



# STV270N4F3

N-channel 40 V, 1.25 mΩ, 270 A, PowerSO-10  
STripFET™ III Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub> (1)
STV270N4F3	40 V	< 1.5 mΩ	270 A

1. Current limited by package

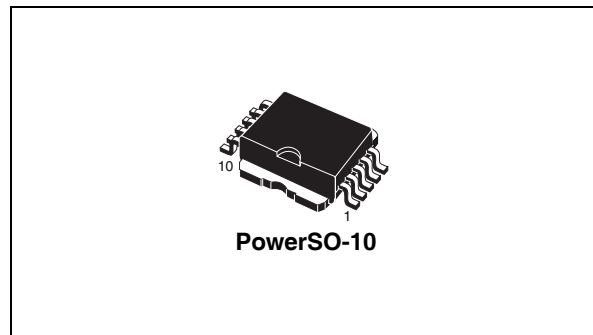
- Conduction losses reduced
- Low profile, very low parasitic inductance

## Applications

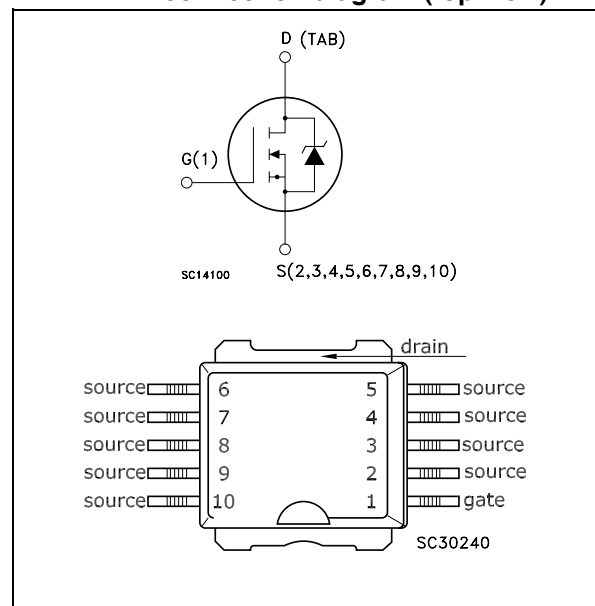
- Switching application

## Description

This STripFET™ III Power MOSFET technology is among the latest improvements, which have been especially tailored to minimize on-state resistance providing superior switching performances.



**Figure 1. Internal schematic diagram and connection diagram (top view)**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
STV270N4F3	270N4F3	PowerSO-10	Tape and reel

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
	2.1 Electrical characteristics .....	6
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>9</b>
<b>5</b>	<b>Revision history</b> .....	<b>11</b>

# 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	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	270	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	220	A
$I_{DM}^{(1)}$	Drain current (pulsed)	1080	A
$P_{TOT}^{(2)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$E_{AS}^{(3)}$	Single pulse avalanche energy	1000	mJ
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		

1. Current limited by package
2. This value is rated according to  $R_{thj-c}$
3. Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = 80\text{ A}$ ,  $V_{DD} = 32\text{ V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	$^\circ\text{C}/\text{W}$

1. When mounted on 1 inch<sup>2</sup> FR-4 2 oz Cu.

## 2 Electrical characteristics

(T<sub>case</sub> = 25 °C unless otherwise specified)

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	40			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating, V <sub>DS</sub> = Max rating, T <sub>c</sub> = 125 °C			10 100	μA μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>DS</sub> = ± 20 V			±200	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 80 A		1.25	1.5	mΩ

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 100 A	-	200		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0	-	7500 1900 50		pF pF pF
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 160 A, V <sub>GS</sub> = 10 V <i>Figure 14</i>	-	110 30 25	150	nC nC nC

