

## N-channel 100 V, 2.85 mΩ typ., 110 A STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data

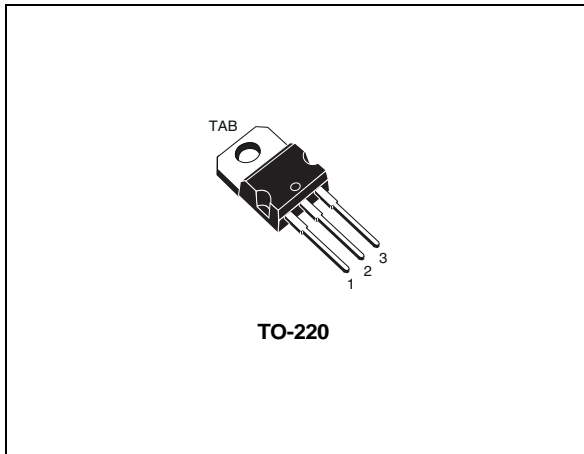
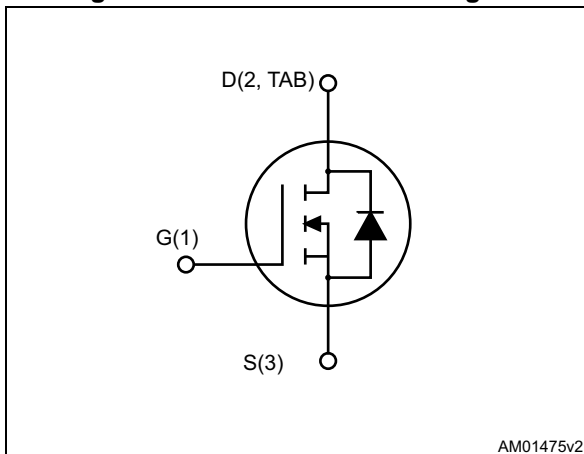


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STP240N10F7	100 V	3.2 mΩ	110 A

- Ultra low on-resistance
- 100% avalanche tested

### Applications

- High current switching applications

### Description

This N-channel Power MOSFET utilizes the 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
STP240N10F7	240N10F7	TO-220	Tube

## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	100	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	110	A
$I_D^{(1)}$	Drain current (continuous) at $T_C=100^\circ\text{C}$	110	A
$I_{DM}^{(2)}$	Drain current (pulsed)	440	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	300	W
$E_{AS}^{(3)}$	Single pulse avalanche energy	500	mJ
$T_j$	Operating junction temperature	- 55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting  $T_j=25^\circ\text{C}$ ,  $I_d=45\text{A}$ ,  $V_{dd}=50\text{V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.5	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  unless otherwise specified).

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\ \mu A$	100			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 100\ V$			1	$\mu A$
		$V_{GS} = 0, V_{DS} = 100\ V, T_C = 125\text{ °C}$			100	$\mu A$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0, V_{GS} = +20\ V$			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	$V_{GS} = 10\ V, I_D = 60\ A$		2.85	3.2	m $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{GS} = 0, V_{DS} = 25\ V, f = 1\ MHz$	-	11550	-	pF
$C_{oss}$	Output capacitance		-	2950	-	pF
$C_{riss}$	Reverse transfer capacitance		-	217	-	pF
$Q_g$	Total gate charge	$V_{DD} = 50\ V, I_D = 110\ A,$	-	160	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10\ V$	-	48	-	nC
$Q_{gd}$	Gate-drain charge	(see <a href="#">Figure 14</a> )	-	38	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ V, I_D = 90\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see <a href="#">Figure 13</a> , <a href="#">Figure 18</a> )	-	49	-	ns
$t_r$	Rise time		-	139	-	ns
$t_{d(off)}$	Turn-off delay time		-	110	-	ns
$t_f$	Fall time		-	112	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		110	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		440	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS}=0$ , $I_{SD}=110$ A	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD}=110$ A, $di/dt = 100$ A/ $\mu$ s, $V_{DD}=80$ V, $T_j=150^\circ$ C (see <a href="#">Figure 15</a> )	-	108		ns
$Q_{rr}$	Reverse recovery charge		-	315		nC
$I_{RRM}$	Reverse recovery current		-	5.8		A

