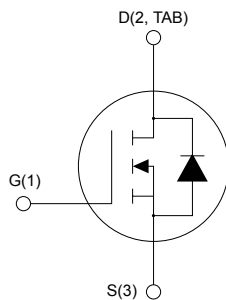
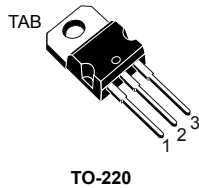


## N-channel 100 V, 55 mΩ typ., 26 A STripFET II Power MOSFET in a TO-220 package



AM01475v1\_noZen



### Product status link

[STP24NF10](#)

### Product summary

<b>Order code</b>	STP24NF10
<b>Marking</b>	P24NF10
<b>Package</b>	TO-220
<b>Packing</b>	Tube

### Features

Type	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STP24NF10	100 V	60 mΩ	26 A

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

### Applications

- Switching applications

### Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	100	V
$V_{DGR}$	Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )	100	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	26	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	18	
$I_{DM}^{(1)}$	Drain current (pulsed)	104	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	85	W
$E_{AS}^{(2)}$	Single-pulse avalanche energy	220	mJ
$dv/dt^{(3)}$	Peak diode recovery voltage slope	9	V/ns
$T_{stg}$	Storage temperature range	-55 to 175	$^\circ\text{C}$
$T_J$	Operating junction temperature range		$^\circ\text{C}$

1. Pulse width limited by safe operating area.
2. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 12\text{ A}$ ,  $V_{DD} = 30\text{ V}$ .
3.  $I_{SD} \leq 24\text{ A}$ ,  $di/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DD} = 80\%V_{(BR)DSS}$ .

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	1.76	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal resistance, junction-to-ambient	62.5	$^\circ\text{C}/\text{W}$

## 2 Electrical characteristics

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

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	100			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$ , $T_C = 125\text{ }^\circ\text{C}^{(1)}$			10	
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 12\text{ A}$		55	60	m $\Omega$

1. Specified by design, not tested in production.

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15\text{ V}$ , $I_D = 12\text{ A}$	-	10		S
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	870		pF
$C_{oss}$	Output capacitance		-	125		pF
$C_{rss}$	Reverse transfer capacitance		-	50		pF
$Q_g$	Total gate charge	$V_{DD} = 80\text{ V}$ , $I_D = 24\text{ A}$ , $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	30	41	nC
$Q_{gs}$	Gate-source charge		-	6		nC
$Q_{gd}$	Gate-drain charge		-	10		nC

1. Pulsed: pulse duration=300  $\mu\text{s}$ , duty cycle 1.5%.

**Table 5. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$ , $I_D = 12\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	60	-	ns
$t_r$	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	50	-	ns
$t_f$	Fall time		-	20	-	ns

**Table 6. Source-drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		26	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		104	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 24 \text{ A}$ , $V_{GS} = 0 \text{ V}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 24 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ ,	-	100		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 30 \text{ V}$ , $T_J = 150 \text{ }^\circ\text{C}$	-	375		nC
$I_{RRM}$	Reverse recovery current	(see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	7.5		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

