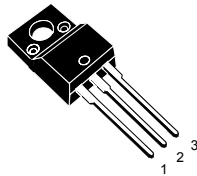
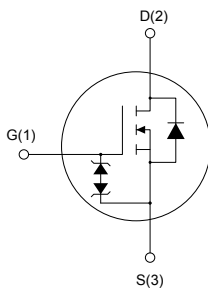


N-channel 800 V, 1.3 Ω typ., 4.5 A MDmesh K5 Power MOSFET in a TO-220FP package



TO-220FP



AM01476v1


Product status link
[STF6N80K5](#)
Product summary

Order code	STF6N80K5
Marking	6N80K5
Package	TO-220FP
Packing	Tube

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STF6N80K5	800 V	1.6 Ω	4.5 A

- Ultra-low gate charge
- Very low FoM (figure of merit)
- Zener-protected
- 100% avalanche tested

Applications

- Switching applications

Description

This very high voltage N-channel Power MOSFET is designed using MDmesh K5 technology based on an innovative proprietary vertical structure. The result is a dramatic reduction in on-resistance and ultra-low gate charge for applications requiring superior power density and high efficiency.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	800	V
V_{GS}	Gate-source voltage	±30	V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	4.5	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	2.8	
$I_{DM}^{(1)}$	Drain current (pulsed)	18	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	25	W
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink ($t = 1\text{ s}$; $T_C = 25\text{ °C}$)	2.5	kV
$dv/dt^{(2)}$	Peak diode recovery voltage slope	4.5	V/ns
$dv/dt^{(3)}$	MOSFET dv/dt ruggedness	50	V/ns
T_{stg}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range		°C

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 4.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DS}(\text{peak}) < V_{(BR)DSS}$.
3. $V_{DD} \leq 640\text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	5	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	°C/W

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	1.5	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	85	mJ

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	800	-	-	V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$, $T_C = 125\text{ °C}^{(1)}$	-	-	50	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$	-	-	± 10	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 100\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 2\text{ A}$	-	1.3	1.6	Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	270	-	pF
C_{oss}	Output capacitance		-	25	-	pF
C_{rss}	Reverse transfer capacitance		-	0.7	-	pF
$C_{o(tr)}^{(1)}$	Equivalent output capacitance time related	$V_{DS} = 0\text{ to }640\text{ V}$, $V_{GS} = 0\text{ V}$	-	38	-	pF
$C_{o(er)}^{(2)}$	Equivalent output capacitance energy related		-	16	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	7.5	-	Ω
Q_g	Total gate charge	$V_{DD} = 640\text{ V}$, $I_D = 4.5\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 14. Test circuit for gate charge behavior)	-	13	-	nC
Q_{gs}	Gate-source charge		-	2.1	-	nC
Q_{gd}	Gate-drain charge		-	9.6	-	nC

1. $C_{o(tr)}$ is a constant capacitance value that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

2. $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$, $I_D = 2.25\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	16	-	ns
t_r	Rise time		-	7.5	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	28.5	-	ns
t_f	Fall time		-	16	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	4.5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	18	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 4.5\text{ A}$	-	-	1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 4.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	280	-	ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$	-	2.2	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 15. Test circuit for inductive load switching and diode recovery times)	-	15.5	-	A
t_{rr}	Reverse recovery time	$I_{SD} = 4.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	450	-	ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	3.15	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 15. Test circuit for inductive load switching and diode recovery times)	-	14	-	A

