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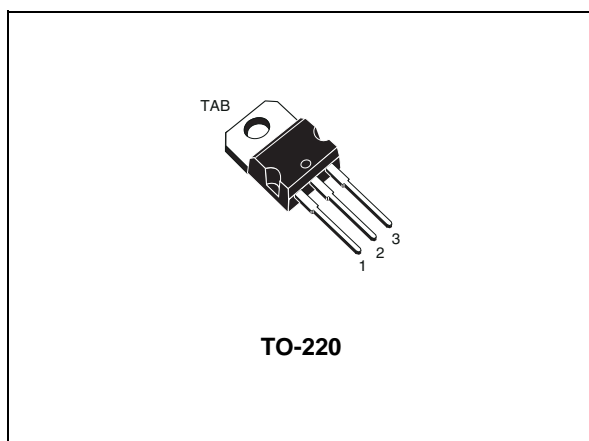
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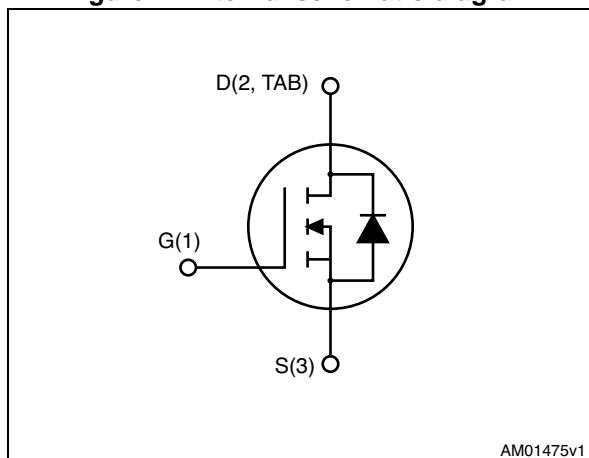
# STP80N6F6

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

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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/°C
$T_{stg}$	Storage temperature	- 55 to 175	°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	°C/W
$R_{thj-a}$	Thermal resistance junction-ambient max	62.5	°C/W

Electrical characteristics

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## 2 Electrical characteristics

(T<sub>CASE</sub> = 25 °C unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage (V <sub>GS</sub> = 0)	I <sub>D</sub> = 250 μA	60			V
I <sub>DSS</sub>	Zero gate voltage Drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 60 V			1	μA
		V <sub>DS</sub> = 60 V, T <sub>C</sub> = 125 °C			100	μA
I <sub>GSS</sub>	Gate-body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20 V			± 100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	3		4.5	V
R <sub>DS(on)</sub>	Static drain-source on-resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 40 A		4.4	5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0	-	8325	-	pF
C <sub>oss</sub>	Output capacitance		-	500	-	pF
C <sub>rss</sub>	Reverse transfer capacitance		-	400	-	pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V	-	147	-	nC
Q <sub>gs</sub>	Gate-source charge		-	44	-	nC
Q <sub>gd</sub>	Gate-drain charge		-	46	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 40 A R <sub>G</sub> = 4.7 Ω V <sub>GS</sub> = 10 V	-	40	-	ns	
t <sub>r</sub>	Rise time			71		ns	
t <sub>d(off)</sub>	Turn-off-delay time			-	132	-	ns
t <sub>f</sub>	Fall time			-	40	-	ns

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**Electrical characteristics**
**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%

