



# STV270N4F3

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

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub> <sup>(1)</sup>
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 n-channel enhancement mode Power MOSFET is the latest refinement of STMicroelectronics' unique "single feature size" strip-based process, which has decreased the critical alignment steps, offering remarkable manufacturing reproducibility. The outcome is a transistor with extremely high packing density for low on resistance, rugged avalanche characteristics and low gate charge.

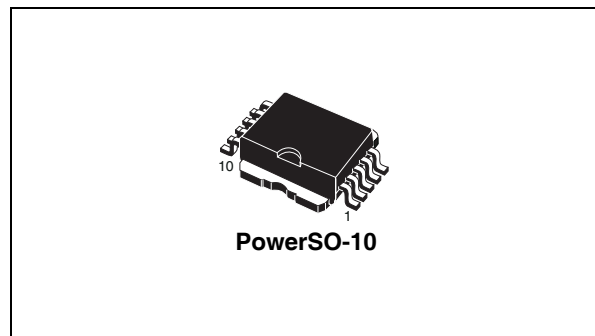


Figure 1. Internal schematic diagram and connection diagram (top view)

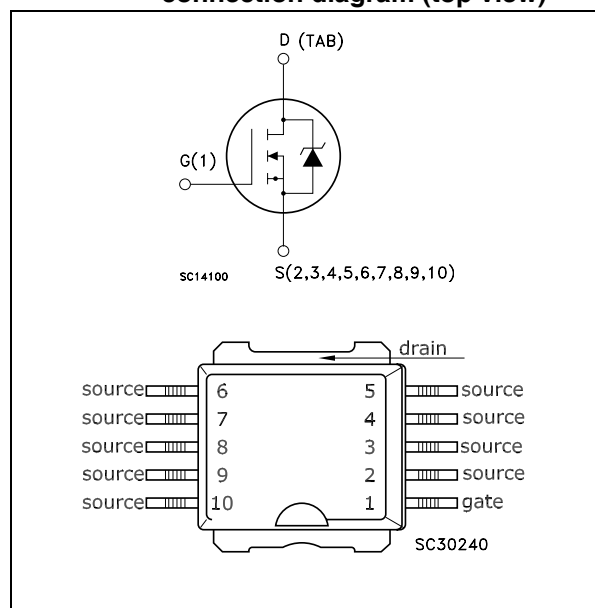


Table 1. Device summary

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

# Contents

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# 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	50	$^\circ\text{C}/\text{W}$

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>	Input capacitance	V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0		7500		pF
C <sub>oss</sub>	Output capacitance			1900		pF
C <sub>rss</sub>	Reverse transfer capacitance			50		pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 160 A,		110	150	nC
Q <sub>gs</sub>	Gate-source charge	V <sub>GS</sub> = 10 V		30		nC
Q <sub>gd</sub>	Gate-drain charge	(see Figure 14)		25		nC

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

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 20\text{ V}$ , $I_D = 80\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 13)		25 180		ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 20\text{ V}$ , $I_D = 80\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ , (see Figure 13)		110 45		ns ns

