

Automotive-grade N-channel 100 V, 2.3 mΩ typ., 180 A STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data

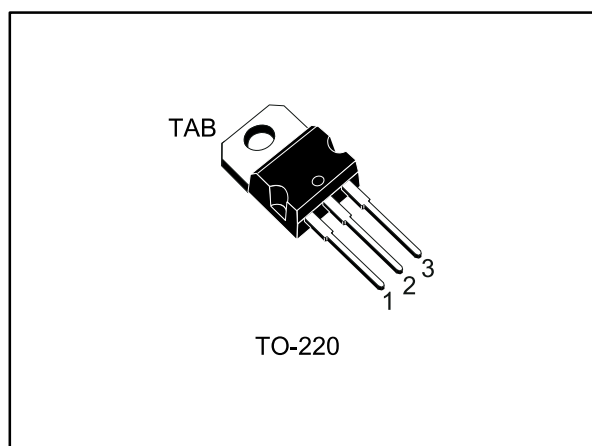
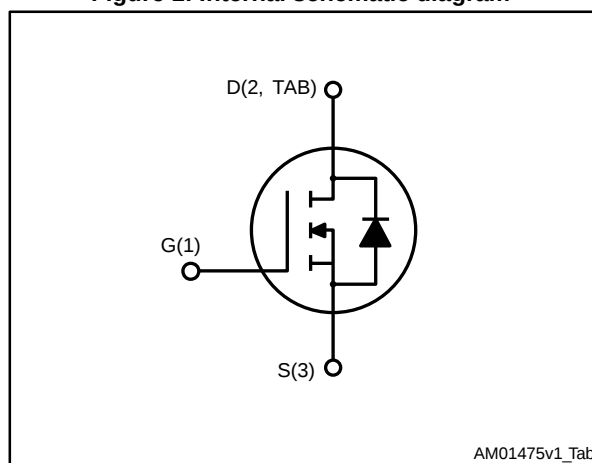


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STP315N10F7	100 V	2.7 mΩ	180 A

Features

- Designed for automotive applications and AEC-Q101 qualified
- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} 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
STP315N10F7	315N10F7	TO-220	Tube

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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	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	120	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	315	W
$E_{AS}^{(3)}$	Single pulse avalanche energy ($T_J = 25\text{ }^{\circ}\text{C}$, $L=0.55\text{ mH}$, $I_{AS}=65\text{ A}$)	1	J
T_J	Operating junction temperature range	-55 to 175	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		

Notes:

⁽¹⁾Current limited by package.

⁽²⁾Pulse width limited by safe operating area.

⁽³⁾Starting $T_J=25^{\circ}\text{C}$, $I_D=60\text{ A}$, $V_{DD}=50\text{ V}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.48	$^{\circ}\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	$^{\circ}\text{C/W}$

2 Electrical characteristics

(T_C = 25 °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 V, I _D = 250 μA	100			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 100 V			1	μA
		V _{GS} = 0 V, V _{DS} = 100 V, T _C = 125 °C ⁽¹⁾			100	μA
I _{GSS}	Gate-body leakage current	V _{DS} = 0 V, V _{GS} = 20 V			100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	2.5	3.5	4.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 60 A		2.3	2.7	mΩ

Notes:

⁽¹⁾Defined by design, not subject to production test.

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz	-	12800	-	pF
C _{oss}	Output capacitance		-	3500	-	pF
C _{rss}	Reverse transfer capacitance		-	170	-	pF
Q _g	Total gate charge	V _{DD} = 50 V, I _D = 180 A, V _{GS} = 10 V (see Figure 14: "Test circuit for gate charge behavior")	-	180	-	nC
Q _{gs}	Gate-source charge		-	78	-	nC
Q _{gd}	Gate-drain charge		-	34	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 50V, I _D = 90 A, R _G = 4.7 Ω, V _{GS} = 10 V (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	62	-	ns
t _r	Rise time		-	108	-	ns
t _{d(off)}	Turn-off delay time		-	148	-	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		-		180	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		720	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 60\text{ A}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 180\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 80\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	85		ns
Q_{rr}	Reverse recovery charge		-	200		nC
I_{RRM}	Reverse recovery current		-	4.7		A

Notes:

⁽¹⁾Pulse width limited by safe operating area.

