

N-channel 40 V, 1.8 mΩ typ., 120 A STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data

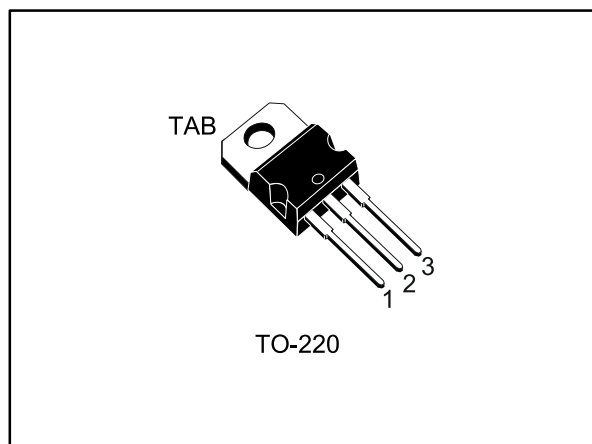


Figure 1: Internal schematic diagram

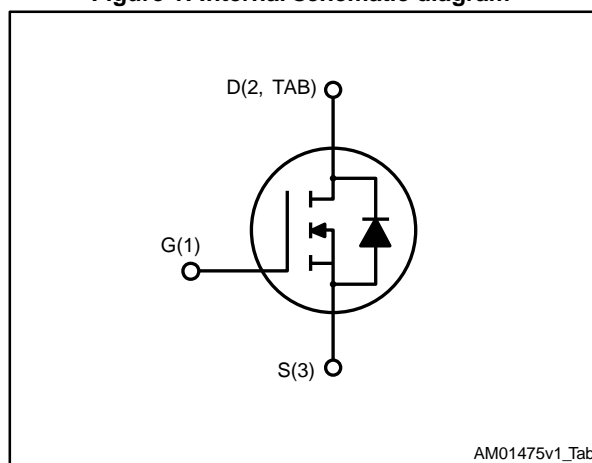


Table 1: Device summary

Order code	Marking	Package	Packaging
STP260N4F7	260N4F7	TO-220	Tube

Features

Order code	V _{DS}	R _{DS(on)max}	I _D	P _{TOT}
STP260N4F7	40 V	2.2 mΩ	120 A	235 W

Features

- 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.

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	40	V
V_{GS}	Gate source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	120	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	120	A
$I_{DM}^{(2)}$	Drain current (pulsed)	480	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	235	W
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.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.64	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	$^\circ\text{C/W}$

2 Electrical characteristics

($T_C = 25\text{ °C}$ unless otherwise specified)

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	40			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 40\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 40\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = 20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 60\text{ A}$		1.8	2.2	m Ω

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	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	-	5600	-	pF
C_{oss}	Output capacitance		-	2400	-	pF
C_{riss}	Reverse transfer capacitance		-	35	-	pF
Q_g	Total gate charge	$V_{DD} = 20\text{ V}$, $I_D = 120\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	67	-	nC
Q_{gs}	Gate-source charge		-	31	-	nC
Q_{gd}	Gate-drain charge		-	9	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20\text{ V}$, $I_D = 60\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	30	-	ns
t_r	Rise time		-	21	-	ns
$t_{d(off)}$	Turn-off delay time		-	42	-	ns
t_f	Fall time		-	13	-	ns

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 120\text{ A}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 120\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	68		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 32\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	98		nC
I_{RRM}	Reverse recovery current		-	2.9		A

Notes:

