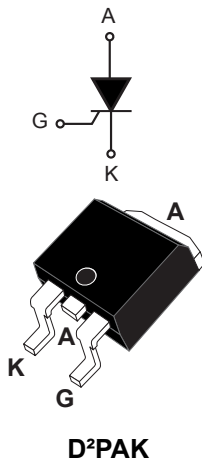


50 A 800 V high temperature SCR thyristors in D<sup>2</sup>PAK package


## Features

- High junction temperature:  $T_j = 150\text{ °C}$
- 800 V  $V_{DRM} / V_{RRM}$
- 900 V  $V_{DSM} / V_{RSM}$
- Low  $I_{GT}$ : 15 mA
- High static immunity  $dV/dt = 1000\text{ V}/\mu\text{s}$  at 150 °C
- High turn-on rise  $dI/dt$  at 200 A/ $\mu\text{s}$
- Halogen-free molding, lead-free plating
- ECOPACK2 compliant

## Application

- Inrush current limiting circuits in AC/DC converters
- General purpose AC line load switching
- Heating resistor control, solid state relays

## Description

Thanks to its junction temperature  $T_j$  up to 150 °C, the TN5015H-8G offers high thermal performance operation up to 50 A RMS in a compact D<sup>2</sup>PAK SMD package.

Its trade-off noise immunity ( $dV/dt = 1000\text{ V}/\mu\text{s}$ ) versus its gate triggering current ( $I_{GT} = 15\text{ mA}$ ) and its turn-on current rise ( $dI/dt = 200\text{ A}/\mu\text{s}$ ) allow to design robust and compact control circuit in AC/DC converters for inrush current limiting circuits and industrial drives, such as overvoltage crowbar protection, motor control circuits and power tools.

## Product status

TN5015H-8G

## Product summary

Order code	TN5015H-8G
Package	D <sup>2</sup> PAK
$I_{T(RMS)}$	50 A
$V_{DRM}/V_{RRM}$	800 V
$T_j$ (max.)	150 °C

# 1 Characteristics

**Table 1. Absolute maximum ratings (limiting values),  $T_j = 25\text{ °C}$  unless otherwise specified**

Symbol	Parameter		Value	Unit	
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)	$T_c = 122\text{ °C}$	50	A	
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)	$T_c = 124\text{ °C}$	30	A	
		$T_c = 130\text{ °C}$	25		
		$T_c = 135\text{ °C}$	20		
$I_{TSM}$	Non repetitive surge peak on-state current ( $T_j$ initial = 25 °C)	$t_p = 8.3\text{ ms}$	550	A	
		$t_p = 10\text{ ms}$	500		
$I^2t$	$I^2t$ value for fusing	$t_p = 10\text{ ms}$	1250	A <sup>2</sup> s	
$di/dt$	$I_G = 2 \times I_{GT}$ , $tr \leq 100\text{ ns}$ Critical rate of rise of on-state current	$f = 50\text{ Hz}$	200	A/ $\mu$ s	
$V_{DRM}/V_{RRM}$	Repetitive peak off-state voltage	$T_j = 150\text{ °C}$	800	V	
$V_{DSM}/V_{RSM}$	Non repetitive surge peak off-state voltage	$t_p = 10\text{ ms}$	900	V	
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu$ s	$T_j = 150\text{ °C}$	4	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 150\text{ °C}$	1	W	
$V_{RGM}$	Maximum peak reverse gate voltage		5	V	
$T_{stg}$	Storage junction temperature range		-40 to +150	°C	
$T_j$	Maximum operating junction temperature		-40 to +150	°C	
$T_l$	Maximum lead temperature soldering during 10 s		260	°C	