1. Pulse width is limited by safe operating area.
2. Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

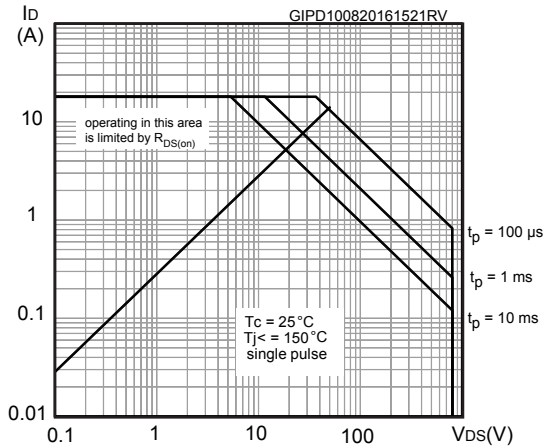
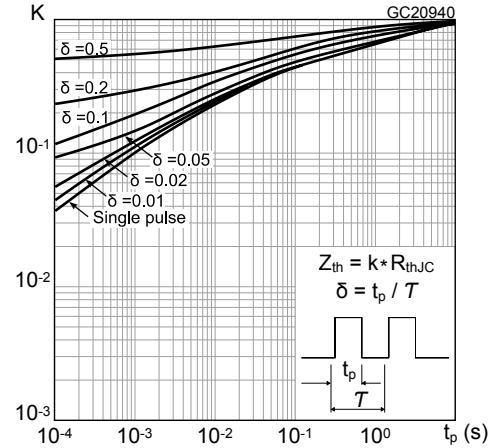
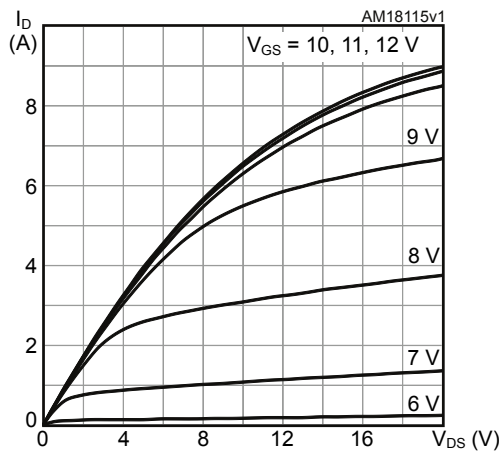
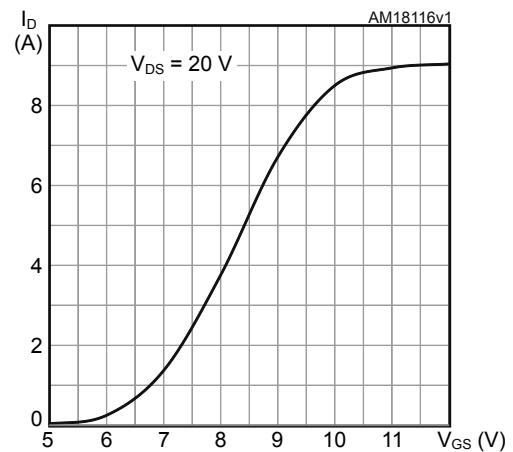
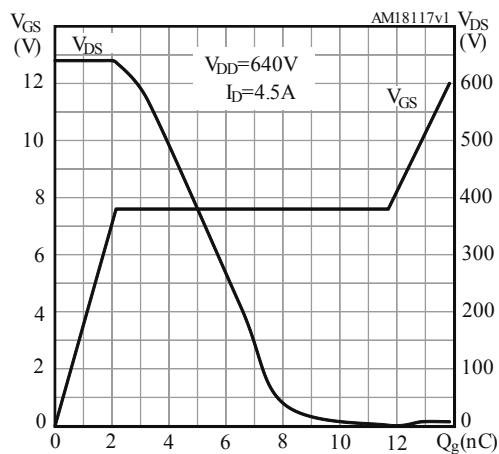
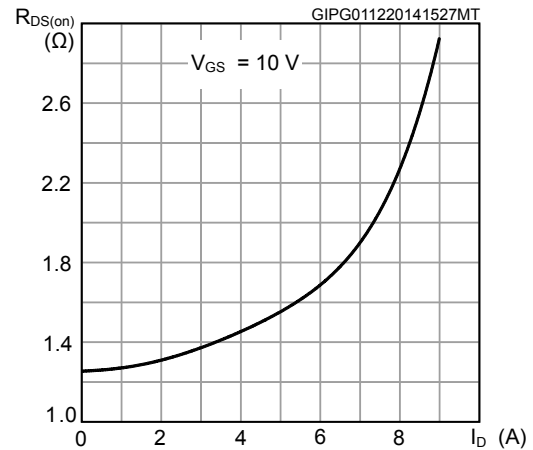
Figure 1. Safe operating area

