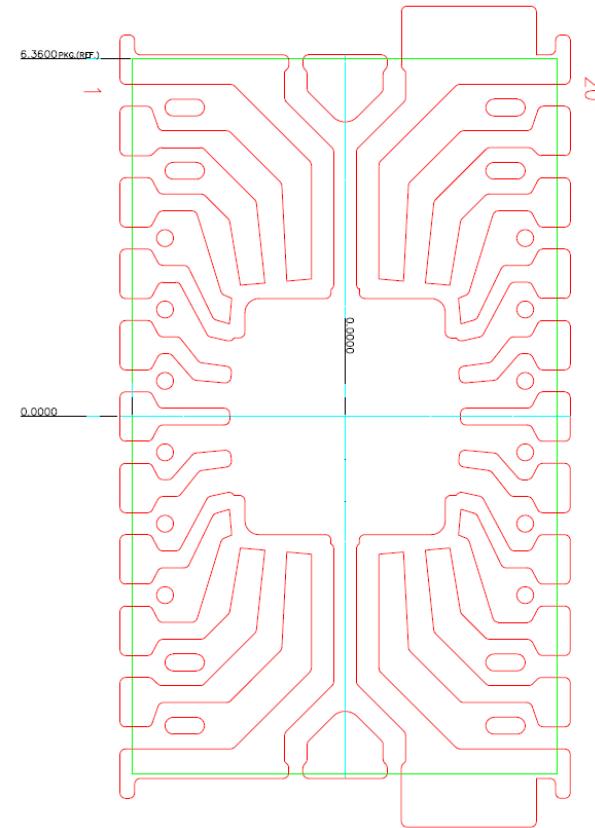
[Note: SEM Mag 1000X]

