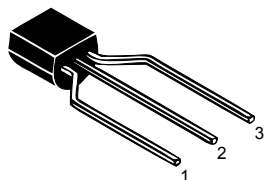
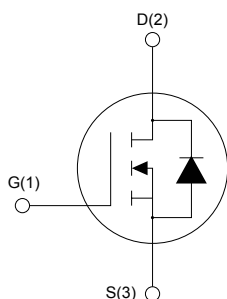


N-channel 600 V, 7.3 Ω typ., 0.4 A SuperMESH Power MOSFET in a TO-92 package



TO-92 ammopack



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Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STQ1HNK60R-AP	600 V	8.5 Ω	0.4 A

- Extremely high dv/dt capability
- 100% avalanche tested
- Gate charge minimized

Applications

- Switching applications

Description

This high voltage device is an N-channel Power MOSFET developed using the SuperMESH technology by STMicroelectronics, an optimization of the well-established PowerMESH. In addition to a significant reduction in on-resistance, this device is designed to ensure a high level of dv/dt capability for the most demanding applications.

Product status link

[STQ1HNK60R-AP](#)

Product summary

Order code	STQ1HNK60R-AP
Marking	1HNK60R
Package	TO-92
Packing	Ammopack

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	600	V
V_{GS}	Gate- source voltage	± 30	V
I_D	Drain current (continuous) at $T_L = 25\text{ }^{\circ}\text{C}$	0.4	A
I_D	Drain current (continuous) at $T_L = 100\text{ }^{\circ}\text{C}$	0.25	A
$I_{DM}^{(1)}$	Drain current (pulsed)	1.6	A
P_{TOT}	Total dissipation at $T_L = 25\text{ }^{\circ}\text{C}$	3	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	3	V/ns
T_J	Operating junction temperature range	-55 to 150	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		$^{\circ}\text{C}$

1. Pulse width limited by safe operating area.

2. $I_{SD} \leq 0.4\text{ A}$, $di/dt \leq 100\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJA}	Thermal resistance, junction-to-ambient	120	$^{\circ}\text{C}/\text{W}$
R_{thJL}	Thermal resistance, junction-to-lead	40	$^{\circ}\text{C}/\text{W}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max.)	0.4	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	25	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	600			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾			50	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 30\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.25	3	3.7	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 0.5\text{ A}$		7.3	8.5	Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	156		pF
C_{oss}	Output capacitance		-	23.5		pF
C_{rss}	Reverse transfer capacitance		-	3.8		pF
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 1\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior)	-	7	$10^{(1)}$	nC
Q_{gs}	Gate-source charge		-	1.1		nC
Q_{gd}	Gate-drain charge		-	3.7		nC

1. Specified by design, not tested in production.

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300\text{ V}$, $I_D = 0.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	6.5	-	ns
t_r	Rise time		-	5	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	19	-	ns
t_f	Fall time		-	25	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		0.4	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		1.6	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 0.4 \text{ A}$, $V_{GS} = 0 \text{ V}$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 1.0 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 25 \text{ V}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	140		ns
Q_{rr}	Reverse recovery charge		-	240		nC
I_{RRM}	Reverse recovery current		-	3.3		A
t_{rr}	Reverse recovery time	$I_{SD} = 1.0 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 25 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	229		ns
Q_{rr}	Reverse recovery charge		-	377		nC
I_{RRM}	Reverse recovery current		-	3.3		A

