STI300N4F6

N-channel 40 V, 1.7 mΩ typ., 160 A, STripFET™ VI DeepGATE™ Power MOSFET in a I²PAK package

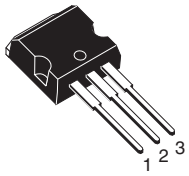
Datasheet — production data

Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STI300N4F6	40 V	2.2 mΩ	160 A(1)

1. Limited by wire bonding

- Standard level $V_{GS(th)}$
- 100% avalanche rated



I²PAK

Applications

- Automotive switching applications

Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Figure 1. Internal schematic diagram

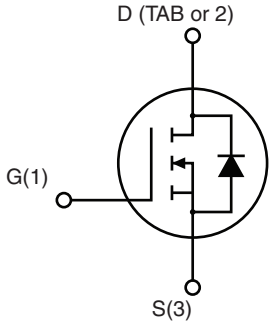


Table 1. Device summary

Order code	Marking	Package	Packaging
STI300N4F6	300N4F6	I²PAK	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	40	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	160	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	160	A
I_{DM} (2)	Drain current (pulsed)	640	A
P_{TOT}	Total dissipation at T_C = 25 °C	300	W
I_{AV}	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_{j\ max}$)	160	A
E_{AS}	Single pulse avalanche energy (starting T_J=25 °C, I_D=I_{AV}, V_{DD}=35 V)	1100	mJ
T_{stg}	Storage temperature	- 55 to 175	°C
T_j	Operating junction temperature		

1. Limited by wire bonding
2. Pulse width limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.5	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	62.5	

2 Electrical characteristics

(T_J = 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= 250 µA	40			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 40 V, V_{DS} = 40 V, T_C=125 °C			1 100	µA µA
I_{GSS}	Gate-source leakage current	V_{GS} = ±20 V, V_{DS} = 0			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= 80 A		1.7	2.2	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25 V, f = 1 MHz, V_{GS} = 0	-	13800 1870 1095	-	nF nF nF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 20 V, I_D = 160 A V_{GS} =10 V (see *Figure 14*)	-	240 59 75.2	-	nC nC nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD}= 20 V, I_D= 80 A, R_G=4.7 Ω, V_{GS}=10 V (see *Figure 13*)	-	28 98 190 95	-	ns ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-	-	160	A
I_{SDM}(1)	Source-drain current (pulsed)		-	-	640	A
V_{SD}(2)	Forward on voltage	I_{SD} = 160 A, V_{GS} = 0	-		1.1	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 160 A, di/dt = 100 A/µs, V_{DD}= 32 V, T_J = 25 °C (see *Figure 15*)	-	58.7 99.2 3.38		ns nC A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

