

## PRODUCT / PROCESS CHANGE NOTIFICATION

### 1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.		ADG/21/12712
1.3 Title of PCN		TO-220 Capacity Extension - Tongfu Microelectronics (China) - Industrial
1.4 Product Category		IGBT's
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
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2.2 Change responsibility	
2.2.1 Product Manager	Angelo RAO
2.1.2 Marketing Manager	Natale Sandro D'ANGELO
2.1.3 Quality Manager	Vincenzo MILITANO

### 3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Transfer	Line transfer for a full process or process brick (process step, control plan, recipes) from one site to another site: Assembly site (SOP 2617)	Tongfu Microelectronics (China)

### 4. Description of change

	Old	New
4.1 Description	TO-220 IGBT products are manufactured in Shenzhen (China)	TO-220 IGBT products will be manufactured in Tongfu Microelectronics (China)
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	no impact	

### 5. Reason / motivation for change

5.1 Motivation	Capacity expansion
5.2 Customer Benefit	CAPACITY INCREASE

### 6. Marking of parts / traceability of change

6.1 Description	By internal traceability and dedicated FG code.
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### 7. Timing / schedule

7.1 Date of qualification results	2021-03-30
7.2 Intended start of delivery	2021-06-30
7.3 Qualification sample available?	Upon Request

### 8. Qualification / Validation

8.1 Description	12712 RRPTD21023_1.0_STGP30IH65DF_STGP30M65DF2_STGP19NC60KD_TO220 DD TFMF.pdf
8.2 Qualification report and qualification results	Available (see attachment)

Issue Date 2021-03-30

### 9. Attachments (additional documentations)

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
	STGP10H60DF	
	STGP10M65DF2	
	STGP10NB60SD	
	STGP10NC60HD	
	STGP10NC60KD	
	STGP14NC60KD	
	STGP15H60DF	
	STGP15M120F3	
	STGP15M65DF2	
	STGP19NC60HD	
	STGP19NC60KD	
	STGP19NC60SD	
	STGP20H60DF	
	STGP20M65DF2	
	STGP20V60DF	
	STGP20V60F	
	STGP30H60DF	
	STGP30H60DFB	
	STGP30M65DF2	
	STGP30V60DF	
	STGP30V60F	
	STGP35HF60W	
	STGP3NC120HD	
	STGP40V60F	
	STGP4M65DF2	
	STGP5H60DF	
	STGP6M65DF2	
	STGP6NC60HD	
	STGP7H60DF	
	STGP7NC60HD	
	STGP8M120DF3	
	STGP8NC60KD	
	STGPL6NC60DI	

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## Public Products List

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**PCN Title :** TO-220 Capacity Extension - Tongfu Microelectronics (China) - Industrial

**PCN Reference :** ADG/21/12712

**Subject :** Public Products List

Dear Customer,

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

STGP10NC60HD	STGP20H65DFB2	STGP40V60F
STGP30H60DFB	STGP20H65FB2	STGP30V60F
STGP10NB60S	STGP20V60F	STGP10NC60KD
STGP7H60DF	STGP30H60DF	STGP30H65DFB2
STGP8NC60KD	STGP30V60DF	STGP10M65DF2
STGP15H60DF	STGP19NC60KD	STGP6M65DF2
STGP19NC60HD	STGP8M120DF3	STGP19NC60SD
STGP4M65DF2	STGP14NC60KD	STGP20M65DF2
STGP3NC120HD	STGP20H60DF	STGP5H60DF
STGP15M120F3	STGP6NC60HD	STGP10NB60SD
STGP30M65DF2	STGP10H60DF	STGP15M65DF2
STGP20V60DF	STGP20NC60V	STGP35HF60W
STGPL6NC60DI	STGP7NC60HD	



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# Reliability Evaluation Report

## IGBT TGEI and IGBT Planar Technologies – TO220 dual die

Tongfu Microelectronics TFME (China) subcon

**Note:** this report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the electronic device conformance to its specific mission profile for Automotive Application. This report and its contents shall not be disclosed to a third party without previous written agreement from STMicroelectronics or under the approval of the author (see below).

