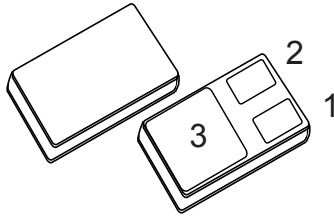
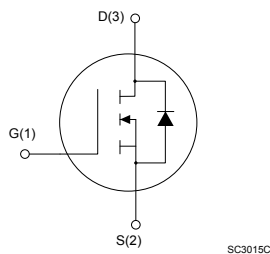


Rad-Hard 200 V, 16 A, N-channel Power MOSFET


SMD.5


Features

V_{DS}	I_D	$R_{DS(on)}$ typ.	Q_g
200 V	16 A	70 mΩ	52 nC

- ESCC qualified as per detail specification 5205/034
- 100 krad total ionizing dose guaranteed
- Wide RBSOA under heavy-ions radiation exposure
- Low $R_{DS(on)}$
- Low total gate charge
- Fast switching

Description

The STRHMF16N20 is a N-channel Power MOSFET able to operate in extreme environment conditions and severe radiation exposure. It provides superior high reliability performance and high immunity to the total ionizing dose (TID) and single event effects (SEE).

Qualified as per ESCC detail specification 5205/034 and available in SMD.5 hermetic package, it is specifically recommended for space and harsh environment applications and suitable for power conversion, motor control and power switch circuits.

Product status link

[STRHMF16N20](#)

Device summary

Product summary				
Part number	Quality level	Package	Lead finish	Radiation level
STRHMF16N20S1	Engineering model	SMD.5	Gold	-
STRHMF16N20SG	Flight model			100 krad
STRHMF16N20ST	Flight model		Solder dip	100 krad

Note: See [Table 8](#) for ordering information.

1 Electrical ratings

$T_{amb} = 25\text{ °C}$ unless otherwise specified

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	200	V
$V_{GS}^{(1)}$	Gate-source voltage	+20/-16	V
$I_D^{(2)}$	Drain current (continuous)	16	A
	Drain current (continuous) at $T_{amb} = 100\text{ °C}$	10	A
$I_{DM}^{(3)}$	Drain current (pulsed)	64	A
P_{TOT}	Total power dissipation	66	W
T_{op}	Operating temperature range	-55 to 150	°C
T_j	Max. operating junction temperature range	150	°C

1. This value is guaranteed over the full range of temperature.
2. Rated according to the $R_{thj-case} + R_{thc-s}$
3. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case (maximum)	1.53	°C/W
R_{thCS}	Thermal resistance, case-to-heatsink (typical)	50	°C/W

Table 3. Avalanche data

Symbol	Parameter	Value	Unit
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ °C}$, $V_{DD} = 60\text{ V}$, $I_D = 8\text{ A}$, $R_g = 47\text{ }\Omega$)	120	mJ

2 Electrical characteristics

$T_a = 25\text{ °C}$ unless otherwise specified

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Max.	Unit
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}$		10	μA
		$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_a = 125\text{ °C}$		100	
I_{GSS}	Gate body leakage current	$V_{GS} = 20\text{ V}$		100	nA
		$V_{GS} = 20\text{ V}, T_a = 125\text{ °C}$		200	
		$V_{GS} = -16\text{ V}$	-100		
		$V_{GS} = -16\text{ V}, T_a = 125\text{ °C}$	-200		
$V_{(BR)DSS}$	Drain-to-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	200		V
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 1\text{ mA}, T_a = 125\text{ °C}$	1.5		V
		$V_{DS} = V_{GS}, I_D = 1\text{ mA}, T_a = -55\text{ °C}$	2.3	5.5	
		$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	2	4.5	
$R_{DS(on)}^{(2)}$	Static drain-source on resistance	$V_{GS} = 12\text{ V}, I_D = 16\text{ A}$		90	m Ω
		$V_{GS} = 12\text{ V}, I_D = 16\text{ A}, T_a = 125\text{ °C}$		180	
$C_{iss}^{(1)}$	Input capacitance	$V_{DS} = 100\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$		5200	pF
$C_{oss}^{(1)}$	Output capacitance			120	pF
$C_{rss}^{(1)}$	Reverse transfer capacitance			3	pF
$Q_g^{(1)}$	Total gate charge	$V_{DS} = 160\text{ V}, I_D = 16\text{ A}, V_{GS} = 10\text{ V}$		78	nC
$Q_{gs}^{(1)}$	Gate-to-source charge			34	nC
$Q_{gd}^{(1)}$	Gate-to-drain ("Miller") charge			6.1	nC
$R_G^{(1)}$	Gate input resistance	$f = 1\text{ MHz}$ gate DC bias = 0, test signal level = 20 mV open drain		23	Ω
$t_{d(on)}^{(1)}$	Turn-on delay time	$V_{DD} = 100\text{ V}, I_D = 8\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 12\text{ V}$		20	ns
$t_r^{(1)}$	Rise time			7	
$t_{d(off)}^{(1)}$	Turn-off delay time			345	
$t_f^{(1)}$	Fall time			113	
$V_{SD}^{(2)}$	Diode forward voltage	$I_{SD} = 16\text{ A}, V_{GS} = 0\text{ V}$		1.2	V
		$I_{SD} = 16\text{ A}, V_{GS} = 0\text{ V}, T_a = 125\text{ °C}$		1.1	
t_{rr}	Reverse recovery time	$V_{DS} = 25\text{ V}, I_{SD} = 4\text{ A}, di/dt = 50\text{ A}/\mu\text{s}$		380	ns