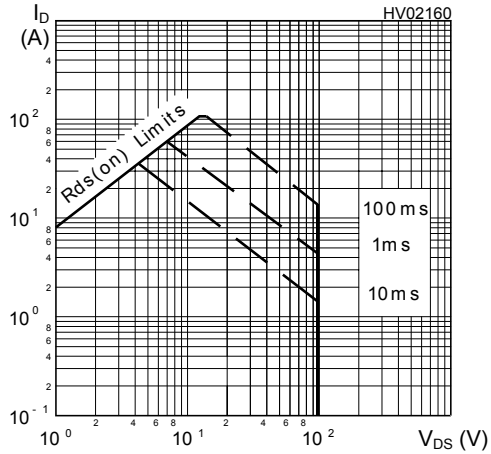


Figure 2. Thermal impedance

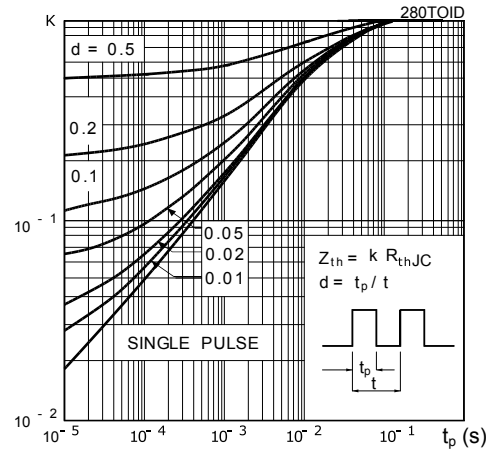


Figure 3. Output characteristics

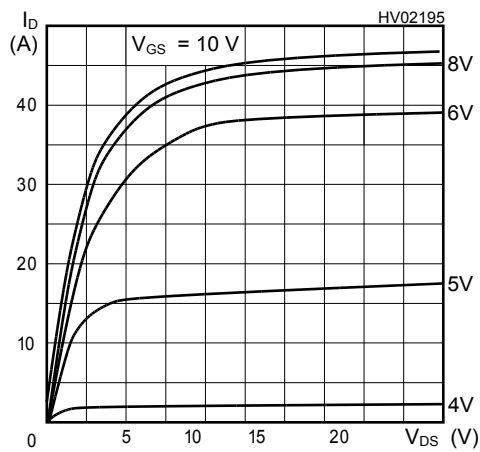


Figure 4. Transfer characteristics

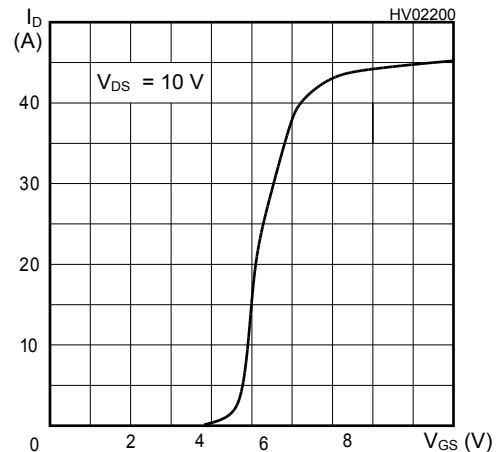


Figure 5. Transconductance

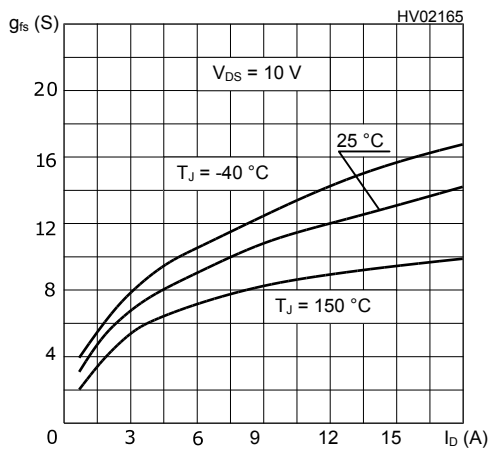
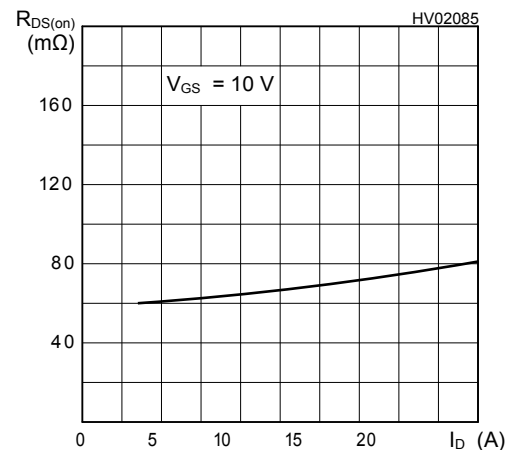
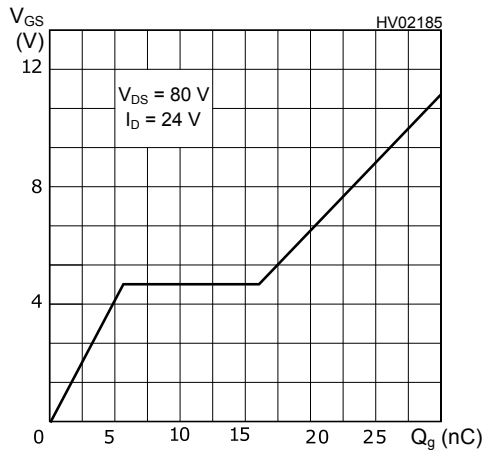