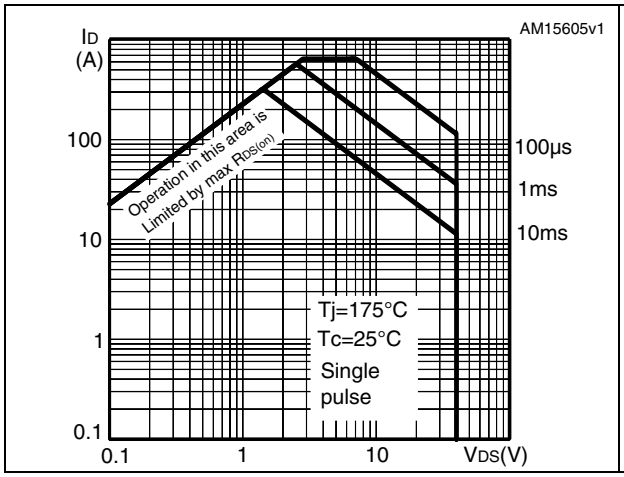


Figure 3. Thermal impedance

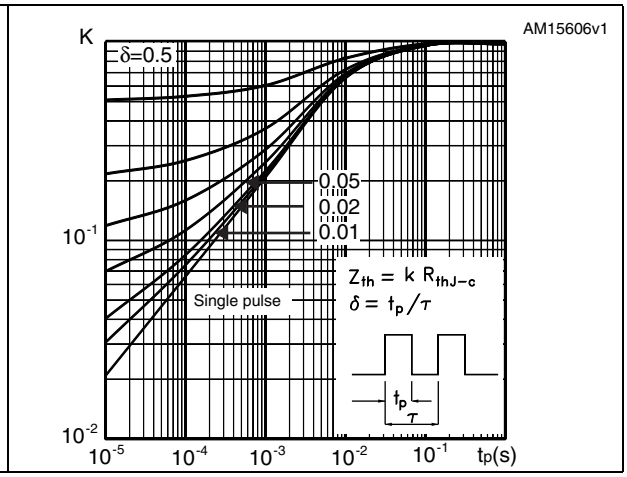


Figure 4. Output characteristics

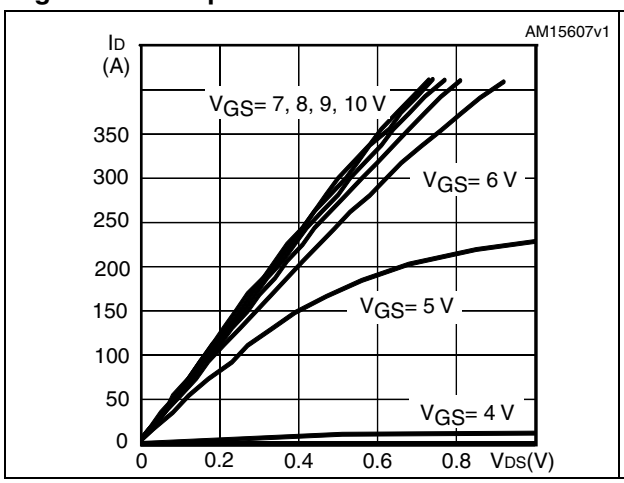


Figure 5. Transfer characteristics

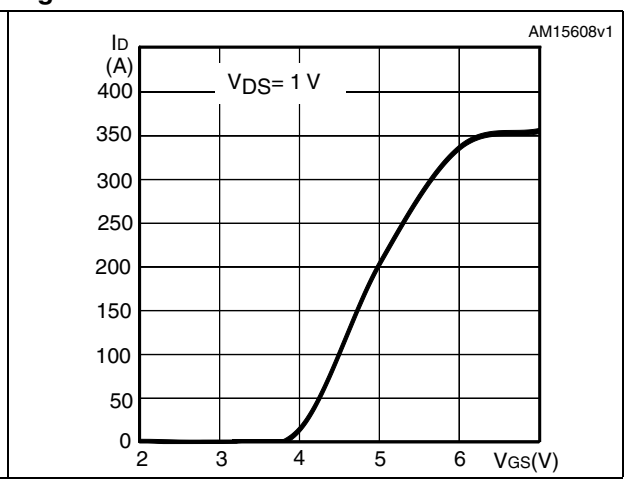


Figure 6. Gate charge vs gate-source voltage

