

LM2904AVQPWRG4Q1

Quality, reliability & packaging data download

Status: ACTIVE

Report date: 03/20/2024



Assembly site: TI MALAYSIA A/T

RoHS	Yes
REACH	Yes
Device marking	2904AVQ
Lead finish/Ball material	NIPDAU
MSL rating/Peak reflow	Level-1-260C-UNLIM
Rating	Automotive

## Material content

Homogeneous Material Level				Component Level			
Component	Substance	CAS Number	Amount (mg)	Percentage %	ppm	Percentage %	ppm
<b>Bond Wire</b>							
Copper and Its Alloys	Copper	7440-50-8	0.03228	97.584570	975846	0.079295	793
Not Categorized	Proprietary Materials	—	0.000004	0.012092	121	0.000010	0
Precious Metals	Palladium	7440-05-3	0.000794	2.400314	24003	0.001950	20
Precious Metals	Silver	7440-22-4	0.000001	0.003023	30	0.000002	0
Sub-total	—	—	0.033079	100	1000000	0.081258	813
<b>Die Attach Adhesive</b>							
Precious Metals	Silver	7440-22-4	0.222929	80.000072	800001	0.547620	5476
Thermoplastics	Epoxy	85954-11-6	0.055732	19.999928	199999	0.136904	1369
Sub-total	—	—	0.278661	100	1000000	0.684525	6845
<b>Lead Frame</b>							
Copper and Its Alloys	Copper	7440-50-8	18.024088	97.427497	974275	44.275789	442758
Copper and Its Alloys	Iron	7439-89-6	0.43475	2.350000	23500	1.067954	10680
Copper and Its Alloys	Phosphorus	7723-14-0	0.015263	0.082503	825	0.037493	375
Other Nonferrous Metals and Alloys	Lead	7439-92-1	0.002775	0.015000	150	0.006817	68
Zinc and Its Alloys	Zinc	7440-66-6	0.023125	0.125000	1250	0.056806	568
Sub-total	—	—	18.500001	100	1000000	45.444859	454449
<b>Lead Frame Plating</b>							
Nickel and Its Alloys	Nickel	7440-02-0	0.060877	95.120313	951203	0.149543	1495
Precious Metals	Gold	7440-57-5	0.000499	0.779688	7797	0.001226	12
Precious Metals	Palladium	7440-05-3	0.002624	4.100000	41000	0.006446	64
Sub-total	—	—	0.064000	100	1000000	0.157215	1572
<b>Mold Compound</b>							
Other Inorganic Materials	Silica	7631-86-9	17.782779	84.999998	850000	43.683019	436830
Other Organic Materials	Carbon Black	1333-86-4	0.104605	0.500002	5000	0.256960	2570
Thermoplastics	Epoxy	85954-11-6	3.033533	14.500000	145000	7.451809	74518
Sub-total	—	—	20.920917	100	1000000	51.391788	513918
<b>Semiconductor Device</b>							
Ceramics / Glass	Doped Silicon	7440-21-3	0.912019	100.000000	1000000	2.240355	22404
Sub-total	—	—	0.912019	100	1000000	2.240355	22404
Total	—	—	40.708677	—	—	100	1000000

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				Homogeneous Material Level		Component Level	
Component	Substance	CAS Number	Amount (mg)	Percentage %	ppm	Percentage %	ppm
<b>Bond Wire</b>							
Copper and Its Alloys	Copper	7440-50-8	0.024673	97.533304	975333	0.060890	609
Not Categorized	Proprietary Materials	—	0.000003	0.011859	119	0.000007	0
Precious Metals	Gold	7440-57-5	0.000013	0.051389	514	0.000032	0
Precious Metals	Palladium	7440-05-3	0.000607	2.399494	23995	0.001498	15
Precious Metals	Silver	7440-22-4	0.000001	0.003953	40	0.000002	0
Sub-total	—	—	0.025297	100	1000000	0.062430	624
<b>Die Attach Adhesive</b>							
Precious Metals	Silver	7440-22-4	0.081373	80.000197	800002	0.200819	2008
Thermoplastics	Epoxy	85954-11-6	0.020343	19.999803	199998	0.050204	502
Sub-total	—	—	0.101716	100	1000000	0.251023	2510
<b>Lead Frame</b>							
Copper and Its Alloys	Copper	7440-50-8	18.024088	97.427497	974275	44.481394	444814
Copper and Its Alloys	Iron	7439-89-6	0.43475	2.350000	23500	1.072913	10729
Copper and Its Alloys	Phosphorus	7723-14-0	0.015263	0.082503	825	0.037667	377
Other Nonferrous Metals and Alloys	Lead	7439-92-1	0.002775	0.015000	150	0.006848	68
Zinc and Its Alloys	Zinc	7440-66-6	0.023125	0.125000	1250	0.057070	571
Sub-total	—	—	18.500001	100	1000000	45.655893	456559
<b>Lead Frame Plating</b>							
Nickel and Its Alloys	Nickel	7440-02-0	0.060877	95.120313	951203	0.150237	1502
Precious Metals	Gold	7440-57-5	0.000499	0.779688	7797	0.001231	12