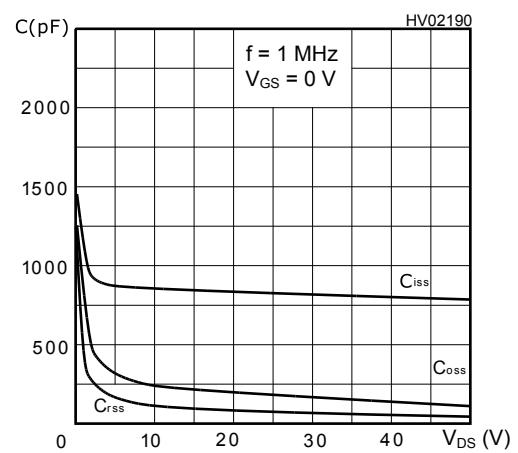
Figure 6. Static drain-source on-resistance



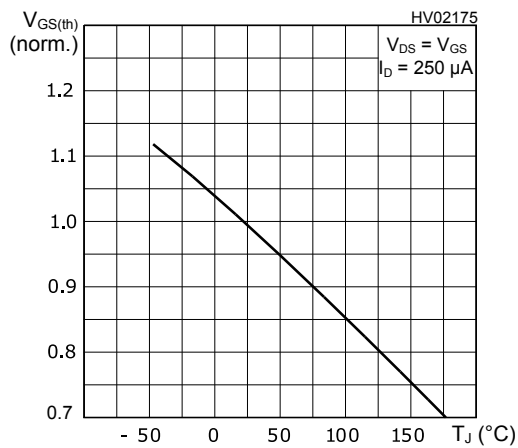
**Figure 7. Gate charge vs gate-source voltage**



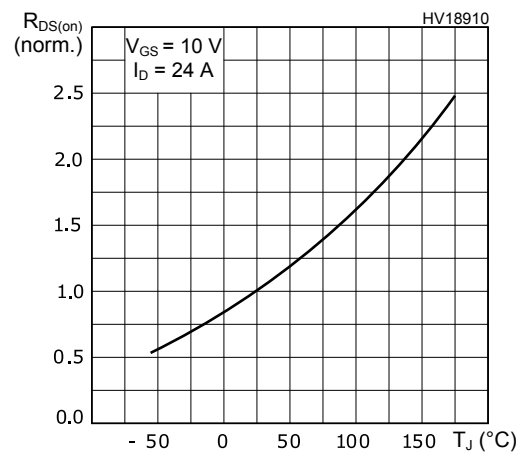
**Figure 8. Capacitance variations**



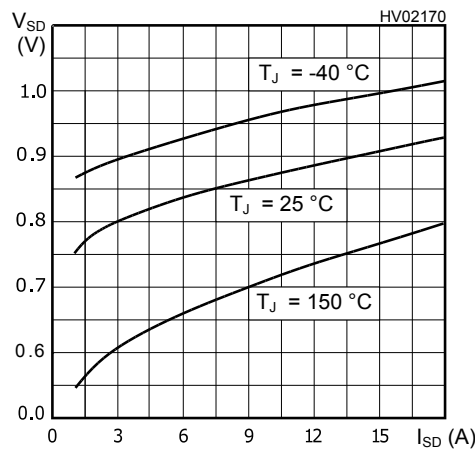
**Figure 9. Normalized gate threshold voltage vs temperature**



