N-channel 800 V, 0.95 Ω typ., 6.5 A MDmesh Power MOSFET in an IPAK package

TAB

IPAK

D(2, TAB)

G(1)

S(3)

AM01475v1_noZen

Product status link

STD7NM80-1

Product summary

Product summary	
Order code	STD7NM80-1
Marking	D7NM80
Package	IPAK
Packing	Tube

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STD7NM80-1	800 V	1.05 Ω	6.5 A
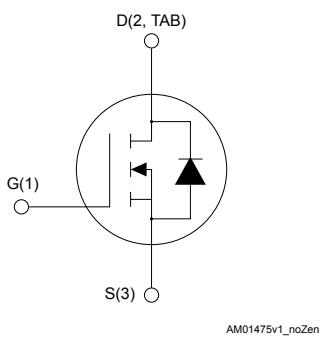
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Applications

- Switching applications

Description

This N-channel Power MOSFET is developed using STMicroelectronics' revolutionary MDmesh technology, which associates the multiple drain process with the company's PowerMESH horizontal layout. This device offers extremely low on-resistance, high dv/dt, and excellent avalanche characteristics. Using STMicroelectronics's proprietary strip technique, this Power MOSFET boasts an overall dynamic performance that is superior to similar products on the market.

DS14325 - **Rev 1** - **May 2023**
For further information contact your local STMicroelectronics sales office.

www.st.com

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 °C	6.5	A
	Drain current (continuous) at T_C = 100 °C	4	
I_{DM}[1]	Drain current (pulsed)	26	A
P_{TOT}	Total power dissipation at T_C = 25 °C	90	W
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.*

Table 2. **Thermal data**

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.4	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	100	°C/W

Table 3. **Avalanche characteristics**

Symbol	Parameter	Value	Unit
I_{AS}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	1	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AS}, V_{DD} = 50 V)	240	mJ

2 Electrical characteristics

$T_C = 25$ °C unless otherwise specified.

Table 4. On/off states

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1$ mA, $V_{GS} = 0$ V	800			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0$ V, $V_{DS} = 800$ V			10	µA
		$V_{GS} = 0$ V, $V_{DS} = 800$ V, $T_C = 125$ °C[1]			100	
I_{GSS}	Gate body leakage current	$V_{DS} = 0$ V, $V_{GS} = \pm30$ V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250$ µA	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10$ V, $I_D = 3.25$ A		0.95	1.05	Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50$ V, f = 1 MHz, $V_{GS} = 0$ V	-	620	-	pF
C_{oss}	Output capacitance		-	460	-	pF
C_{rss}	Reverse transfer capacitance		-	15	-	pF
R_g	Gate input resistance	f = 1 MHz open drain	-	7	-	Ω
Q_g	Total gate charge	$V_{DD} = 640$ V, $I_D = 6.5$ A, $V_{GS} = 0$ to 10 V (see Figure 13. Test circuit for gate charge behavior)	-	18	-	nC
Q_{gs}	Gate-source charge		-	4	-	nC
Q_{gd}	Gate-drain charge		-	11	-	nC

Table 6. Switching times

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400$ V, $I_D = 3.25$ A, $R_G = 4.7$ Ω, $V_{GS} = 10$ V (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	20	-	ns
t_r	Rise time		-	8	-	ns
$t_{d(off)}$	Turn-off delay time		-	35	-	ns
t_f	Fall time		-	10	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		6.5	A
I_{SDM}[1]	Source-drain current (pulsed)		-		26	A
V_{SD}[2]	Forward on voltage	I_{SD} = 6.5 A, V_{GS} = 0 V	-		1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 6.5 A, di/dt = 100 V	-	460		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 50 V (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	4		µC
I_{RRM}	Reverse recovery current		-	17		A
t_{rr}	Reverse recovery time	I_{SD} = 6.5 A, di/dt = 100 A/µs	-	680		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 50 V (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	6		µC
I_{RRM}	Reverse recovery current		-	17		A