**Table 7. Source drain diode**

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

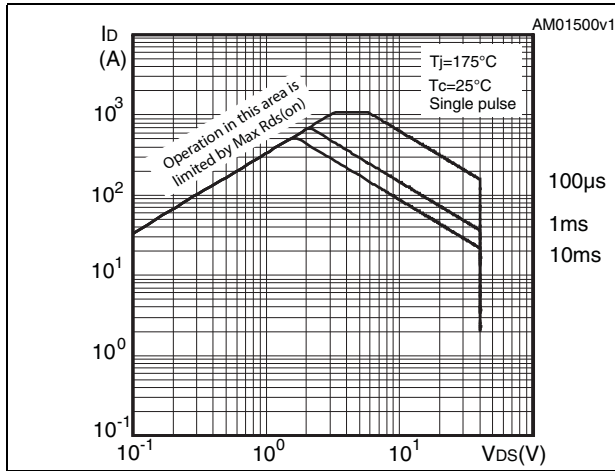


Figure 3. Thermal impedance

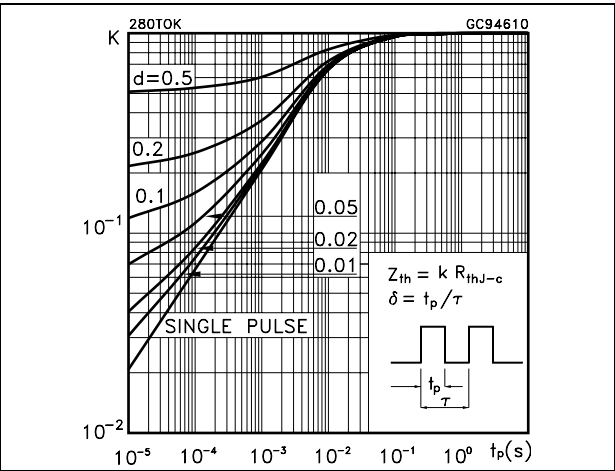


Figure 4. Output characteristics

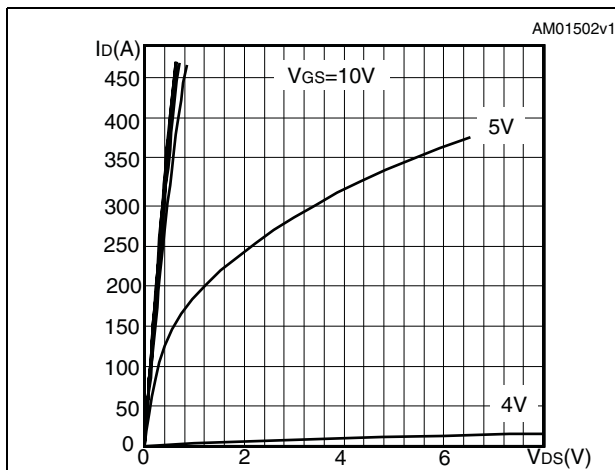


Figure 5. Transfer characteristics

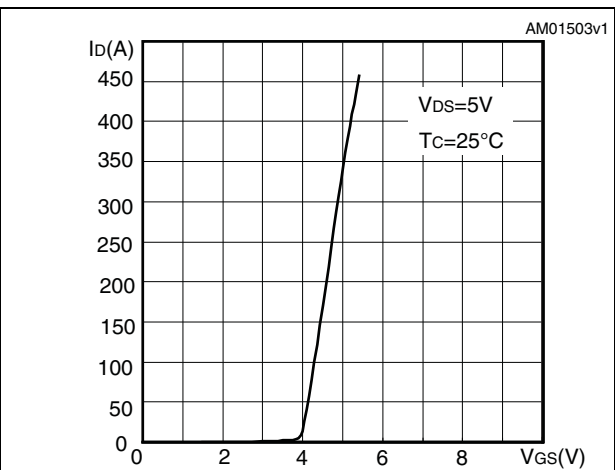