1. Not tested in production, guaranteed by process.

2. Pulse duration = 680 μs , duty cycle $\leq 2\%$

3 Radiation characteristics

The STRHMF16N20 is guaranteed in radiation exposure in single event effects (SEE) as per ESCC25100 and total ionizing dose (TID) as per ESCC 22900.

Each lot is tested in radiation and accepted according to the characteristics of [Table 5](#).

3.1 Total dose radiation (TID) testing

During the irradiation exposure the device is biased at $V_{GS} = +15\text{ V}$ and $V_{DS} = 0\text{ V}$.

The parameters listed in [Table 5](#) are measured:

- Before irradiation
- After irradiation
- After 24 hrs at room temperature
- After 168 hrs at 100 °C anneal

Table 5. Post-irradiation electrical characteristics ($T_{amb} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Max.	Unit
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$		10	μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = 20\text{ V}$		100	nA
		$V_{GS} = -16\text{ V}$	-100		
$V_{(BR)DSS}$	Drain-to-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	200		V
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	2	4.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 12\text{ V}$, $I_D = 16\text{ A}$		90	m Ω
$V_{SD}^{(1)}$	Diode forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 16\text{ A}$		1.2	V

1. Pulse duration = 680 μs , duty cycle $\leq 2\%$

3.2 Single event effect RBSOA

The STRHMF16N20 is able to withstand heavy ions exposure according to the MIL-STD-750E test method 1080. Reverse Biased Safe Operating Area is characterized using the circuit depicted in Figure 2.

SEB and SEGR tests are performed with a fluence of $3e+5$ ions/cm² with the following acceptance criteria:

- SEB test: drain voltage checked, trigger level is set to $V_{DS} = -5$ V. Stop condition: as soon as a SEB occurs or if the fluence reaches $3e+5$ ions/cm².
- SEGR test: the gate current is monitored every 200 ms. A gate stress is performed before and after irradiation. Stop condition: as soon as the gate current reaches 100 nA (during irradiation or during PIGS test) or if the fluence reaches $3e+5$ ions/cm².

Table 6. Single event effect (SEE), safe operating area (SOA)

Ion	Let (Mev/(mg/cm ²))	Energy (MeV)	Range (μm)
Kr	31.1	845	111
Xe	48.5	2059	155
Xe	62	1091	81

