



STI55NF03L

N-channel 30 V, 0.01 Ω , 55 A, I²PAK
STripFET™ II Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D
STI55NF03L	30 V	< 0.013 Ω	55 A

- Optimized for high switching operation
- Low gate charge
- Logic level gate drive

Application

- Switching applications
 - Automotive

Description

This Power MOSFET is the latest development of STMicroelectronics unique “single feature size” strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps allowing remarkable manufacturing reproducibility.

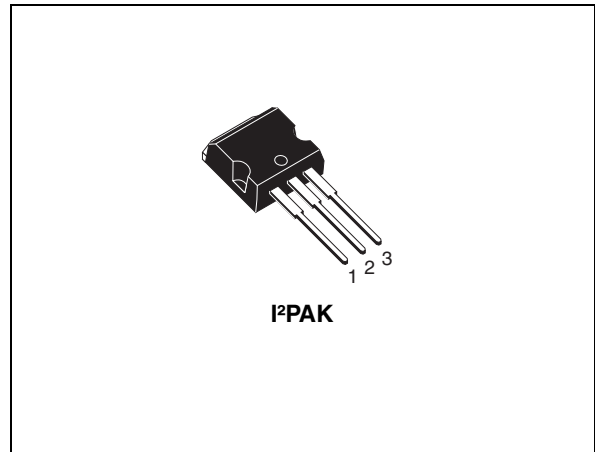


Figure 1. Internal schematic diagram

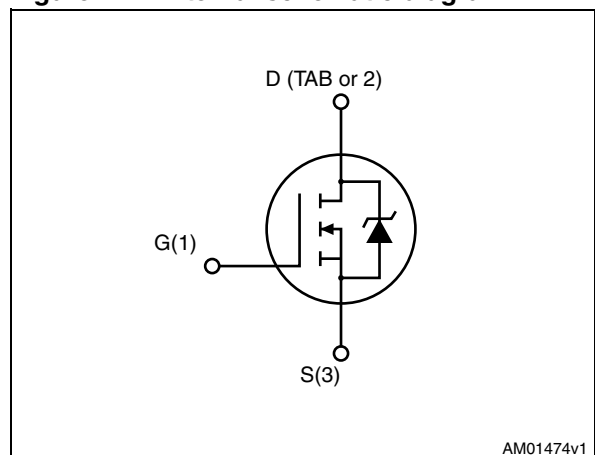


Table 1. Device summary

Order code	Marking	Package	Packaging
STI55NF03L	55NF03L	I ² PAK	Tube

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	30	V
V_{GS}	Gate-source voltage	± 16	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	55	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	39	A
$I_{DM}^{(1)}$	Drain current (pulsed)	220	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	80	W
	Derating factor	0.53	W/ $^{\circ}\text{C}$
$E_{AS}^{(2)}$	Single pulse avalanche energy	120	mJ
T_{stg}	Storage temperature	– 60 to 175	$^{\circ}\text{C}$
T_j	Max. operating junction temperature		

1. Pulse width limited by safe operating area

2. Starting $T_j = 25\text{ }^{\circ}\text{C}$, $I_D = 32.5\text{ A}$, $V_{DD} = 45\text{ V}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.875	$^{\circ}\text{C/W}$
R_{thj-a}	Thermal resistance junction-ambient max	62.5	$^{\circ}\text{C/W}$
T_l	Maximum lead temperature for soldering purpose	300	$^{\circ}\text{C}$

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage Drain current ($V_{GS} = 0$)	$V_{DS} = \text{max rating}$ $V_{DS} = \text{max rating}$, $T_C = 125\text{ °C}$			1 10	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 16\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1.5		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 27.5\text{ A}$ $V_{GS} = 4.5\text{ V}$, $I_D = 27.5\text{ A}$		0.01 0.013	0.013 0.02	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		1265		pF
C_{oss}	Output capacitance			435		pF
C_{rss}	Reverse transfer capacitance			115		pF
Q_g	Total gate charge	$V_{DD} = 24\text{ V}$, $I_D = 55\text{ A}$, $V_{GS} = 4.5\text{ V}$ (see Figure 14)		20	27	nC
Q_{gs}	Gate-source charge			7		nC
Q_{gd}	Gate-drain charge			10		nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD} = 15\text{ V}$, $I_D = 27.5\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13)		28 400		ns ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time	$V_{DD} = 15\text{ V}$, $I_D = 27.5\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13)		25 50		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current				55	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				220	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 55\text{ A}$, $V_{GS} = 0$			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 55\text{ A}$, $V_{DD} = 30\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15)		70 160 4.5		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

