PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	ADG/21/12697
1.3 Title of PCN	DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad capacity expansion - TFME (China) - INDUSTRIAL
1.4 Product Category	Power MOSFET HV
1.5 Issue date	2021-03-30

2. PCN Team	
2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Maurizio GIUDICE
2.1.2 Marketing Manager	Paolo PETRALI
2.1.3 Quality Manager	Vincenzo MILITANO

3. Change		
3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New direct material part number (same supplier, different supplier or new supplier), Lead frame base material	TFME (China)

4. Description of change		
	Old	New
4.1 Description	DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad is manufactured in Shenzhen (China)	DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad is also manufactured in TFME (China)
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	no impcat	

5. Reason / motivation for change	
5.1 Motivation	DPAK back-end Capacity Extension
5.2 Customer Benefit	CAPACITY INCREASE

6. Marking of parts / traceability of change	
6.1 Description	By internal traceability and dedicated FG code

7. Timing / schedule	
7.1 Date of qualification results	2021-03-22
7.2 Intended start of delivery	2021-06-23
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	12697 Rel-01-Mar.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2021-03-30

9. Attachments (additional documentations)
12697 Public product.pdf 12697 DPAK 3 mils Al Dual Gauge Matrix Large Die Pad capacity expansion - TFME (China).pdf 12697 Rel-01-Mar.pdf 12697 POA Comparison.pdf

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	STD12N60DM6	
	STD15N60DM6	
	STD16N60M6	

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PCN ADG/21/12697

Catania, March 26 2021

Automotive Discrete Group (ADG)
Power Transistor MACRO-Division
HV Business Unit
Process Change Notification

DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad capacity expansion - TFME (China)

INDUSTRIAL

Dear Customer,

Following the continuous improvement of our service and in order to increase back-end Capacity, this document is announcing we're going to use Tongfu Microelectronics Automatic Assembly/Testing line of DPAK 3 mils Al Gate wire, Dual Gauge, Matrix, Large Die Pad line for selected Power MOSFET HV Transistors. You already received products in DPAK 3 mils Al Gate wire, Dual Gauge, Matrix, Large Die Pad from Shenzhen (China). Products manufactured in Tongfu Microelectronics, guarantee the same quality and electrical characteristics as reported in the relevant data sheets. Devices used for qualification are available as samples.

The involved product series are listed in the table below:

Product Family	Product / Series	Package	Test Vehicle
Power MOSFET HV Transistors	**STDxxx**	**DPAK**	**STD11N60M6 STD15N60DM6**

Qualification program and results availability:

The reliability test report is provided in attachment to this document.

Samples availability:

Samples of the test vehicle devices will be available on request starting from week 15 of 2021.
Any other sample request will be processed and scheduled by HV Business Unit, upon request.

Change implementation schedule:

The production start and first shipments will be implemented after week 25 of 2021 or even earlier, by agreement with the customer.

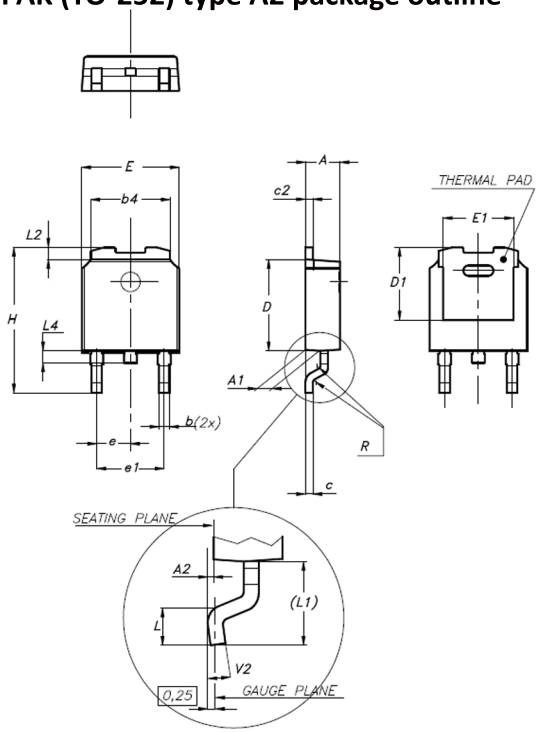
Marking and traceability:

Unless otherwise stated by customer specific requirement, traceability of products manufactured in DPAK of Tongfu Microelectronics (China), will be ensured by internal code (Finished Good) and Q.A. number.

Yours faithfully.