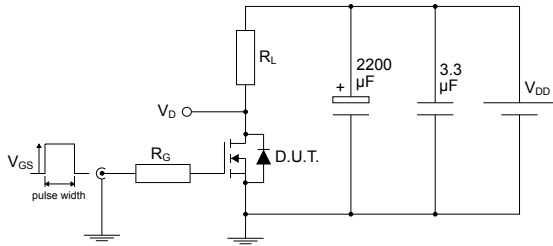
**Figure 10. Normalized on-resistance vs temperature**



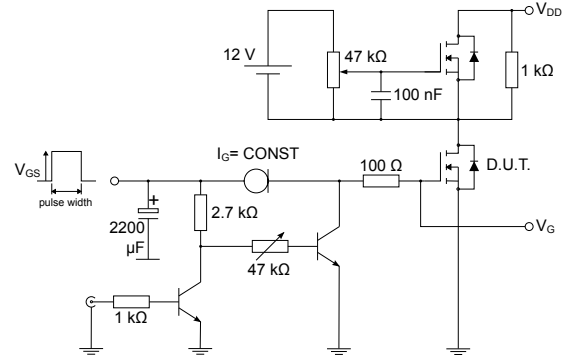
**Figure 11. Source-drain diode forward characteristics**



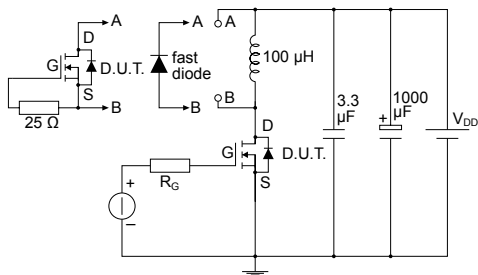
### 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**


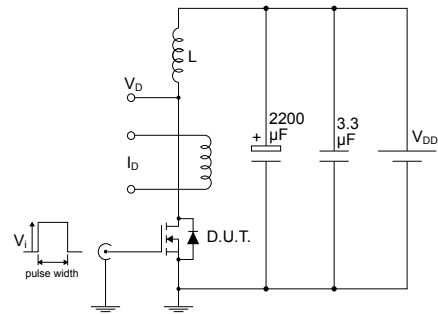
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**Figure 13. Test circuit for gate charge behavior**


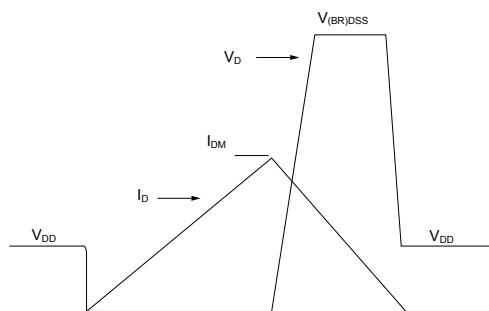
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**Figure 14. Test circuit for inductive load switching and diode recovery times**


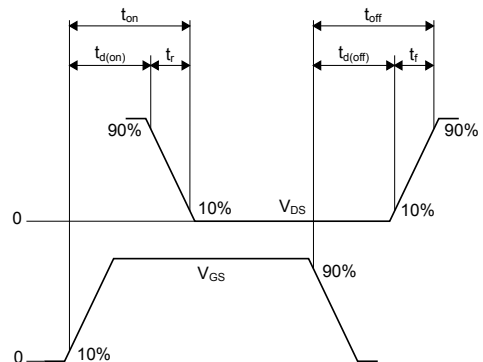
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**Figure 15. Unclamped inductive load test circuit**


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**Figure 16. Unclamped inductive waveform**


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**Figure 17. Switching time waveform**