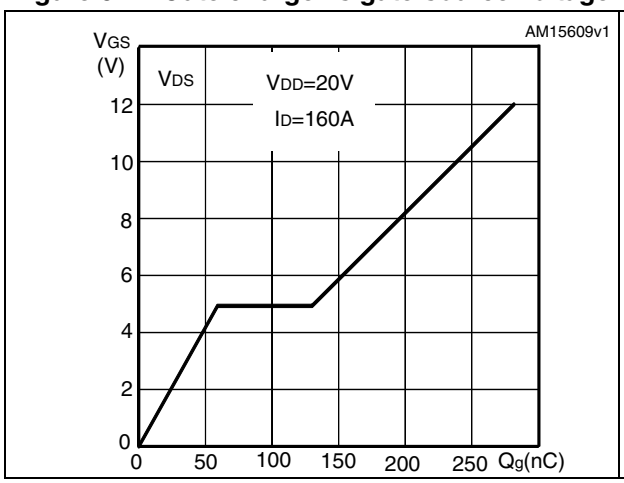


Figure 7. Static drain-source on-resistance

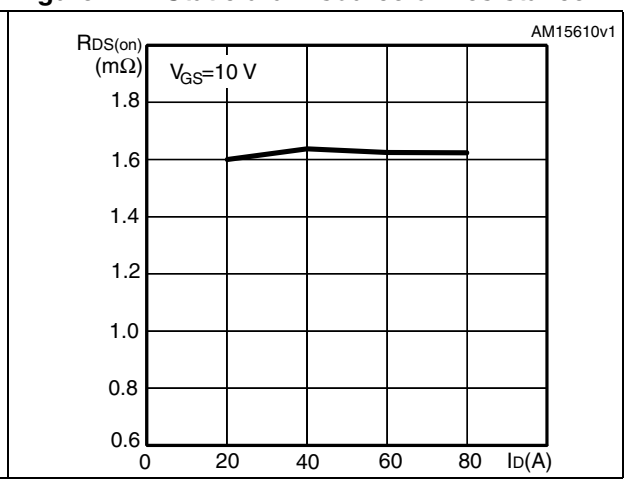


Figure 8. Capacitance variations

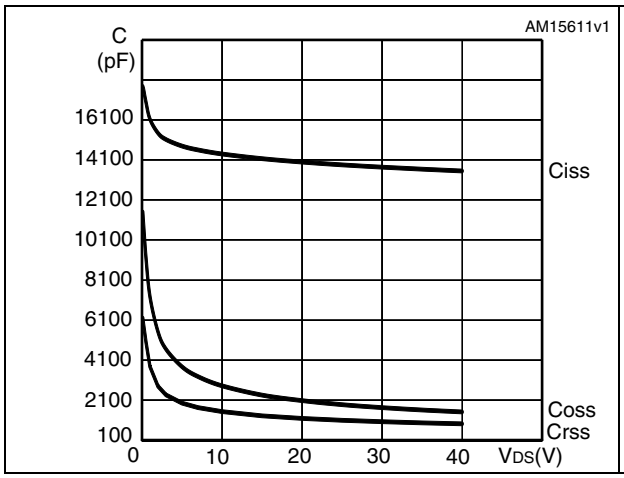


Figure 9. Drain-source diode forward characteristics

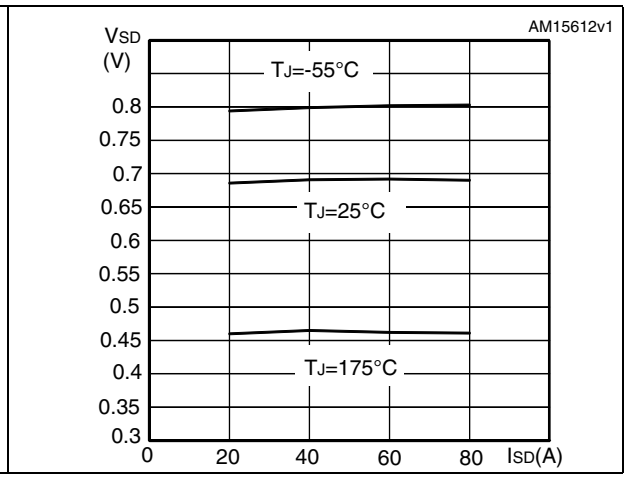