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

2.2 Electrical characteristics (curves)

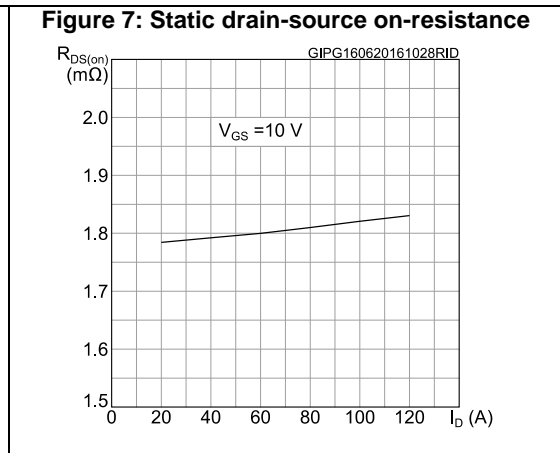
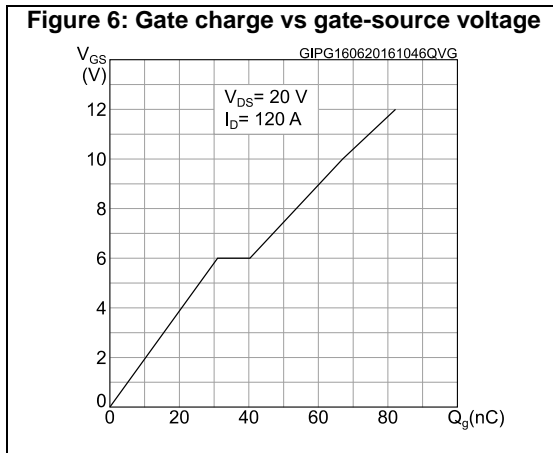
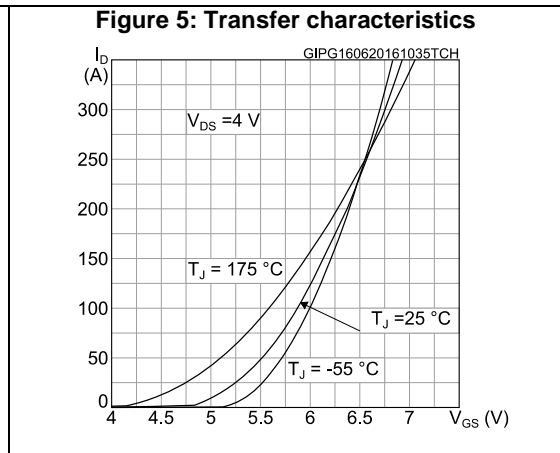
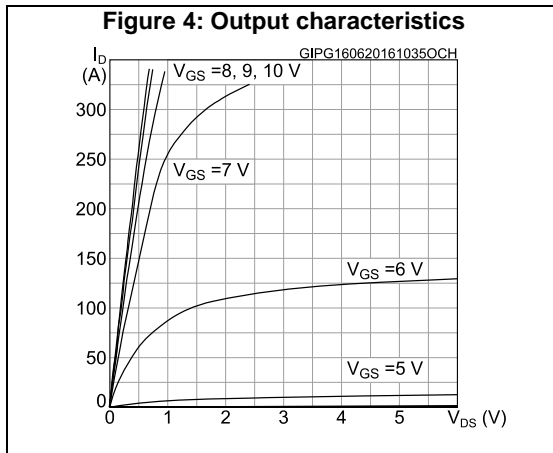
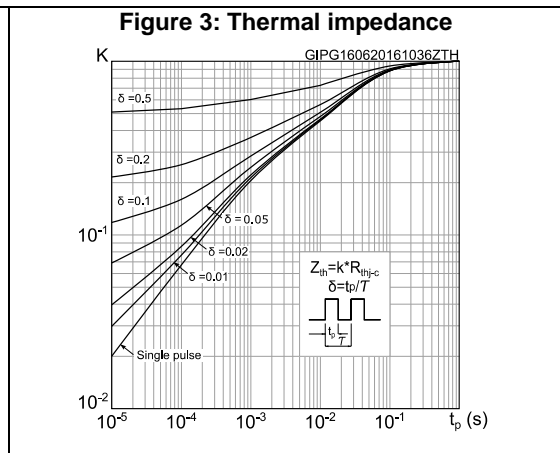
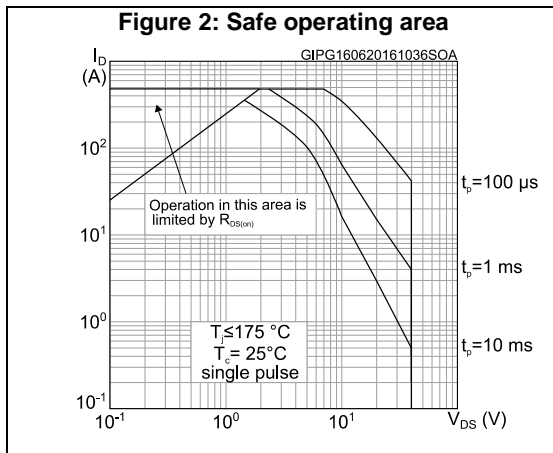