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

2.1 Electrical characteristics (curves)

Figure 1. **Safe operating area**
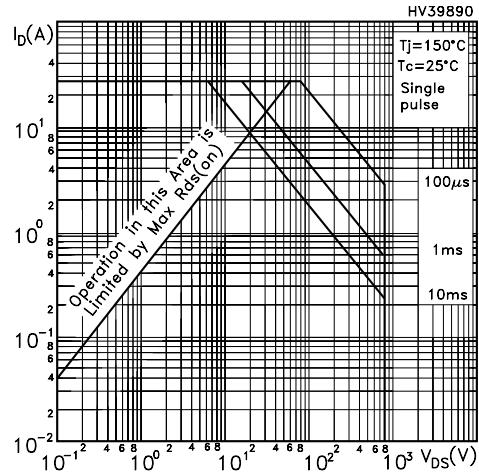
Figure 2. **Thermal impedance**
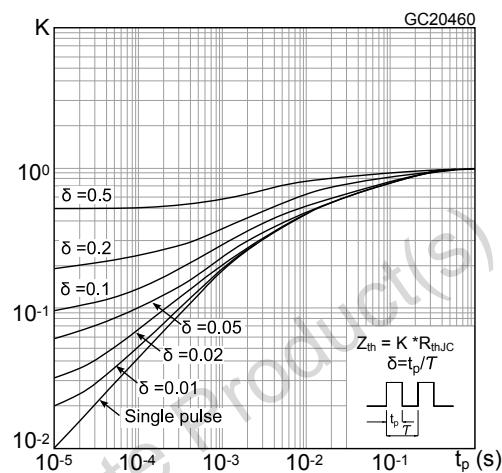
Figure 3. **Output characterisics**
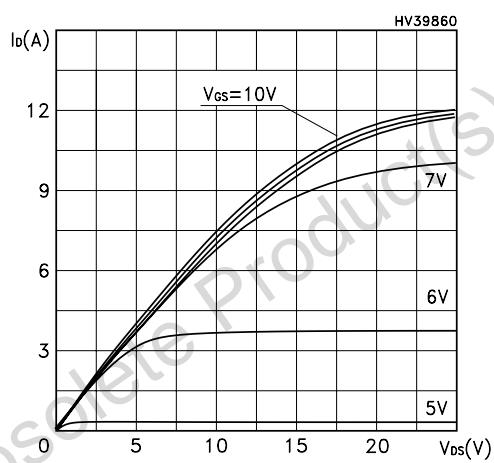
Figure 4. **Transfer characteristics**
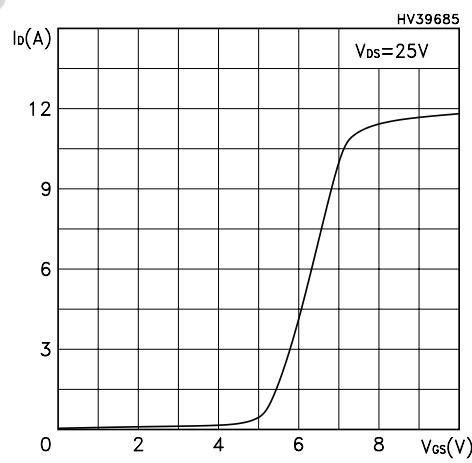
Figure 5. **Static drain-source on-resistance**
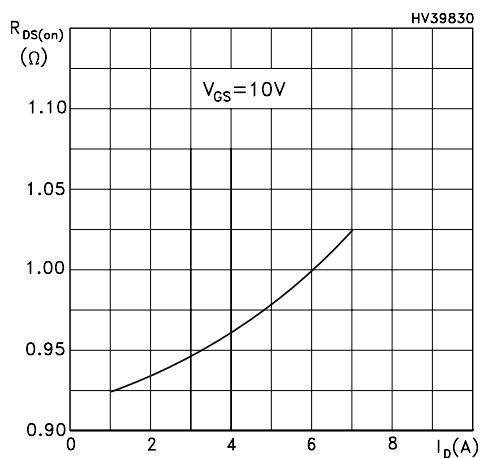