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

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Turn-on delay time Rise time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 80 A R <sub>G</sub> = 4.7 Ω, V <sub>GS</sub> = 10 V <i>Figure 13</i>	-	25 180	-	ns ns
t <sub>d(off)</sub> t <sub>f</sub>	Turn-off delay time Fall time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 80 A R <sub>G</sub> = 4.7 Ω, V <sub>GS</sub> = 10 V, <i>Figure 13</i>	-	110 45	-	ns ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		270	A
$I_{SD}^{(1)}$	Source-drain current (pulsed)		-		1080	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80 \text{ A}, V_{GS} = 0$	-		1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 160 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 32 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$ <i>Figure 15</i>	-	70		ns
$Q_{rr}$	Reverse recovery charge		-	225		nC
$I_{RRM}$	Reverse recovery current		-	3.2		A

1. Pulse width limited by safe operating area
2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics

Figure 2. Safe operating area

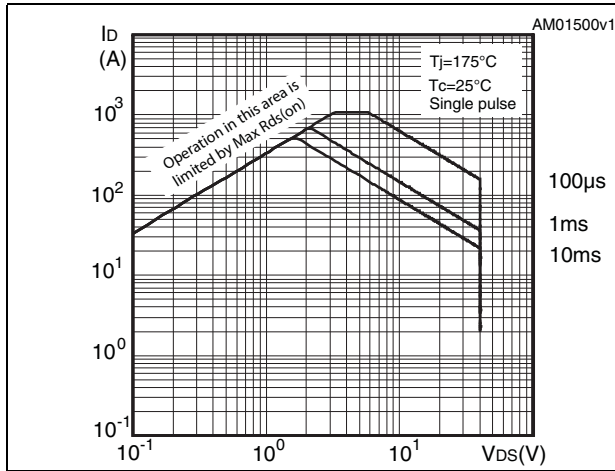


Figure 3. Thermal impedance

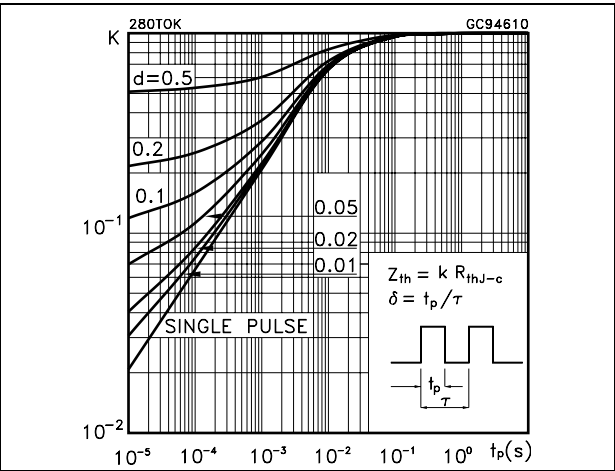