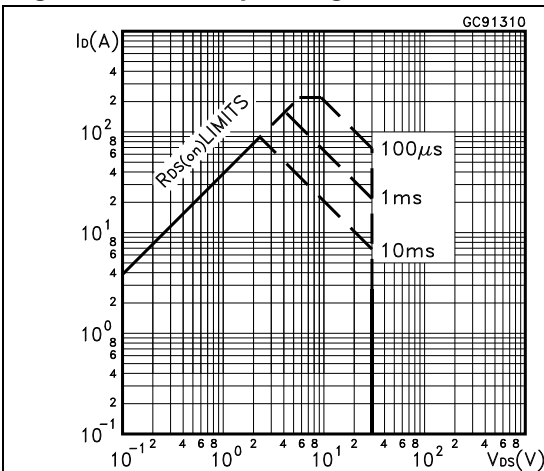


Figure 3. Thermal impedance

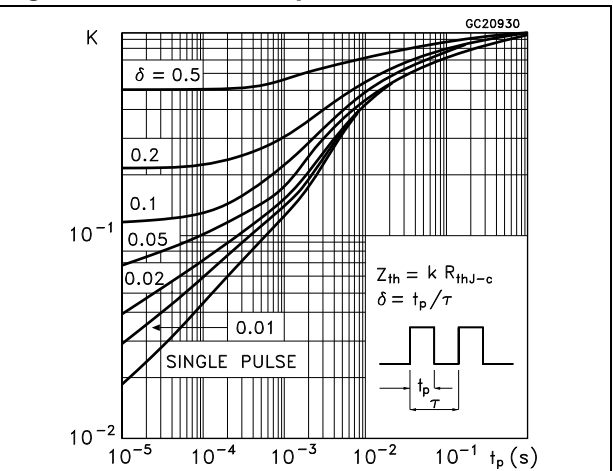


Figure 4. Output characteristics

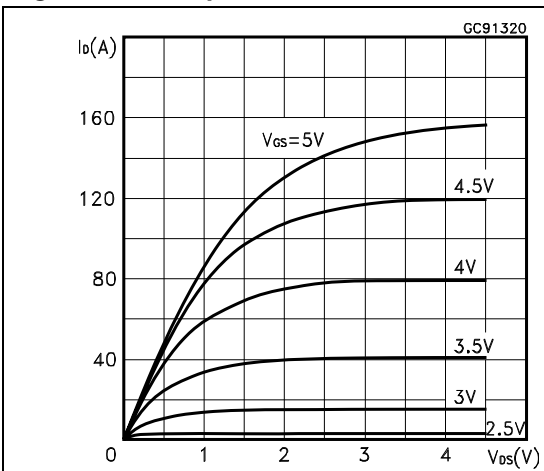


Figure 5. Transfer characteristics

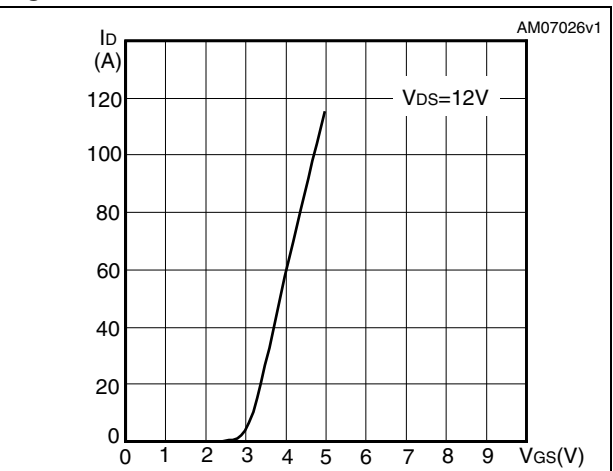


Figure 6. Normalized $B_{V_{DS}}$ vs temperature

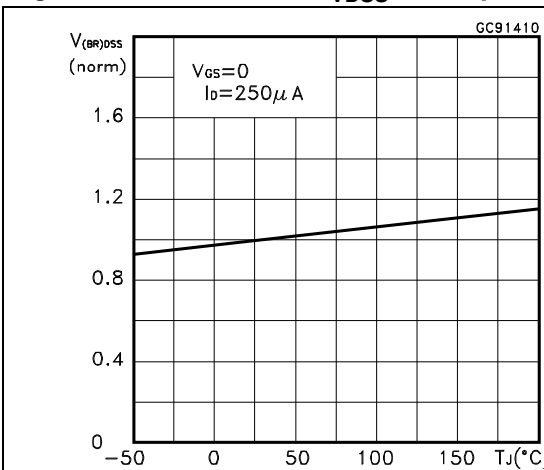