Figure 6. **Gate charge vs gate-source voltage**
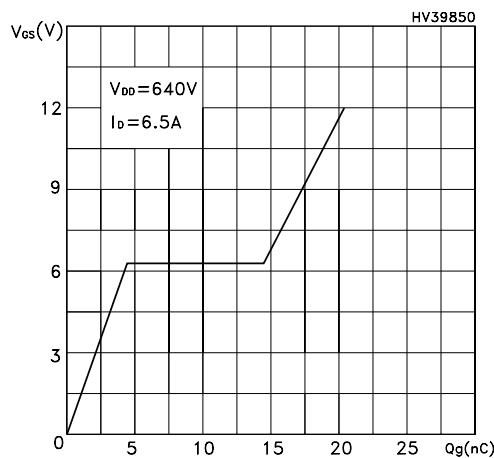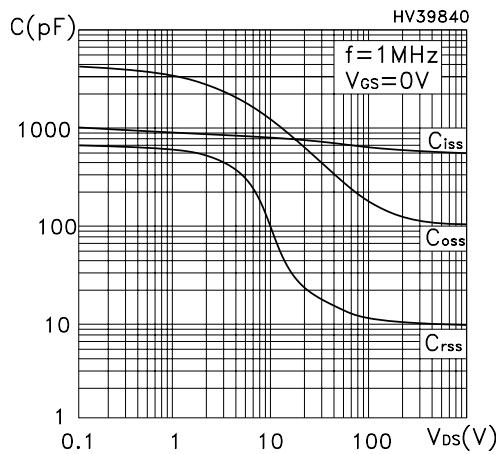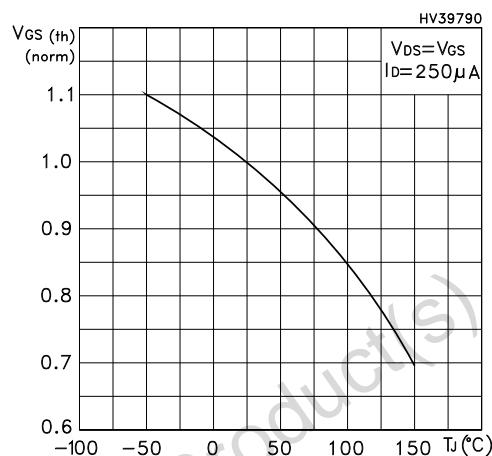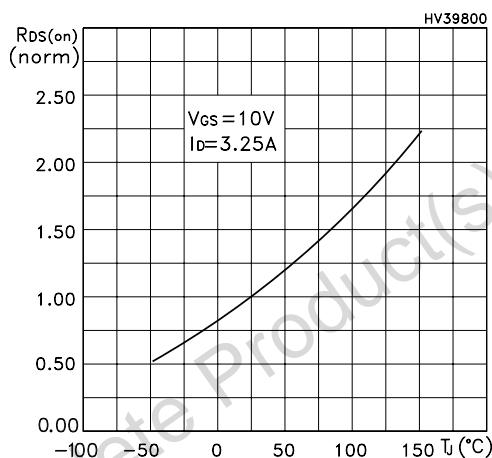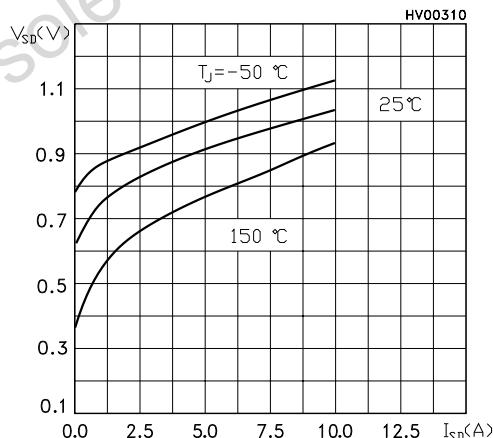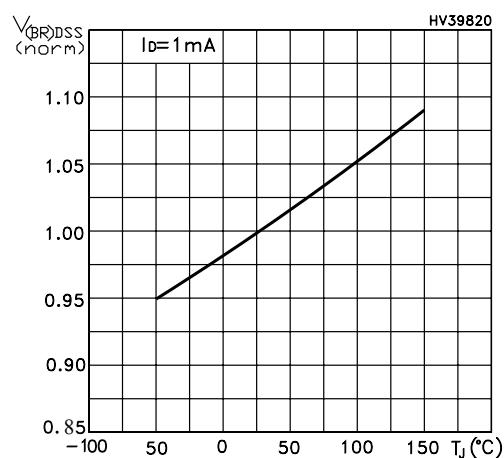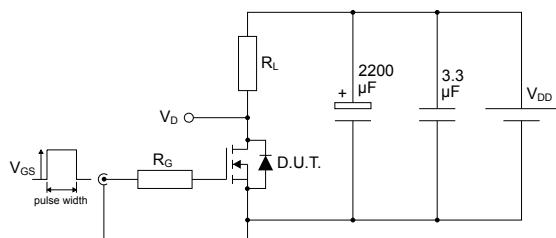
Figure 7. Capacitance variations