### Revision history

Rev.	Changes description	Author	Date
1.0	First release	M. Panzarella – ADG Reliability	March 22 <sup>th</sup> , 2021

### Approved by

Function	Location	Name	Date
Division Reliability Manager	ST Catania (Italy)	A. Marmoni	March 22 <sup>th</sup> , 2021

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## 1. Reliability Evaluation Overview

### 1.1. Objective

Aim of this report is to present the results of the reliability evaluations performed on selected test vehicles designed both in IGBT Trench Gate Emitter Implant and IGBT Planar Technologies, diffused in ST CT8 Catania (Italy) 8" Wafer Fab and ST SG6 Ang Mo kio (Singapore) 6" Wafer Fab, assembled in package TO220 dual die, to activate Tongfu Microelectronics TFME (China) assembly plant subcon in addition to ST Shenzhen (China) for product manufacturing.

The chosen test vehicles are:

- **STGP30IH65DF** (SWF4 as ST silicon line), IGBT Trench Gate Emitter Implant
- **STGP30M65DF2** (KLF5 as ST silicon line), IGBT Trench Gate Emitter Implant
- **STGP19NC60KD** (KV65 as ST silicon line), IGBT Planar

### 1.2. Reliability Strategy and Test Plan

#### 1.2.1. Reliability strategy

Reliability trials performed as part of this reliability evaluation on 1 lot per each vehicle, are in agreement with **ST 0061692** specification and are listed in below Test Plan. For details on test conditions, generic data used and specifications references, refer to test results summary in section 3.

### 1.2.2. Test Plan

Test Plan Table

#	TEST NAME	DESCRIPTION / COMMENTS	TEST FLAG
1	TEST	Pre- and Post- Stress Electrical Test	Yes
2	PC	Preconditioning	Not Applicable
3	EV	Eternal Visual	Yes
4	PV	Parametric Verification	Yes
5	HTRB	High Temperature Reverse Bias	Yes
6	HTGB	High Temperature Gate Bias	Yes
7	TC	Temperature Cycling	Yes
8	AC	Autoclave	Yes
9	THB	Temperature Humidity Bias	Yes
10	IOL	Intermittent Operational Life	Yes
11	ESD	ESD Characterization	Yes

### 1.3. Conclusion

All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.

Based on the overall results obtained the products designed both in IGBT Trench Gate Emitter Implant and IGBT Planar Technologies, diffused in ST CT8 Catania (Italy) 8" Wafer Fab and ST SG6 Ang Mo kio (Singapore) 6" Wafer Fab, assembled in package TO220 dual die in Tongfu Microelectronics TFME (China) assembly plant subcon, have positively passed reliability evaluation performed in agreement with **ST 0061692** specification.

## 2. Product Characteristics

### 2.1. Generalities

#### 2.1.1. Test vehicle



## STGB19NC60KDT4, STGF19NC60KD, STGP19NC60KD

20 A, 600 V short-circuit rugged IGBT

[Datasheet - production data](#)

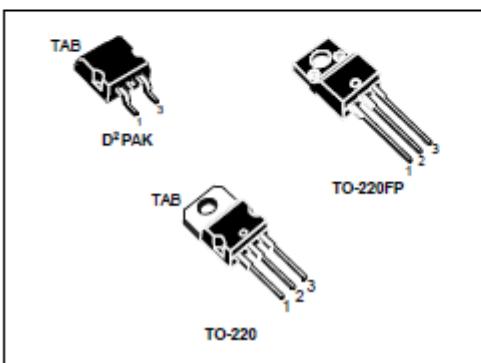
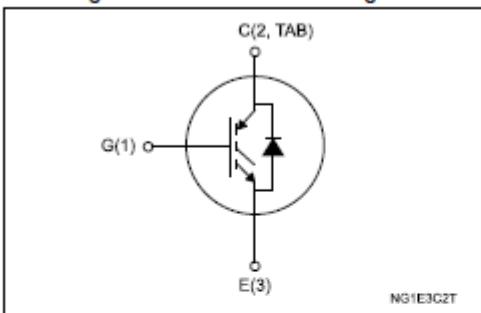


Figure 1: Internal schematic diagram



#### Features

- Low on voltage drop ( $V_{CE(sat)}$ )
- Low  $C_{RES}$  /  $C_{IES}$  ratio (no cross-conduction susceptibility)
- Short-circuit withstand time 10  $\mu$ s
- IGBT co-packaged with ultrafast free-wheeling diode

#### Applications

- High frequency inverters
- Motor drives

#### Description

These devices are very fast IGBTs developed using advanced PowerMESH™ technology. This process guarantees an excellent trade-off between switching performance and low on-state behavior.