Figure 2. Normalized transient thermal impedance

Figure 3. Typical output characteristics

Figure 4. Typical transfer characteristics

Figure 5. Typical gate charge characteristics

Figure 6. Typical drain-source on-resistance


Figure 7. Typical capacitance characteristics

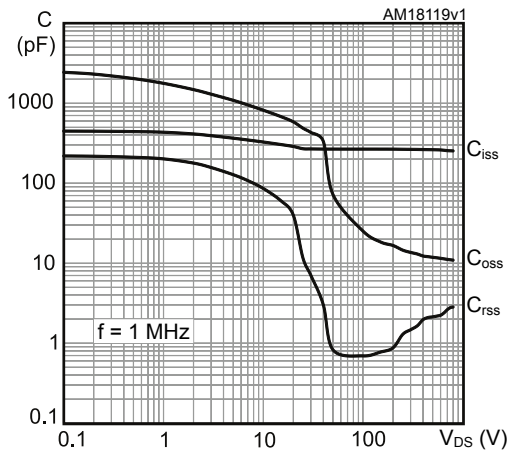


Figure 8. Typical output capacitance stored energy

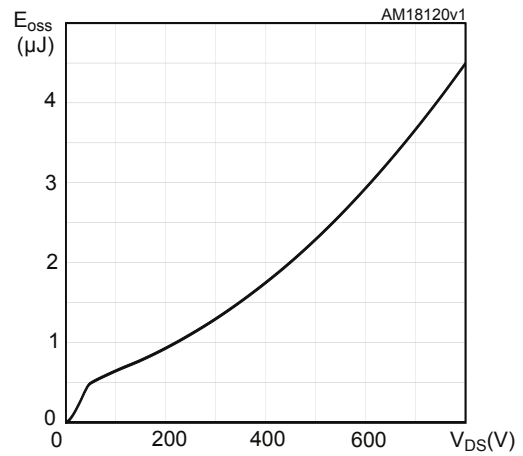


Figure 9. Normalized gate threshold vs temperature

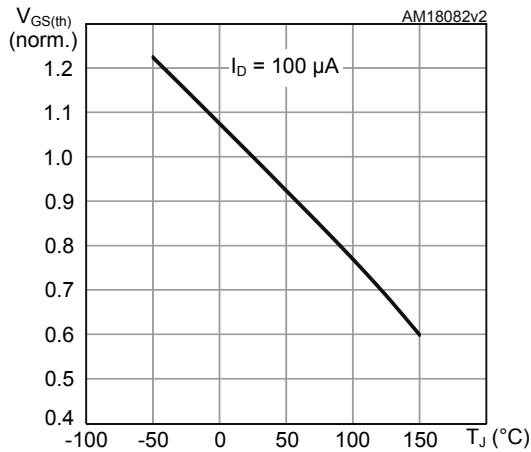


Figure 10. Normalized on-resistance vs temperature

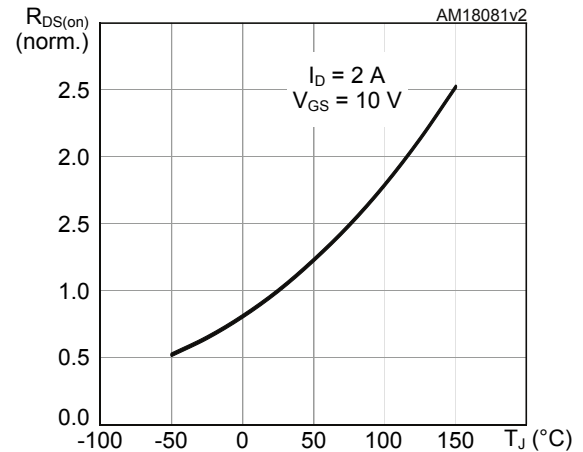


Figure 11. Normalized breakdown voltage vs temperature

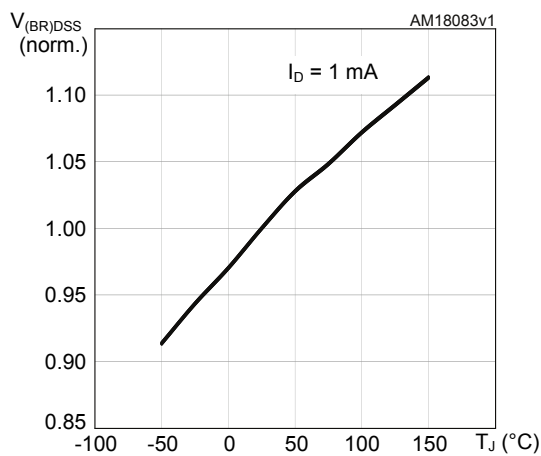
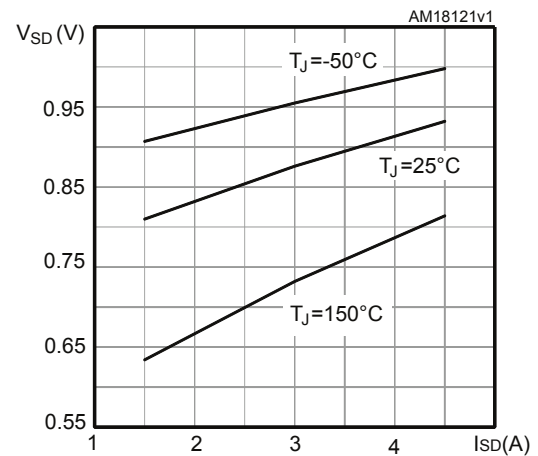


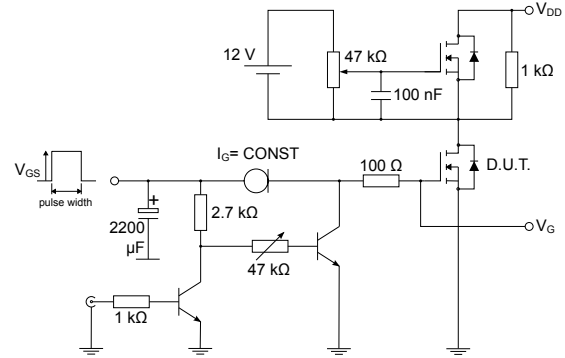
Figure 12. Typical reverse diode forward characteristics



3 Test circuits

Figure 13. Test circuit for resistive load switching times


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Figure 14. Test circuit for gate charge behavior


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Figure 15. Test circuit for inductive load switching and diode recovery times


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Figure 16. Unclamped inductive load test circuit


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Figure 17. Unclamped inductive waveform


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Figure 18. Switching time waveform