⁽²⁾Pulse duration = 300 μs , duty cycle 1.5%

2.2 Electrical characteristics (curves)

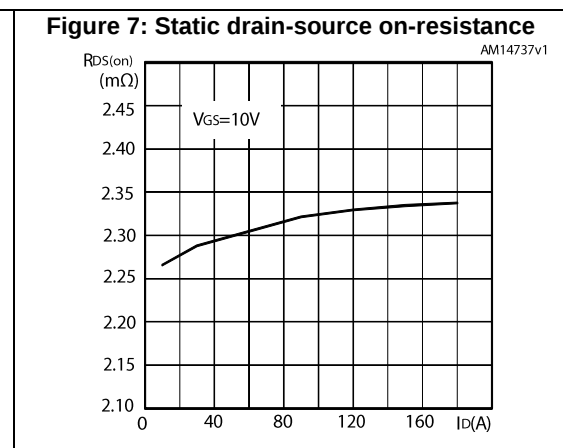
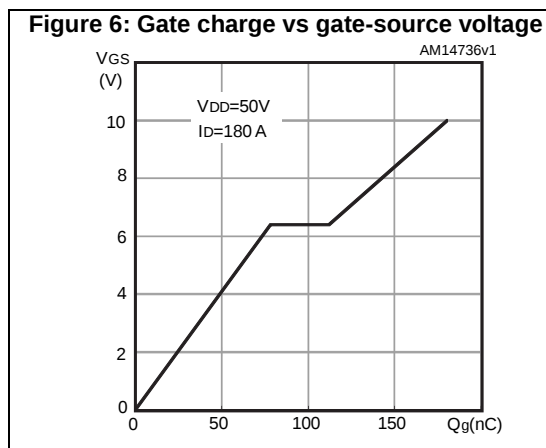
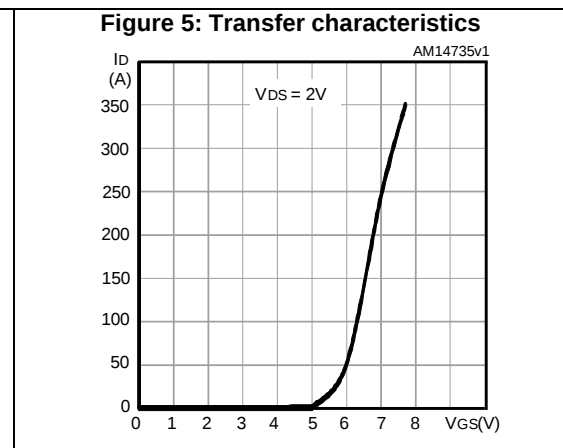
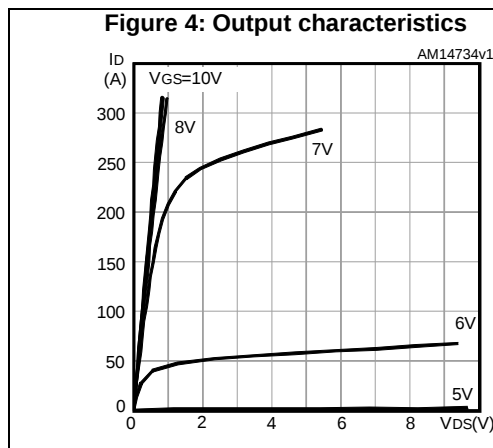
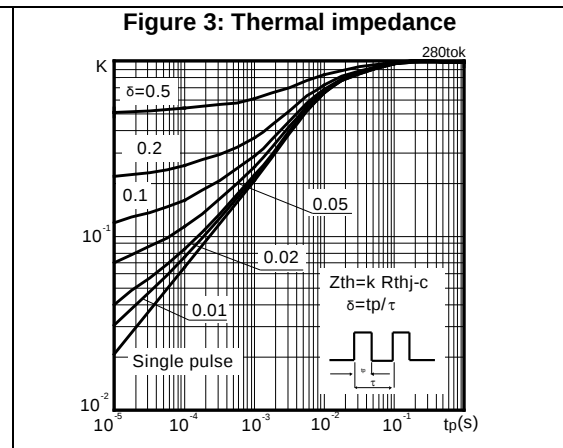
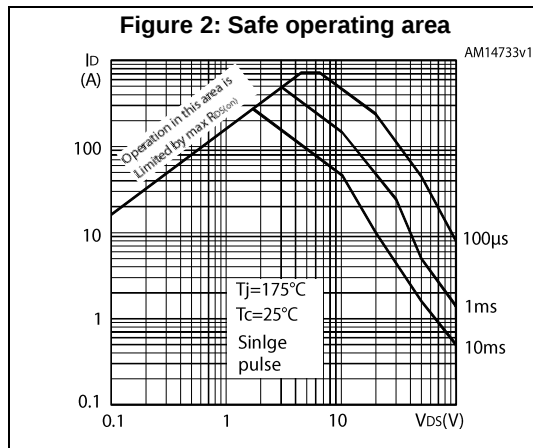