Figure 4. Output characteristics

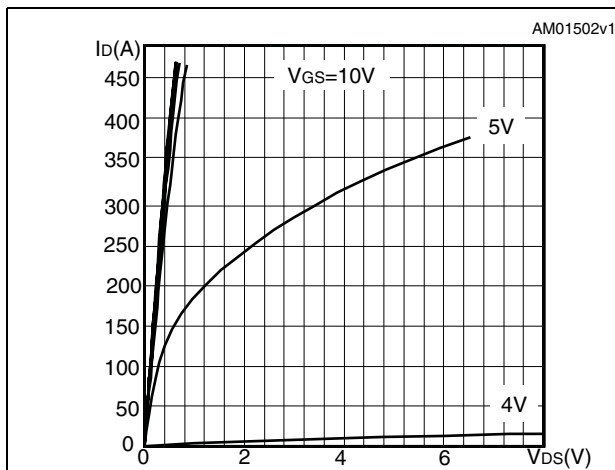


Figure 5. Transfer characteristics

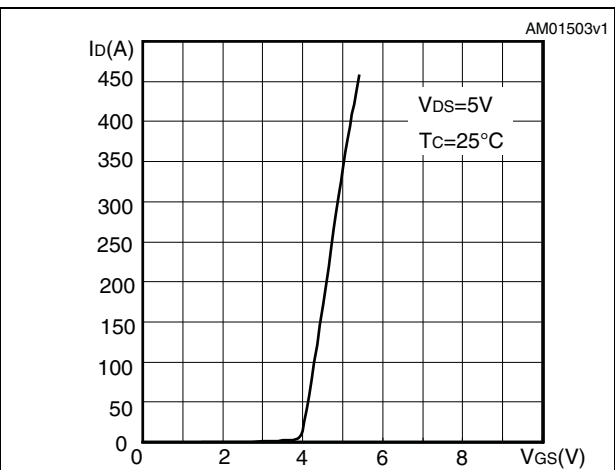


Figure 6. Static drain-source on resistance

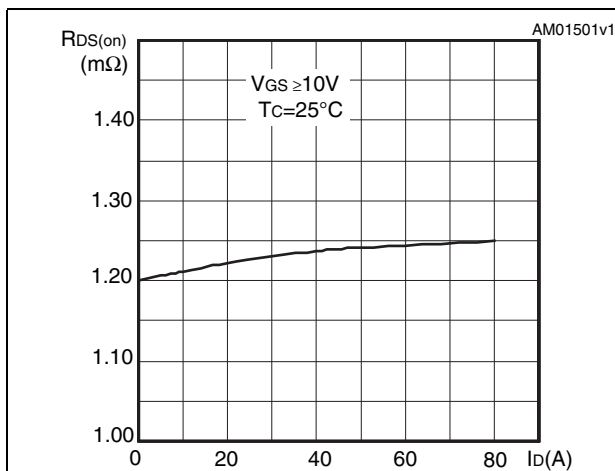


Figure 7. Normalized BV<sub>DSS</sub> vs temperature

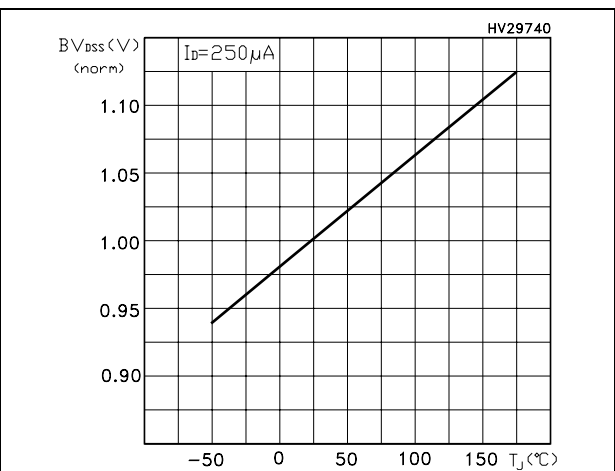


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

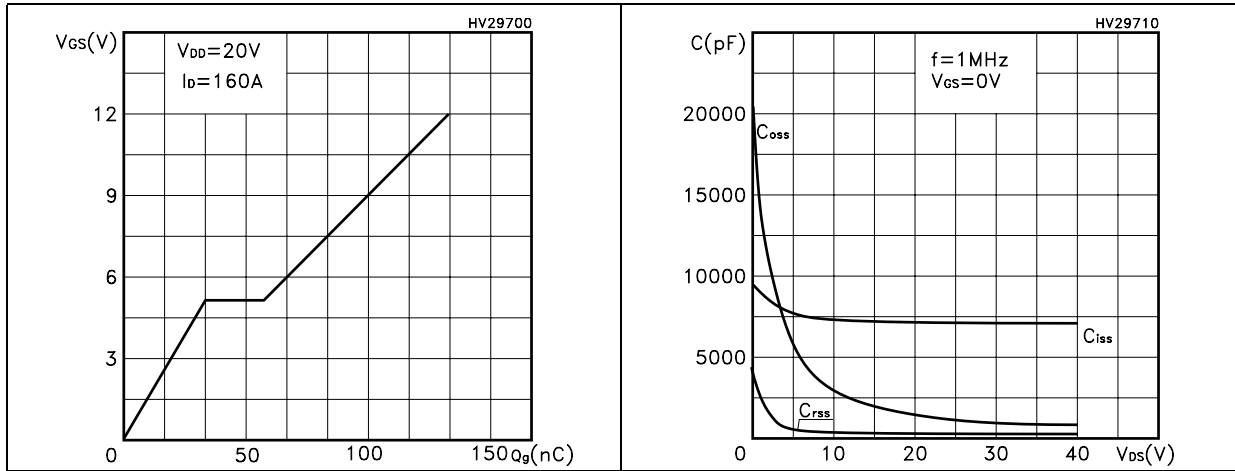


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

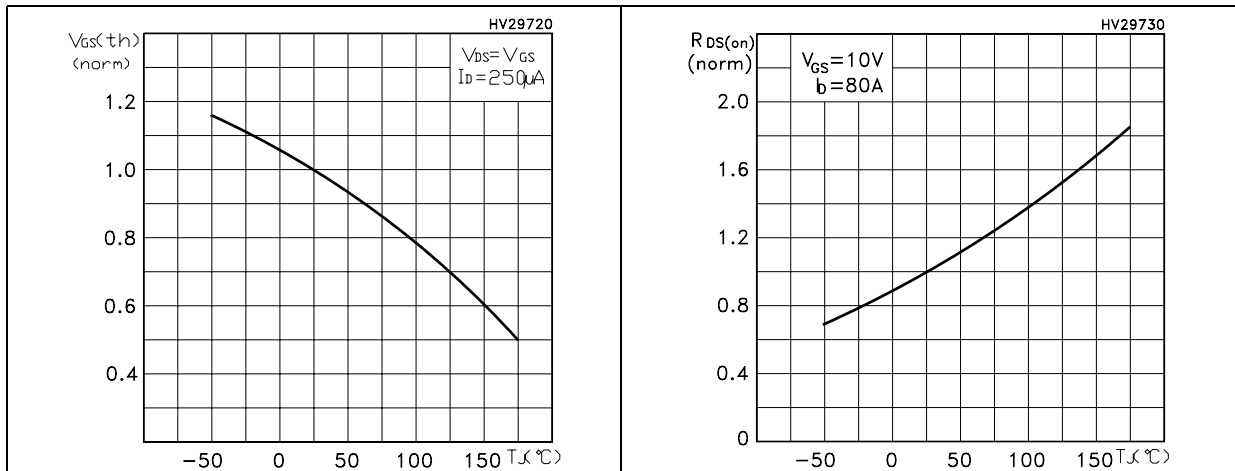
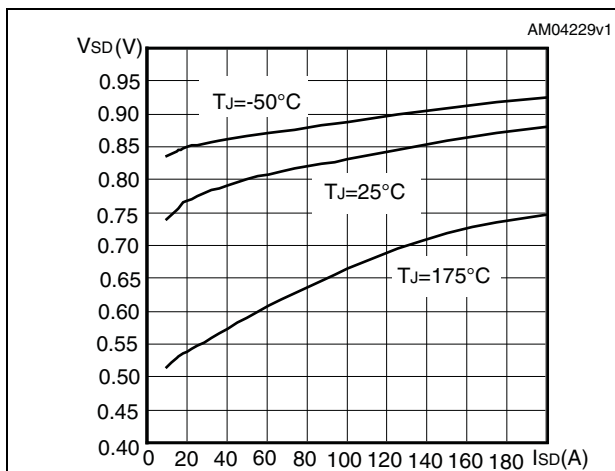
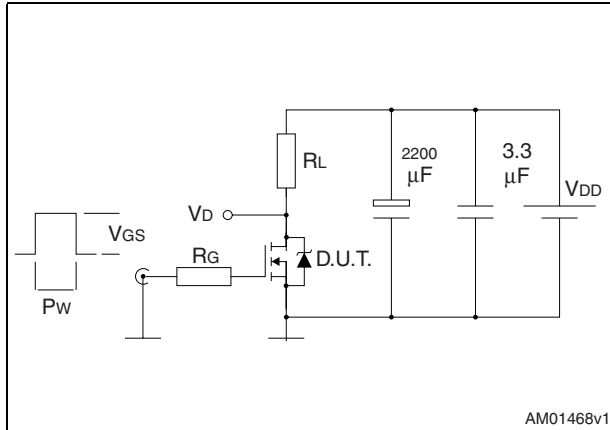