Figure 7. Static drain-source on resistance

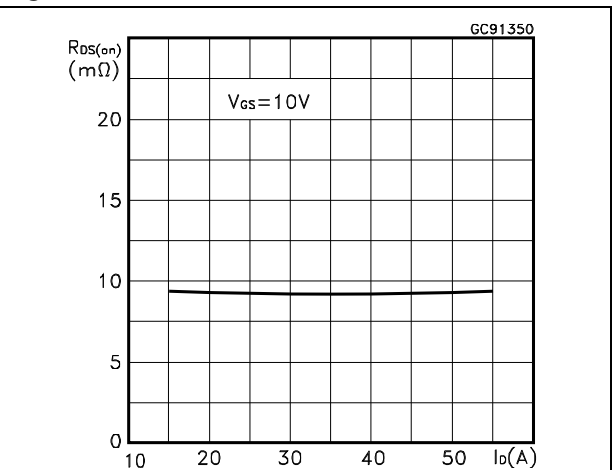


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

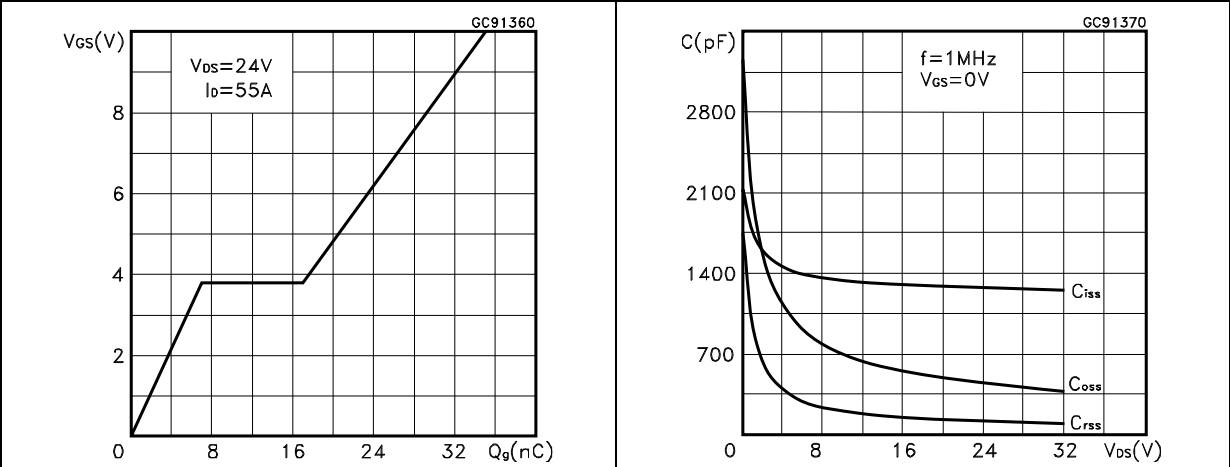


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

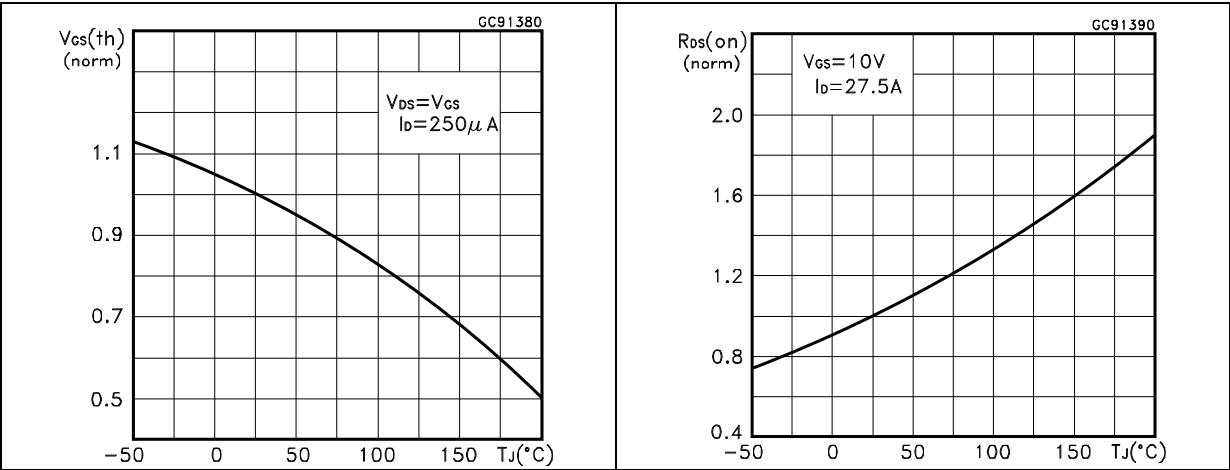
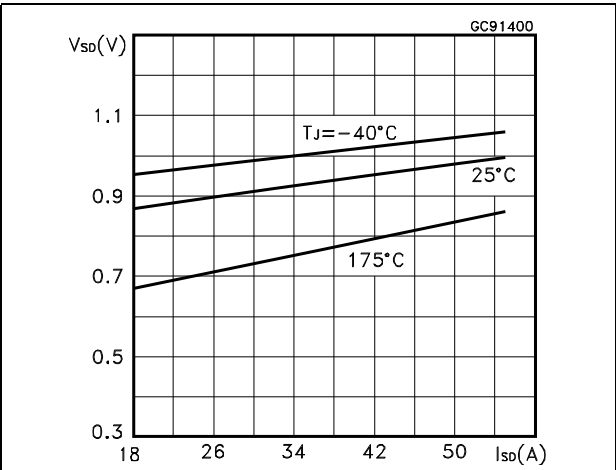


