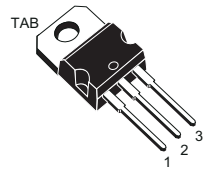
STP110N7F6

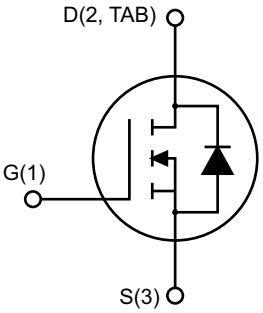
N-channel 68 V, 0.0055 Ω typ., 110 A, STripFET™ F6 Power MOSFET in a TO-220 package

Datasheet - production data



TO-220

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)max.}$	I_D	P_{TOT}
STP110N7F6	68 V	0.0065 Ω	110 A	176 W

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

Table 1. Device summary

Order code	Marking	Package	Packing
STP110N7F6	110N7F6	TO-220	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	68	V
V_{GS}	Gate- source voltage	±20	V
I_D	Drain current (continuous) at T_C = 25 °C	110	A
	Drain current (continuous) at T_C = 100 °C	80	A
I_{DM}(1)	Drain current (pulsed) T_C = 25 °C	440	A
P_{TOT}	Total dissipation at T_C = 25 °C	176	W
E_{AS}(2)	Single pulse avalanche energy	185	mJ
T_J	Operating junction temperature range	-55 to 175	°C
T_{stg}	Storage temperature range		°C

1. Pulse width is limited by safe operating area
2. Starting T_J = 25 °C, I_D = 35 A, V_{DD} = 50 V

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max.	0.85	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max.	62.5	°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, I_D = 1 mA	68			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0, V_{DS} = 68 V			1	µA
		V_{GS} = 0, V_{DS} = 68 V, T_C = 125 °C (1)			100	µA
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 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 55 A		0.0055	0.0065	Ω

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_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	5850	-	pF
C_{oss}	Output capacitance			340		pF
C_{rss}	Reverse transfer capacitance			240		pF
Q_g	Total gate charge	V_{DD} = 34 V, I_D = 110 A, V_{GS} = 10 V (see *Figure 14*)		100		nC
Q_{gs}	Gate-source charge			32		nC
Q_{gd}	Gate-drain charge			19		nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 34 V, I_D = 55 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13*)	-	23	-	ns
t_r	Rise time			29		ns
$t_{d(off)}$	Turn-off delay time			103		ns
t_f	Fall time			23		ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	I_{SD} = 110 A, V_{GS} = 0	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 110 A, di/dt = 100 A/µs V_{DD} = 54 V, (see *Figure 15*)		31		ns
Q_{rr}	Reverse recovery charge			39		nC
I_{RRM}	Reverse recovery current			2.6		A

1. Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

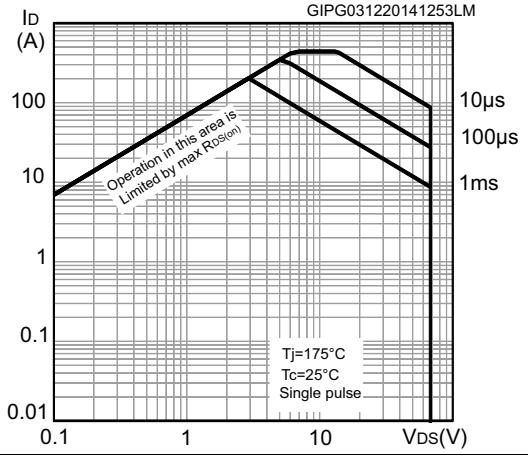


Figure 3. Normalized thermal impedance

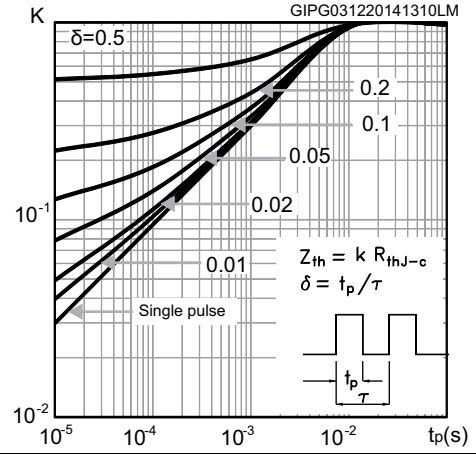


Figure 4. Output characteristics

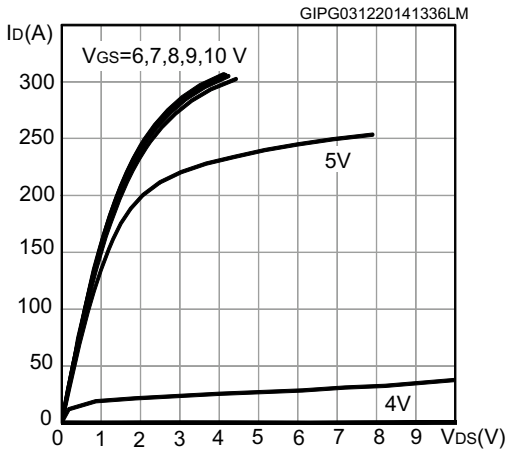


Figure 5. Transfer characteristics

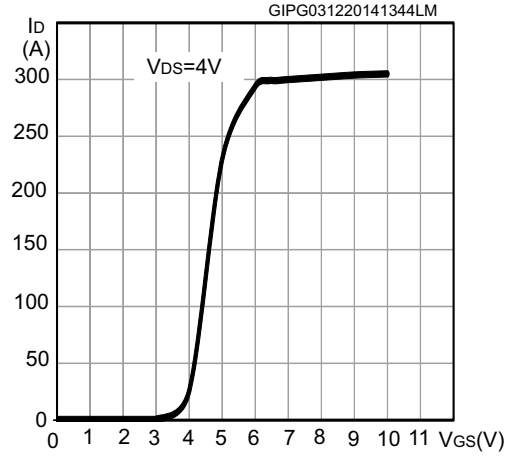


Figure 6. Gate charge vs gate-source voltage

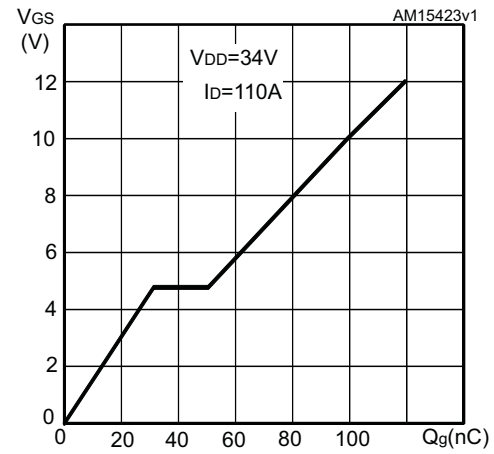


Figure 7. Static drain-source on-resistance