Precious Metals	Palladium	7440-05-3	0.002624	4.100000	41000	0.006476	65
Sub-total	—	—	0.064000	100	1000000	0.157945	1579
<b>Mold Compound</b>							
Other Inorganic Materials	Silica	7631-86-9	18.272104	85.000000	850000	45.093469	450935
Other Organic Materials	Carbon Black	1333-86-4	0.107483	0.500000	5000	0.265256	2653
Thermoplastics	Epoxy	85954-11-6	3.117006	14.500000	145000	7.692415	76924
Sub-total	—	—	21.496593	100	1000000	53.051140	530511
<b>Semiconductor Device</b>							
Ceramics / Glass	Doped Silicon	7440-21-3	0.332904	100.000000	1000000	0.821569	8216
Sub-total	—	—	0.332904	100	1000000	0.821569	8216
Total	—	—	40.520511	—	—	100	1000000

## MTBF/FIT estimates

MTBF / FIT				MTBF / FIT supporting data					
MTBF	FIT	Usage temp (°C)	Conf level (%)	Activation energy (eV)	Test temp (°C)	Test duration (hours)	Sample size	Fails	Additional comments
1.6×10 <sup>9</sup>	0.6	55	60	0.7	125	1000	41301	1	—

## Qualification summary

Type	AEC Q100 test #	Test spec	Min lot qty	SS / lot	Test name	Condition	Result	Notes
<b>Test group A - accelerated environment stress test</b>								
THB/HAST	A2	JESD22-A101/JESD22-A110	3	77	Biased HAST	130C/85%RH 96 hours	Pass	Or equivalent Q100 condition
AC/UHAST	A3	JESD22-A102/JESD22-A118	3	77	Unbiased HAST	130C/85%RH for 96 hours	Pass	Or equivalent Q100 condition
TC	A4	JESD22-A104	3	77	Temperature cycle	Per grade requirements. See data sheet.	Pass	—
TC-WBP	A4	MIL-STD883 method 2011	1	30	Post temp cycle bond pull	Per requirements	Pass	As applicable per die configuration
HTSL	A6	JESD22-A103	1	45	High temp storage bake	Per grade requirements. See data sheet.	Pass	—
<b>Test group B - accelerated lifetime simulation test</b>								
HTOL	B1	JESD22-A108	3	77	High temperature operating life	Per grade requirements. See data sheet.	Pass	—
ELFR	B2	AEC Q100-008	3	800	Early life failure rate	Per grade requirements. See data sheet.	Pass	—
<b>Test group C - package assembly integrity tests</b>								
WBS	C1	AEC Q100-001	1	30	Wire bond shear	Cpk > 1.67	Pass	As applicable per die configuration
WBP	C2	MIL-STD883 method 2011	1	30	Wire bond pull	Cpk > 1.67	Pass	As applicable per die configuration
SD	C3	JEDEC J-STD-002	1	15	Solderability	>95% lead coverage	Pass	—

PD	C4	JESD22-B100 and B108	3	10	Physical dimensions	Cpk > 1.67	Pass	—
SBS	C5	AEC Q100-010	3	5 balls from 10 devices	Solder Ball Shear	Cpk > 1.67	Pass	As applicable per die configuration
<b>Test group D - die fabrication reliability tests</b>								
EM	D1	—	—	—	Electromigration	Per technology requirements	Pass	—
Tddb	D2	—	—	—	Time dependent dielectric breakdown	Per technology requirements	Pass	—
HCI	D3	—	—	—	Hot carrier injection	Per technology requirements	Pass	—
BTI	D4	—	—	—	Bias temperature instability	Per technology requirements	Pass	—
<b>Test group E - electrical verification</b>								
HBM	E2	AEC Q100-002	1	3	Electrostatic discharge - human body model	Per AEC Q100-002	<a href="#">See data sheet</a>	—
CDM	E3	AEC Q100-011	1	3	Electrostatic discharge - charged device model	Per AEC Q100-011	<a href="#">See data sheet</a>	—
LU	E4	AEC Q100-004	1	3	Latch-up	Per AEC Q100-004	Pass	As applicable per Q100-004
ED	E5	AEC Q100-009	3	30	Electrical distributions	Per AEC Q100-009	Pass	—

## Ongoing reliability monitoring

### FAB process reliability data

Fab Process	Reliability Test	Rolling Year (1Q2023 - 4Q2023) Sample Size	Cumulative Sample Size	Disposition
BIPOLAR	Life test 125C, 1000 Hours or Equivalent JEDEC Condition	308	17907	Pass

### Assembly process reliability data

Package Family	Reliability Test	Rolling Year (1Q2023 - 4Q2023) Sample Size	Cumulative Sample Size	Disposition
TSSOP	Biased HAST 130C/85%RH, 96 Hours or Equivalent JEDEC Condition	3003	41384	Pass
TSSOP	High temp storage bake 150C, 1000 Hours or Equivalent JEDEC Condition	1683	31583	Pass
TSSOP	Temperature cycle -65/150C, 500 Hours or Equivalent JEDEC Condition	7546	87212	Pass
TSSOP	Unbiased HAST 130C/85% RH, 96 Hours or Equivalent JEDEC Condition	5313	70606	Pass

## Additional resources

[General quality guidelines](#)

[Certifications](#)

[Conflict minerals specialized disclosure report](#)

[Restricted chemical test report](#)

For additional component information, please visit [Material content search](#)

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