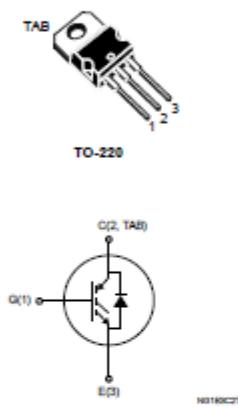
Table 1: Device summary

Order code	Marking	Package	Packing
STGB19NC60KDT4	GB19NC60KD	DPAK	Tape and reel
STGF19NC60KD	GF19NC60KD	TO-220FP	Tube
STGP19NC60KD	GP19NC60KD	TO-220	



## STGP30IH65DF

## Datasheet

 Trench gate field-stop 650 V, 30 A, soft-switching IH series IGBT  
 in a TO-220 package


## Features

- Designed for soft commutation only
- Maximum junction temperature:  $T_J = 175^\circ\text{C}$
- $V_{CE(\text{sat})} = 1.55\text{ V (typ.)} @ I_C = 30\text{ A}$
- Minimized tail current
- Tight parameter distribution
- Low thermal resistance
- Low drop voltage freewheeling co-packaged diode
- Positive  $V_{CE(\text{sat})}$  temperature coefficient

## Applications

- Induction heating
- Resonant converters
- Microwave ovens

## Description

The newest IGBT 650 V soft-switching IH series has been developed using an advanced proprietary trench gate field-stop structure, whose performance is optimized both in conduction and switching losses for soft commutation. A freewheeling diode with a low drop forward voltage is included. The result is a product specifically designed to maximize efficiency for any resonant and soft-switching applications.

Product status link	
<a href="#">STGP30IH65DF</a>	
Product summary	
Order code	STGP30IH65DF
Marking	G30IH65DF
Package	TO-220
Packing	Tube



## STGP30M65DF2

Trench gate field-stop IGBT, M series 650 V, 30 A  
 low-loss in a TO-220 package

Datasheet - production data

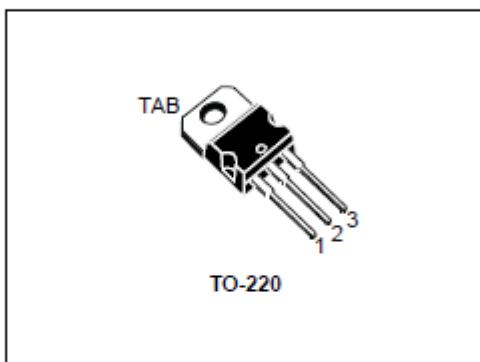


Figure 1: Internal schematic diagram

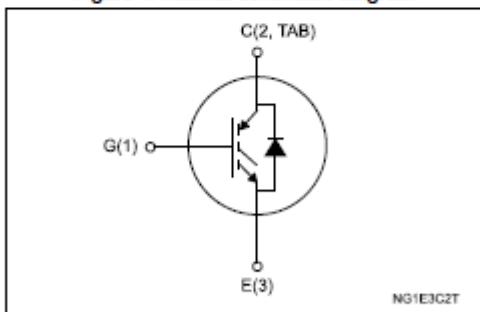


Table 1: Device summary

Order code	Marking	Package	Packaging
STGP30M65DF2	G30M65DF2	TO-220	Tube

### Features

- 6  $\mu$ s of minimum short-circuit withstand time
- $V_{CE(sat)} = 1.55$  V (typ.) @  $I_C = 30$  A
- Tight parameters distribution
- Safer paralleling
- Low thermal resistance
- Soft and very fast recovery antiparallel diode