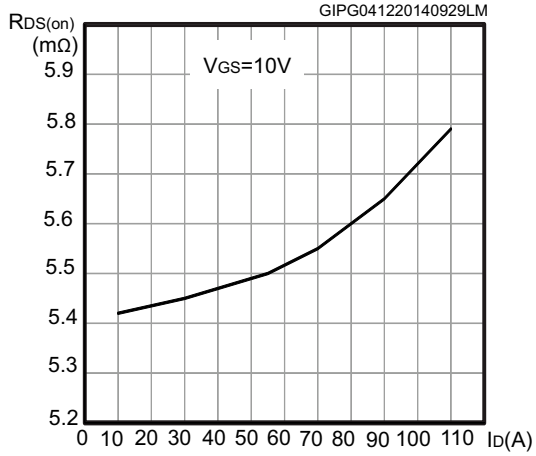


Figure 8. Capacitance variations

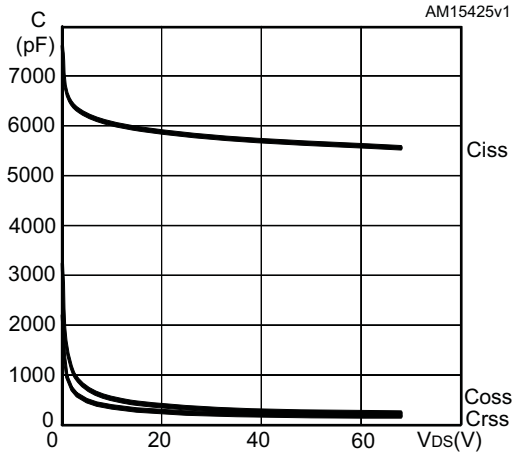


Figure 9. Normalized $V_{(BR)DSS}$ vs temperature

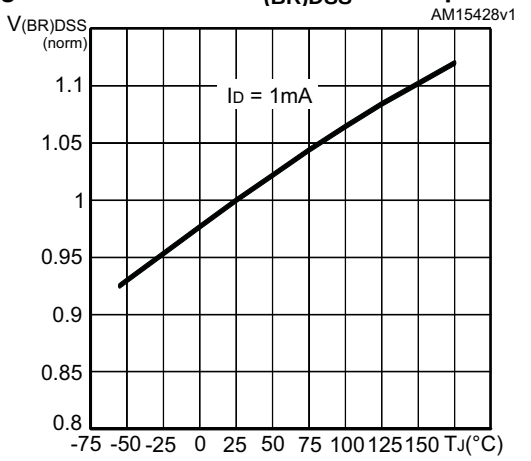


Figure 10. Normalized gate threshold voltage vs temperature

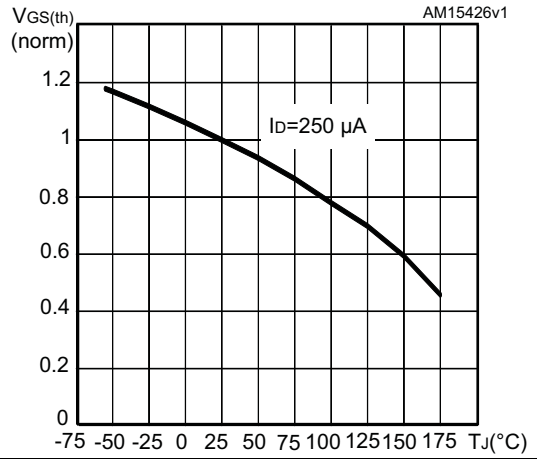


Figure 11. Normalized on-resistance vs temperature

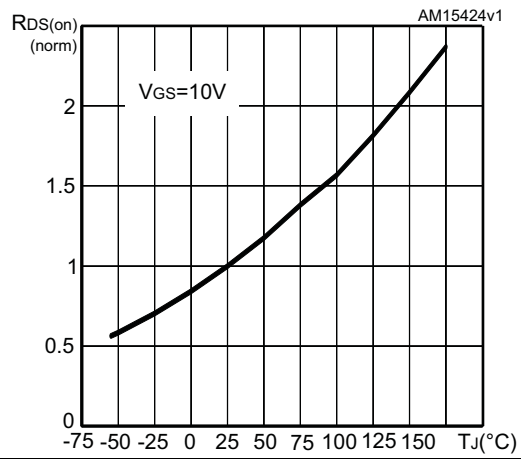
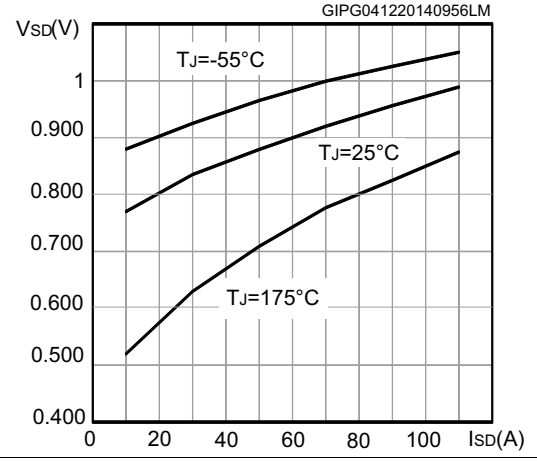