Leadframe drawing comparison

ST Line: U750, U538



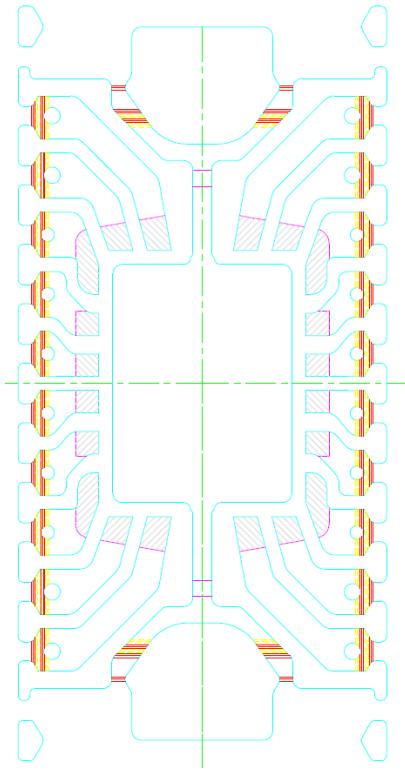
Current leadframe
die pad 157x160mils



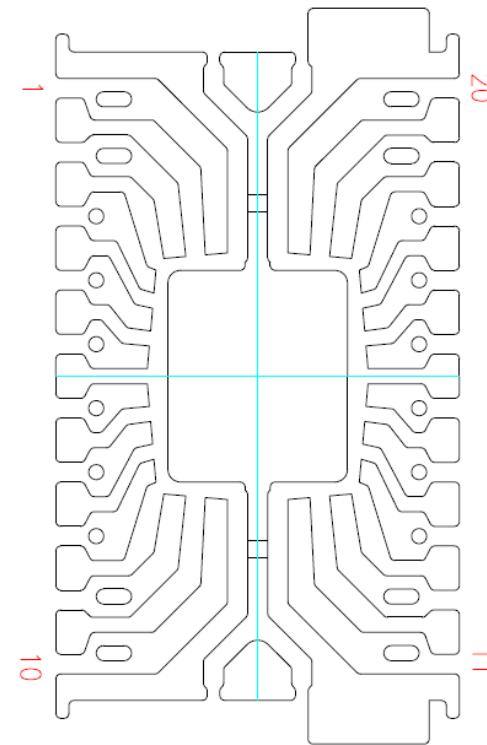
New leadframe
die pad 140x165mils

Leadframe drawing comparison

ST Line: UF34



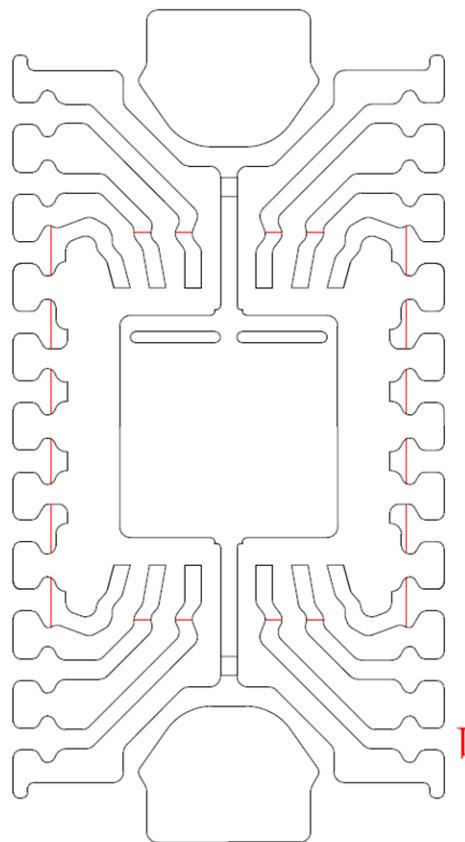
Current leadframe
die pad 150x200 mils



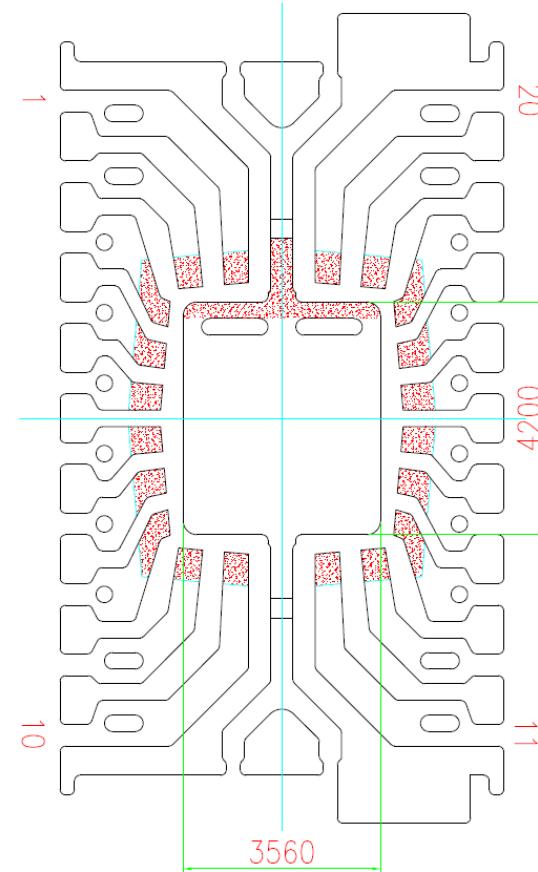
New leadframe
die pad 140x165 mils

leadframe drawing comparison

Product Line: U569, U717



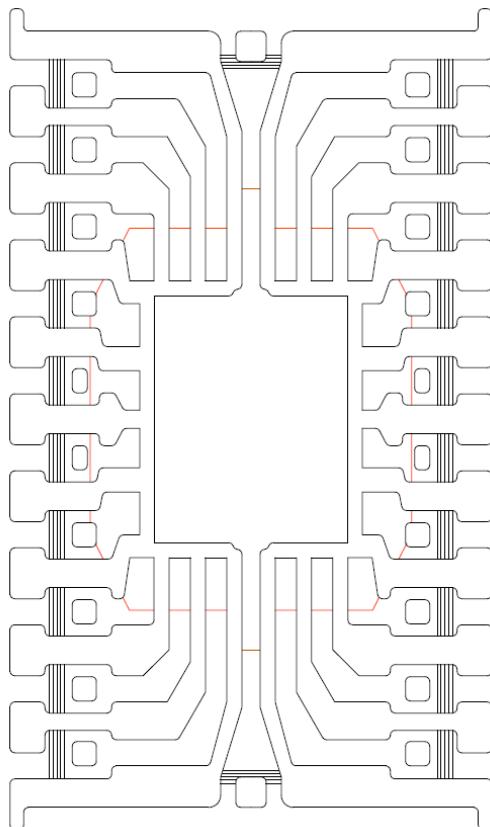
Current leadframe
die pad 157x160mils



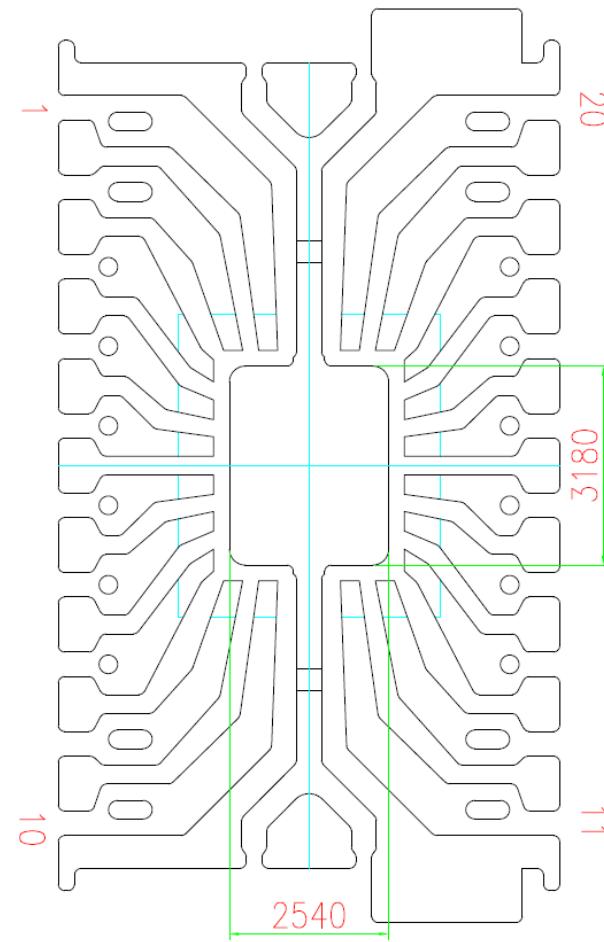
New leadframe
die pad 140x165mils

leadframe drawing comparison