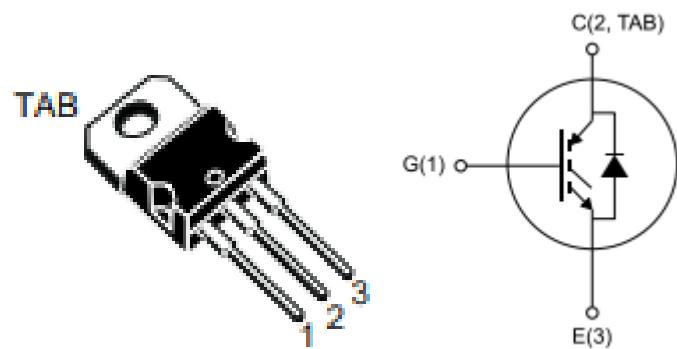
### Applications

- Motor control
- UPS
- PFC

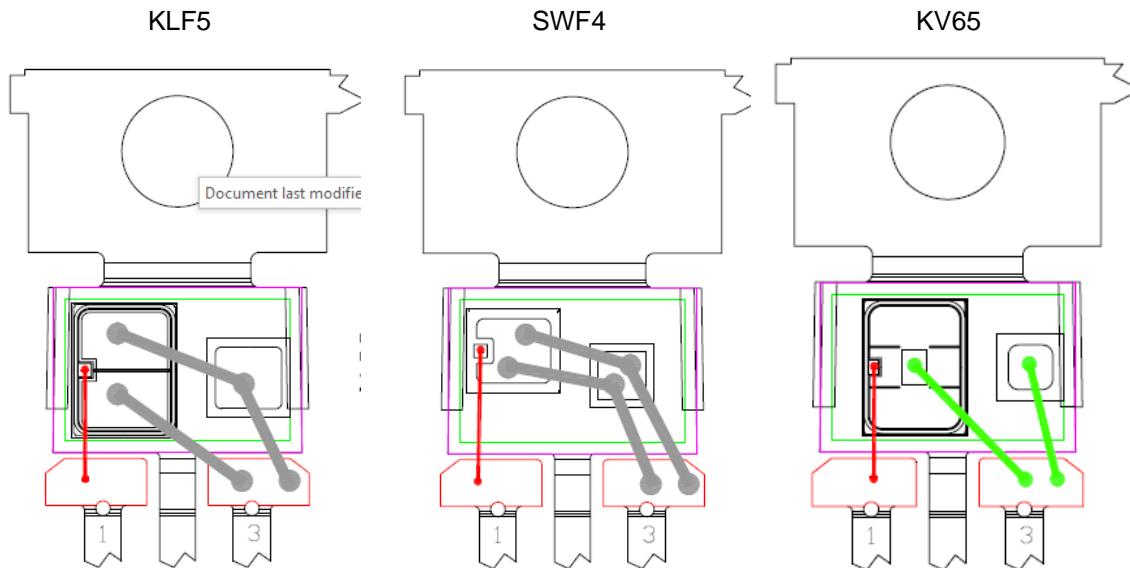
### Description

This device is an IGBT developed using an advanced proprietary trench gate field-stop structure. The device is part of the M series of IGBTs, which represent an optimum compromise in performance to maximize the efficiency of inverter systems where low-loss and short-circuit capability are essential. Furthermore, a positive  $V_{CE(sat)}$  temperature coefficient and tight parameter distribution result in safer paralleling operation.

## 2.1.2. Pin connection



## 2.1.3. Bonding Diagram



## 2.2. Traceability

### 2.2.1. Wafer Fab information

Wafer fab name / location	ST CTM8 Catania (Italy) SWF4 / KLF5 ST SG6 (Singapore) KV65
Wafer diameter (inches)	6" 8"
Silicon process technology	IGBT Trench Gate Emitter Implant – SWF4 / KLF5 IGBT Planar – KV65
Die finishing front side	SiN
Die finishing back side	Al/Ti/NiV/Ag – SWF4/KLF5 CHROMIUM/NICKEL/SILVER – KV65
Die size (micron)	3200 x 2880 um <sup>2</sup> SWF4 3600 x 4600 um <sup>2</sup> KLF5 3490 x 4570 um <sup>2</sup> KV65
Metal levels/ materials/ thicknesses	1 level, AlCu/W 4.5um SWF4/KLF5 1 level, AlSi, 4.5um – KV65

### 2.2.2. Assembly information

Assembly plant name / location	Tongfu Microelectronics TFME (China) subcon
Package description	TO220 DD
Lead frame/Substrate	CP2-3E (IL Ni) DWG CP-LFM-YZ006
Die attach material	SOFT SOLDER Pb/Ag/Sn 95.5/2.5/2
Wire bonding material/diameter	Al 15 mils Emitter – Al 5 mils Gate SWF4 / KLF5 Al 10 mils Emitter – Al 5 mils Gate KV65
Molding compound material	RESIN LOCTITE HYSOL GR30 Green
Package Moisture Sensitivity Level (JEDEC J-STD020D)	Not available