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

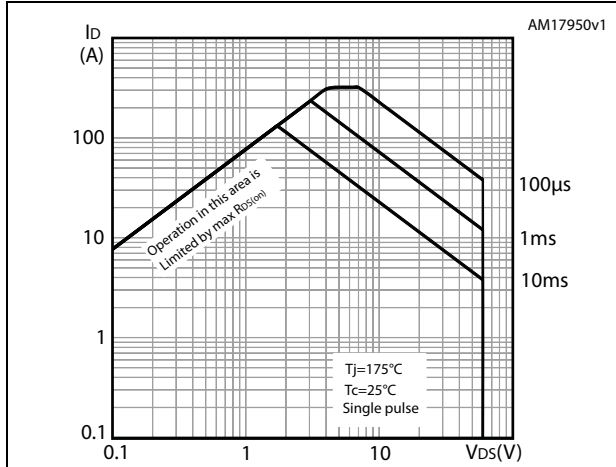


Figure 3. Thermal impedance

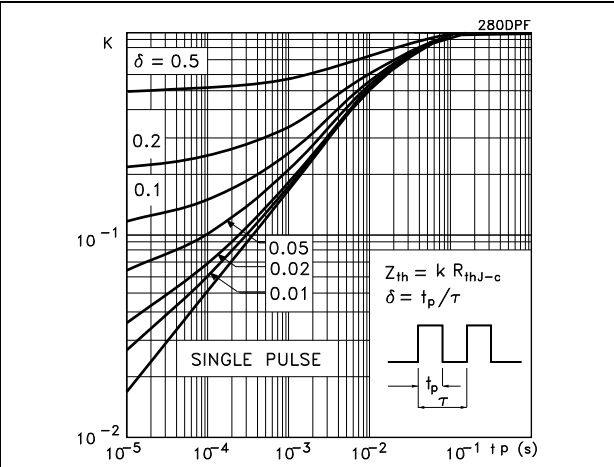


Figure 4. Output characteristics

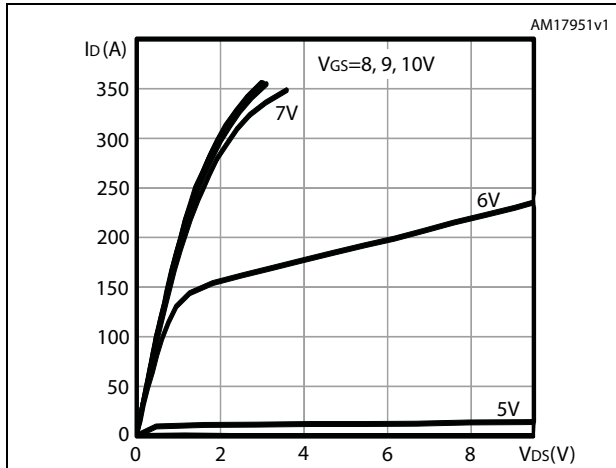


Figure 5. Transfer characteristics

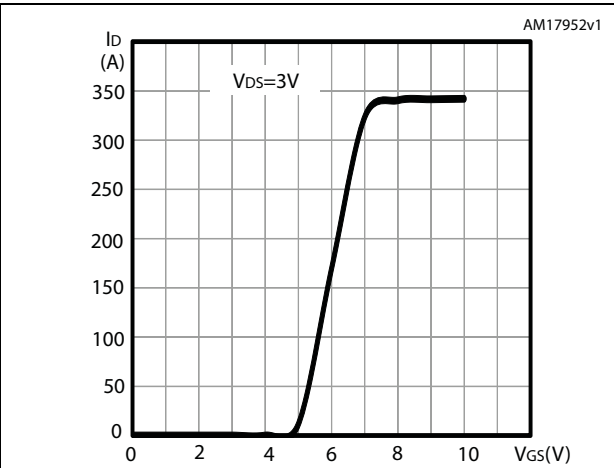


Figure 6. Gate charge vs gate-source voltage

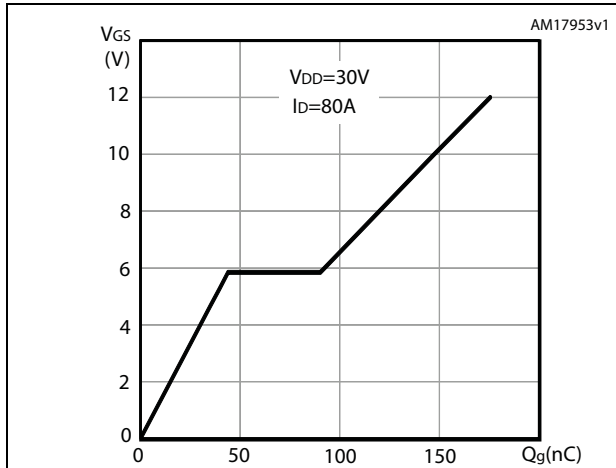
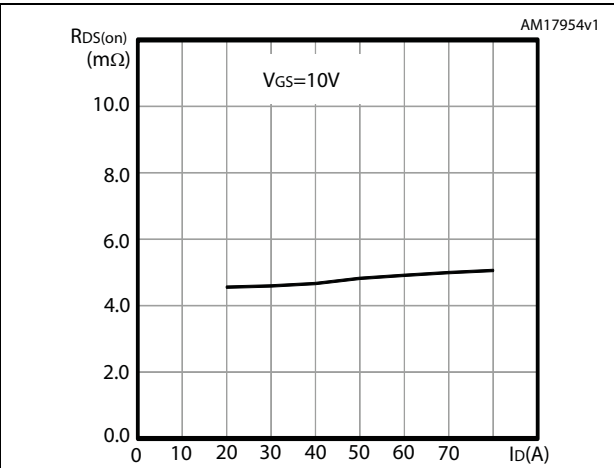