**Table 2. Electrical characteristics ( $T_j = 25\text{ °C}$  unless otherwise specified)**

Symbol	Test conditions		Value	Unit	
$I_{GT}$	$V_D = 12\text{ V}$ , $R_L = 33\text{ }\Omega$	Min.	5	mA	
		Max.	15		
$V_{GT}$		Max.	1.3	V	
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$	$T_j = 150\text{ °C}$	Min.	0.2	V
$I_H$	$I_T = 500\text{ mA}$ , gate open		Max.	50	mA
$I_L$	$I_G = 1.2 \times I_{GT}$		Max.	70	mA
$dV/dt$	$V_D = 536\text{ V}$ , gate open	$T_j = 150\text{ °C}$	Min.	1000	V/ $\mu$ s
$t_{gt}$	$I_{TM} = 100\text{ A}$ , $V_D = 536\text{ V}$ , $I_G = 30\text{ mA}$ , $(di_G/dt)_{max} = 0.2\text{ A}/\mu$ s		Typ.	1.9	$\mu$ s
$t_q$	$I_T = 100\text{ A}$ , $V_D = 536\text{ V}$ , $V_R = 25\text{ V}$ , $dV_D/dt = 40\text{ V}/\mu$ s	$T_j = 125\text{ °C}$	Typ.	70	$\mu$ s
		$T_j = 150\text{ °C}$	Typ.	85	$\mu$ s

**Table 3. Static characteristics**

Symbol	Test conditions			Value	Unit
$V_{TM}$	$I_{TM} = 100\text{ A}$ , $t_p = 380\ \mu\text{s}$	$T_j = 25\text{ }^\circ\text{C}$	Max.	1.55	V
$V_{TO}$	Threshold voltage	$T_j = 150\text{ }^\circ\text{C}$	Max.	0.85	
$R_D$	Dynamic resistance	$T_j = 150\text{ }^\circ\text{C}$	Max.	8	m $\Omega$
$I_{DRM}$ , $I_{RRM}$	$V_D = V_{DRM} = V_{RRM}$	$T_j = 25\text{ }^\circ\text{C}$	Max.	2.5	$\mu\text{A}$
		$T_j = 150\text{ }^\circ\text{C}$		12	mA

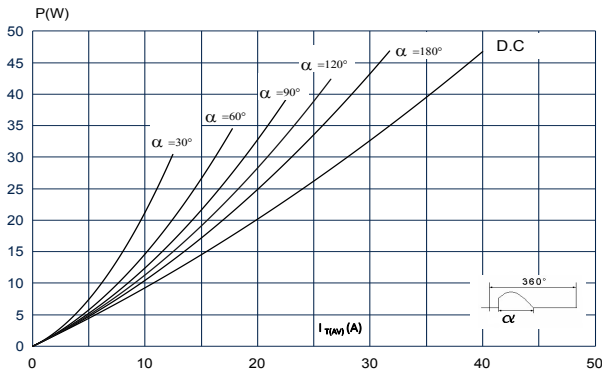
**Table 4. Thermal parameters**

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	0.6
$R_{th(j-a)}$	Junction to ambient, $S = 2.5\text{ cm}^2$ <sup>(1)</sup> , $E_{CU} = 70\ \mu\text{m}$	Typ.	45

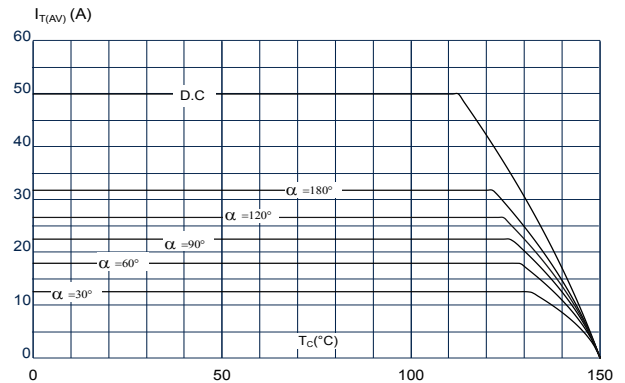
1. Copper surface under tab, on PCB FR4.