Product Line: UH03



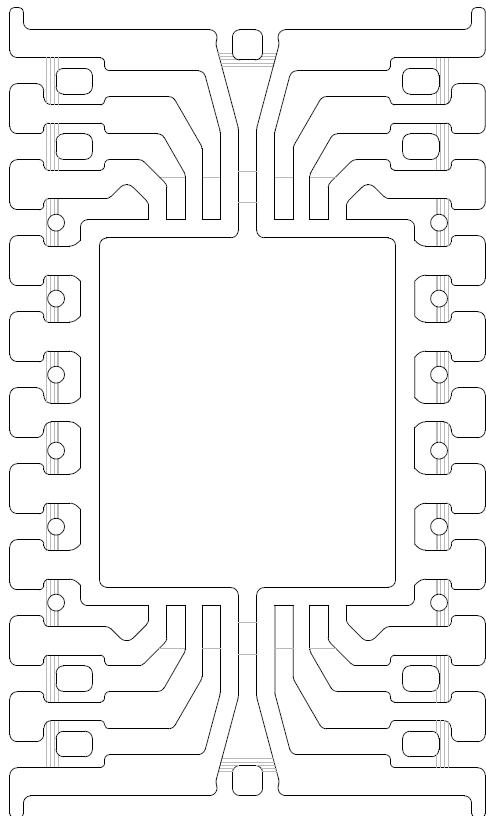
Current leadframe
die pad 125x160mils



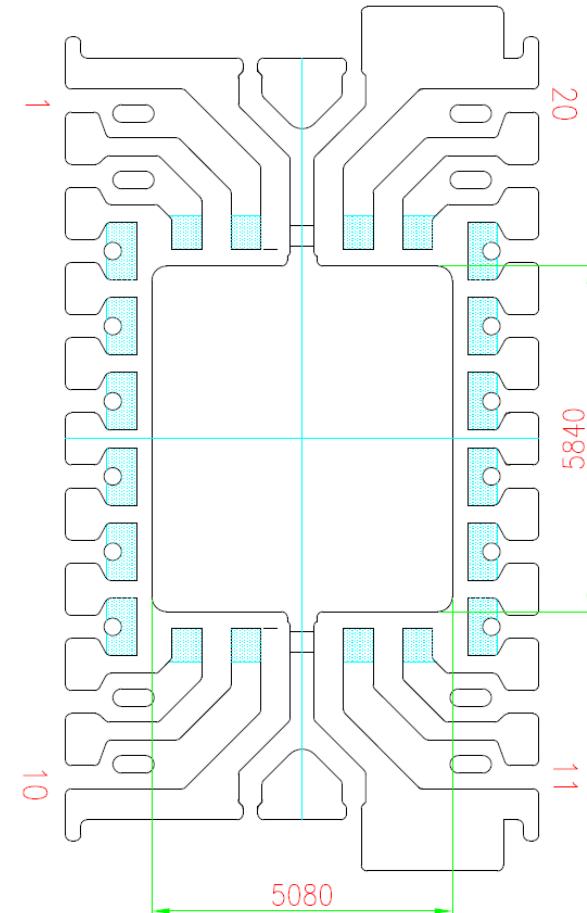
New leadframe
die pad 100x125mils

leadframe drawing comparison

Product Line: A108, A205, A139



Current leadframe
die pad 195x230mils



New leadframe
die pad 200x230mils

Leadframe Comparison

ITEM	EXISTING	NEW
Frame size	(215.7 x 57 mm)	(215.7 x 57 mm)
Units/Strip	24	48
Inner Lead Plating	PPF (NiPdAuAg or TNPD)	Selective Ag or Ring Ag
Frame base material	C194	C194
Frame process	Etched	Stamped
Plating	PPF (NiPdAuAg or TNPD)	Sn
Leadframe Supplier	DCI	ASM
Surface treatment	No	ME2



