

## N-channel 80 V, 6.4 mΩ typ., 80 A, STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data

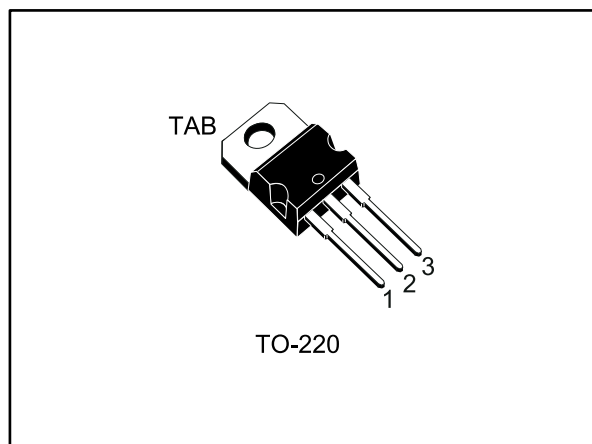
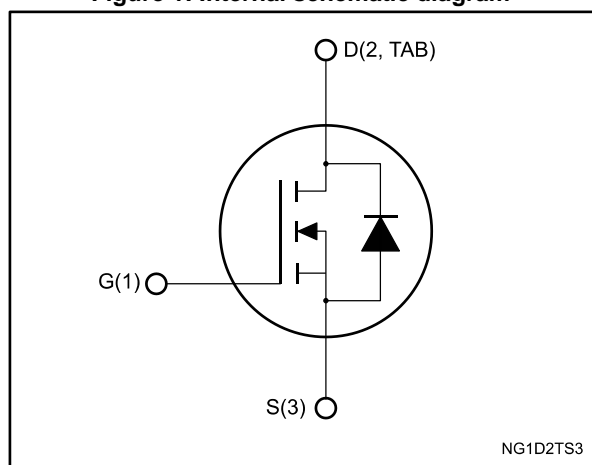


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)max</sub>	I <sub>D</sub>	P <sub>TOT</sub>
STP110N8F7	80 V	7.5 mΩ	80 A	170 W

- Among the lowest R<sub>DS(on)</sub> on the market
- Excellent figure of merit (FoM)
- Low C<sub>rss</sub>/C<sub>iss</sub> ratio for EMI immunity
- High avalanche ruggedness

### Applications

- Switching applications

### Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packaging
STP110N8F7	110N8F7	TO-220	Tube

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# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	80	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80 <sup>(1)</sup>	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	76	A
$I_{DM}$ <sup>(2)</sup>	Drain current (pulsed)	320	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	170	W
$E_{AS}$ <sup>(3)</sup>	Single pulse avalanche energy	220	mJ
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		$^\circ\text{C}$

**Notes:**

<sup>(1)</sup>Limited by package

<sup>(2)</sup>Pulse width is limited by safe operating area

<sup>(3)</sup>Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_d = 25\text{ A}$ ,  $V_{dd} = 40\text{ V}$

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.88	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C/W}$

## 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	$V_{GS} = 0, I_D = 250\ \mu A$	80			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 80\ V$			1	$\mu A$
		$V_{GS} = 0, V_{DS} = 80\ V, T_C = 125\text{ °C}$			10	$\mu A$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0, V_{GS} = \pm 20\ V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 10\ V, I_D = 40\ A$		6.4	7.5	m $\Omega$

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{GS} = 0, V_{DS} = 40\ V, f = 1\ MHz$	-	3435	-	pF
$C_{oss}$	Output capacitance		-	653	-	pF
$C_{rss}$	Reverse transfer capacitance		-	57	-	pF
$Q_g$	Total gate charge	$V_{DD} = 40\ V, I_D = 80\ A,$	-	46.8	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10\ V$	-	23.4	-	nC
$Q_{gd}$	Gate-drain charge	(see <a href="#">Figure 14: "Test circuit for gate charge behavior"</a> )	-	11.2	-	nC