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

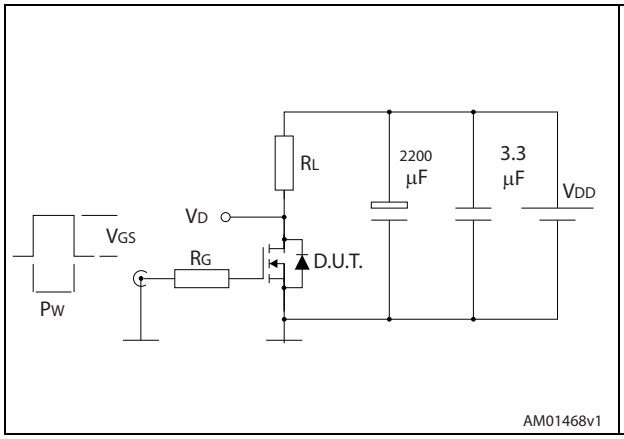


Figure 14. Gate charge test circuit

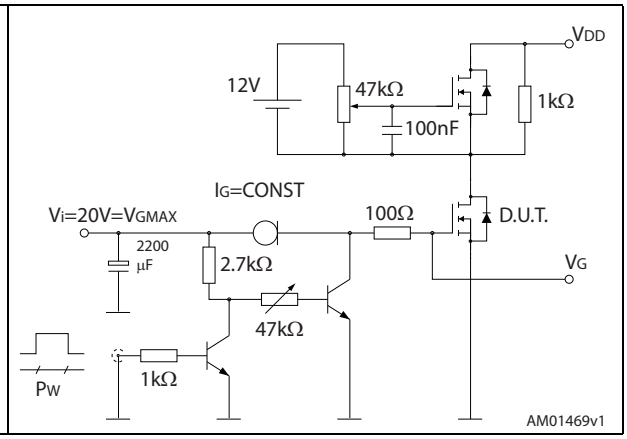


Figure 15. Test circuit for inductive load switching and diode recovery times

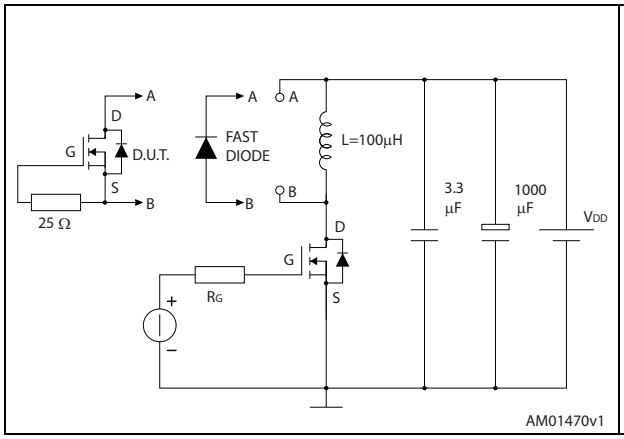


Figure 16. Unclamped inductive load test circuit

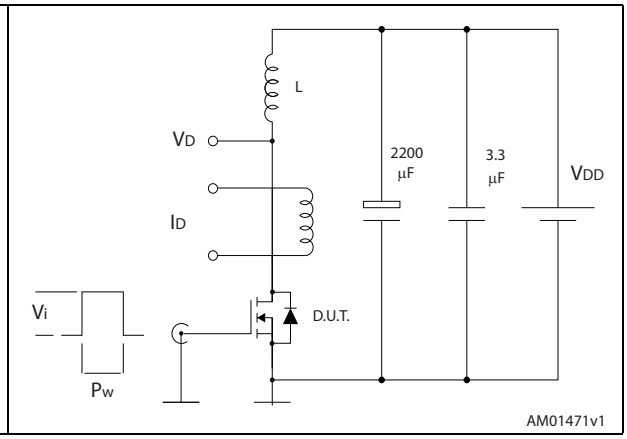


Figure 17. Unclamped inductive waveform

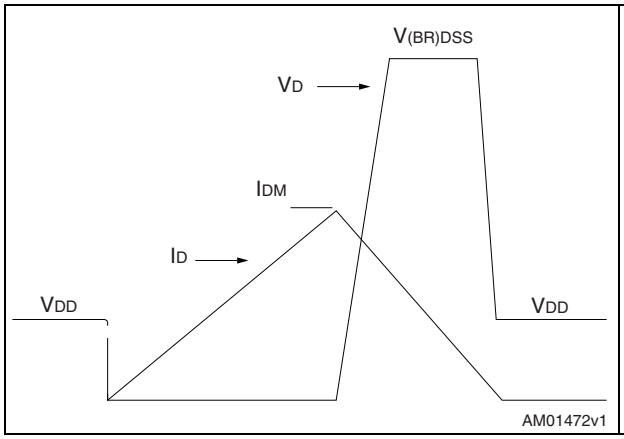
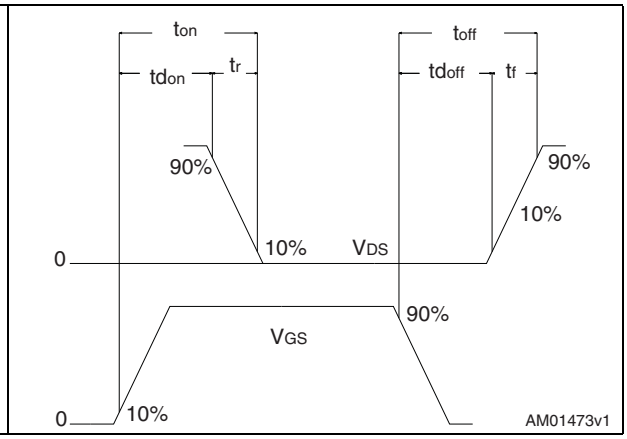