## 1.1 Characteristics curves

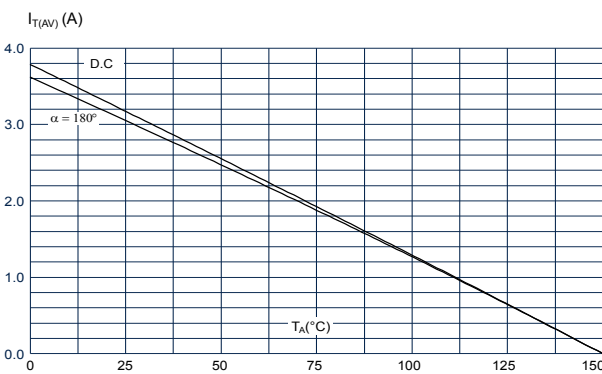
**Figure 1. Maximum average power dissipation versus average on-state current**



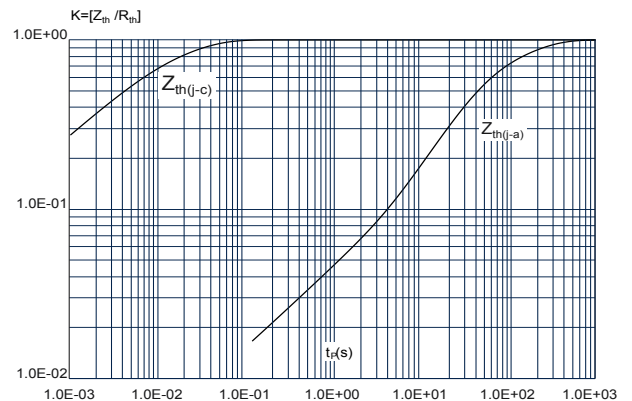
**Figure 2. Average and DC on-state current versus case temperature**



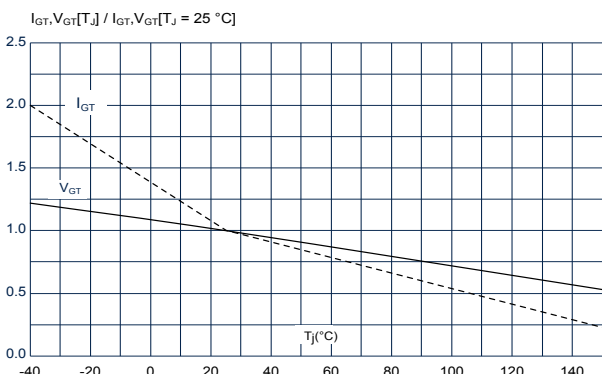
**Figure 3. Average and D.C. on state current versus ambient temperature**



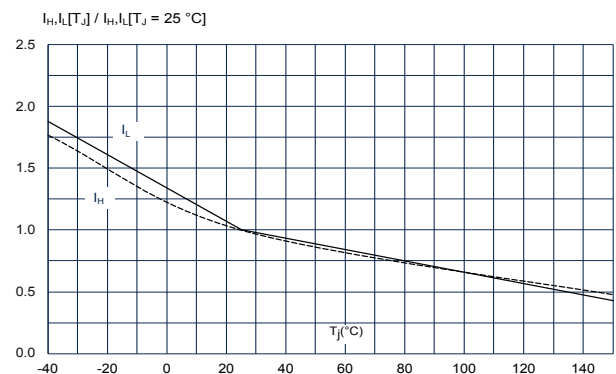
**Figure 4. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**



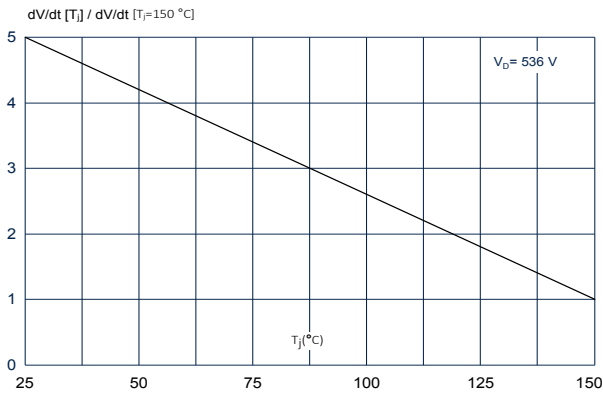
**Figure 5. Relative variation of gate trigger current and gate voltage versus junction temperature**