DPAK Large Die Pad STS

DPAK (TO-252) type A2 package outline

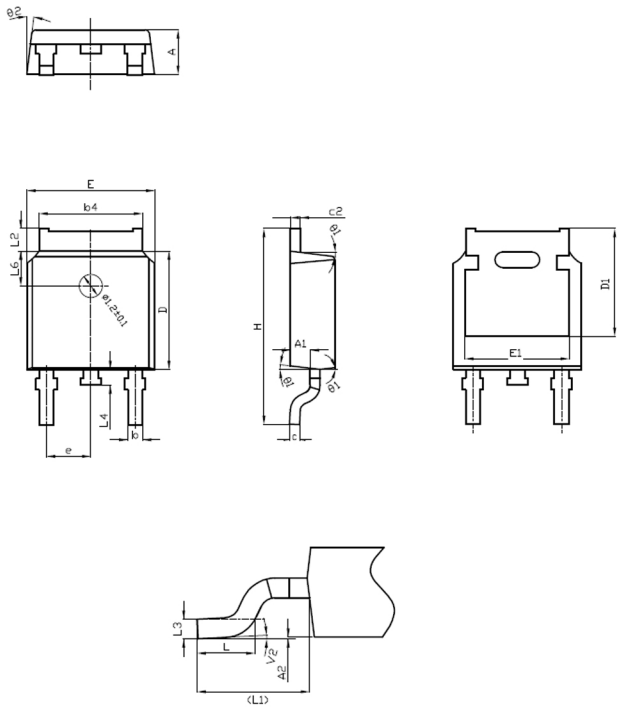


DPAK (TO-252) type A2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.159	2.286	2.413
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

DPAK Large Die Pad TFME

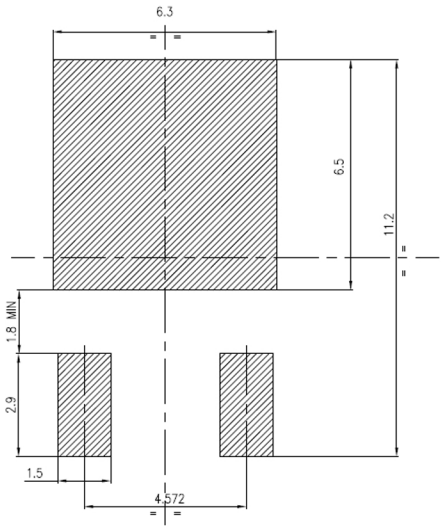
DPAK (TO-252) type C2 package outline



DPAK (TO-252) type C2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.10		5.60
E	6.50	6.60	6.70
E1	5.20		5.50
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1		2.90 REF	
L2	0.90		1.25
L3		0.51 BSC	
L4	0.60	0.80	1.00
L6		1.80 BSC	
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°

DPAK (TO-252) recommended footprint (dimensions are in mm)



Public Products List

Publict 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 : DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad capacity expansion - TFME (China) - INDUSTRIAL

PCN Reference : ADG/21/12697

Subject : Public Products List

Dear Customer,

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

STD12N60DM6	STD13N60M6	STD12N60M6
STD16N60M6	STD11N60M6	STD15N60DM6

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RELIABILITY REPORT

DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad capacity expansionTFME (China)

Process Change

General Information	
Commercial Product	: STD11N60M6 / STD15N60DM6
Product Line (Test Vehicle)	*:* BQ6101 / PQ6301
Product Description	: HV Voltage Power MOSFET
Package	: DPAK
Main Tech	*:* MDmesh M6, MDmesh DM6
Division	*: Power Transistor Division*

Traceability	
Diffusion Plant	*:* SG6" (Singapore)
Assembly Plant	*:* Tongfu Microelectronics Co Ltd (China)
Reliability assessment	
Passed	☒

Disclaimer: *this report is a summary of the qualification plan results performed in good faith by STMicroelectronics to evaluate the electronic devices conformance to its specific mission profile. This report and its contents shall not be disclosed to a third party, except in full, without previous written agreement by STMicroelectronics or under the approval of the author (see below)*

REVISION HISTORY

Version	Date	Author	Comment
1.0	15 March 2021	Diego Di Salvo	Final

APPROVED BY:
Corrado CAPPELLO
ADG Q&R department - Catania
STMicroelectronics

TABLE OF CONTENTS

1. RELIABILITY EVALUATION OVERVIEW

1.1 Objective

Reliability evaluation to qualify **DPAK 3 mils Al Gate wire, Dual Gauge Matrix, Large Die Pad capacity expansion TFME** for PTD HV Industrial products (MDmesh M6, MDmesh DM6 technology), manufactured in Tongfu Microelectronics Co Ltd..