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

2.1 Electrical characteristics (curves)

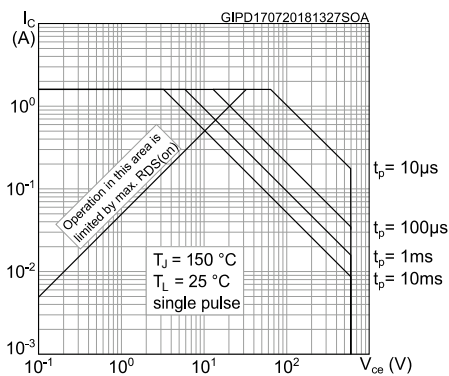
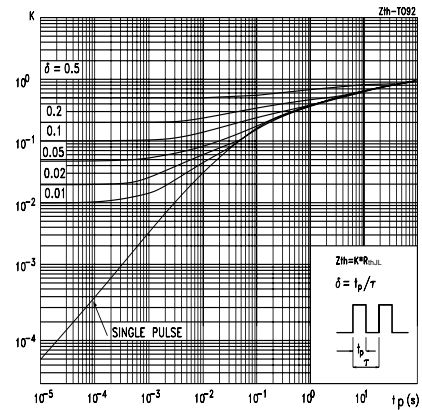
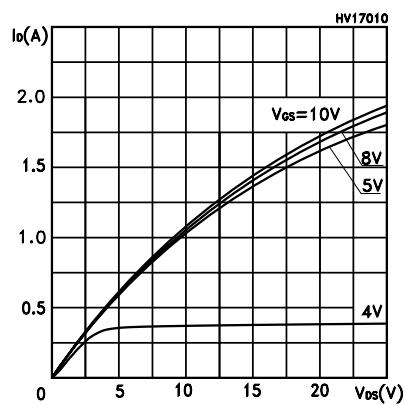
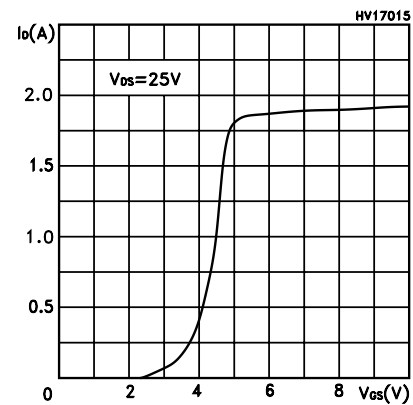
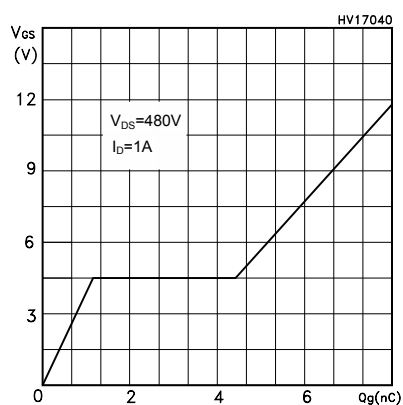