**Table 6: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 40\ V, I_D = 40\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see <a href="#">Figure 13: "Test circuit for resistive load switching times"</a> and <a href="#">Figure 18: "Switching time waveform"</a> )	-	49	-	ns
$t_r$	Rise time		-	95	-	ns
$t_{d(off)}$	Turn-off delay time		-	60	-	ns
$t_f$	Fall time		-	32	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0, I_{SD} = 80 \text{ A}$	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 80 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 60 \text{ V}$ (see <a href="#">Figure 15</a> : "Test circuit for inductive load switching and diode recovery times")	-	48.6		ns
$Q_{rr}$	Reverse recovery charge		-	58.6		nC
$I_{RRM}$	Reverse recovery current		-	2.4		A

**Notes:**

<sup>(1)</sup>Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.2 Electrical characteristics (curves)

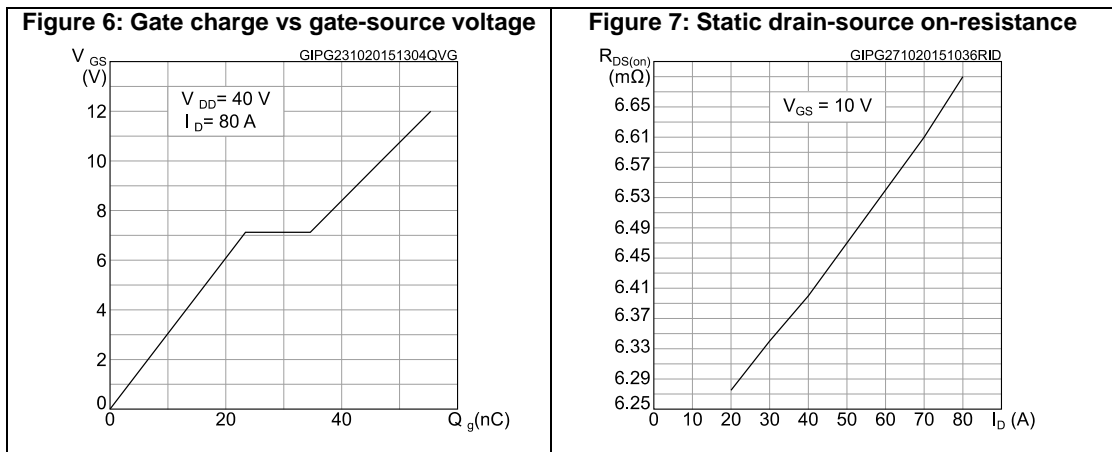
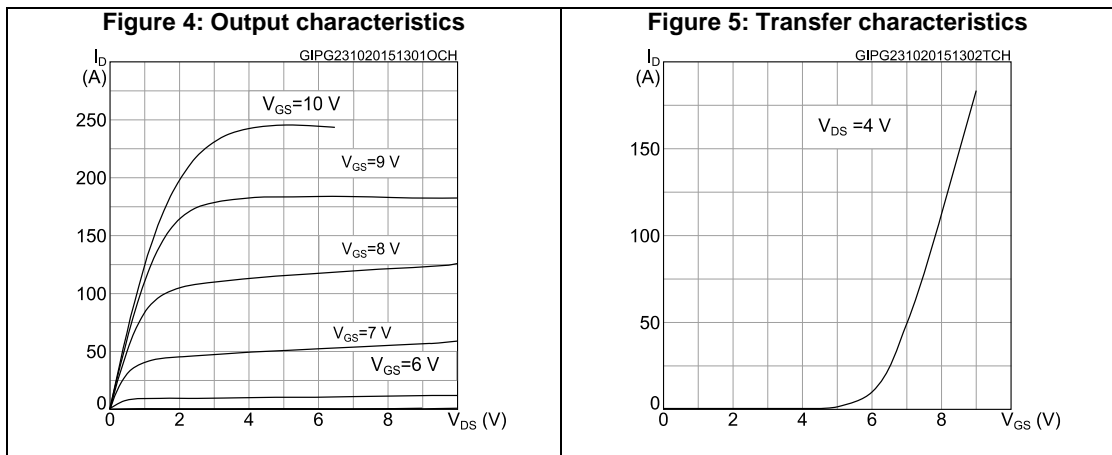
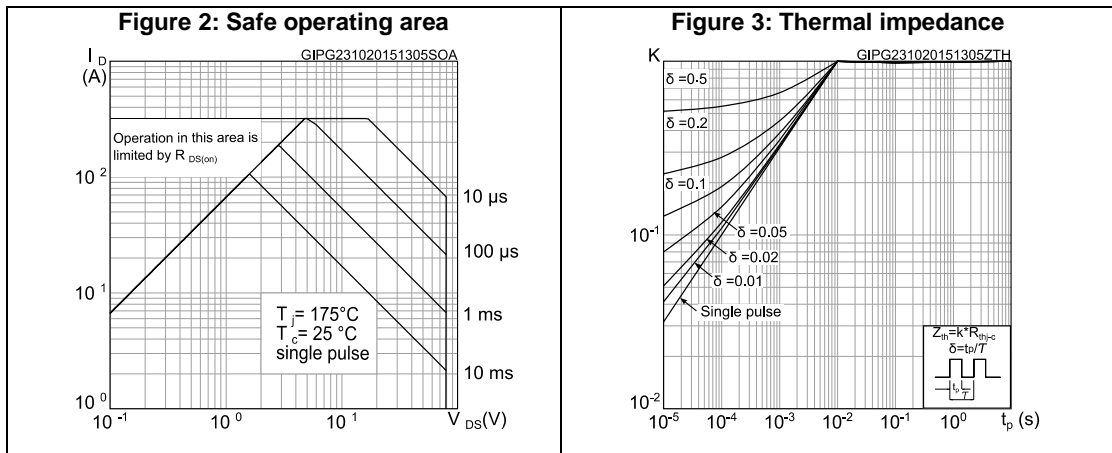