1. Pulse width limited by safe operating area.
2. Pulse duration = 300 $\mu$ s, duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

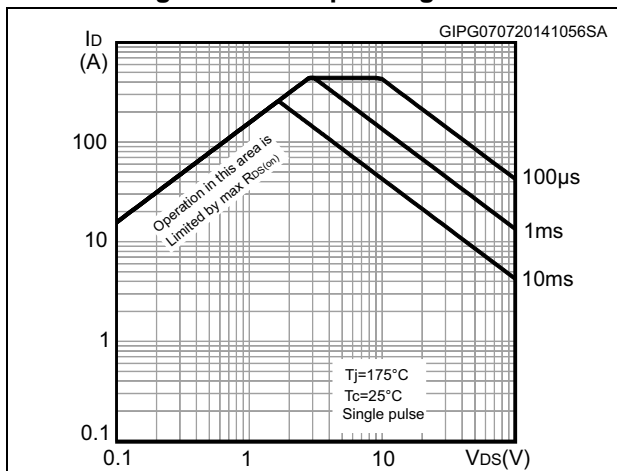


Figure 3. Thermal impedance

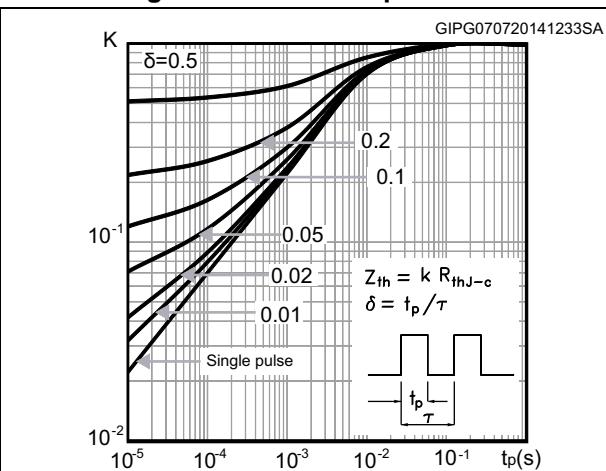


Figure 4. Output characteristics

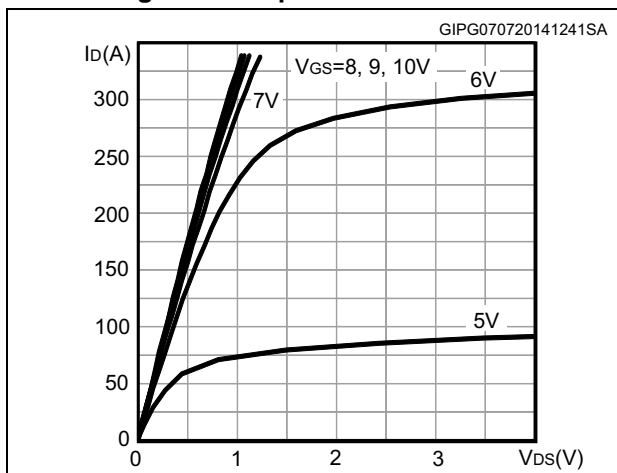


