STP43N60DM2



N-channel 600 V, 0.085 Ω typ., 34 A MDmesh™ DM2 Power MOSFET in a TO-220 package

Datasheet - production data

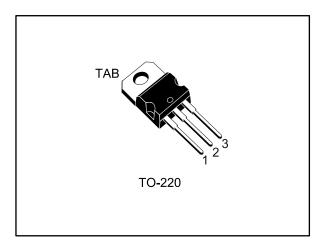
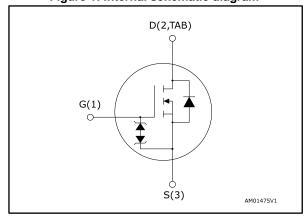


Figure 1: Internal schematic diagram



Features

Order code	V _{DS} @ T _{Jmax.}	R _{DS(on)} max.	I _D	P _{TOT}
STP43N60DM2	650 V	0.093 Ω	34 A	250 W

- Fast-recovery body diode
- Extremely low gate charge and input capacitance
- Low on-resistance
- 100% avalanche tested
- Extremely high dv/dt ruggedness
- Zener-protected

Applications

Switching applications

Description

This high voltage N-channel Power MOSFET is part of the MDmesh $^{\text{TM}}$ DM2 fast recovery diode series. It offers very low recovery charge (Q_{rr}) and time (t_{rr}) combined with low $R_{\text{DS(on)}}$, rendering it suitable for the most demanding high efficiency converters and ideal for bridge topologies and ZVS phase-shift converters.

Table 1: Device summary

Order code	Marking	Package	Packing
STP43N60DM2	43N60DM2	TO-220	Tube

Contents STP43N60DM2

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STP43N60DM2 Electrical ratings

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	±25	V
	Drain current (continuous) at T _{case} = 25 °C	34	۸
l _D	Drain current (continuous) at T _{case} = 100 °C	21	A
I _{DM} ⁽¹⁾	Drain current (pulsed)	136	А
P _{TOT}	Total dissipation at T _{case} = 25 °C	250	W
dv/dt ⁽²⁾	Peak diode recovery voltage slope	50	\//no
dv/dt ⁽³⁾	MOSFET dv/dt ruggedness	50 V/n	
T _{stg}	Storage temperature -55 to 150		°C
Tj	Operating junction temperature -55		C

Notes:

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R _{thj-case}	Thermal resistance junction-case	0.50	°C/W
R _{thj-amb}	Thermal resistance junction-ambient	62.5	

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
I _{AR}	Avalanche current, repetitive or not repetitive	6	Α
E _{AS} ⁽¹⁾	Single pulse avalanche energy	800	mJ

Notes:

 $^{^{\}left(1\right)}$ Pulse width is limited by safe operating area.

 $^{^{(2)}}$ $I_{SD} \leq 34$ A, di/dt=900 A/µs; V_{DS} peak < $V_{(BR)DSS},~V_{DD}$ = 400 V.

 $^{^{(3)}}$ V_{DS} ≤ 480 V.

 $^{^{(1)}}$ starting $T_j = 25~^{\circ}C,~I_D = I_{AR},~V_{DD} = 50~V.$

Electrical characteristics STP43N60DM2

2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 5: Static

Symbol	Parameter Test conditions		Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	$V_{GS} = 0 \text{ V}, I_D = 1 \text{ mA}$	600			V
	Zero gate voltage drain current	$V_{GS} = 0 \text{ V}, V_{DS} = 600 \text{ V}$			1	
I _{DSS}		$V_{GS} = 0 \text{ V}, V_{DS} = 600 \text{ V},$ $T_{case} = 125 \text{ °C}$			100	μA
I _{GSS}	Gate-body leakage current	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 25 \text{ V}$			±5	μΑ
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	3	4	5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 17 A		0.085	0.093	Ω

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
C _{iss}	Input capacitance		-	2500	•	
C _{oss}	Output capacitance	$V_{DS} = 100 \text{ V}, f = 1 \text{ MHz},$	-	120	ı	pF
C _{rss}	Reverse transfer capacitance	$V_{GS} = 0 V$	-	3	-	Pi
Coss eq. (1)	Equivalent output capacitance	$V_{DS} = 0$ to 480 V, $V_{GS} = 0$ V	-	200	-	pF
R _G	Intrinsic gate resistance	$f = 1 \text{ MHz}, I_D = 0 \text{ A}$	-	4	1	Ω
Q_g	Total gate charge	$V_{DD} = 480 \text{ V}, I_D = 34 \text{ A},$	•	56	•	
Q _{gs}	Gate-source charge	V _{GS} = 10 V (see <i>Figure 15</i> :	-	13	•	nC
Q_{gd}	Gate-drain charge	"Gate charge test circuit")	-	30	-	