Figure 8: Capacitance variations

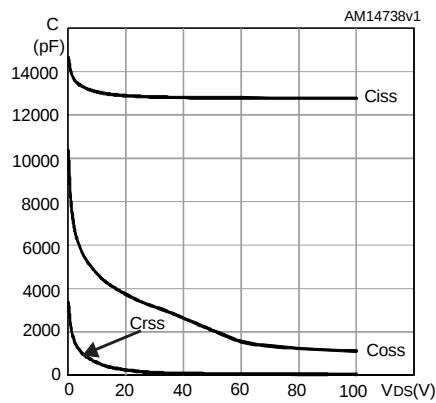


Figure 9: Normalized on-resistance vs temperature

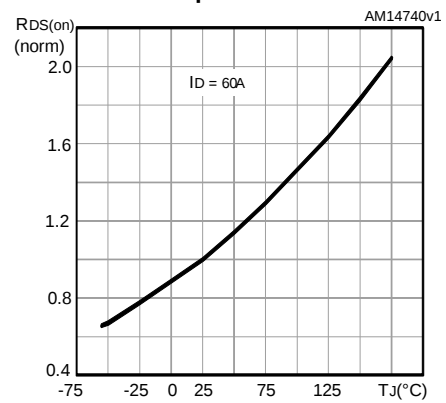
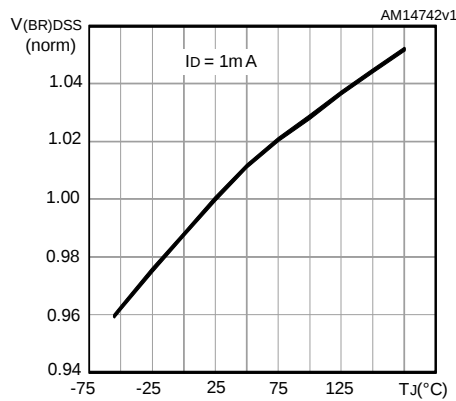
Figure 10: Normalized $V_{(BR)DSS}$ vs temperature

Figure 11: Normalized gate threshold voltage vs temperature

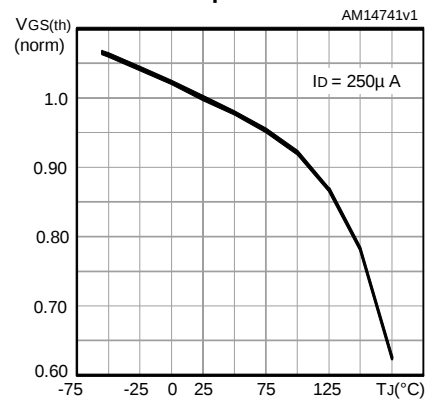
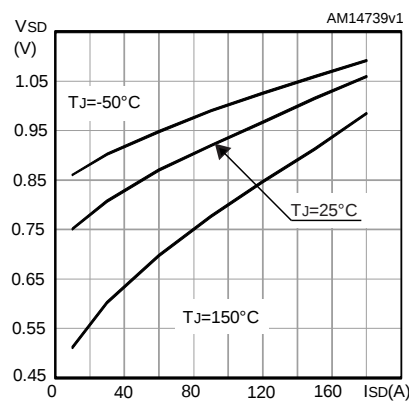