Figure 5. Transfer characteristics

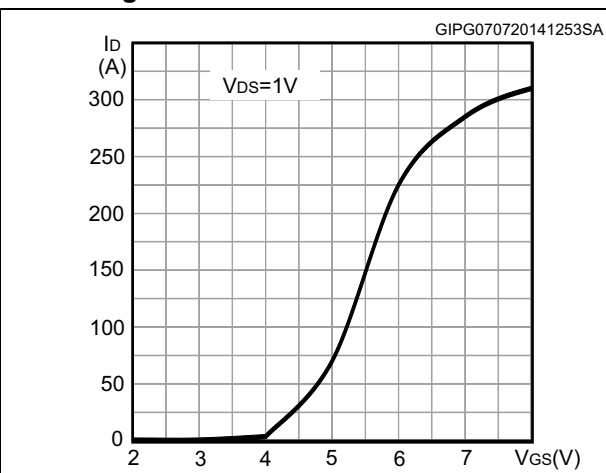


Figure 6. Gate charge vs gate-source voltage

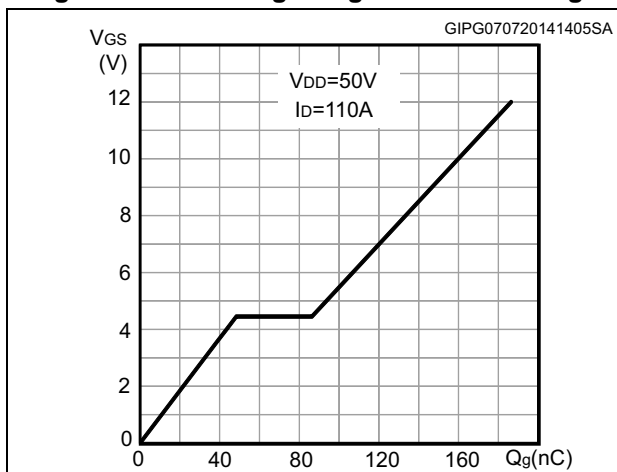


Figure 7. Static drain-source on-resistance

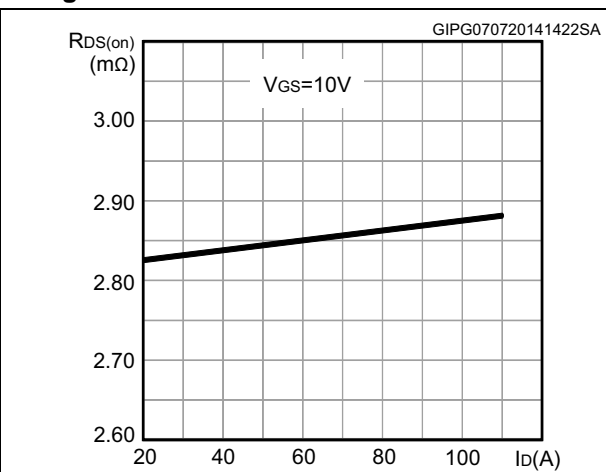


Figure 8. Capacitance variations

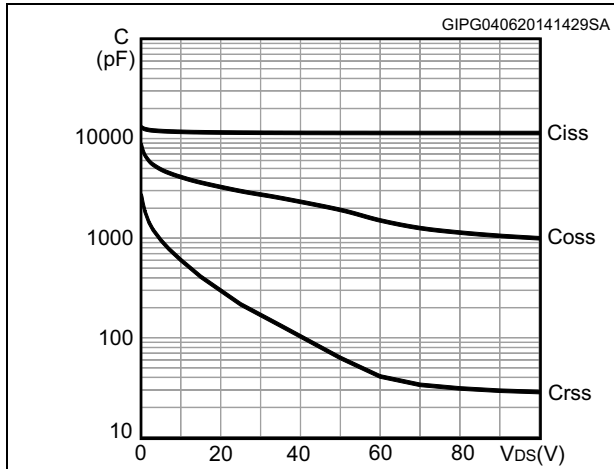