Figure 10. Normalized gate threshold voltage vs temperature

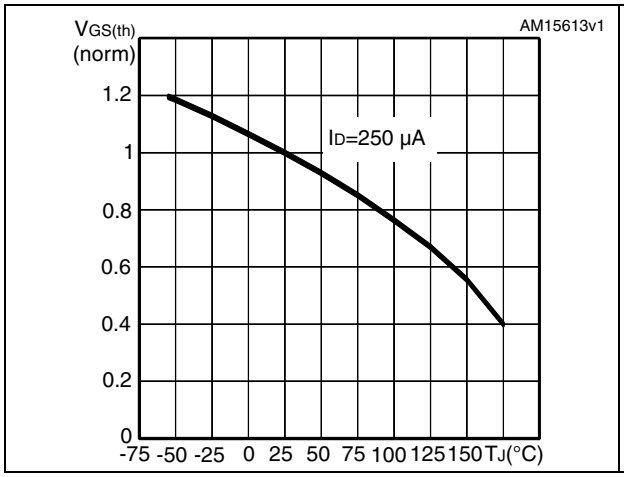


Figure 11. Normalized on-resistance vs temperature

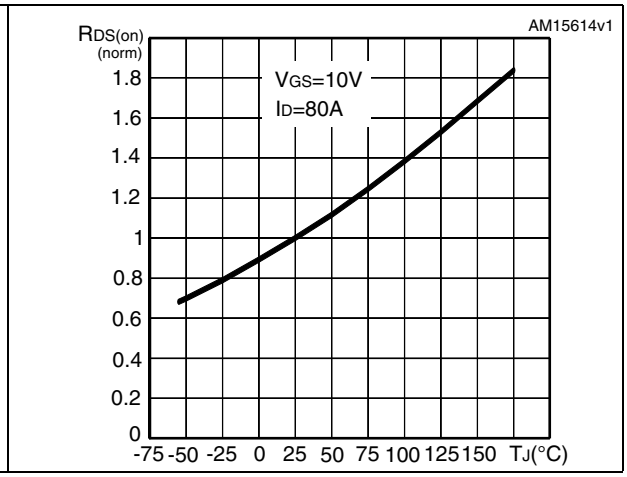
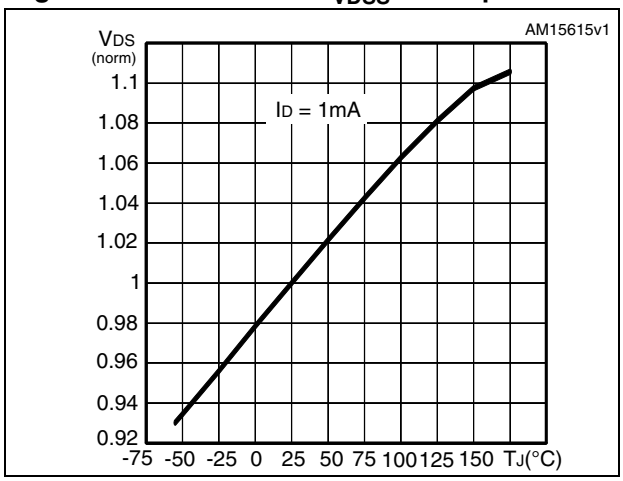


Figure 12. Normalized B_{VDSS} vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load