Notes:

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time	$V_{DD} = 300 \text{ V}, I_D = 25 \text{ A}$	ı	29	•	
t _r	Rise time	$R_G = 4.7 \Omega$, $V_{GS} = 10 V$ (see Figure 14: "Switching times	ı	27	ı	
t _{d(off)}	Turn-off delay time	test circuit for resistive load"	-	85	-	ns
t _f	Fall time	and Figure 19: "Switching time waveform")	-	6	-	

 $^{^{(1)}}$ $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS} .

Table 8: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain current		-		34	Α
I _{SDM} ⁽¹⁾	Source-drain current (pulsed)		-		136	Α
V _{SD} ⁽²⁾	Forward on voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 34 \text{ A}$	-		1.6	V
t _{rr}	Reverse recovery time	I _{SD} = 34 A, di/dt = 100 A/μs,	-	120		ns
Q _{rr}	Reverse recovery charge	V _{DD} = 60 V (see Figure 16: "Test circuit for inductive load switching and diode recovery	-	0.6		μC
I _{RRM}	Reverse recovery current	times")	-	10.4		Α
t _{rr}	Reverse recovery time	I _{SD} = 34 A, di/dt = 100 A/µs,	-	240		ns
Q _{rr}	Reverse recovery charge	V _{DD} = 60 V, T _j = 150 °C (see Figure 16: "Test circuit for inductive load switching and	-	2.4		μC
I _{RRM}	Reverse recovery current	diode recovery times")	-	20.5		Α

Notes:

 $^{^{\}left(1\right) }$ Pulse width is limited by safe operating area.

 $^{^{(2)}}$ Pulse test: pulse duration = 300 $\mu s,$ duty cycle 1.5%.

2.1 Electrical characteristics (curves)

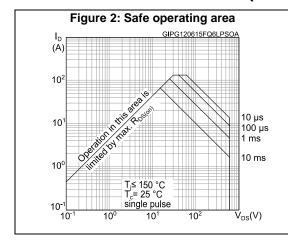


Figure 3: Thermal impedance

(C20540

0.2

0.1

0.05

0.02

Z_{th=K'Rthj-c}

0= t_p/T

10⁻²

10⁻⁵

10⁻⁴

10⁻³

10⁻²

10⁻¹

t_p(s)

Figure 5: Transfer characteristics

(A)

100

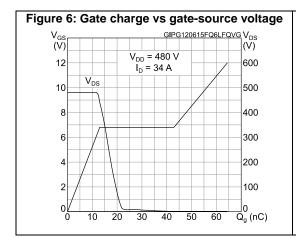
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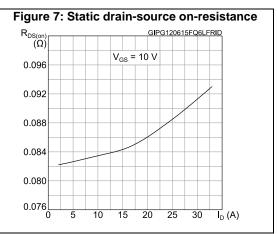
60

40

20

3 4 5 6 7 8 9 V_{GS} (V)





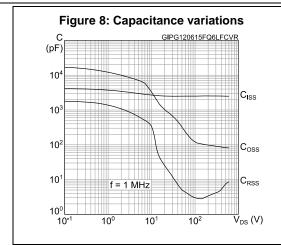


Figure 10: Normalized on-resistance vs temperature

R_{DS(on)} GIPG120615FQ6LPRON

(norm.)

2.2

V_{GS} = 10 V

1.8

1.4

1.0

0.6

0.2

-75

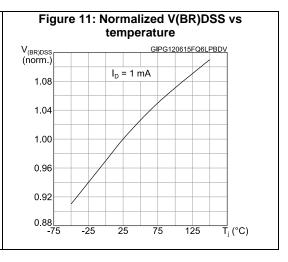
-25

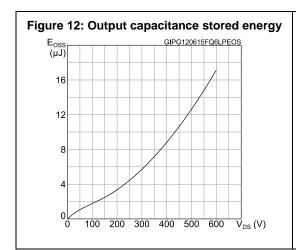
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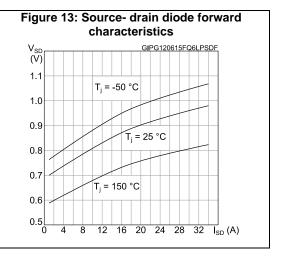
75