Figure 18. Switching time waveform



4 Package information

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 package information

Figure 19. TO-220 type A package outline

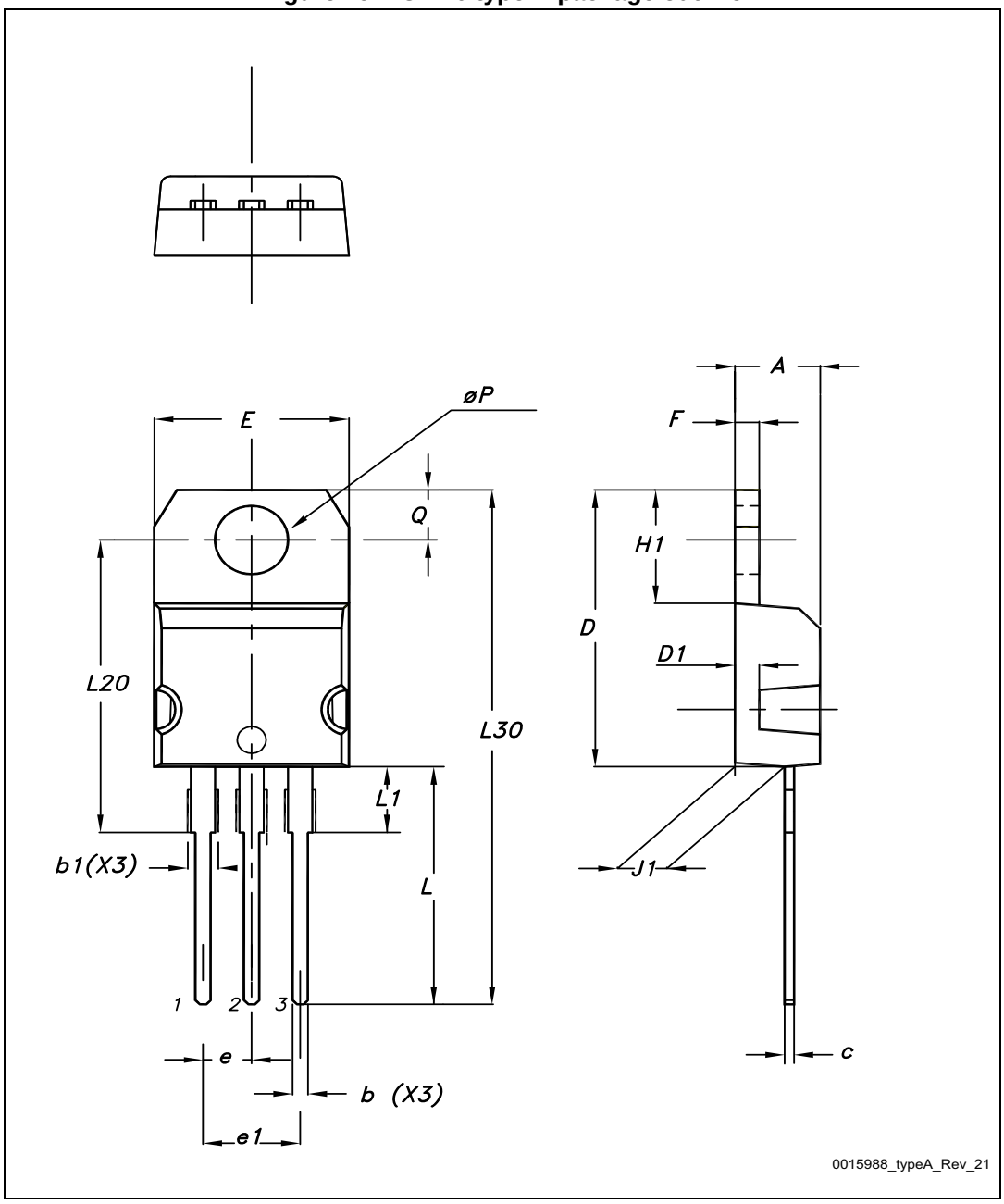


Table 8. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
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
04-Dec-2014	1	First release.
30-Mar-2015	2	Document status promoted from preliminary to production data.
13-Oct-2016	3	Updated *Figure 11: Normalized on-resistance vs temperature* and *Section 4.1: TO-220 package information*. Minor text changes.

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