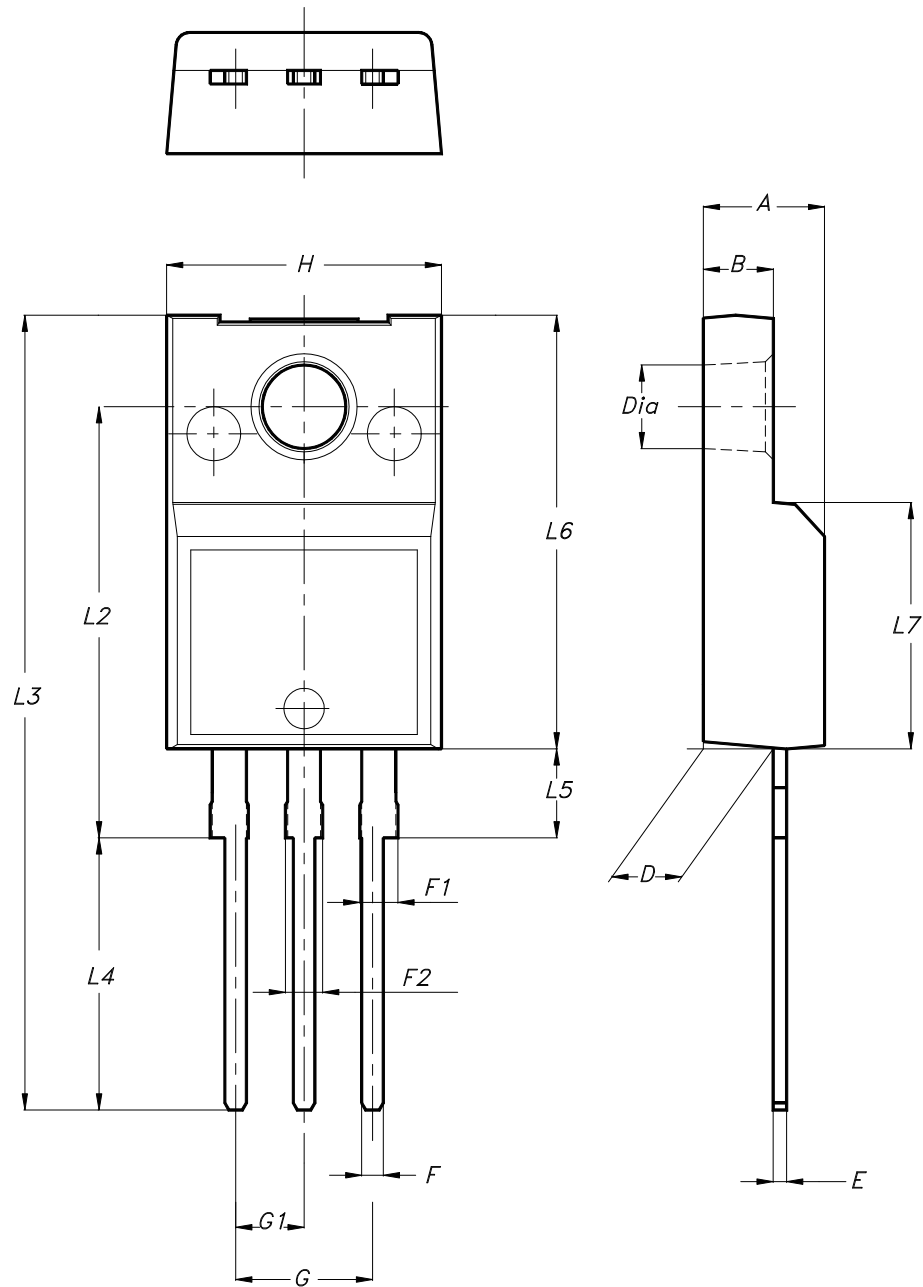

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4 Package information

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.

4.1 TO-220FP type B package information

Figure 19. TO-220FP type B package outline



7012510_B_rev.14

Table 8. TO-220FP type B package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
B	2.50		2.70
D	2.50		2.75
E	0.45		0.70
F	0.75		1.00
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.20
G1	2.40		2.70
H	10.00		10.40
L2		16.00	
L3	28.60		30.60
L4	9.80		10.60
L5	2.90		3.60
L6	15.90		16.40
L7	9.00		9.30
Dia	3.00		3.20

Revision history

Table 9. Document revision history

Date	Revision	Changes
28-May-2013	1	First release.
05-Mar-2014	2	<p>Datasheet status promoted from preliminary data to production data.</p> <p>Added: I2PAKFP package.</p> <p>Modified: E_{AS} value in <i>Table 2</i>.</p> <p>Added: MOSFET dv/dt ruggedness test condition and <i>note 4</i> in <i>Table 2</i>.</p> <p>Modified: R_G value in <i>Table 5</i>.</p> <p>Modified: the entire typical values in <i>Table 5</i>, <i>6</i> and <i>7</i>.</p> <p>Added: <i>Section 2.1: Electrical characteristics (curves)</i>.</p> <p>Minor text changes.</p>
05-Dec-2014	3	<p>Updated title, features and description in cover page.</p> <p>Updated <i>Section 2.1: Electrical characteristics (curves)</i> and <i>Section 4: Package information</i>.</p> <p>Minor text changes.</p>
06-Sep-2016	4	<p>Updated <i>Table 2: Absolute maximum ratings</i>, <i>Table 4: On/off states</i>, <i>Table 5: Dynamic</i>, <i>Table 6: Switching times</i> and <i>Table 7: Source drain diode</i>.</p> <p>Updated <i>Figure 2: Safe operating area</i> and <i>Figure 3: Thermal impedance</i>.</p> <p>Minor text changes.</p>
27-Mar-2026	5	<p>Removed order code STF16N80K5.</p> <p>Updated <i>Section 4: Package information</i>.</p> <p>Minor text changes.</p>

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