

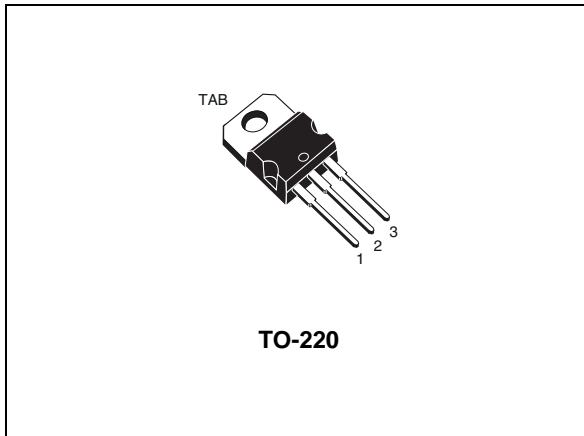


# THE DATASHEET OF STP80N6F6

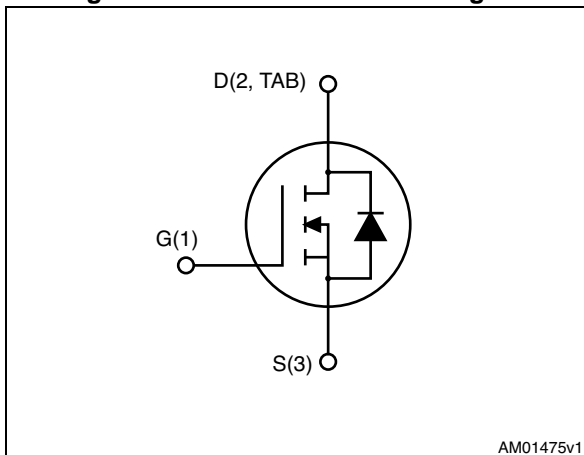


## Automotive-grade N-channel 60 V, 4.4 mΩ typ., 80 A STripFET™ VI DeepGATE™ Power MOSFET in a TO-220 package

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>
STP80N6F6	60 V	5 mΩ	80 A <sup>(1)</sup>

1. Current limited by package

- Designed for automotive applications and AEC-Q101 qualified
- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages.

**Table 1. Device summary**

Order code	Marking	Packages	Packaging
STP80N6F6	80N6F6	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	60	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	80	A
$I_{DM}^{(1)}$	Drain current (pulsed)	320	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	120	W
	Derating factor	0.8	W/ $^\circ\text{C}$
$T_{stg}$	Storage temperature	- 55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		

1. Current limited by package

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.25	$^\circ\text{C}/\text{W}$
$R_{thj-a}$	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 ( $V_{GS} = 0$ )	$I_D = 250\ \mu A$	60			V
$I_{DSS}$	Zero gate voltage Drain current ( $V_{GS} = 0$ )	$V_{DS} = 60\text{ V}$			1	$\mu A$
		$V_{DS} = 60\text{ V}, T_C = 125\text{ °C}$			100	$\mu A$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	3		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 40\text{ A}$		4.4	5	m $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	8325	-	pF
$C_{oss}$	Output capacitance		-	500	-	pF
$C_{rss}$	Reverse transfer capacitance		-	400	-	pF
$Q_g$	Total gate charge	$V_{DD} = 30\text{ V}, I_D = 80\text{ A}, V_{GS} = 10\text{ V}$	-	147	-	nC
$Q_{gs}$	Gate-source charge		-	44	-	nC
$Q_{gd}$	Gate-drain charge		-	46	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}, I_D = 40\text{ A}, R_G = 4.7\ \Omega, V_{GS} = 10\text{ V}$	-	40	-	ns
$t_r$	Rise time			71		ns
$t_{d(off)}$	Turn-off-delay time		-	132	-	ns
$t_f$	Fall time		-	40	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80 \text{ A}, V_{GS} = 0$	-		1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 80 \text{ A}, V_{DD} = 48 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s},$ $T_j = 150 \text{ }^\circ\text{C}$	-	46		ns
$Q_{rr}$	Reverse recovery charge		-	65		nC
$I_{RRM}$	Reverse recovery current		-	2.8		A