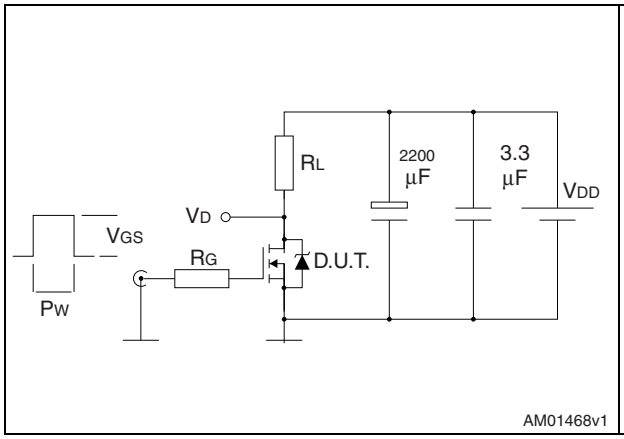


Figure 14. Gate charge test circuit

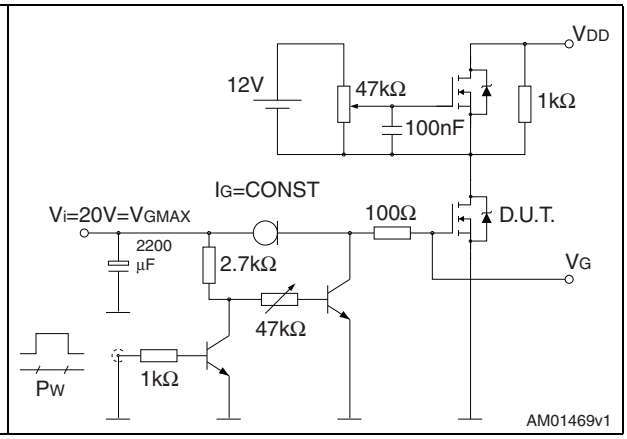


Figure 15. Test circuit for inductive load switching and diode recovery times

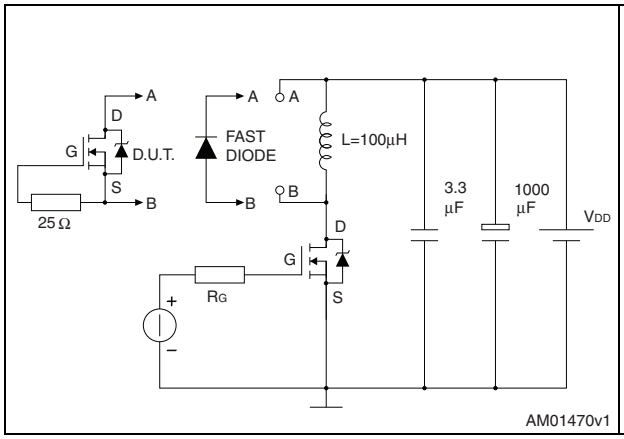


Figure 16. Unclamped inductive load test circuit

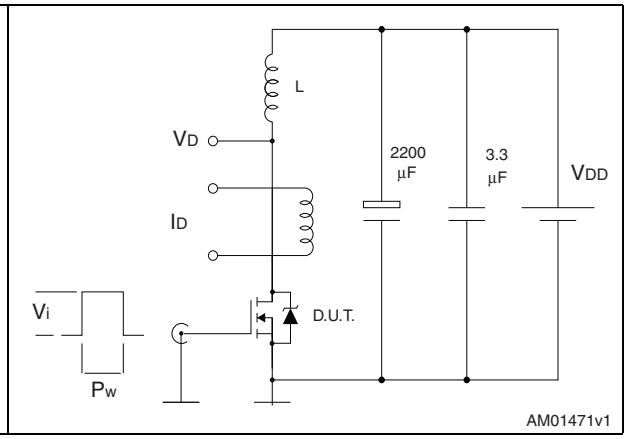


Figure 17. Unclamped inductive waveform

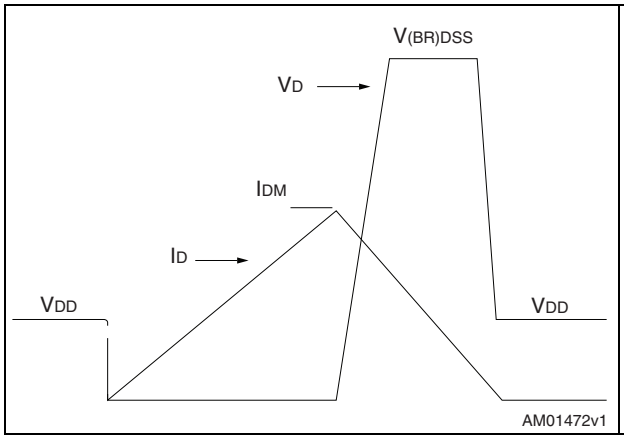
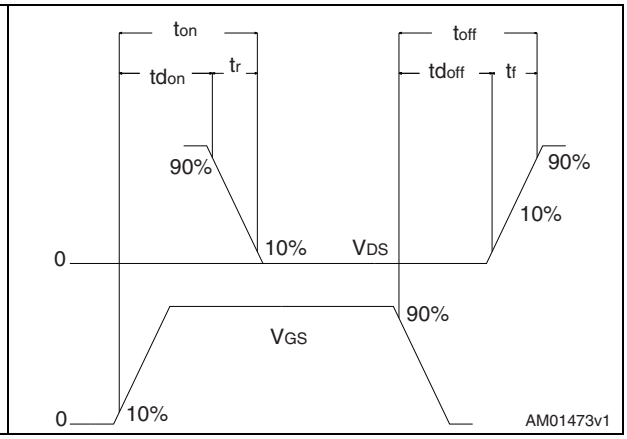