ME2: Micro Etching Version 2



Public Products List

Public Products are off the shelf products. They are not dedicated to specific customers, they are available through ST Sales team, or Distributors, and visible on ST.com

PCN Title : SO-20 Products (Gold wire): Migration to SO20 IDF (Inter Digit Frame) line with new BOM and matte Tin plating process

PCN Reference : ADG/18/11215

Subject : Public Products List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

L9333MD	L93PI	L9333MD-TR
L9380-TR-LF	TDA7418TR	L9339-TR
TDA7418	L9339	L9380-LF
E-L9338MD	E-L9338MD/TR	



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VALIDATION REPORT

SO-20 Products Migration to SO20 IDF (Inter Digit Frame) line with new BOM and matte Tin plating process

Reliability evaluations overview

Objective

This is the summary of reliability trials performed in order to validate the SO-20 Products Migration to SO20 IDF (Inter Digit Frame) line with new BOM and matte Tin plating process.

Results

Based on the overall positive results on below mentioned TVs we consider the change qualified

Product Line	W023	A108	UB63	U447
FE Technology	Bipolar	HF3CMOS	BCD2	BCD3
FE Diffusion Fab	AMK6 (Singapore)	AMK6 (Singapore)	AMK6 (Singapore)	AMK6 (Singapore)
Die size (un)	2160x1960	4420x2980	3500x3100	4120x2510
Passivation	SiN/POLYIMIDE	P-VAPOX(SiO ₂) / NITRIDE (SiN)	P-VAPOX (Si glass)	USG-PSG-SiON-PIX
Die finishing back	CHROMIUM/NICKEL	Raw Silicon	Raw Silicon	Raw Silicon
L/F description	SO 20 IDF	SO 20 IDF	SO 20 IDF	SO 20 IDF
Wire diameter (mils)	Au 1.3	Au 1.3	Au 1.3	Cu 2.0
Molding compound	EME-G633CA	EME-G633CA	EME-G633CA	EME-G633CA
Die attach	LOCTITE ABLESTIK ABP8302	LOCTITE ABLESTIK ABP8302	LOCTITE ABLESTIK ABP8302	LOCTITE ABLESTIK ABP8302

Validation was done according to AEC_Q100 Rev.H using above mentioned Test Vehicles

In the below table the applied stress test as well as a comparison between the AEC-Q100 and ZVEI Requirement is reported:

	Test Group A										Test Group B					Test Group C					Test Group D								Test Group E							
	THB	AC	TC	PTC	HTSL	HTOL	ELFR	WBS	WBP	SD	PD	EM	TDBB	HCI	NBTI	SM	HBM	CDM	LU	ED	GL	EMC	SC													
AEC-Q100	x	x	x		x	x	x	x	x	x	x									x																
ZVEI	x	x	x		x	x	x	x	x	x	x									x																
ST	x	x	x		x	x	x	x	x	x	x									x																

Traceability

Wafer fab information				
	W023	A108	UB63	U447
Wafer fab manufacturing location	AMK6 (Singapore)	AMK6 (Singapore)	AMK6 (Singapore)	AMK6 (Singapore)
Wafer diameter(inches)	6	6	6	6
Silicon process technology	Bipolar	HF3CMOS	BCD2	BCD3
Die finishing back side	CHROMIUM/NICKEL	Raw Silicon	Raw Silicon	Raw Silicon
Die size (un)	2160x1960	4420x2980	3500x3100	4120x2510
Metal levels /materials	2 / AlSiCu	2 / Ti AlSiCu TiN	2 / AlSiCu	2 / AlSiCu
Passivation (front side)	SiN/POLYIMIDE	P-VAPOX(SiO2) / NITRIDE (SiN)	P-VAPOX (Si glass)	USG-PSG-SiON-PIX