Figure 8: Capacitance variations

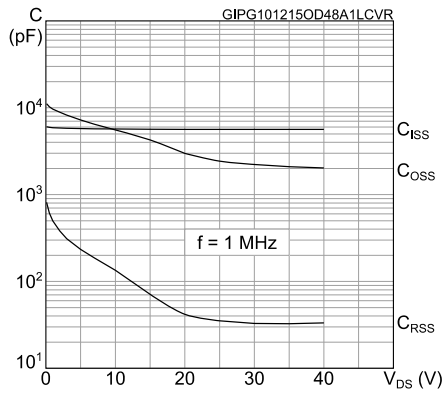


Figure 9: Normalized on-resistance vs temperature

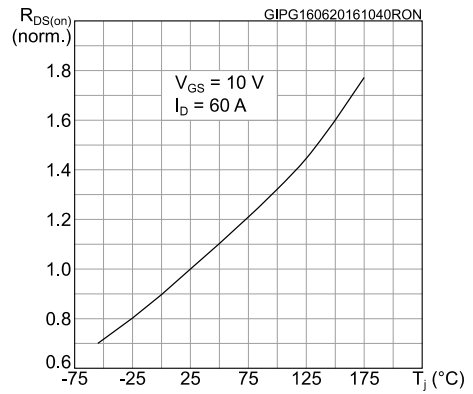


Figure 10: Normalized $V_{(BR)DSS}$ vs temperature

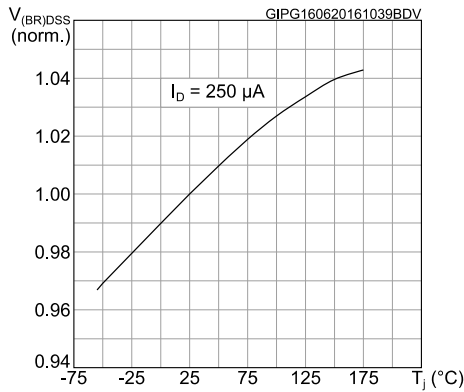


Figure 11: Normalized gate threshold voltage vs temperature

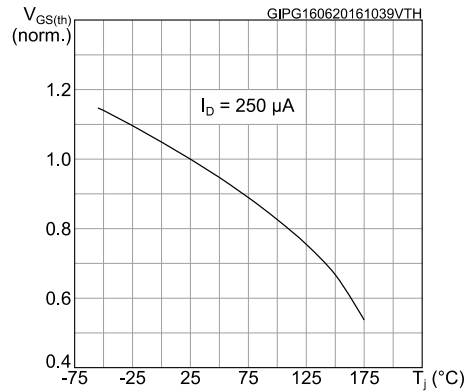
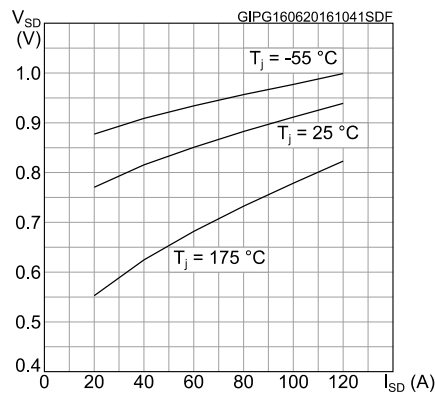
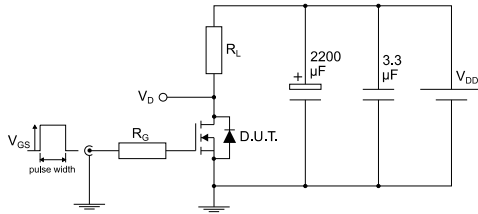


Figure 12: Source-drain diode forward characteristics



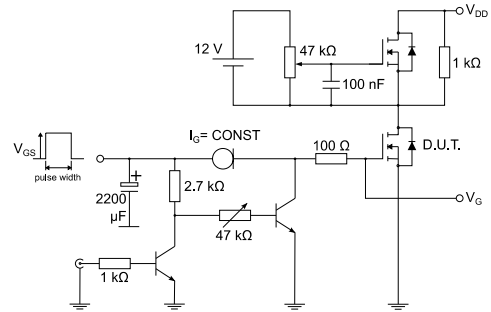
3 Test circuits

Figure 13: Test circuit for resistive load switching times



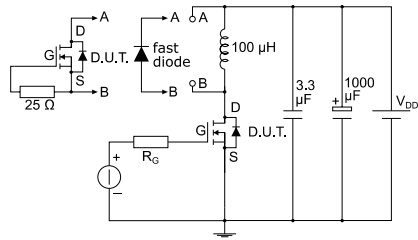
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Figure 14: Test circuit for gate charge behavior



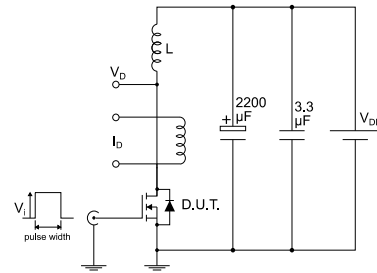
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Figure 15: Test circuit for inductive load switching and diode recovery times



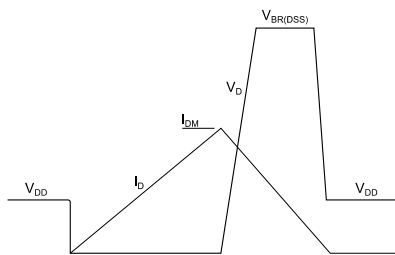
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Figure 16: Unclamped inductive load test circuit