**Figure 8. Normalized gate threshold voltage vs temperature**


Figure 9. Normalized on-resistance vs temperature

Figure 10. Source-drain diode forward characteristics

Figure 11. Normalized V(BR)DSS vs temperature
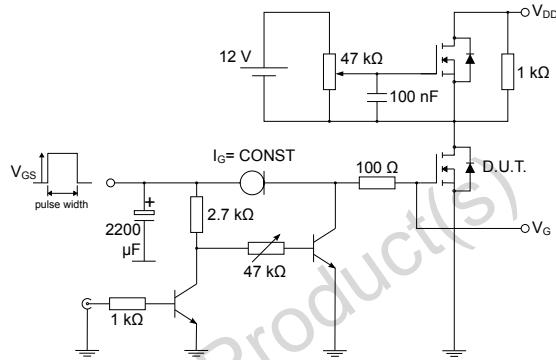
3 Test circuits

Figure 12. Test circuit for resistive load switching times
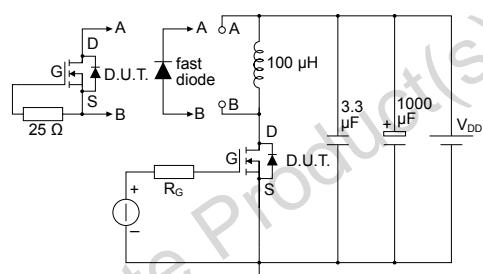
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Figure 13. Test circuit for gate charge behavior
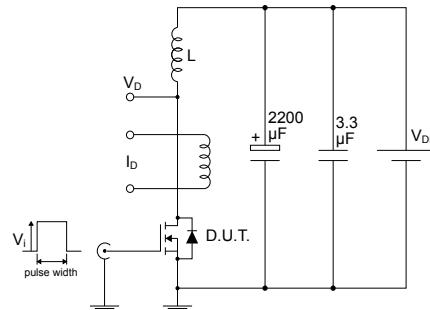
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Figure 14. Test circuit for inductive load switching and diode recovery times
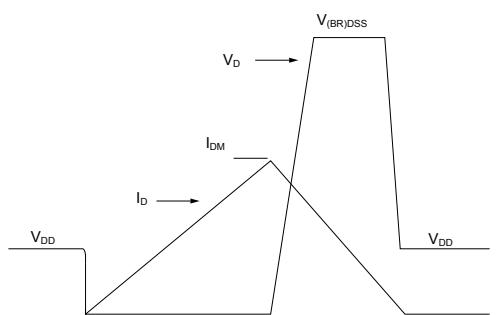
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Figure 15. Unclamped inductive load test circuit
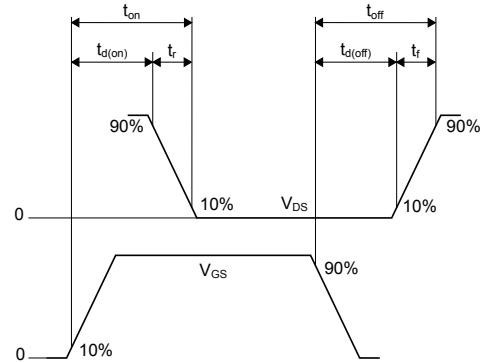
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Figure 16. Unclamped inductive waveform