Figure 8: Capacitance variations

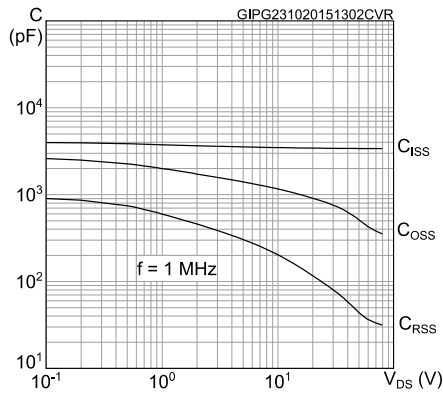


Figure 9: Normalized gate threshold voltage vs temperature

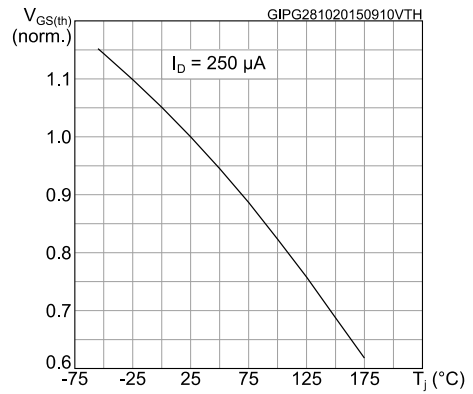


Figure 10: Normalized on-resistance vs temperature

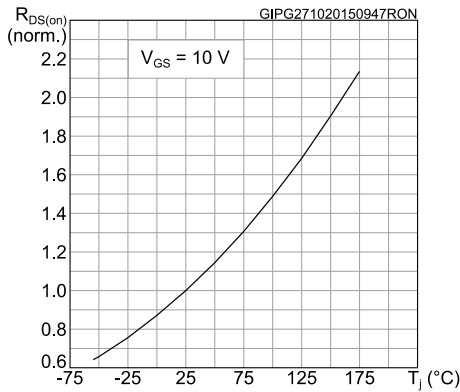


Figure 11: Normalized V(BR)DSS vs temperature

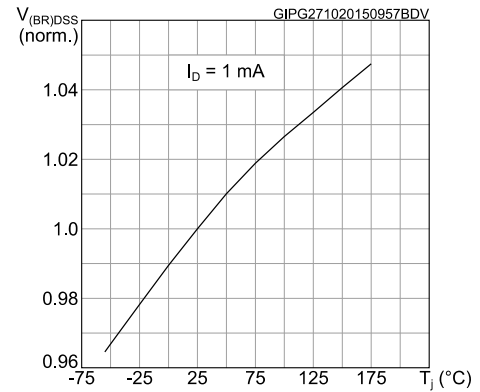
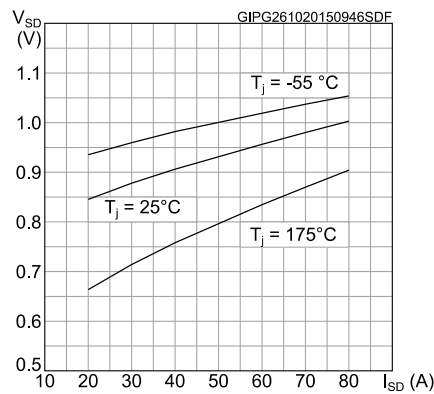


Figure 12: Source-drain diode forward characteristics



### 3 Test circuits

**Figure 13: Test circuit for resistive load switching times**



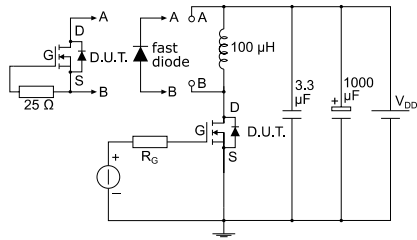
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**Figure 14: Test circuit for gate charge behavior**



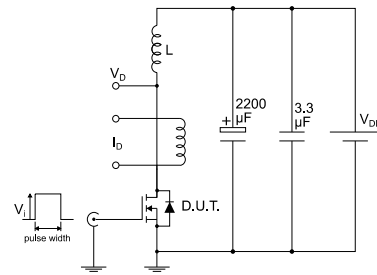
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**Figure 15: Test circuit for inductive load switching and diode recovery times**



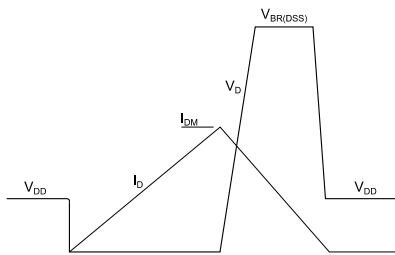
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**Figure 16: Unclamped inductive load test circuit**



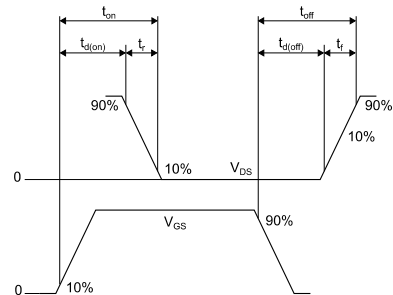
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**Figure 17: Unclamped inductive waveform**



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**Figure 18: Switching time waveform**