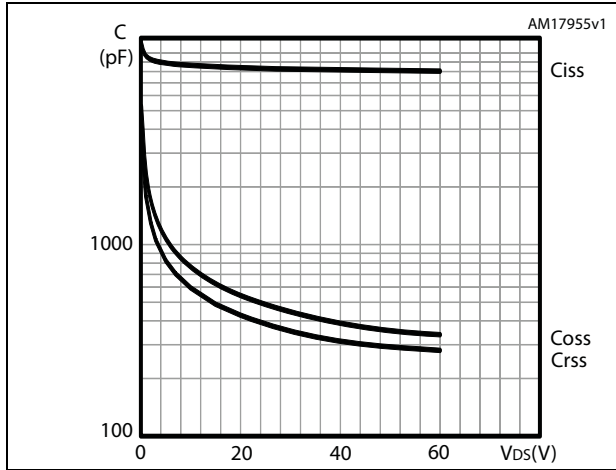
Figure 7. Static drain-source on-resistance



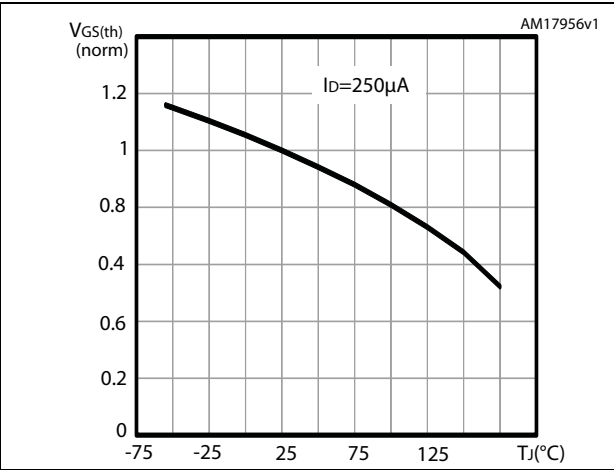
**STP80N6F6**

**Electrical characteristics**

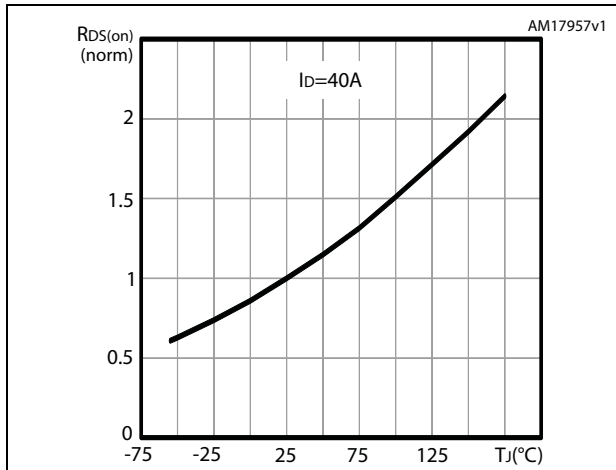
**Figure 8. Capacitance variations**



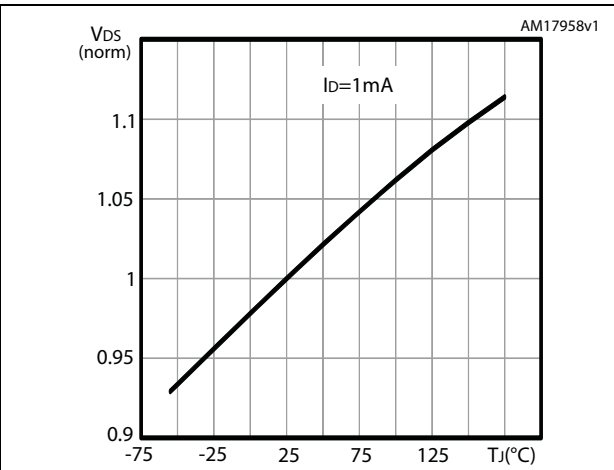
**Figure 9. Normalized gate threshold voltage vs temperature**



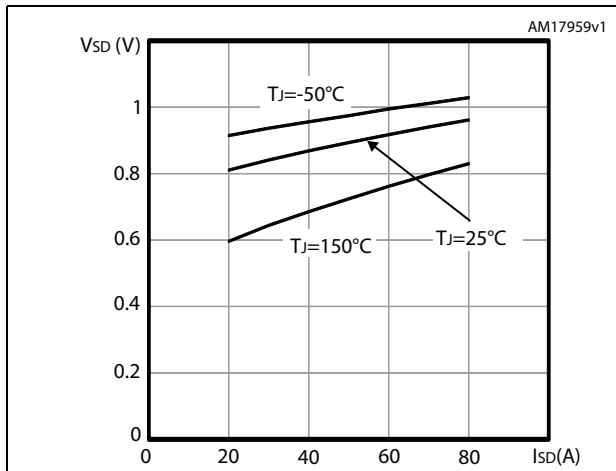
**Figure 10. Normalized on-resistance vs temperature**