Figure 6. Static drain-source on resistance

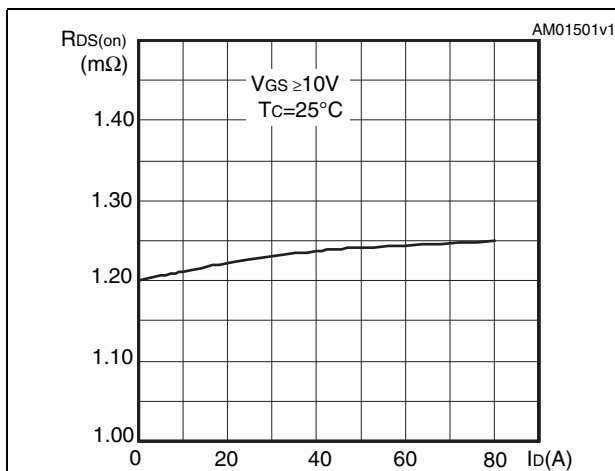


Figure 7. Normalized BVDS vs temperature

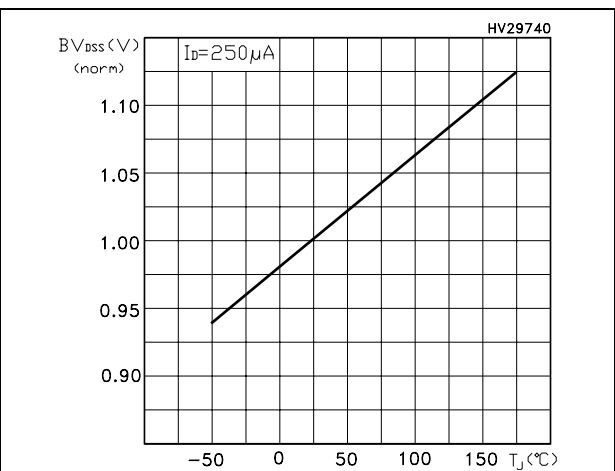


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

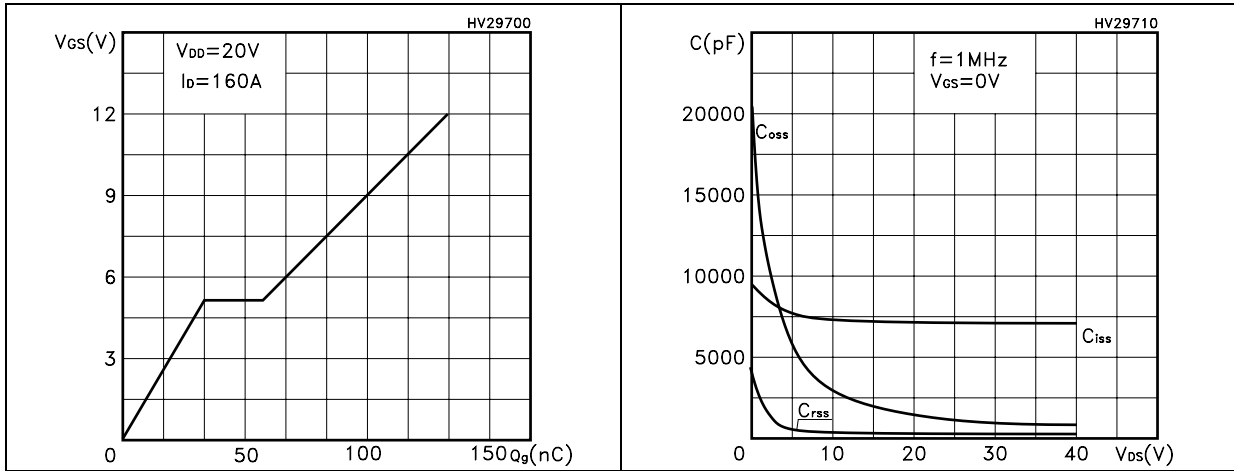


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

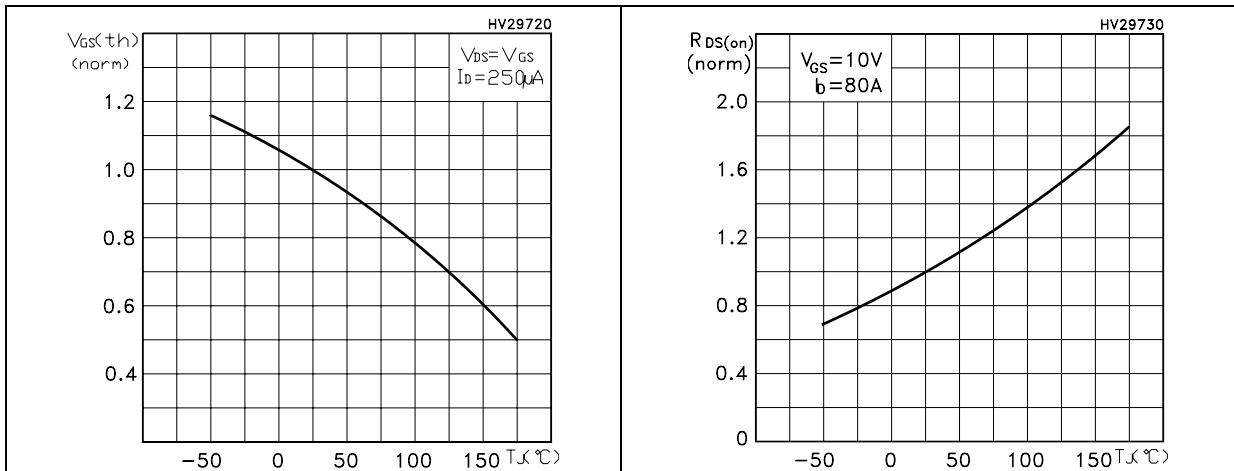