Figure 9. Normalized gate threshold voltage vs temperature

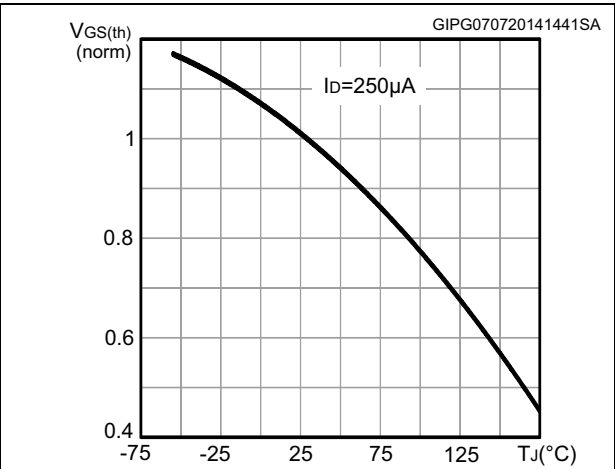


Figure 10. Normalized on-resistance vs temperature

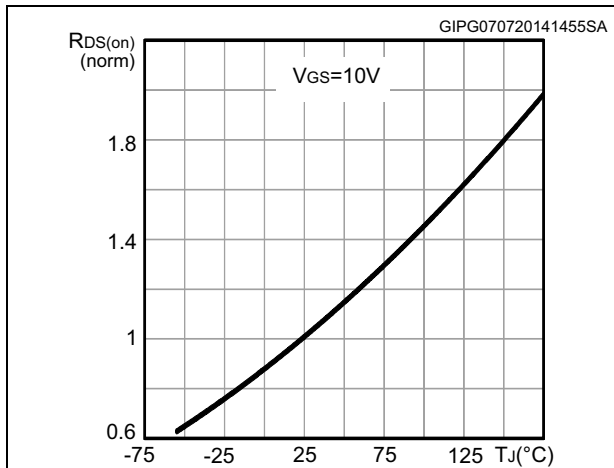


Figure 11. Normalized V(BR)DSS vs temperature

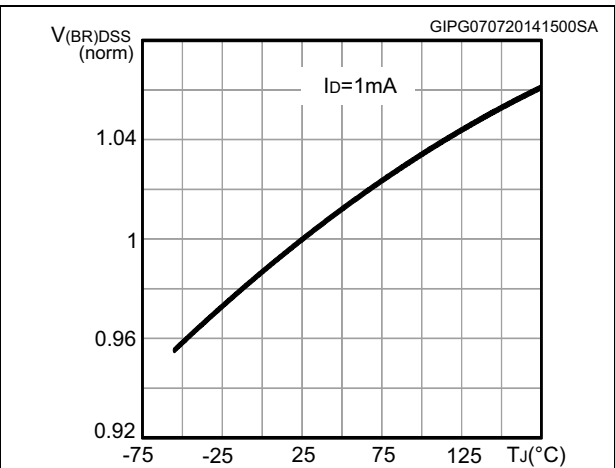
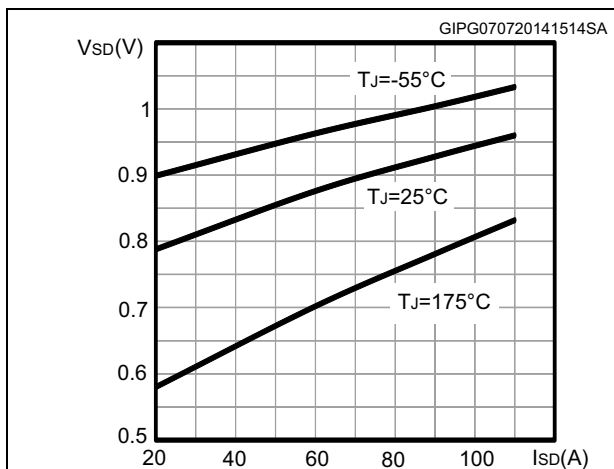