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit

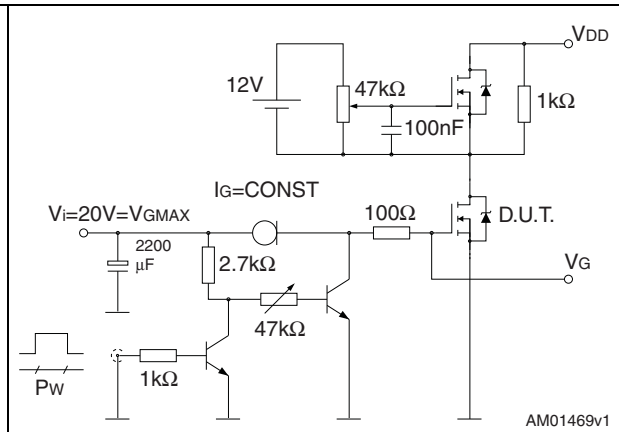


Figure 15. Test circuit for inductive load switching and diode recovery times

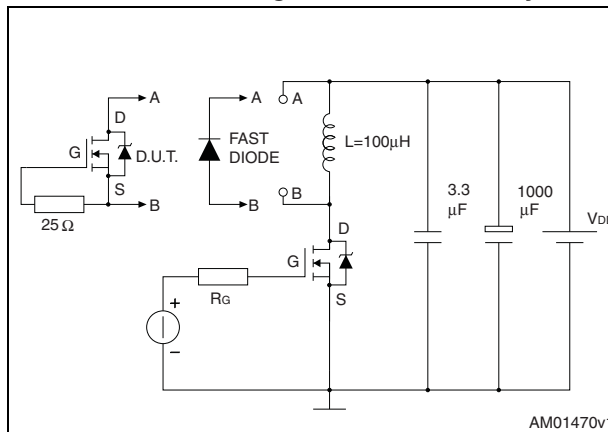


Figure 16. Unclamped inductive load test circuit



Figure 17. Unclamped inductive waveform

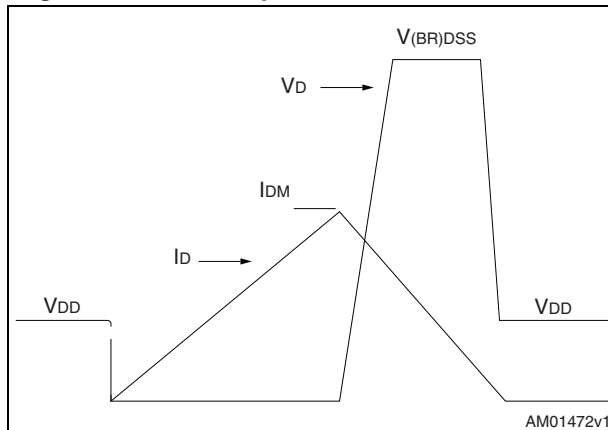