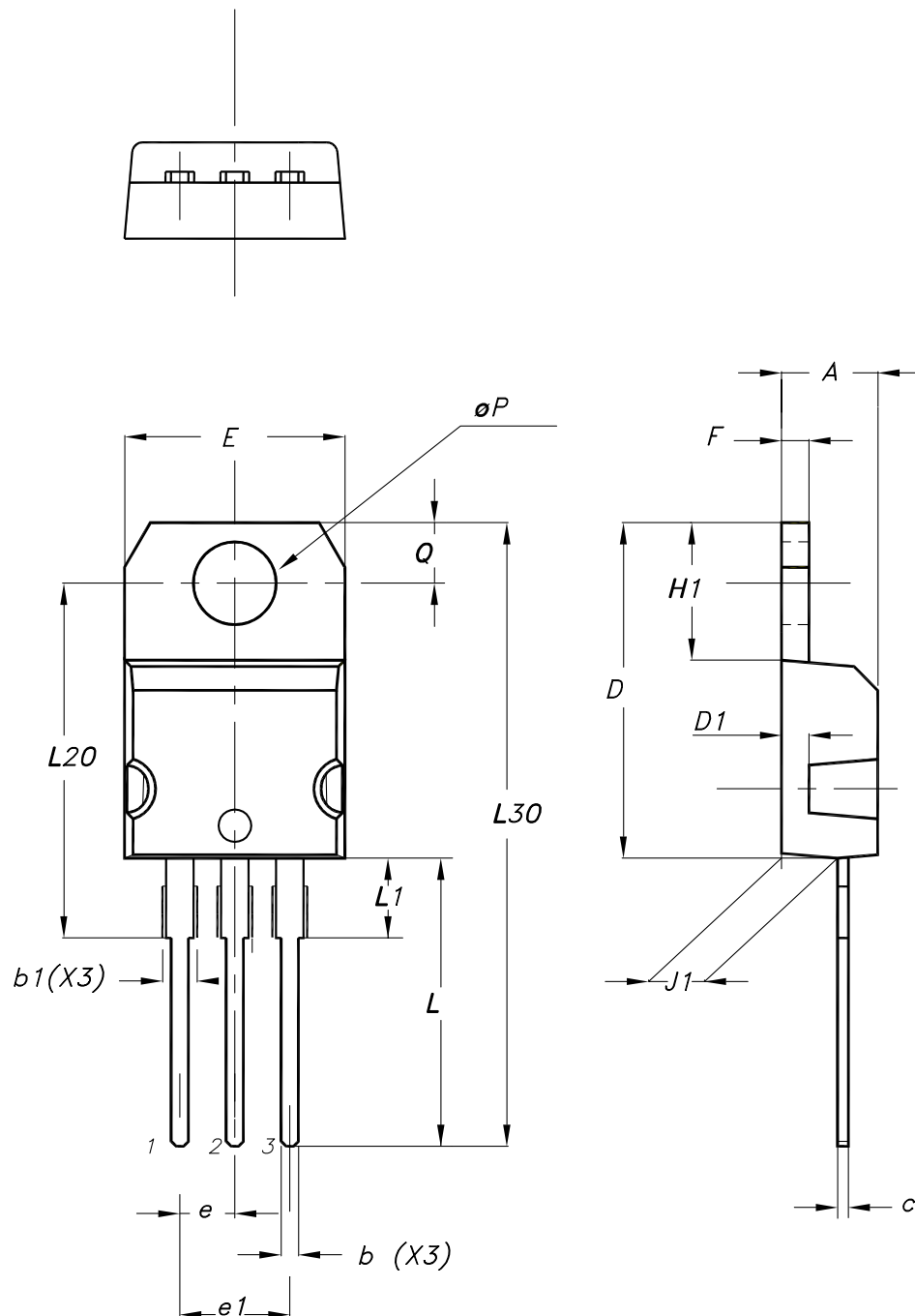
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## 4 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 4.1 TO-220 type A package information

Figure 18. TO-220 type A package outline



0015988\_typeA\_Rev\_23



**Table 7. TO-220 type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	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	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95
Slug flatness		0.03	0.10

## Revision history

**Table 8. Document revision history**

Date	Revision	Changes
09-Sep-2004	6	Complete version.
09-Aug-2006	7	New template, no content change.
22-Feb-2022	8	The part number STB24NF10 have been removed and the document has been updated accordingly. Updated title and <a href="#">Internal schematic</a> on cover page. Updated <a href="#">Section 3 Test circuits</a> . Updated <a href="#">Section 4 Package information</a> . Minor text changes.

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