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

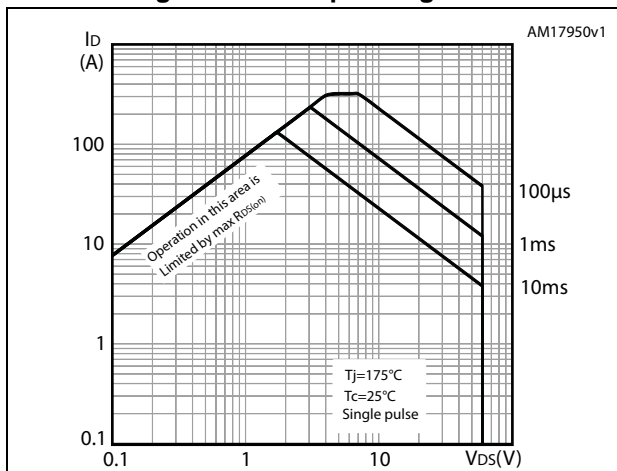


Figure 3. Thermal impedance

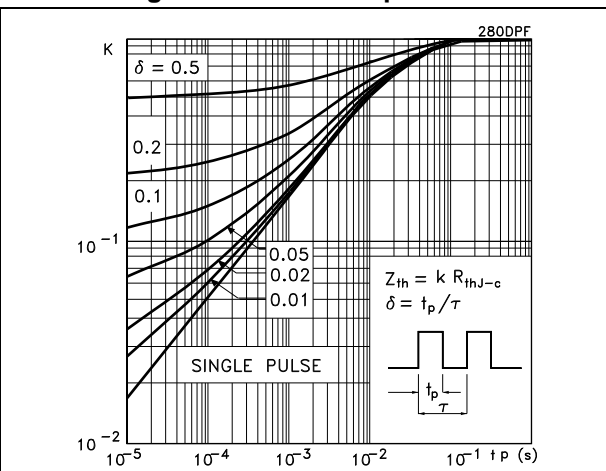


Figure 4. Output characteristics

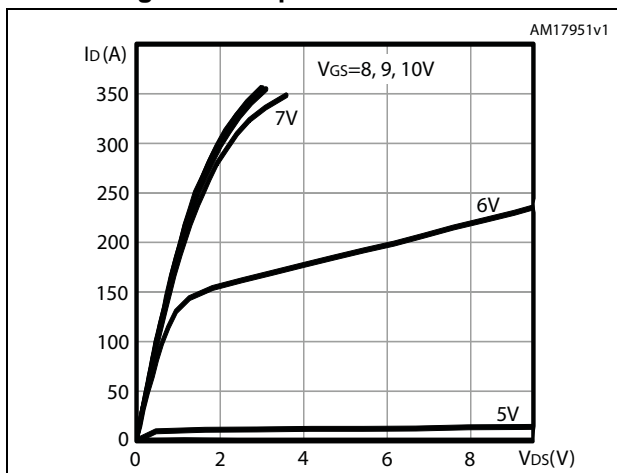


Figure 5. Transfer characteristics