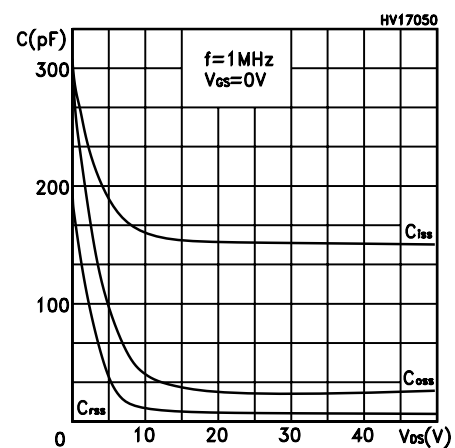
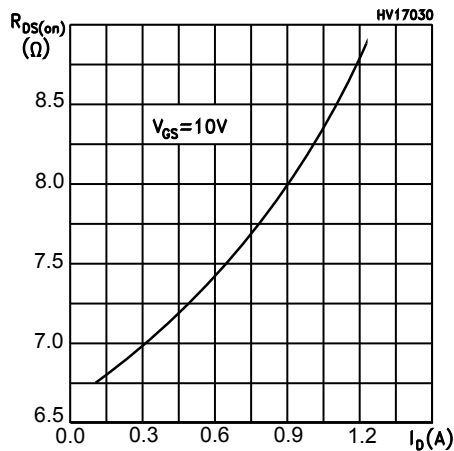
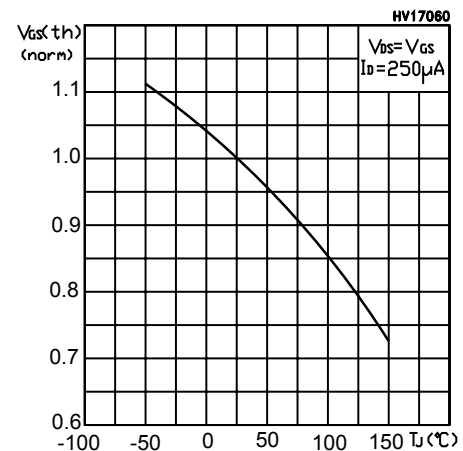
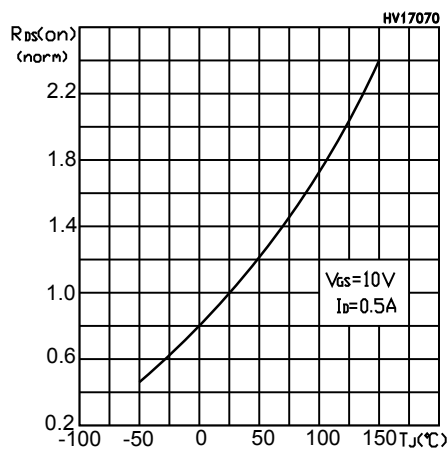
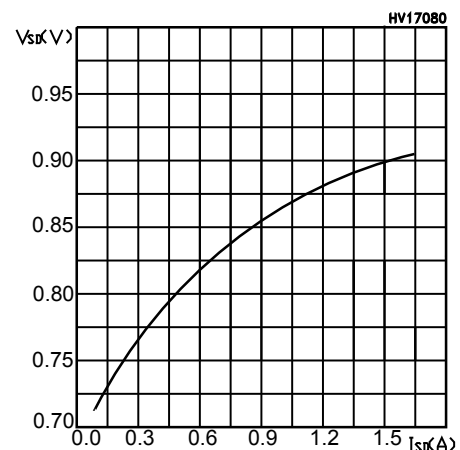
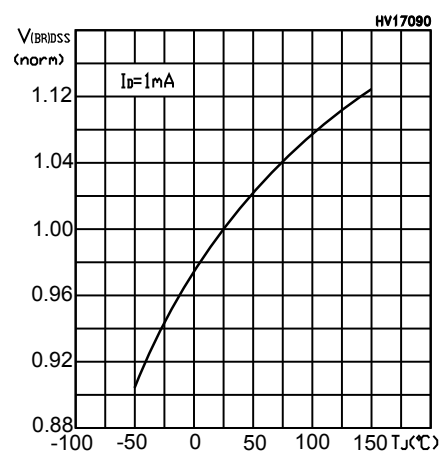
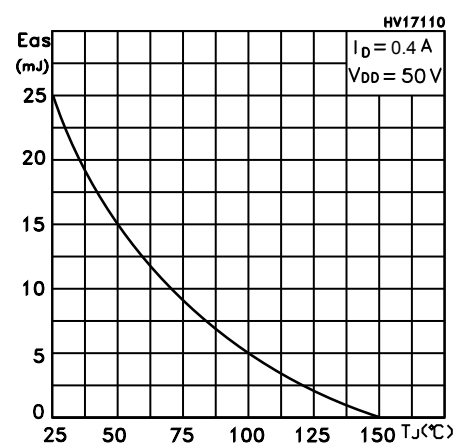
Figure 1. Safe operating area