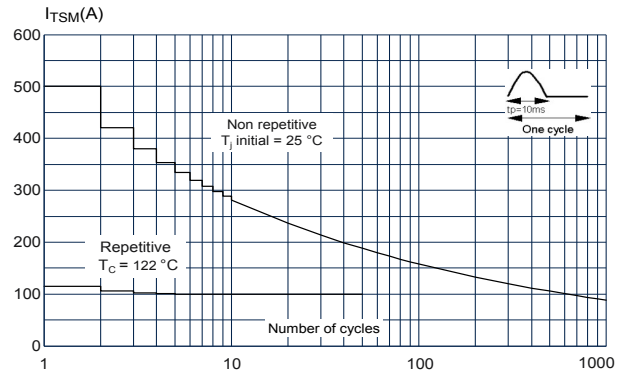
**Figure 6. Relative variation of holding and latching current versus junction temperature**



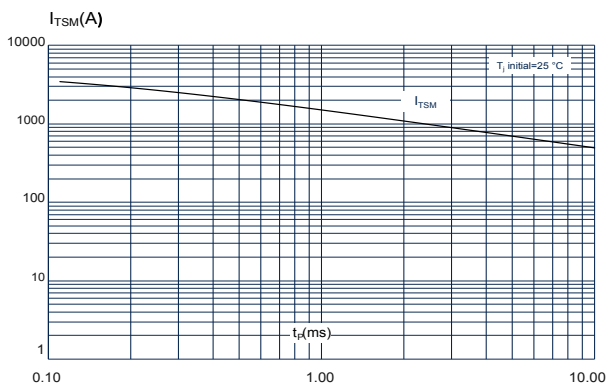
**Figure 7. Relative variation of static dV/dt immunity versus junction temperature**



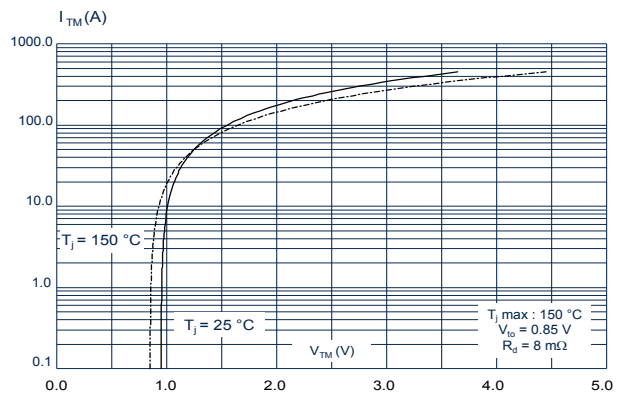
**Figure 8. Surge peak on-state current versus number of cycles**



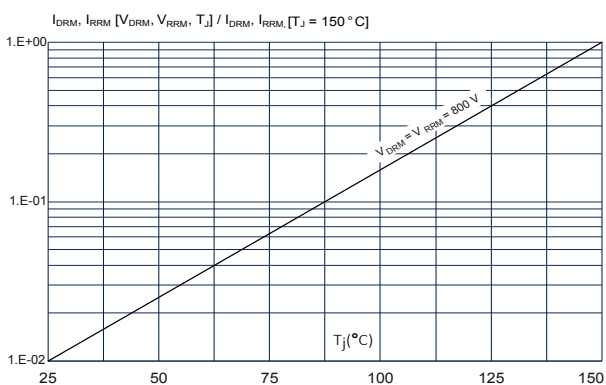
**Figure 9. Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms**