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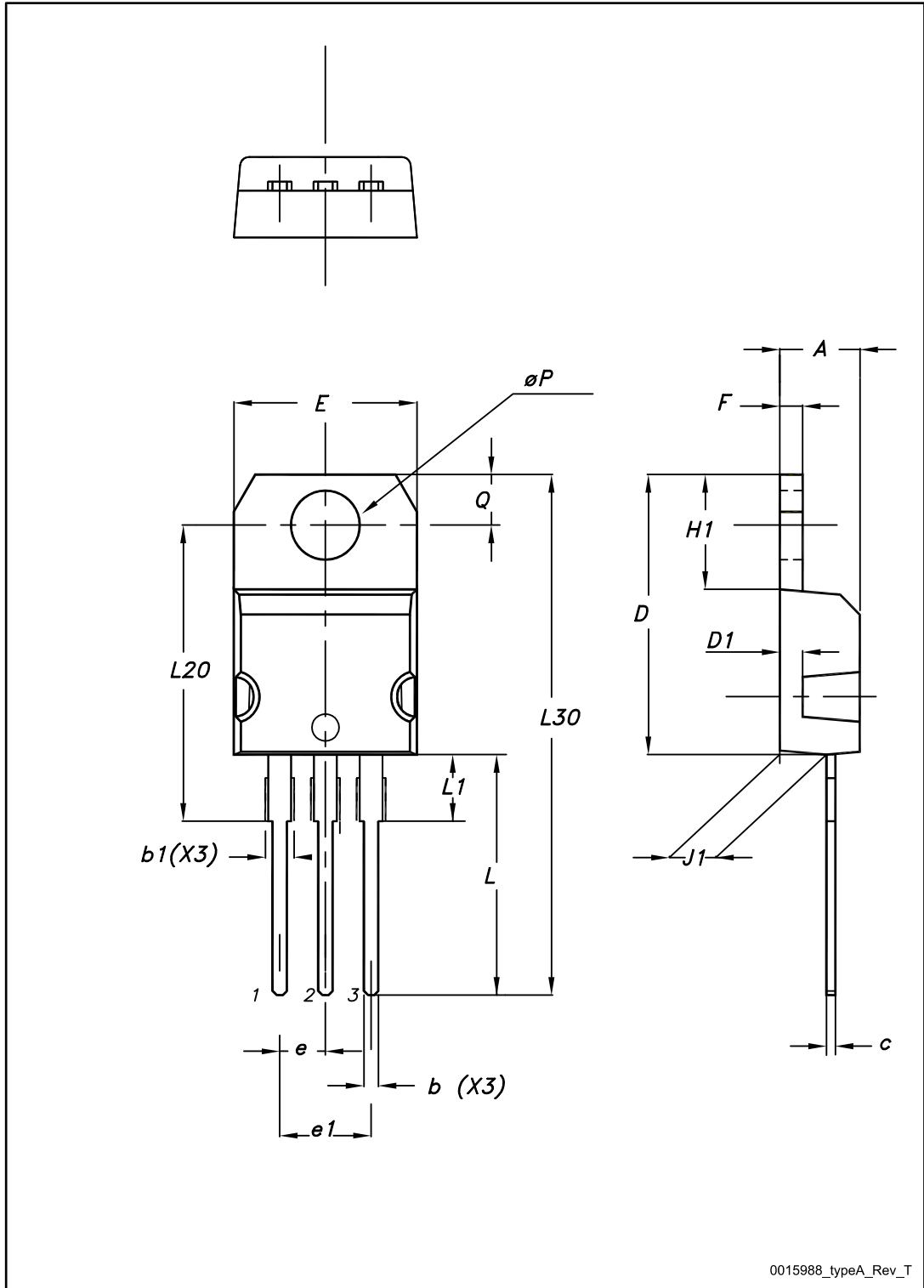


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

### 4.1 TO-220 package mechanical data

Figure 19: TO-220 type A package outline



0015988\_typeA\_Rev\_T

Table 8: TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		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		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

## 5 Revision history

**Table 9: Document revision history**

Date	Revision	Changes
10-Nov-2014	1	Initial release.
04-Nov-2015	2	Datasheet promoted from target to production data. Modified: <a href="#">Table 2: "Absolute maximum ratings"</a> , <a href="#">Table 5: "Dynamic"</a> , <a href="#">Table 6: "Switching times"</a> and <a href="#">Table 7: "Source drain diode"</a> Added: <a href="#">Section 4.1: "Electrical characteristics (curves)"</a> Minor text changes.

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