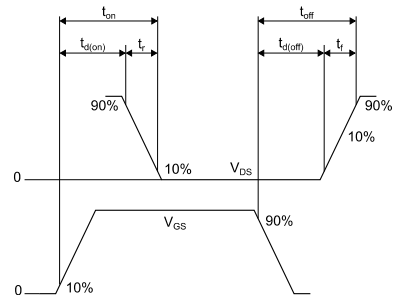
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Figure 17: Unclamped inductive waveform



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Figure 18: Switching time waveform



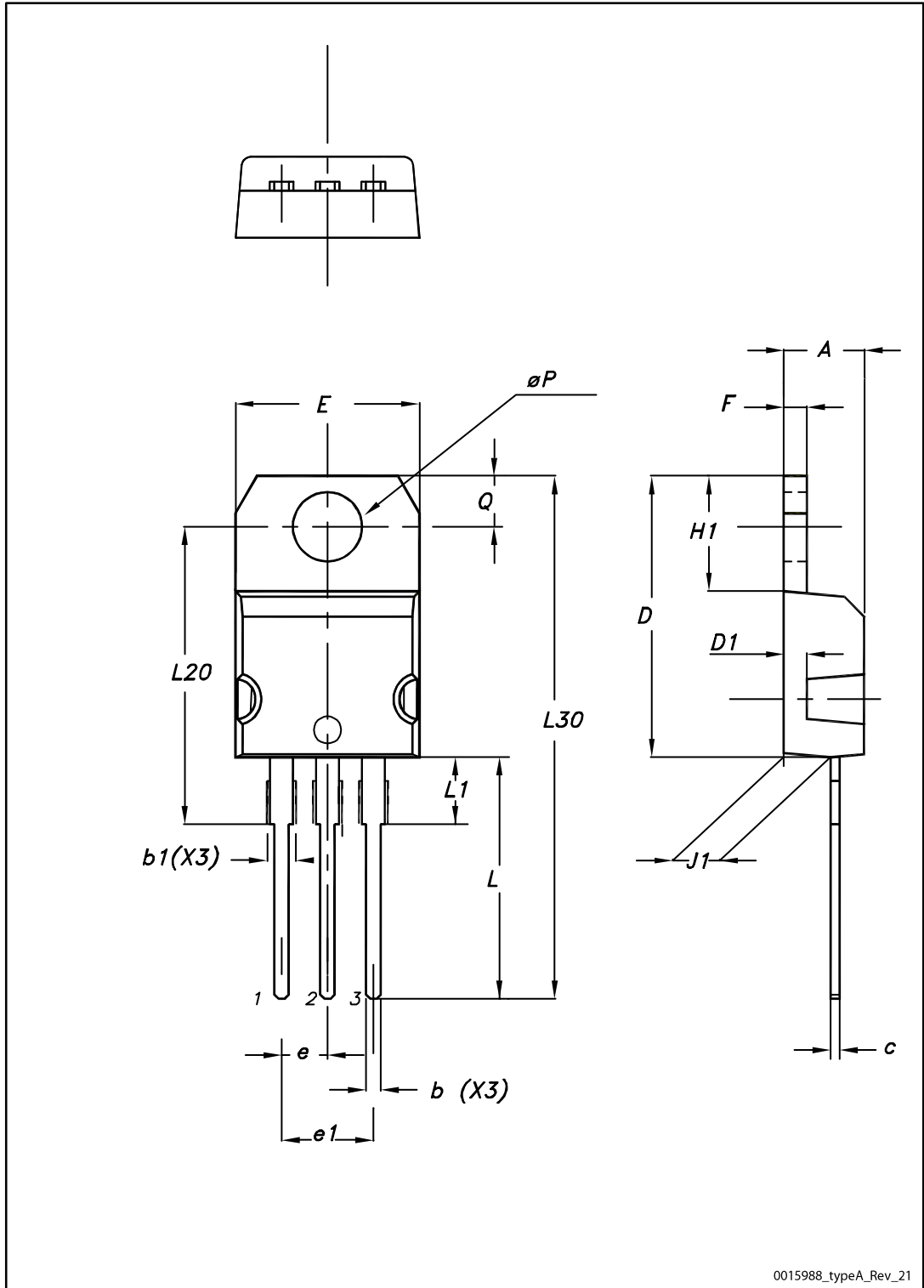
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4 Package information data

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



0015988_typeA_Rev_21

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
21-Sep-2015	1	First release.
16-Jun-2016	2	Modified: title and features in cover page Modified: <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 3: "Thermal data"</i> , <i>Table 4: "On /off states"</i> , <i>Table 5: "Dynamic"</i> , <i>Table 6: "Switching times"</i> and <i>Table 7: "Source-drain diode"</i> Added: <i>Section 5.1: "Electrical characteristics (curves)"</i> Minortext changes

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