Figure 1. Single event effect, SOA

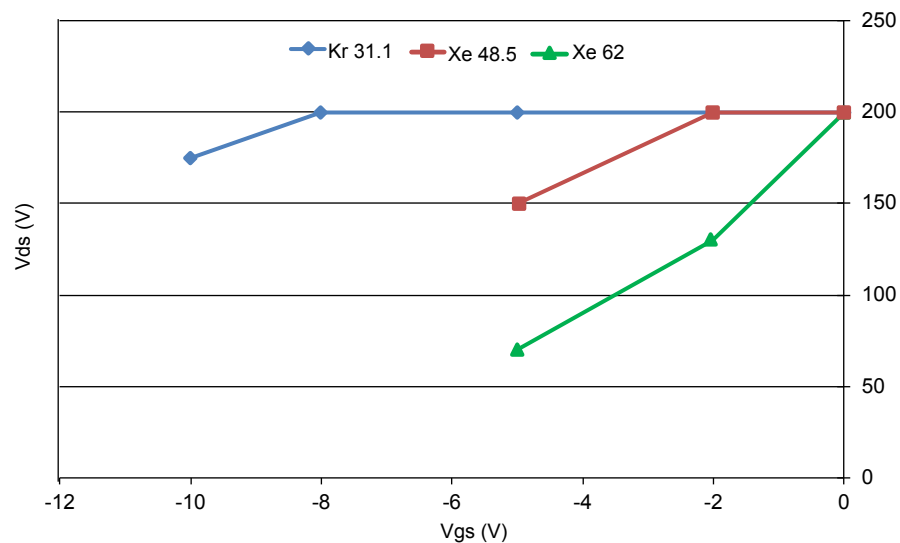
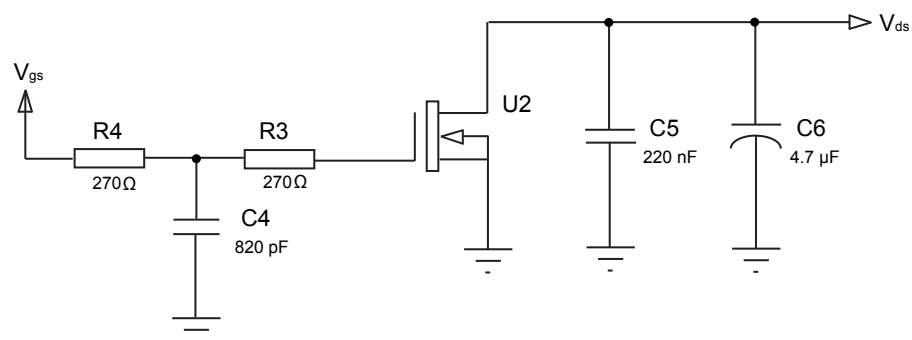