Figure 18. Switching time waveform



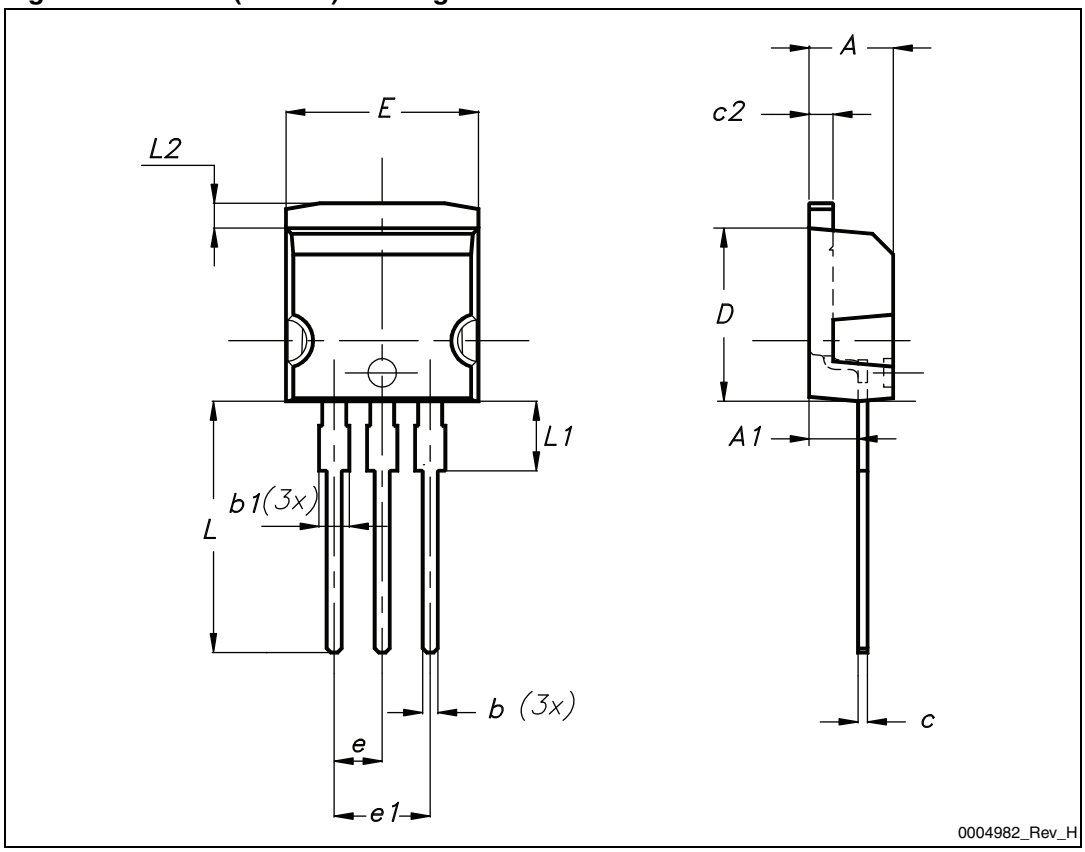
4 Package mechanical data

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.

Table 8. I²PAK (TO-262) mechanical data

DIM.	mm.		
	min.	typ	max.
A	4.40		4.60
A1	2.40		2.72
b	0.61		0.88
b1	1.14		1.70
c	0.49		0.70
c2	1.23		1.32
D	8.95		9.35
e	2.40		2.70
e1	4.95		5.15
E	10		10.40
L	13		14
L1	3.50		3.93
L2	1.27		1.40

Figure 19. I²PAK (TO-262) drawing



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
05-Oct-2010	1	First release
01-Feb-2013	2	– Added: *Section 2.1: Electrical characteristics (curves)* – Minor text changes – Updated: *Section 4: Package mechanical data*

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