1.2 Reliability Test Plan

Reliability tests performed on this device are in agreement with JESD47 and internal spec 0061692 and are listed in the Test Plan. For details on test conditions, generic data used and spec reference see test results summary at Par.3

#	Stress	Abrv	Reference	Test Flag	Comments
1	Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification	Y	
2	External Visual	EV	JESD22B-101	Y	
3	Pre-conditioning	PC	JESD22A-113	Y	
4	Temperature Cycling	TC	JESD22A-104	Y	
5	Autoclave	AC	JESD22A-102	Y	
6	Intermittent Operational Life / Thermal Fatigue	IOL / TF	MIL-STD-750 Method 1037	Y	
7	Solderability	SD	J-STD-002	Y	

1.3 Conclusion

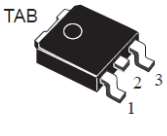
All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.
Parameter drift analysis performed on samples submitted to package oriented test showed a good stability of the main electrical monitored parameters. Package oriented tests have not put in evidence any criticality.
On the basis of the overall results obtained, we can give a positive judgment on the Reliability evaluation for 3mils Al wire process on DPAK Matrix Dual Gauge with Large leadframe assembled in Tongfu Microelectronics Co Ltd (China) for PTD HV Industrial products, in agreement with JESD47 and internal spec 0061692.

2. DEVICE/TEST VEHICLE CHARACTERISTICS

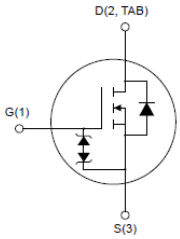
2.1 Generalities

Power MOSFET MDmesh M6, MDmesh DM6

2.2 Pin connection



DPAK



2.3 Traceability

Reference “Product Baseline” document if existing, else provide following chapters/information:

D.U.T.: STD11N60M6 **PACKAGE:** DPAK

Wafer fab information	
Wafer fab manufacturing location	AM6F-Singapore SG6 6"
Wafer diameter (inches)	6”
Silicon process technology	MDmesh M6
Die finishing front side (passivation)	TEOS + NITRIDE
Die finishing back side	Ti-Ni-Ag
Die area (Stepping die size)	2770*2500 µm^2
Metal levels/Materials	Al/Cu (4.5µm)

Assembly Information	
Assembly plant location	Tongfu Microelectronics plant (CHINA)
Package code description	DPAK Matrix Dual Gauge Large
Leadframe/Substrate	TO-252-3H(IL Ni)-DWG TO-LFM-SW005
Die attach material	SOFT SOLDER Pb/Ag/Sn 95.5/2.5/2
Wires bonding materials/diameters	Al (3 mils Gate / 10 mils Source)
Molding compound	(Halogen Free)

Reliability Testing Information	
Reliability laboratory location	Catania (Italy)
Electrical testing location	Catania (Italy)

D.U.T.: STD15N60DM6 PACKAGE: DPAK

Wafer fab information	
Wafer fab manufacturing location	AM6F-Singapore SG6 6"
Wafer diameter (inches)	6”
Silicon process technology	MDmesh DM6
Die finishing front side (passivation)	TEOS + NITRIDE
Die finishing back side	Ti-Ni-Ag
Die area (Stepping die size)	3500*2900 µm^2
Metal levels/Materials	Al/Cu (4.5µm)

Assembly Information	
Assembly plant location	Tongfu Microelectronics plant (CHINA)
Package code description	DPAK Matrix Dual Gauge Large
Leadframe/Substrate	TO-252-3H(IL Ni)-DWG TO-LFM-SW005
Die attach material	SOFT SOLDER Pb/Ag/Sn 95.5/2.5/2
Wires bonding materials/diameters	Al (3 mils Gate / 10 mils Source)
Molding compound	(Halogen Free)

Reliability Testing Information	
Reliability laboratory location	Catania (Italy)
Electrical testing location	Catania (Italy)

3. TESTS RESULTS SUMMARY

3.1 Lot Information

#Lot	Silicon line	Package	Comment
1	BQ61	DPAK	
2	BQ61	DPAK	
3	PQ63	DPAK	
4	PQ63	DPAK	

3.2 Test results summary

Stress (Abrv)	Std ref.	Conditions	Sample Size (S.S)	Steps	Failure/SS			
					Lot 1	Lot 2	Lot 3	Lot 4
TEST	User specification	All qualification parts tested per the requirements of the appropriate device specification.			100	100	100	100
External visual	JESD22 B-101	All devices submitted for testing			100	100	100	100
Package Oriented Test								
Pre-conditioning	JESD22 A-113	Dryng 24H @ 125°C Store 168H @ TA=85°C RH=85% IR Reflow @ 260°C 3 times	All devices to be subjected to AC,TC,IOL	Final	Pass	Pass	Pass	Pass
TC	JESD22 A-104	TA=-65°C TO 150°C 1 HOURS / CYCLE (air to air)	100	500cy	0/25	0/25	0/25	0/25
AC	JESD22 A-102	TA=121°C ; PA=2ATM	100	96H	0/25	0/25	0/25	0/25
IOL	MIL-STD-750 Method 1037	$\Delta Tj \geq 100°C$	100	10Kcy	0/25	0/25	0/25	0/25
Solderability	J-STD-002		20		0/10		0/10	