Figure 2. Single event effect, bias circuit



AM09224v1

3.3 Electrical characteristics (curves)

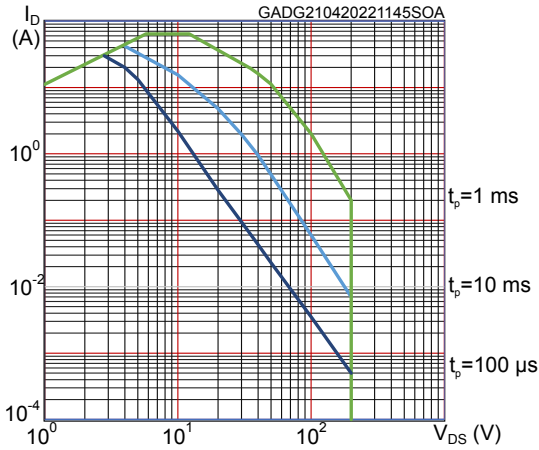
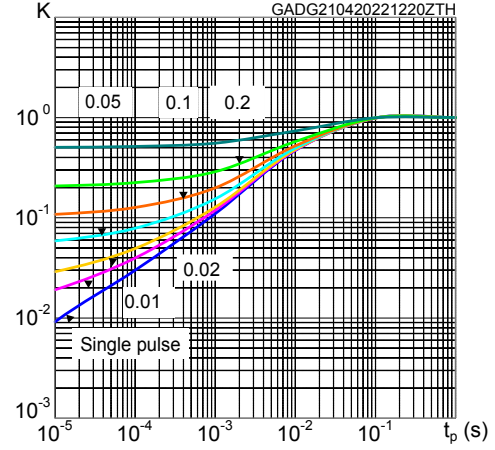
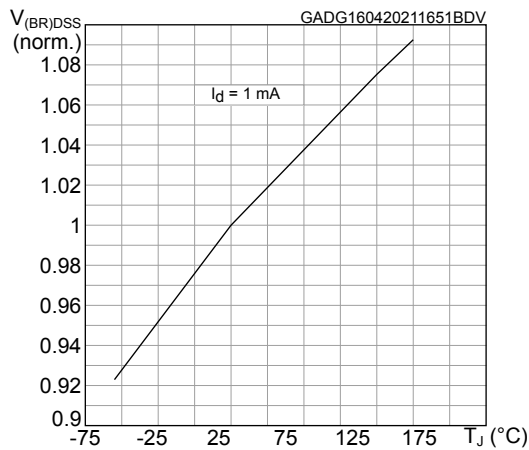
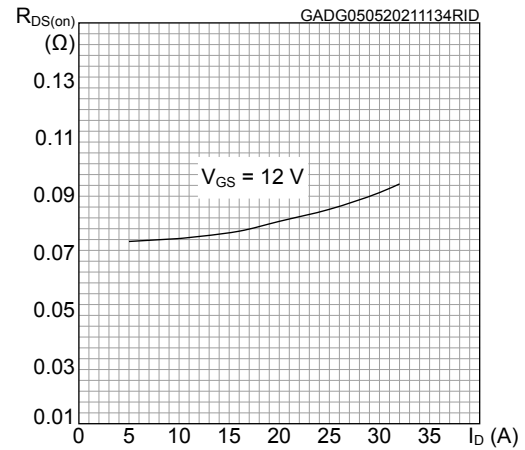
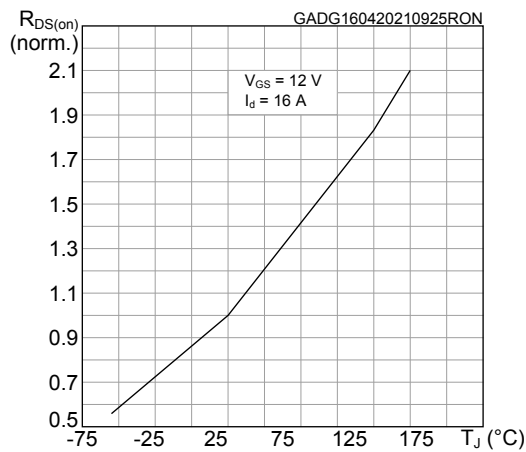
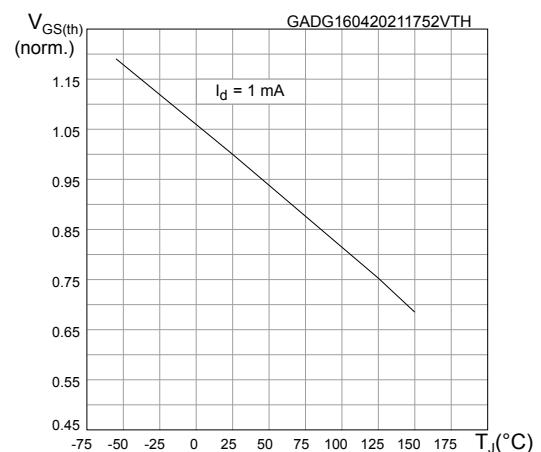
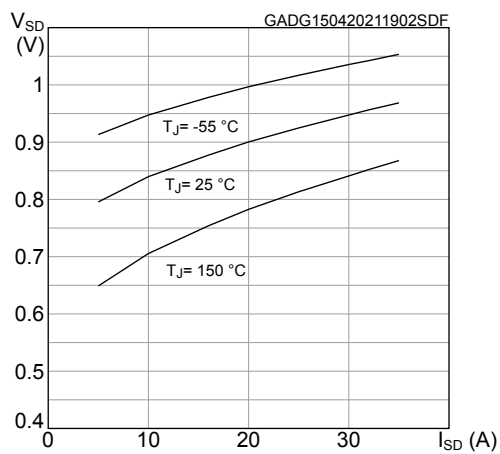
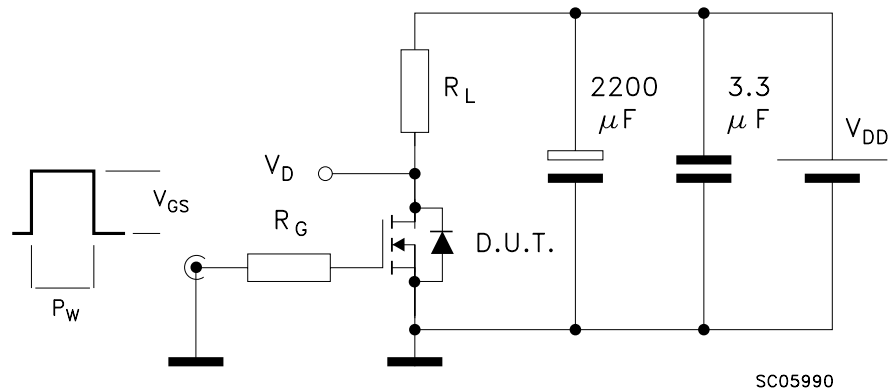
Figure 3. Safe operating area