### 2.2.3. Reliability Testing information

Reliability laboratory location	STM Catania (Italy)
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### 3. Tests Results Summary

#### 3.1. Lot Information

Lot #	Commercial Product	Diffusion Lot	Assembly Lot
Lot1	STGP30IH65DF (SWF4)	59153K7	0DY500090101
Lot2	STGP30M65DF2 (KLF5)	5904J82	0DY500070101
Lot3	STGP19NC60KD (KV65)	60133K0	0DY500100101

#### 3.2. Test results summary (table)

Test method revision reference is the one active at the date of reliability trial execution.

Test	#	Reference	STM Test Conditions	Lot s	S.S.	Total	Results FAIL/SS/Lots	Comments
TEST	1		User specification or supplier's standard specification	3	241	723	0/241/1	All qualification parts
PC	2	-	24h bake@125°C MSL3 (40h@60C/60%RH) 3x Reflow simulation Peak Reflow Temp= 245°C	-	-	-	-	Not Applicable
EV	3	JESD22B-101I	All qualification parts submitted for testing	3	241	723	Passed	
PV	4	-	All parameters according to user specification	3	25	75	Passed	
HTRB	5	MIL-STD-750-1 M1038 Method A	T <sub>j</sub> =150°C , Vbias=480V (KV65) T <sub>j</sub> =175°C , Vbias=520V (KLF5 – SWF4), 1000h	3	45	135	0/45/1	
HTGB	6	JESD22 A-108	T <sub>j</sub> =150°C , Vbias=30V (KV65)) T <sub>j</sub> =175°C , Vbias=30V (KLF5 – SWF4), 1000h	3	45	135	0/45/1	
HTGB	7	JESD22 A-108	T <sub>j</sub> =150°C , Vbias=-30V (KV65)) T <sub>j</sub> =175°C , Vbias=-30V (KLF5 – SWF4)	3	45	135	0/45/1	
TC	8	JESD22A-104	T <sub>a</sub> =-65°C /+150°C, 500cy	3	25	75	0/25/1	
AC	9	JESD22 A-102	T <sub>a</sub> =121°C, Pa=2atm, RH=100%, 96 hours	3	25	75	0/25/1	
THB	10	JESD22A-101	T <sub>a</sub> =85°C, RH=85% Vds=100V, 1000h	3	25	75	0/25/1	
IOL	11	MIL-STD-750 Method 1037	10Kcy @ T <sub>a</sub> =25°C with parts powered to insure $\Delta T_j \geq 100^\circ\text{C}$ (not to exceed absolute maximum ratings).	3	25	75	0/25/1	
ESD	12	Jedec JS-001 Jedec JS-002	HBM / CDM	3	6	18	To be done	

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Automotive Discrete Group (ADG)  
Power Transistor MACRO-Division  
IGBT & IPM Business Unit

### Process Change Notification

#### TO-220 back end capacity expansion to Tongfu Microelectronics (China) on IGBT products

Dear Customer,

Following the continuous improvement of our service and in order to increase back-end capacity, this document is announcing that IGBT products housed in TO-220 package and listed in this PCN, will be also produced in our Subcontractor Tongfu Microelectronics (China) - ex Nantong Fujitsu Microelectronics.

TO-220 package produced in Tongfu Microelectronics FAB, guarantees the same quality and electrical characteristics as per current production.

The involved product series are listed in the table below:

Product Family	Technology	Package	Test Vehicles
IGBT	Planar Trench Field Stop (TFS)	TO-220	STGP30M65DF2 STGP19NC60KD

Any other Product related to the above series, even if not expressly included or partially mentioned in the attached table, is affected by this change.

#### Qualification program and results availability:

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

#### Samples availability:

Any sample request will be processed and scheduled by IGBT&IPM Business Unit, upon request.

#### Change implementation schedule:

The production start and first shipments will be implemented after week 26 of 2021 or even earlier, by agreement with the customer.

#### Marking and traceability:

Unless otherwise stated by customer specific requirement, traceability of TO-220 products, manufactured in Tongfu Microelectronics subcontractor (China), will be ensured by "GF" as first digits of the trace code, internal code (Finished Good) and Q.A. number.

Yours faithfully,