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

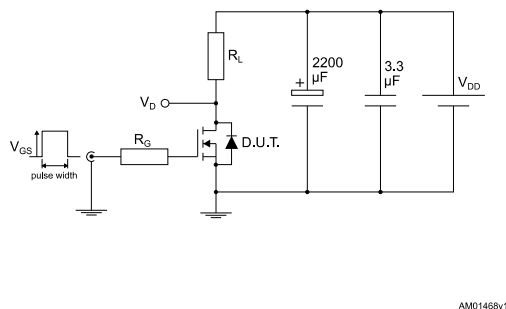


Figure 14: Test circuit for gate charge behavior

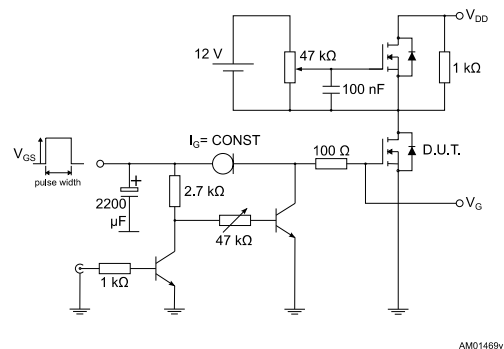


Figure 15: Test circuit for inductive load switching and diode recovery times

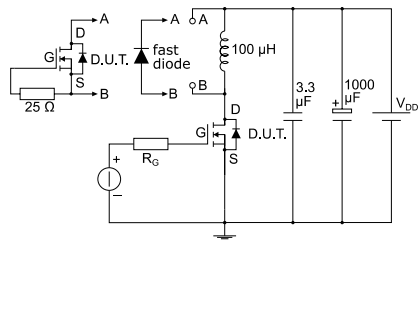


Figure 16: Unclamped inductive load test circuit

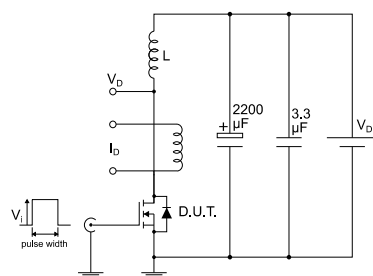


Figure 17: Unclamped inductive waveform

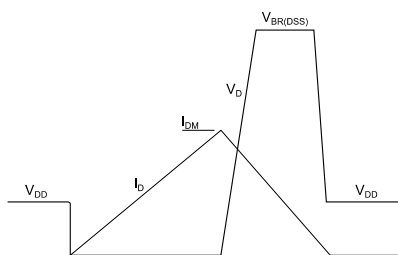
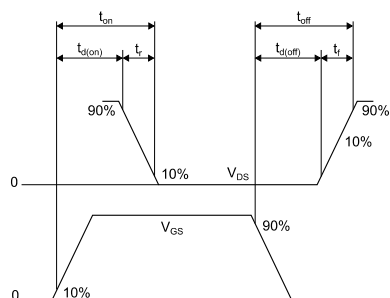


Figure 18: Switching time waveform



4 Package information data

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**. ECOPACK® is an ST trademark.