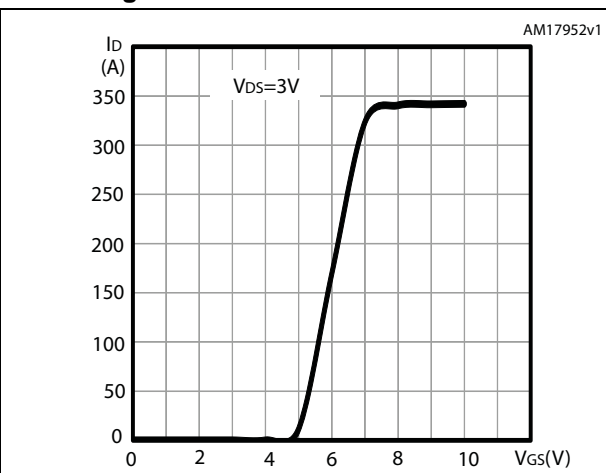


Figure 6. Gate charge vs gate-source voltage

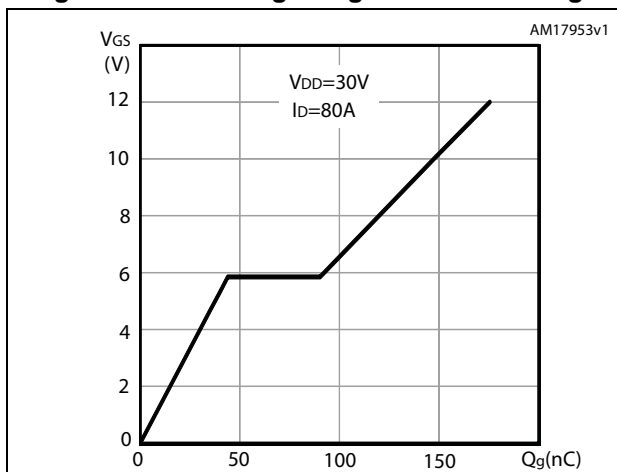


Figure 7. Static drain-source on-resistance

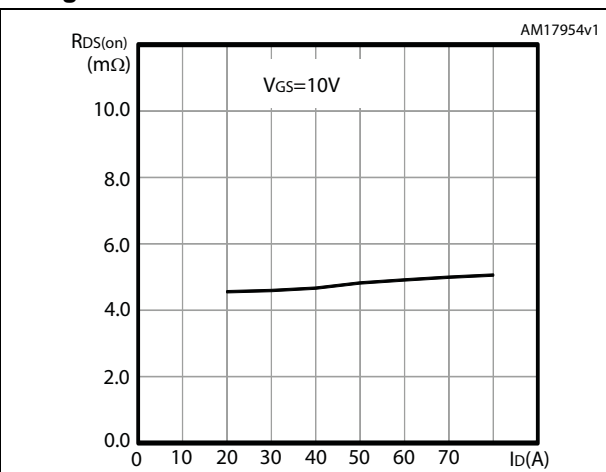


Figure 8. Capacitance variations

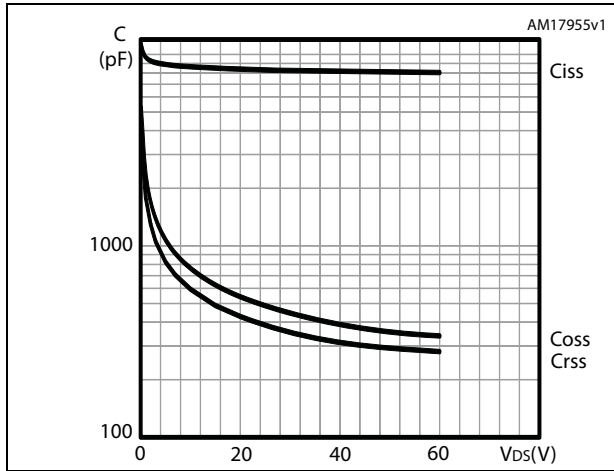