**Figure 10. On-state characteristics (maximum values)**



**Figure 11. Relative variation of leakage current versus junction temperature**



**Figure 12. Thermal resistance junction to ambient versus copper surface under tab**

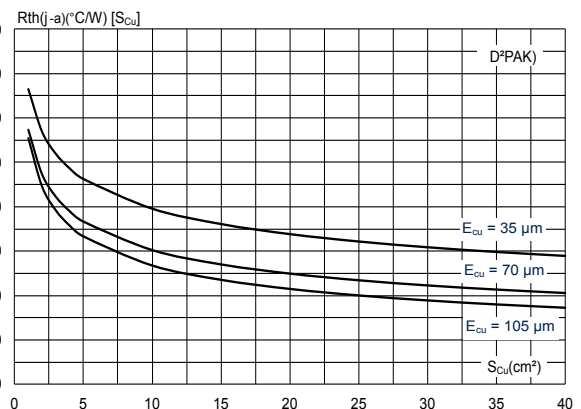
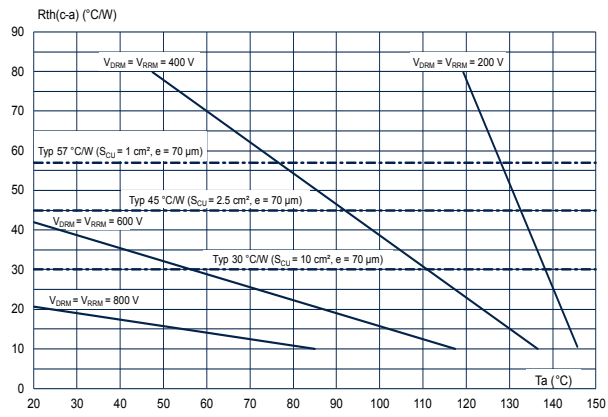


Figure 13. Recommended maximum case-to-ambient thermal resistance versus ambient temperature for different peak off-state voltages



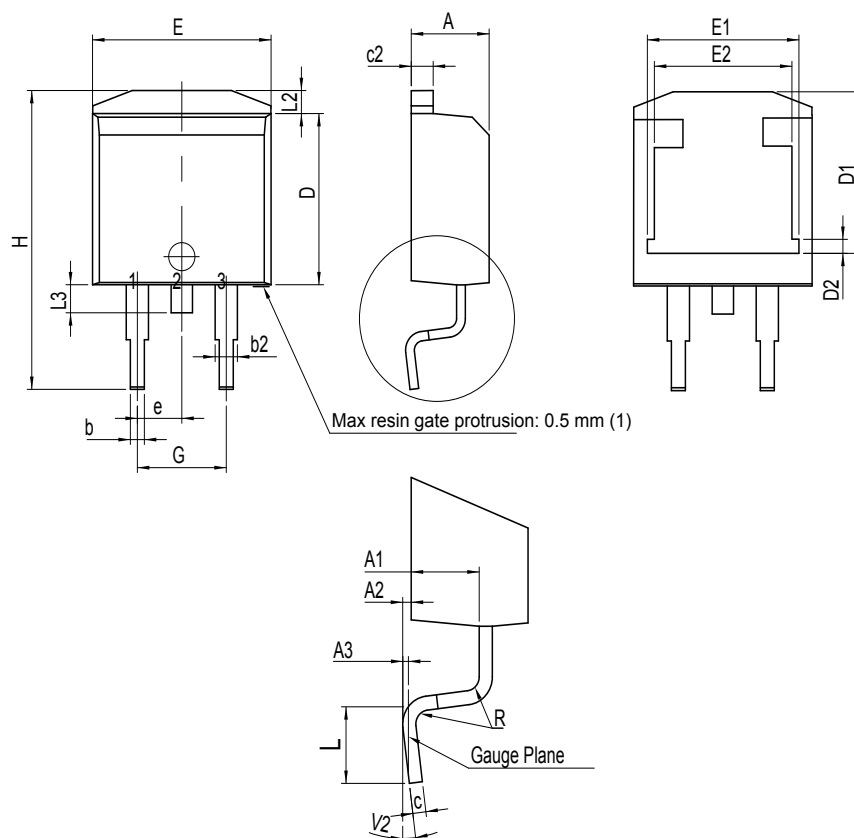
## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 D<sup>2</sup>PAK package information

- **ECOPACK2** compliant
- Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL94 flammability standard level V0

Figure 14. D<sup>2</sup>PAK package outline



(1) Resin gate is accepted in each of position shown on the drawing, or their symmetrical.