Figure 12. Source-drain diode forward characteristics

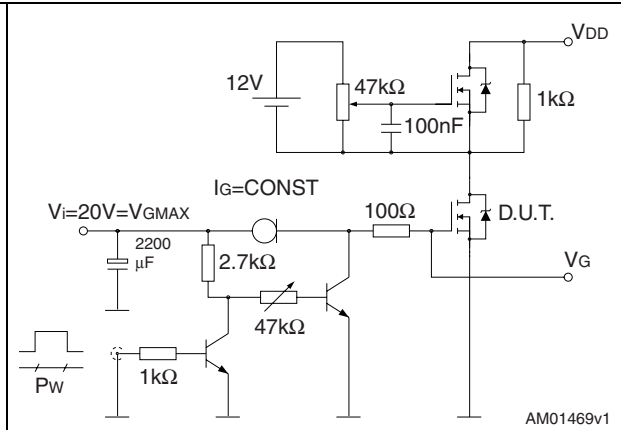


### 3 Test circuits

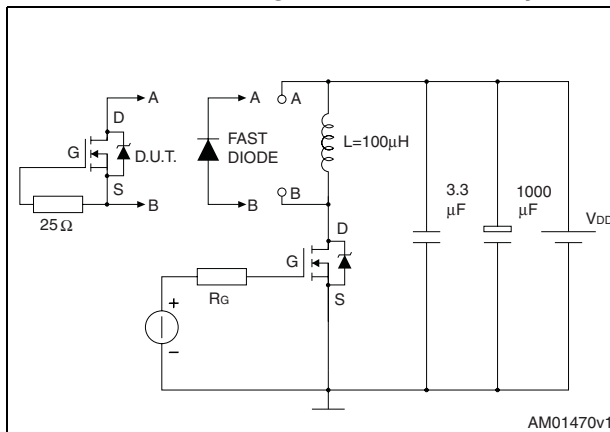
**Figure 13. Switching times test circuit for resistive load**



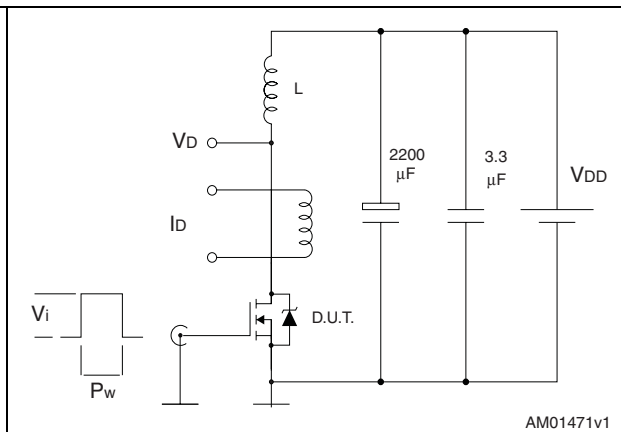
**Figure 14. Gate charge test circuit**



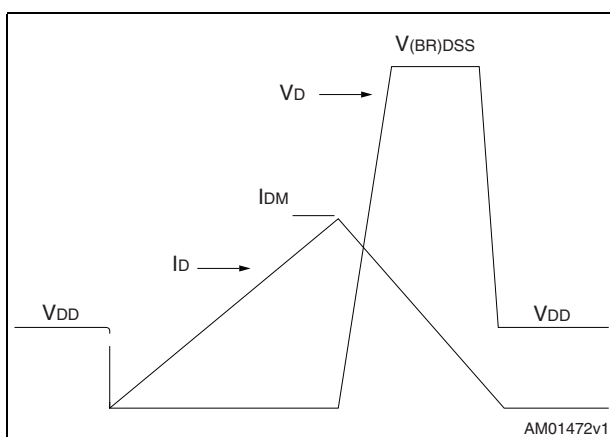
**Figure 15. Test circuit for inductive load switching and diode recovery times**