**Figure 11. Normalized VDS vs temperature**



**Figure 12. Source-drain diode forward characteristics**





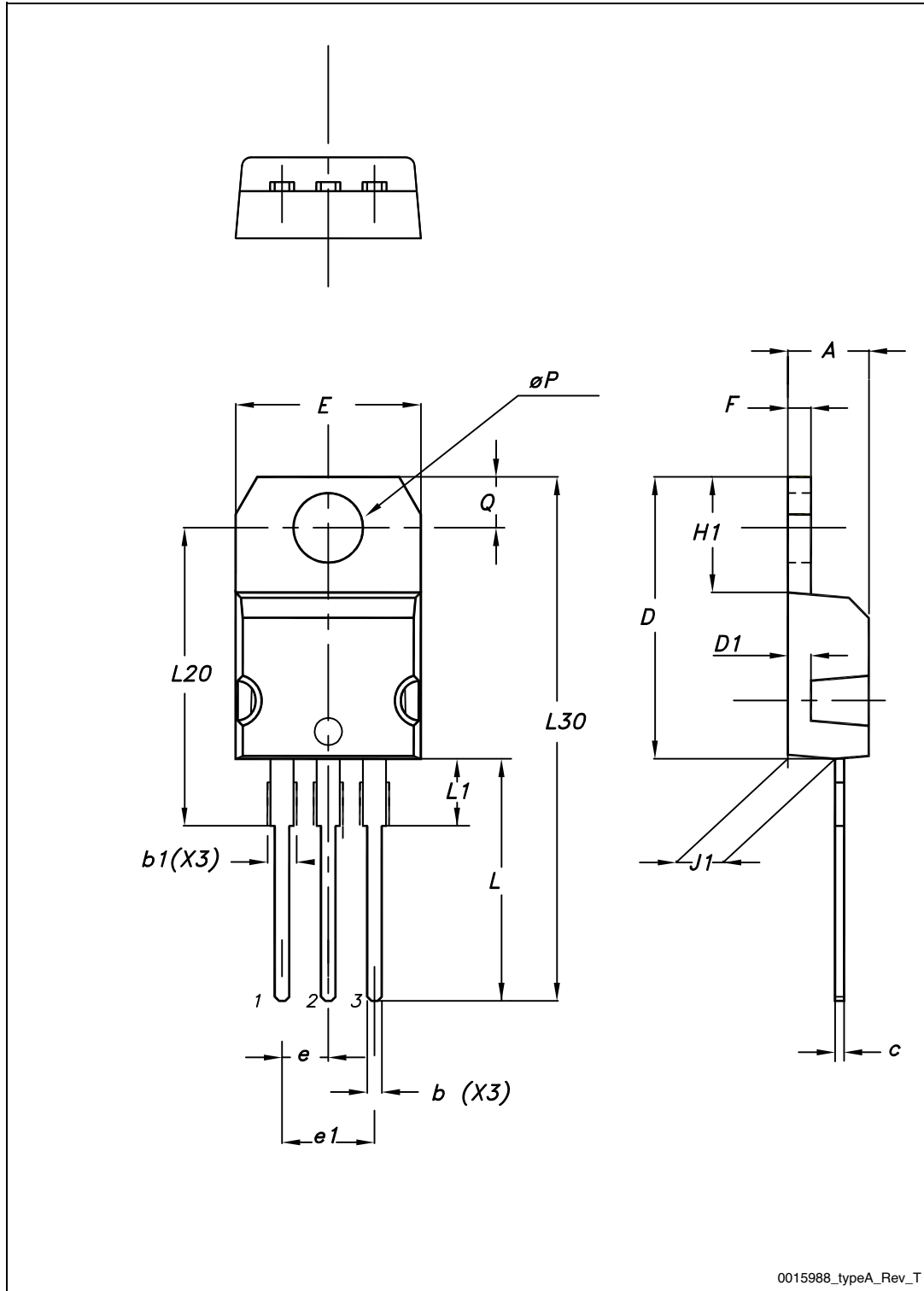
### 3 Package mechanical data

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.

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Package mechanical data

Figure 13. TO-220 type A drawing



Package mechanical data

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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: <a href="#">Features</a></li> <li>– Added: <a href="#">note 1</a> 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{ }^\circ\text{C}</math> and at <math>TC = 100\text{ }^\circ\text{C}</math>) values, <math>I_D</math>, <math>I_{DM}</math> values and added <a href="#">note 1</a> in <a href="#">Table 2</a></li> <li>– Modified: <math>R_{thj-case}</math> value in <a href="#">Table 3</a></li> <li>– Modified: <math>R_{DS(on)}</math> values in <a href="#">Table 4</a></li> <li>– Modified: <math>I_D</math> and the entire typical values in <a href="#">Table 5</a>, <a href="#">6</a> and <a href="#">7</a></li> <li>– Added: <a href="#">Section 2.1: Electrical characteristics (curves)</a></li> <li>– Updated: <a href="#">Section 3: Package mechanical data</a></li> <li>– Minor text changes</li> </ul>

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