Figure 4. Normalized Thermal Impedance

Figure 5. Normalized $V_{(BR)DSS}$ vs. temperature

Figure 6. Static drain-source on-resistance

Figure 7. Normalized on-resistance vs. temperature

Figure 8. Normalized gate threshold voltage vs. temperature


Figure 9. Source-drain diode forward characteristics



4 Test circuits

Figure 10. Switching times test circuit for resistive load



Note: Max driver V_{GS} slope = 1 V/ns (no DUT)

Figure 11. Source drain diode waveform

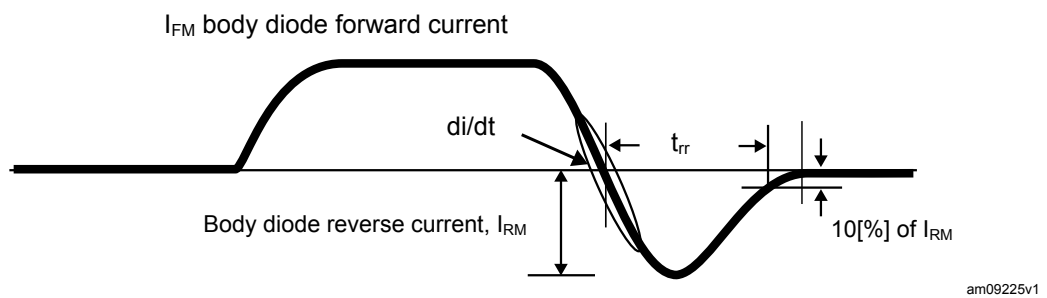
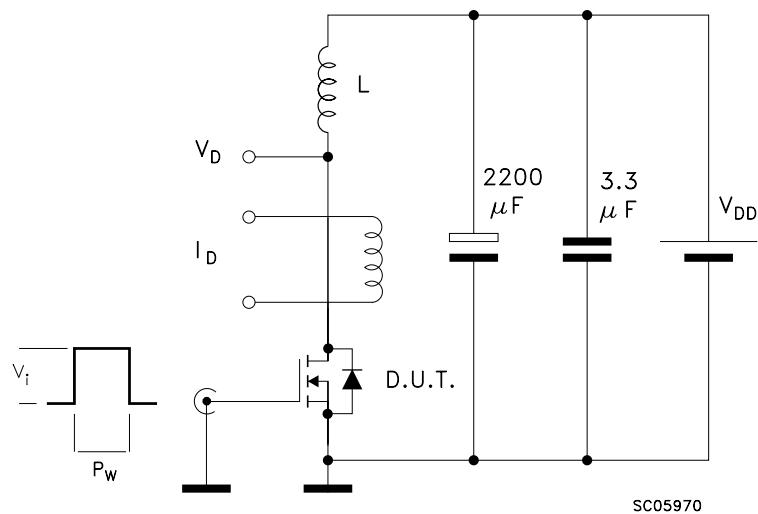


Figure 12. Unclamped inductive load test circuit (single pulse and repetitive)