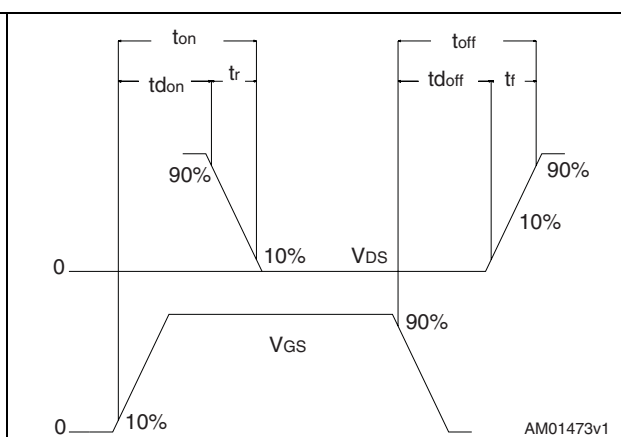
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**



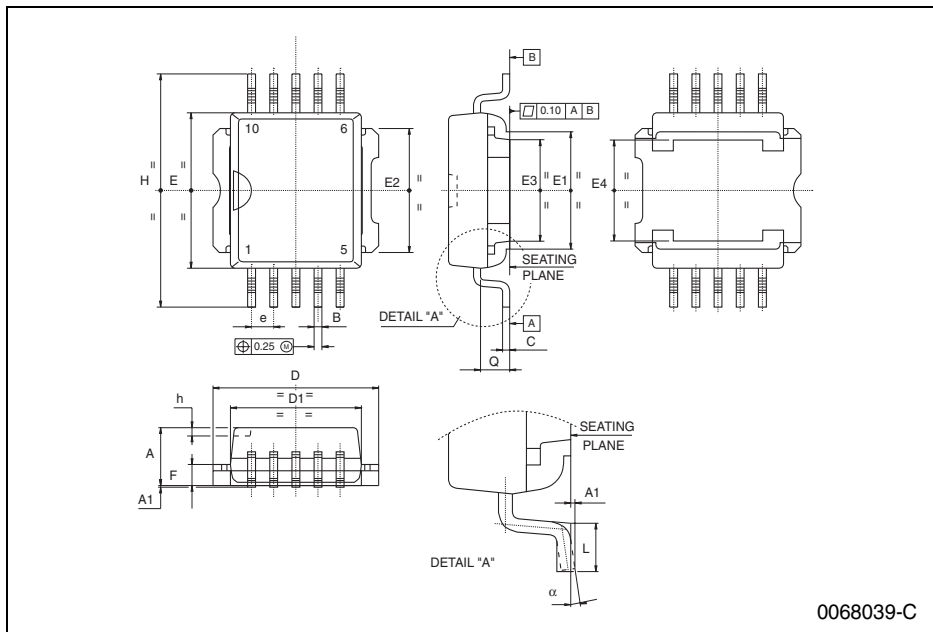


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

**PowerSO-10 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.35		3.65	0.132		0.144
A1	0.00		0.10	0.000		0.004
B	0.40		0.60	0.016		0.024
C	0.35		0.55	0.013		0.022
D	9.40		9.60	0.370		0.378
D1	7.40		7.60	0.291		0.300
e		1.27			0.050	
E	9.30		9.50	0.366		0.374
E1	7.20		7.40	0.283		0.291
E2	7.20		7.60	0.283		0.300
E3	6.10		6.35	0.240		0.250
E4	5.90		6.10	0.232		0.240
F	1.25		1.35	0.049		0.053
h		0.50			0.002	
H	13.80		14.40	0.543		0.567
L	1.20		1.80	0.047		0.071
q		1.70			0.067	
$\alpha$	0°		8°			



## 5 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
25-Oct-2007	1	Initial release
03-Apr-2008	2	$I_D$ value has been updated.
01-Oct-2008	3	Document status promoted from preliminary data to datasheet
09-Mar-2009	4	$R_{thj-pcb}$ value has been changed in <a href="#">Table 3: Thermal data</a> .
05-May-2009	5	Changed: <a href="#">Description</a> and <a href="#">Figure 12: Source-drain diode forward characteristics</a>
17-Jun-2009	6	Corrected typing error on cover page

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