125

T_j (°C)



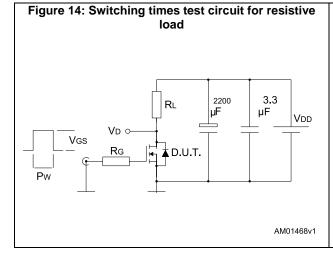




Test circuits STP43N60DM2

3 **Test circuits**





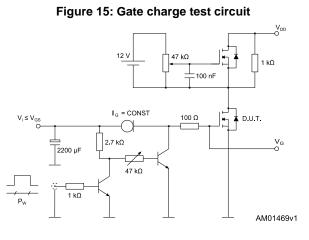


Figure 16: Test circuit for inductive load switching and diode recovery times

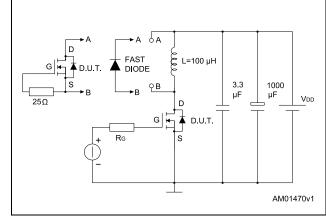
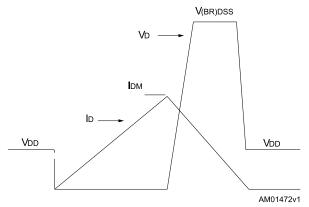
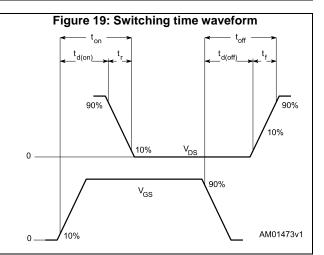


Figure 17: Unclamped inductive load test circuit 2200 3.3 Vdd D.U.T. AM01471v1

Figure 18: Unclamped inductive waveform





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 TO-220 type A package information

Figure 20: TO-220 type A package outline

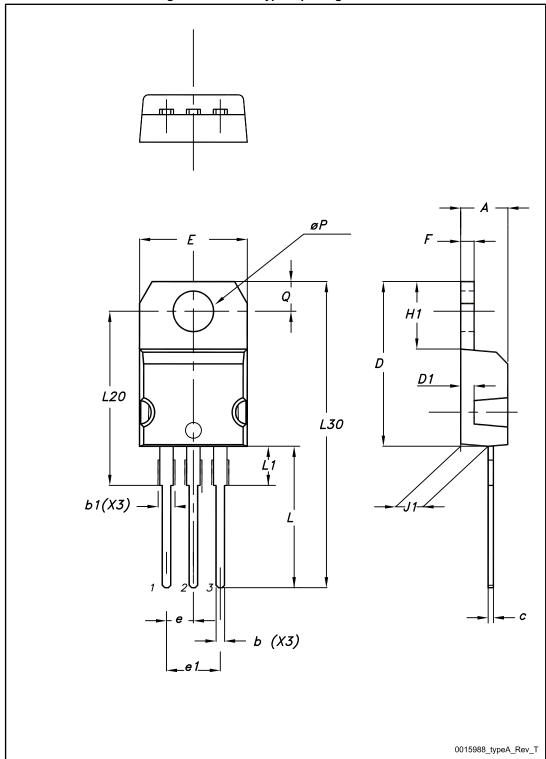


Table 9: TO-220 type A mechanical data

Dim	142.001.001.00	mm	
Dim.	Min.	Тур.	Max.
А	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
С	0.48		0.70
D	15.25		15.75
D1		1.27	
Е	10		10.40
е	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
øΡ	3.75		3.85
Q	2.65		2.95

Revision history STP43N60DM2

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
04-Aug-2014	1	First release.
30-Sep-2014	2	Updated Table 4: Avalanche characteristics, Table 6: Dynamic, Table 7: Switching times and Table 8: Source drain diode. Updated Section 4.2: TO-247, STW43N60DM2.
12-Jun-2015	3	Text and formatting changes throughout document Part number STW43N60DM2 has been moved to a separate datasheet On cover page: - updated title description In Section 2 Electrical characteristics: - updated table 5 On/off states - updated table 8 Source drain diode Added Section 2.1 Electrical characteristics (curves)
19-Jun-2015	4	Updated cover page features table.
02-Jul-2015	5	On cover page: - updated title In section Electrical characteristics: - updated tables Static, Dynamic, Switching times and Source-drain diode In section Electrical characteristics (curves): - updated figures Gate charge vs gate-source voltage, Static drain-source on-resistance, and Capacitance variations

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