Figure 9. Normalized gate threshold voltage vs temperature

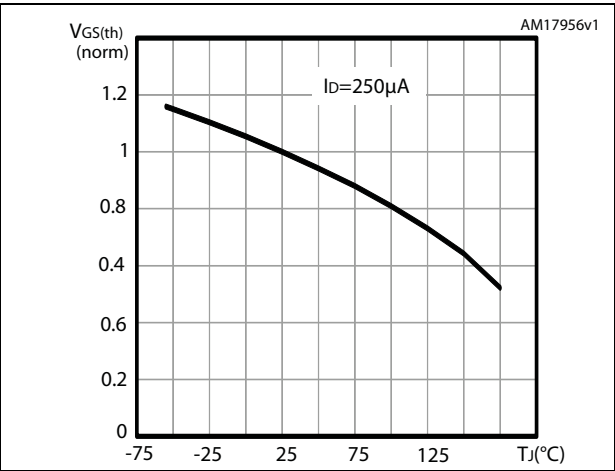


Figure 10. Normalized on-resistance vs temperature

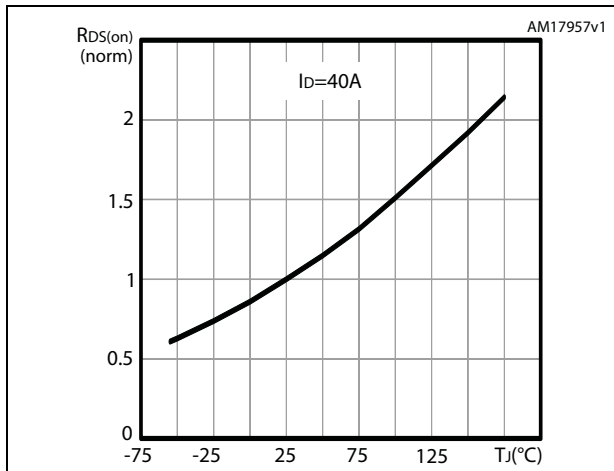


Figure 11. Normalized VDS vs temperature

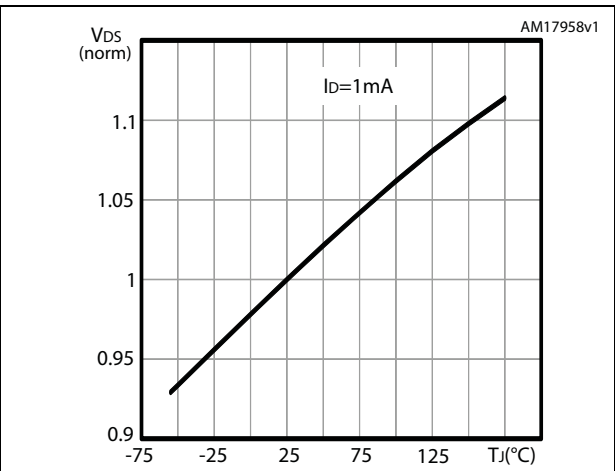
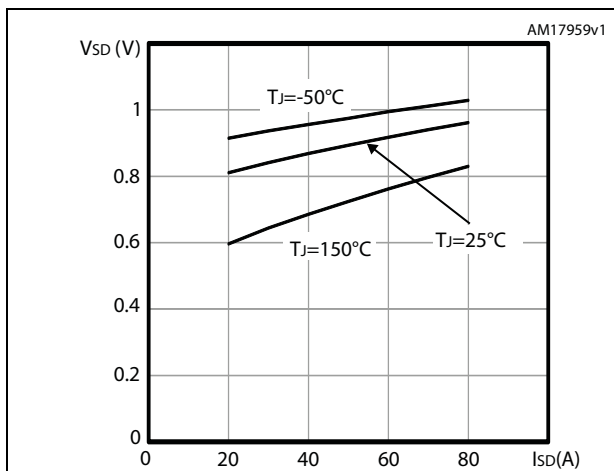