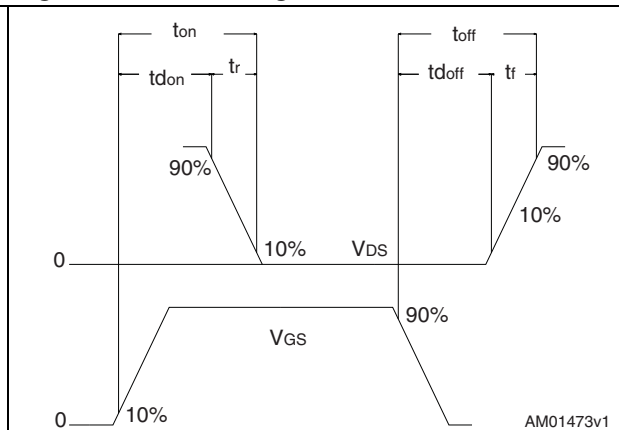


Figure 18. Switching time waveform



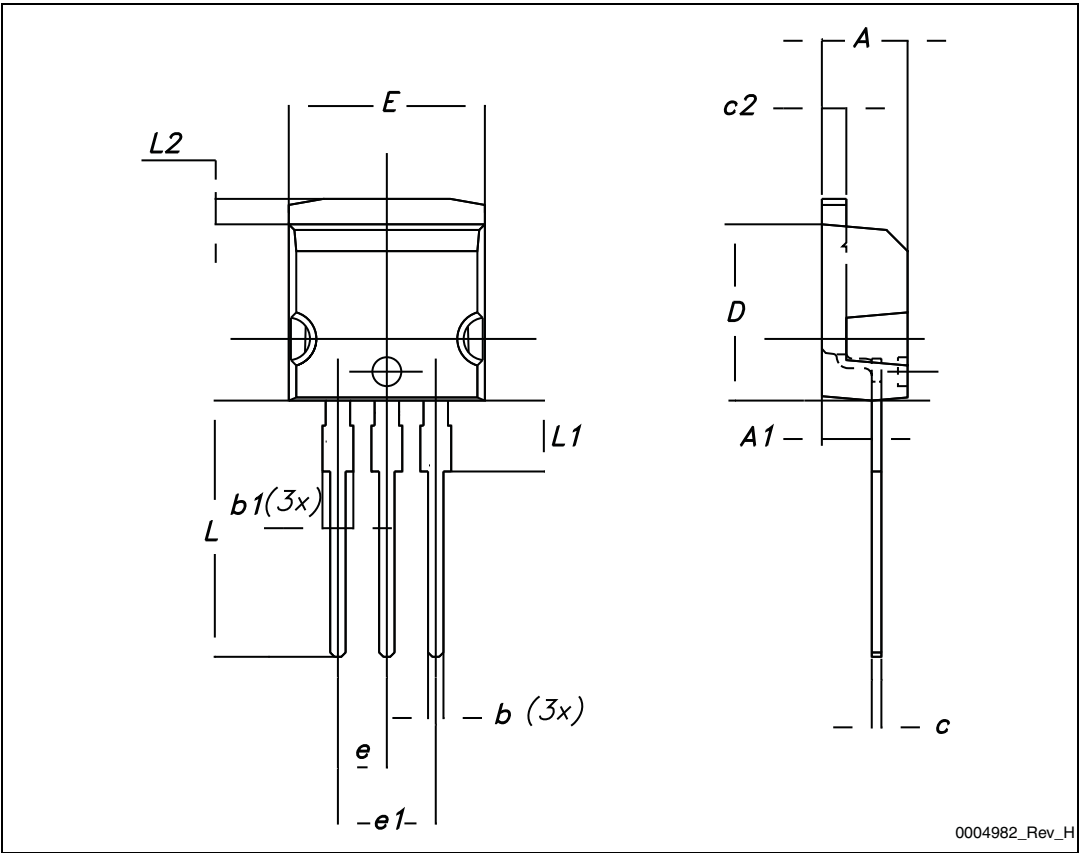
4 **Package mechanical data**

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



0004982_Rev_H

5 Revision history

Table 9. Document revision history

Date	Revision	Changes
18-May-2011	1	First release

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