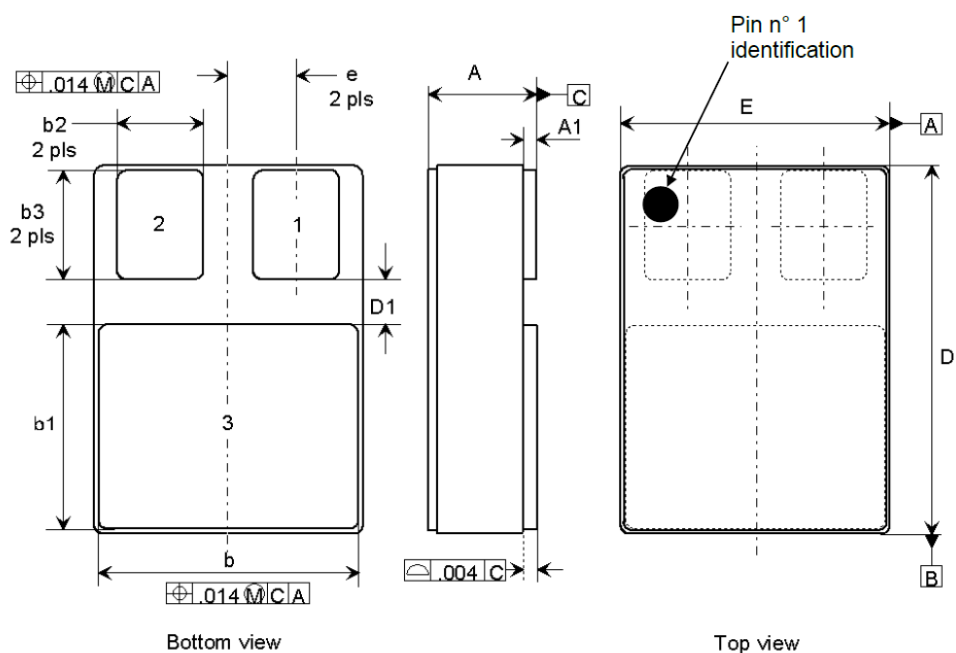


5 Package information

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. ECOPACK is an ST trademark.

5.1 SMD.5 package information

Figure 13. SMD.5 package outline



7386434_7

Table 7. SMD.5 package mechanical data

Symbols	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.84		3.30	0.112		0.130
A1	0.25	0.38	0.51	0.010	0.015	0.020
b	7.13	7.26	7.39	0.281	0.286	0.291
b1	5.58	5.72	5.84	0.220	0.225	0.230
b2	2.28	2.41	2.54	0.090	0.095	0.100
b3	2.92	3.05	3.18	0.115	0.120	0.125
D	10.03	10.16	10.28	0.395	0.400	0.405
D1	0.76			0.030		
E	7.39	7.52	7.64	0.291	0.296	0.301
e		1.91			0.075	

Note: The lid is not connected to any pin.

6 Order codes

Table 8. Ordering information

Part number	ESCC specification	Screening type	Radiation level	Package	Weight	Lead finish	Marking	Packing
STRHMF16N20S1	-	Engineering model	-	SMD.5	1 g	Gold	STRHMF16N20S1	Strip pack
STRHMF16N20SG	5205/034/01	Flight model	100 krad				520503401	
STRHMF16N20ST	5205/034/02	Flight model	100 krad			Solder dip	520503402	

1. *Specific marking only. The full marking includes in addition: For the Engineering Models: ST logo, date code; country of origin (FR). For ESCC flight parts: ST logo, date code, country of origin (FR), ESA logo, serial number of the part within the assembly lot.*

Contact ST sales office for information about specific conditions for products in die form.

7 Other information

Table 9. Traceability and documentation

Screening type	Date code ⁽¹⁾	Radiation level	Documentation
Engineering model	3yywwN	-	Certificate of conformance
Flight model	yywwN	100 krad	Certificate of conformance ESCC qualification maintenance lot reference Radiation verification test (RVT) report at 25 / 50 / 70 / 100 krad at 0.1 rad / s.

1. yy = year, ww = week number, N = lot index in the week.

Revision history

Table 10. Document revision history

Date	Revision	Changes
02-Aug-2021	1	First release.
27-Jul-2022	2	Updated <i>Features</i> , <i>Table 4</i> and <i>Figure 4</i> . Added <i>Figure 3</i> and <i>Section 3.1</i> . Minor text changes.
02-Jan-2023	3	Updated <i>Table 6</i> and <i>Figure 1</i> .
05-May-2023	4	Updated <i>Table 4</i> .
22-Oct-2025	5	Updated <i>Table 4</i> .
14-Apr-2026	6	Updated Table 4 .

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.

In the event of any conflict between the provisions of this document and the provisions of any contractual arrangement in force between the purchasers and ST, the provisions of such contractual arrangement shall prevail.

The 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.

The 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 the 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.

If the purchasers identify an ST product that meets their functional and performance requirements but that is not designated for the purchasers' market segment, the purchasers shall contact ST for more information.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to 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.

© 2026 STMicroelectronics – All rights reserved