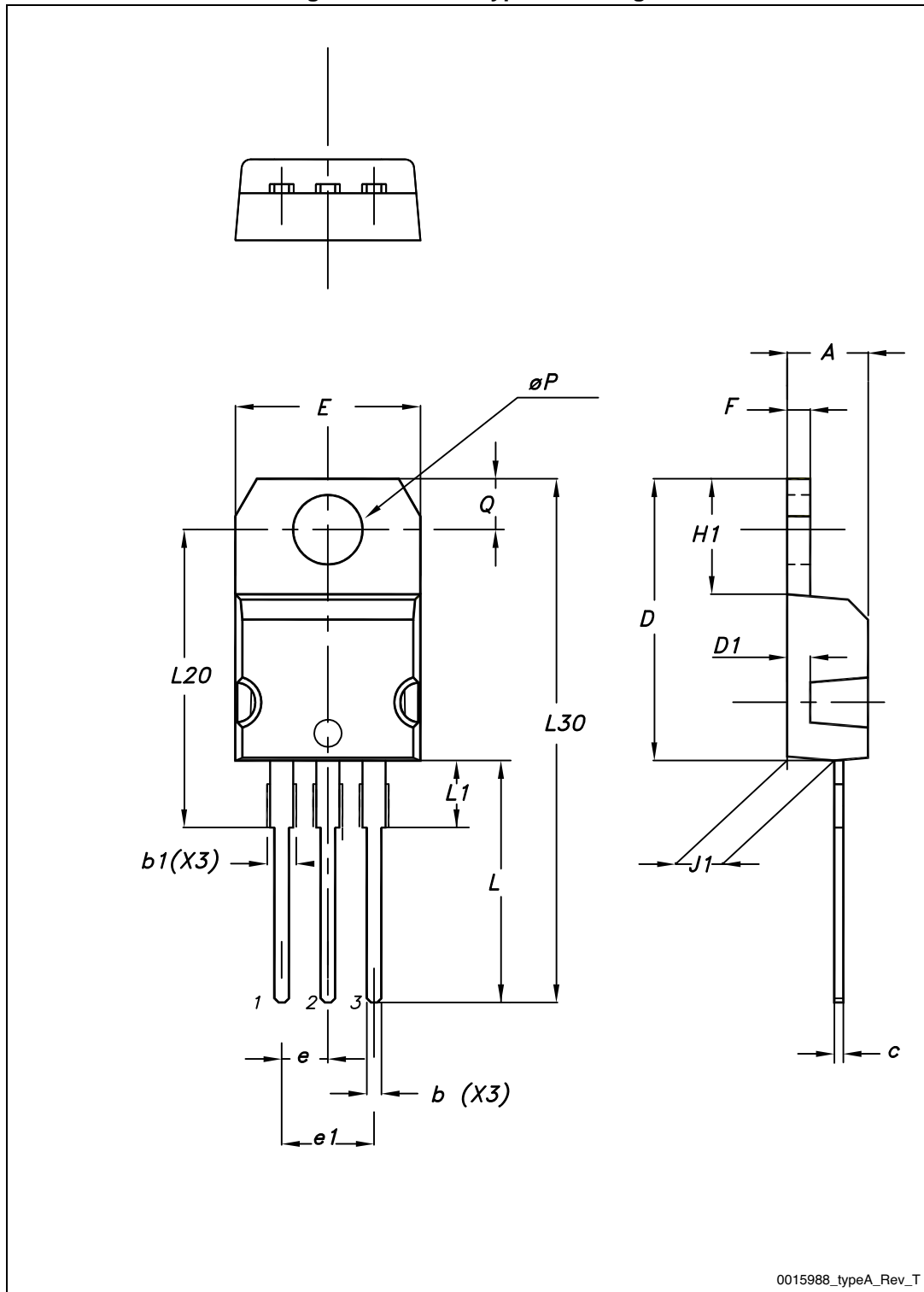
Figure 12. Source-drain diode forward characteristics



### 3 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 13. 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

## 4 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
08-Aug-2012	1	Initial release.
21-Jan-2014	2	<ul style="list-style-type: none"> <li>– Document status promoted from preliminary to production data</li> <li>– Modified: title</li> <li>– Modified: <i>Features</i></li> <li>– Added: <i>note 1</i> in cover page</li> <li>– Modified: <math>R_{DS(on)max}</math> and <math>I_D</math> values in cover page</li> <li>– Modified: <math>I_D</math> (at <math>TC = 25\text{ °C}</math> and at <math>TC = 100\text{ °C}</math>) values, <math>I_D</math>, <math>I_{DM}</math> values and added <i>note 1</i> in <i>Table 2</i></li> <li>– Modified: <math>R_{thj-case}</math> value in <i>Table 3</i></li> <li>– Modified: <math>R_{DS(on)}</math> values in <i>Table 4</i></li> <li>– Modified: <math>I_D</math> and the entire typical values in <i>Table 5, 6 and 7</i></li> <li>– Added: <i>Section 2.1: Electrical characteristics (curves)</i></li> <li>– Updated: <i>Section 3: Package mechanical data</i></li> <li>– Minor text changes</li> </ul>

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