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit



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



Figure 16. Unclamped inductive load test circuit



Figure 17. Unclamped inductive waveform



Figure 18. Switching time waveform

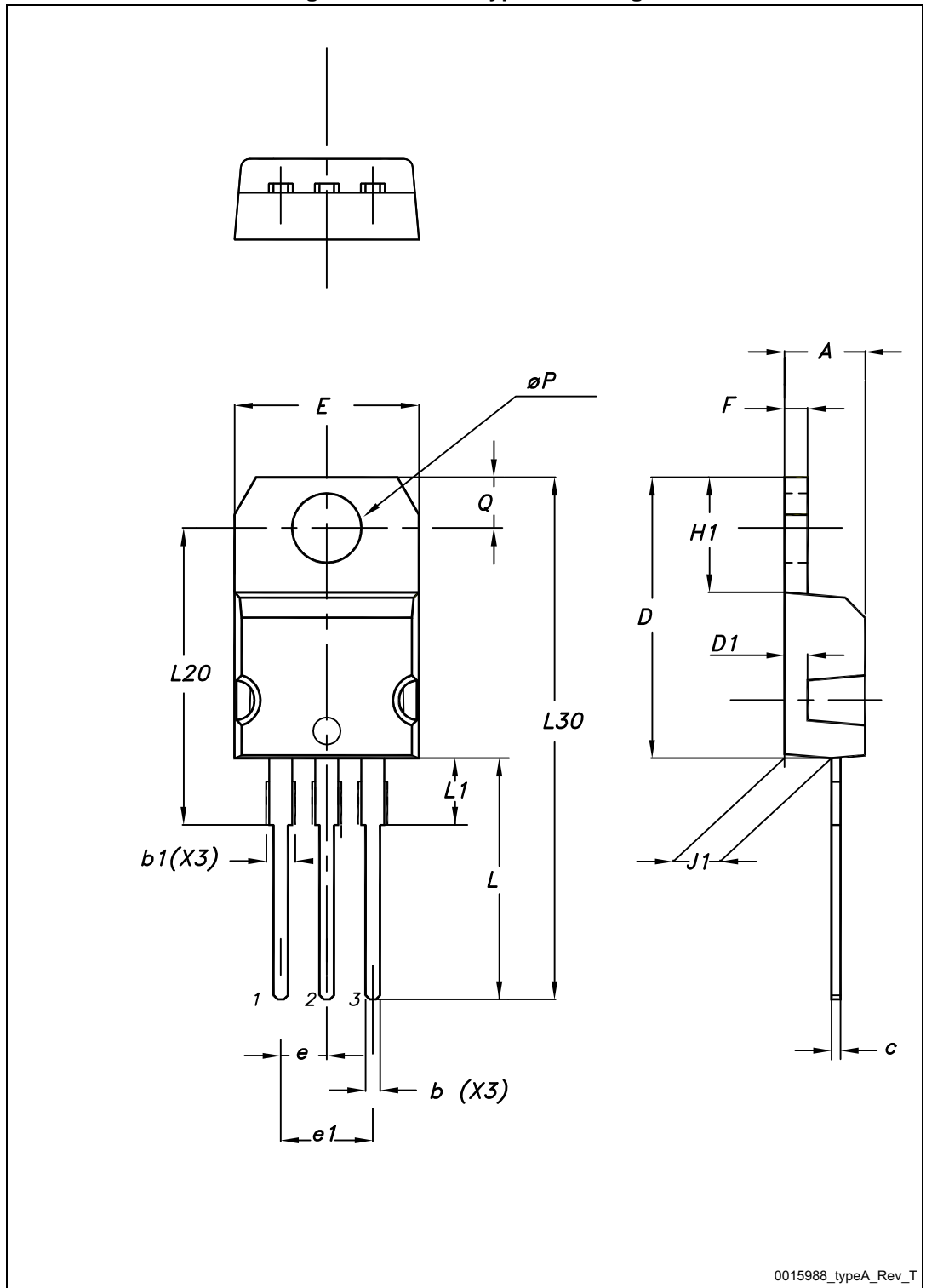




## 4 Package mechanical data

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.

Figure 19. TO-220 type A drawing



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
19-Nov-2012	1	Initial version.
08-Oct-2013	2	Updated $V_{GS(th)}$ typical value in <a href="#">Table 4: On/off states</a> .
14-Jul-2014	3	<ul style="list-style-type: none"> <li>– Document status promoted from preliminary data to production data</li> <li>– Modified: title</li> <li>– Modified: <math>I_D</math> values in cover page</li> <li>– Modified: <math>I_D</math> and <math>I_{DM}</math> values in <a href="#">Table 2</a></li> <li>– Added: <math>E_{AS}</math> value and <a href="#">note 3</a> in <a href="#">Table 2</a></li> <li>– Modified: <math>I_{DSS}</math>, <math>I_{GSS}</math> and <math>V_{GS(th)}</math> values in <a href="#">Table 4</a></li> <li>– Modified: the entire typical values in <a href="#">Table 5</a> and <a href="#">6</a></li> <li>– Modified: max values and <math>I_{SD}</math> values</li> <li>– Added: <a href="#">Section 2.1: Electrical characteristics (curves)</a></li> <li>– Updated: <a href="#">Section 4: Package mechanical data</a></li> <li>– Minor text changes</li> </ul>

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