Figure 2. Normalized transient thermal impedance

Figure 3. Typical output characteristics

Figure 4. Typical transfer characteristics

Figure 5. Typical gate charge characteristics

Figure 6. Typical capacitance characteristics


Figure 7. Typical static drain-source on-resistance

Figure 8. Normalized gate threshold vs temperature

Figure 9. Normalized on-resistance vs temperature

Figure 10. Typical reverse diode forward characteristics

Figure 11. Normalized breakdown voltage vs temperature

Figure 12. Maximum avalanche energy vs temperature


3 Test circuits

Figure 13. Test circuit for resistive load switching times


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Figure 14. Test circuit for gate charge behavior

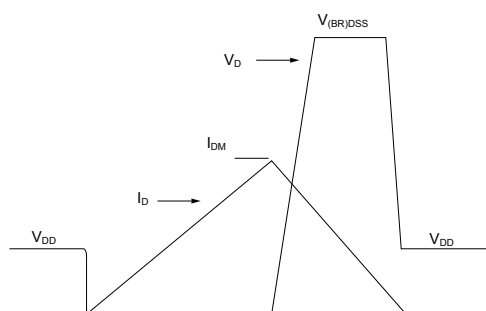

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Figure 15. Test circuit for inductive load switching and diode recovery times


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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

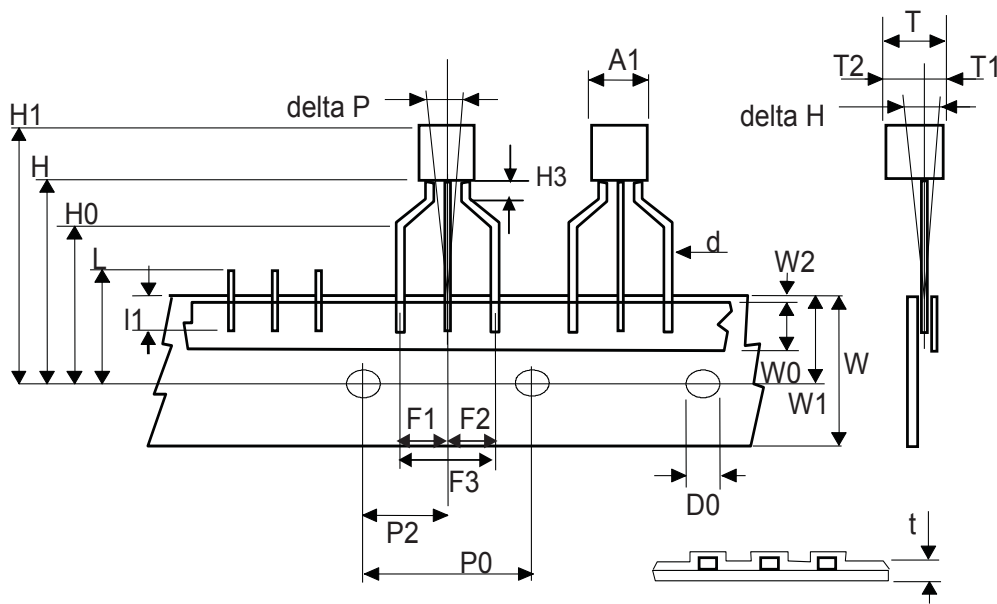

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4 Package information

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-92 ammpack package information

Figure 19. TO-92 ammpack package outline



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Table 8. TO-92 ammpack mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A1			4.80
T			3.80
T1			1.60
T2			2.30
d			0.48
P0	12.50	12.70	12.90
P2	5.65	6.35	7.05
F1, F2	2.40	2.54	2.94
F3	4.98	5.08	5.48
delta H	-2.00		2.00
W	17.50	18.00	19.00
W0	5.70	6.00	6.30
W1	8.50	9.00	9.25
W2			0.50
H	18.50		20.50
H0	15.50	16.00	16.50
H1			25.00
H3	0.50	1.00	2.00
D0	3.80	4.00	4.20
t			0.90
L			11.00
I1	3.00		
delta P	-1.00		1.00

Revision history

Table 9. Document revision history

Date	Revision	Changes
16-Jul-2026	1	First release. Part number STQ1HNK60R-AP previously included in datasheet DS12594.

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