4.1 TO-220 type A package information

Figure 19: TO-220 type A package outline

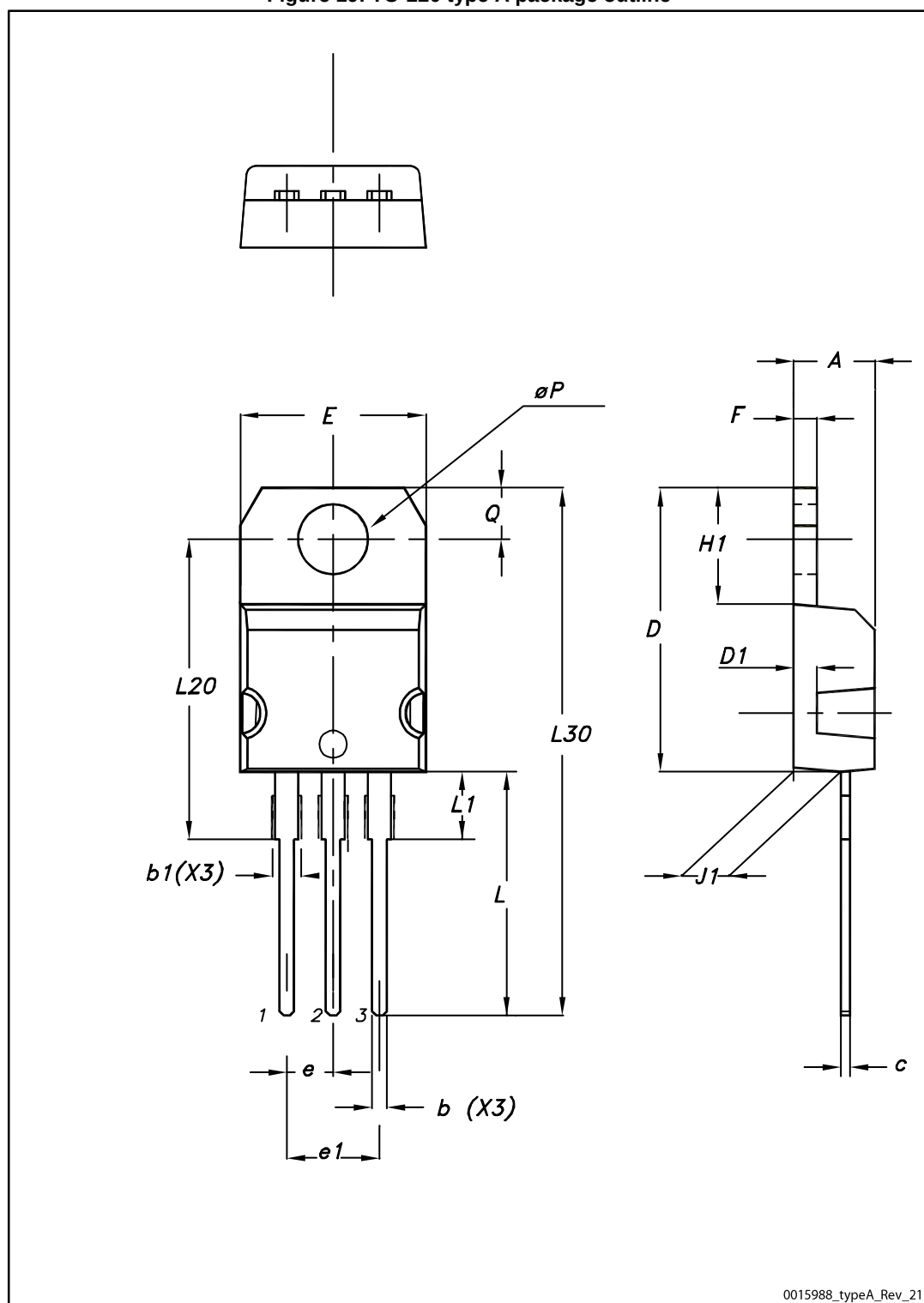


Table 8: TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
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

5 Revision history

Table 9: Document revision history

Date	Revision	Changes
07-Oct-2013	1	First release.
27-May-2014	2	– Modified: title and <i>Features</i> in cover page – Minor text changes
12-Sep-2014	3	– Modified: title, features and description in cover page.
29-Aug-2016	4	Modified: Table 2: "Absolute maximum ratings" and Table 4: "On /off states" Updated: Section 7.1: "TO-220 type A package information" Minor text changes

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