Assembly Information				
	I6Z7*W023FB6	I6Z7*A108BD6	I6Z7*UB63BB6	I9Z7*U447CA6
Assembly plant location	ST Muar	ST Muar	ST Muar	ST Muar
Package description	SO 20 IDF	SO 20 IDF	SO 20 IDF	SO 20 IDF
Molding compound	EME-G633CA	EME-G633CA	EME-G633CA	EME-G633CA
Wires bonding material/diameter	Au 1.3	Au 1.3	Au 1.3	Cu 2.0
Die attach material	LOCTITE ABLESTIK ABP8302	LOCTITE ABLESTIK ABP8302	LOCTITE ABLESTIK ABP8302	LOCTITE ABLESTIK ABP8302
Assembly Lots #	997150KS01	9964318802	996221T101	996451F5RP
	997150KS02		996221T1RQ	996451F5RQ
	9973914201		996221T1RR	996451F5RR

Reliability qualification plan and results

Test group A: Accelerated Environment Stress					
AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
A1	PC Pre Cond	Preconditioning according to JedecJESD22-A113F including 5 Temperature Cycling Ta=-40°C/+60°C Reflow according to leve 3 Jedec JSTD020D-1 100 Temperature Cycling Ta=-50°C/+150°C	Before THB, AC,TC,HTOL		
A2	THB Temp Humidity Bias	Ta=85°C, H=85%V, cc=24Vfor 1000hours	77/3	0/77/3	A108 excluded
A3	AC Autoclave	ENV. SEQ. Enviromental Sequence TC (Ta=-65°C+/ 150°Cfor 100 cycles) + AC (Ta=121°C, Pa=2atm for 96 hours)	77/3	0/77/3	Each Test vehicle
A4	TC Temp. Cycling	Ta=-65°C+/ 150°C for 500 cycles	77/3	0/77/3	Each Test vehicle
A5	PTC Power Temp. Cycling	Ta=-40°C+/ 125°C for 1000 cycles	N/A	N/A	
A6	HTSL High Temp. Storage Life	Ta=150°C for 1000 hours	77/3	0/77/3	Each Test vehicle

Test group B: Accelerated Lifetime Simulation

AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
B1	HTOL High Temp. Op Life	Bias Dynamic stress (JESD22- A108) Ta=125°C, Vcc=28V for 1000 hours	77/3	0/77/3	A108 excluded
B2	ELFR Early Life Failure Rate	Part submitted to HTOL per JESD22-A108 requirements; GRADE1: 24hours at 150°C	1000/3	0/1000/3	U447 only
B3	EDR Endurance Data Retention	Only for memory devices	N/A	N/A	

Test group C: Package Assembly Integrity

AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
C1	WBS Wire Bond Shear	Per AEC-Q100-001	30/3	0/30/3	Each Test vehicle
C2	WBP Wire Bond Pull	Per MIL-STD883, M2011 Condition C o D	30/3	0/30/3	Each Test vehicle
C3	SD Solderability	Wetting balance	10/3	0/10/3	Each Test vehicle
C4	PD Physical Dimensions		10/3	0/10/3	Each Test vehicle
C5	SBS Solder Ball Shear	Only for BGA package	N/A	N/A	
C6	LI Lead Integrity	Not required for Surface Mount Devices			

Test group D: Die Fabrication Reliability

AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
D1	EM Electromigration		N/A	N/A	
D2	TDDB Time Dependent Dielectric Breakdown		N/A	N/A	
D3	HCI Hot Carrier Injection		N/A	N/A	
D4	NBTI Negative Bias Temperature Instability		N/A	N/A	
D5	SM Stress Migration		N/A	N/A	

Test group E: Electrical Verification

AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
E2	ESD HBM	HBM=[R=1.5kΩC, t=150pF]	N/A	N/A	
E3	ESD CDM		N/A	N/A	
E4	LU Latch-Up	Injection current ±100mA Over voltage 1.5 x V _{op} max	N/A	N/A	
E5	ED Electrical Distributions		30/3	0/30/3	U447 only
E7	CHAR Characterization		N/A	N/A	
E8	GL Gate Leakage		N/A	N/A	
E9	EMC Electromagnetic Compatibility		N/A	N/A	
E10	SC Short Circuit Characterization	According to AEC-Q100-012	N/A	N/A	

Test group F: Defects Screening Tests

AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
F1	PAT Process Average Testing				
F2	SBA Statistical Bin/Yield Analysis				Not performed. Implemented in production

Test group G: Cavity Package Integrity Tests

AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
G1	MS Mechanical Shock				
G2	VFV Variable Frequency Vibration				
G3	CA Constant Acceleration				
G4	GFL Gross/Fine Leak				
G5	DROP Package Drop				Not Applicable: Not for plastic package devices
G6	LT Lid Torque				
G7	DS Die Shear				
G8	IWV Internal Water Vapor				