**Table 5. D<sup>2</sup>PAK package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.1693		0.1811
A1	2.49		2.69	0.0980		0.1059
A2	0.03		0.23	0.0012		0.0091
A3		0.25			0.0098	
b	0.70		0.93	0.0276		0.0366
b2	1.25		1.7	0.0492		0.0669
c	0.45		0.60	0.0177		0.0236
c2	1.21		1.36	0.0476		0.0535
D	8.95		9.35	0.3524		0.3681
D1	7.50		8.00	0.2953		0.3150
D2	1.30		1.70	0.0512		0.0669
e		2.54			0.1000	
E	10.00		10.28	0.3937		0.4047
E1	8.30		8.70	0.3268		0.3425
E2	6.85		7.25	0.2697		0.2854
G	4.88		5.28	0.1921		0.2079
H	15		15.85	0.5906		0.6240
L	1.78		2.28	0.0701		0.0898
L2	1.19		1.40	0.0468		0.0551
L3	1.40		1.75	0.0551		0.0689
R		0.40			0.0157	
V2 <sup>(2)</sup>	0°		8°	0°		8°

1. Dimensions in inches are given for reference only

2. Degrees





### 3 Ordering information

Figure 17. Ordering information scheme

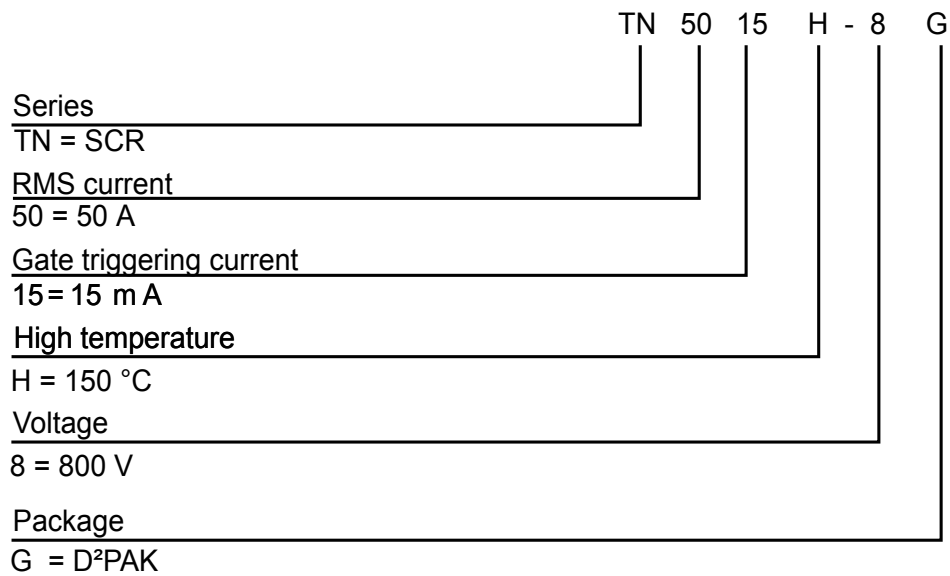


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN5015H-8G	TN5015H8G	D <sup>2</sup> PAK	1.38 g	1000	Tape and reel

## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
26-Oct-2023	1	Initial release.
30-Apr-2024	2	Updated <a href="#">Table 3</a> , and <a href="#">Figure 13</a> .

**IMPORTANT NOTICE – READ CAREFULLY**

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to [www.st.com/trademarks](http://www.st.com/trademarks). All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2024 STMicroelectronics – All rights reserved