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Figure 17. Switching time waveform
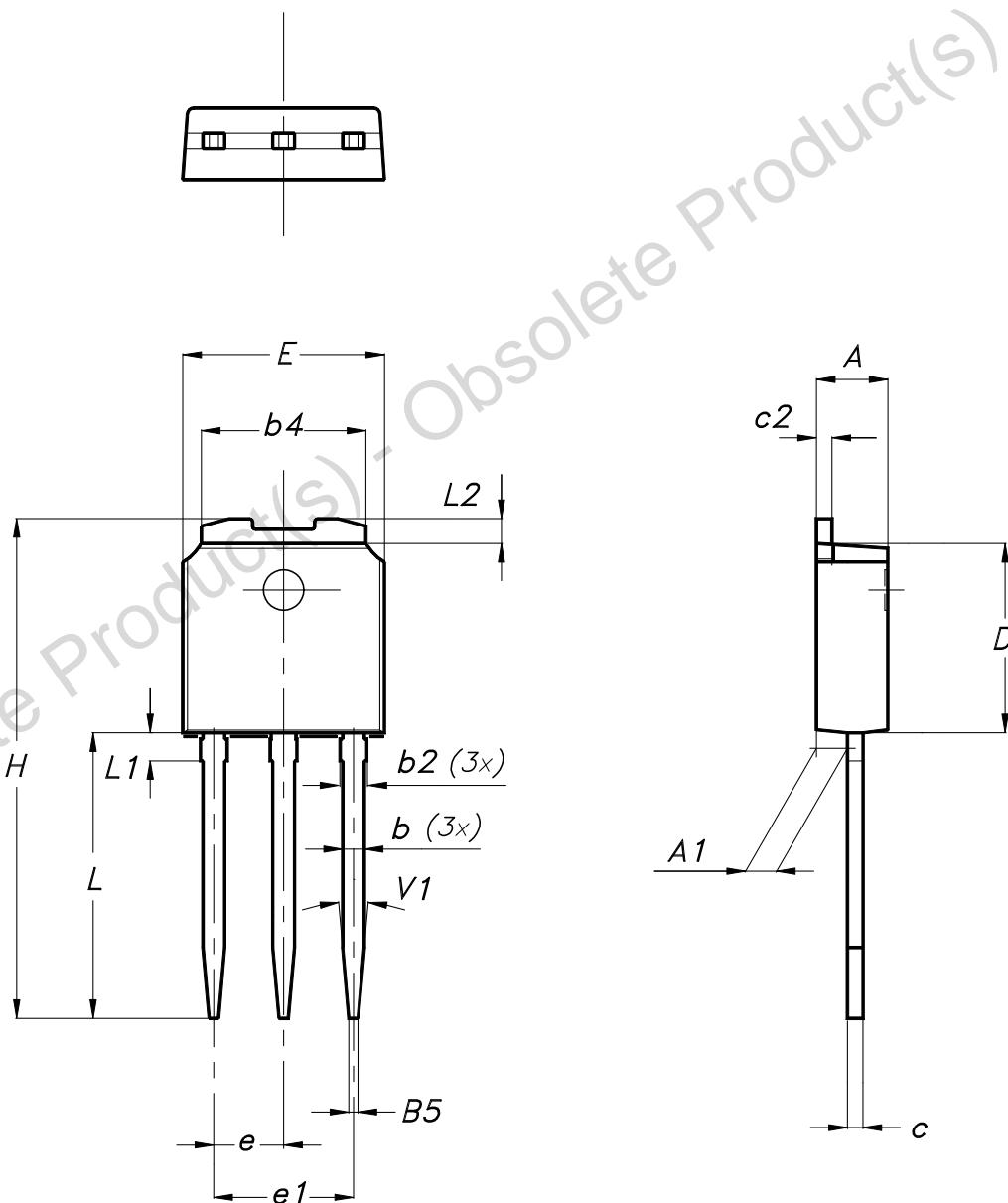
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4 Package information

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. ECOPACK is an ST trademark.

4.1 IPAK (TO-251) type A package information

Figure 18. IPAK (TO-251) type A package outline

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Table 8. **IPAK (TO-251) type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
b	0.64		0.90
b2			0.95
b4	5.20		5.40
B5		0.30	
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
E	6.40		6.60
e		2.28	
e1	4.40		4.60
H		16.10	
L	9.00		9.40
L1	0.80		1.20
L2		0.80	1.00
V1		10°	

Revision history

Table 9. Document revision history

Date	Revision	Changes
30-May-2023	1	First release. The part number STD7NM80-1 was previously inserted in the DS4854.

Contents

IMPORTANT NOTICE – READ CAREFULLY