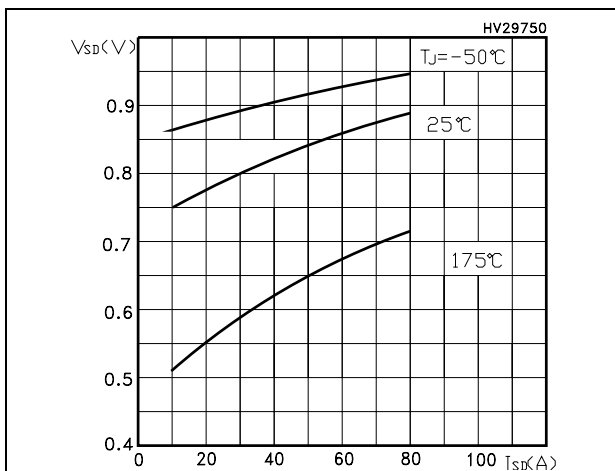


Figure 12. Source-drain diode forward characteristics



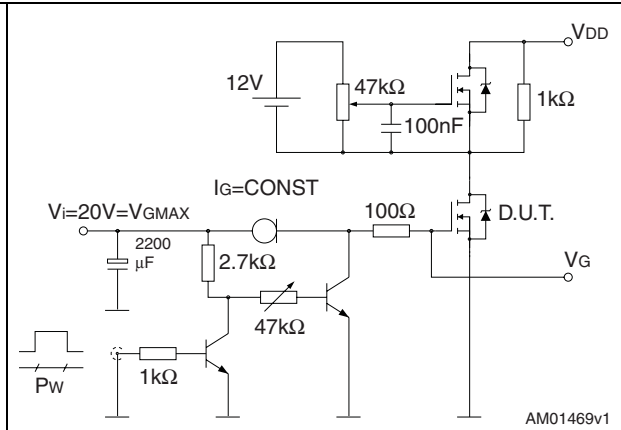
### 3 Test circuits

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



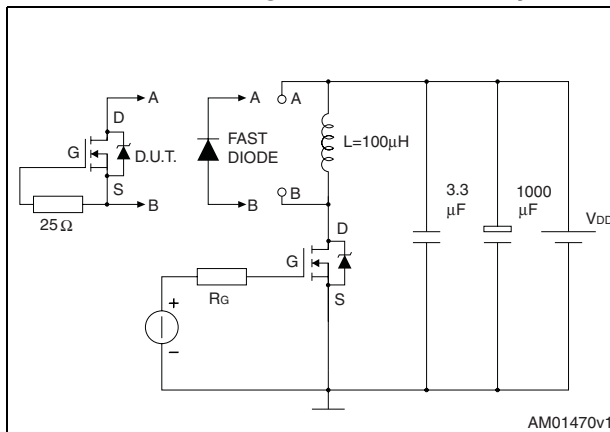
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**Figure 14. Gate charge test circuit**



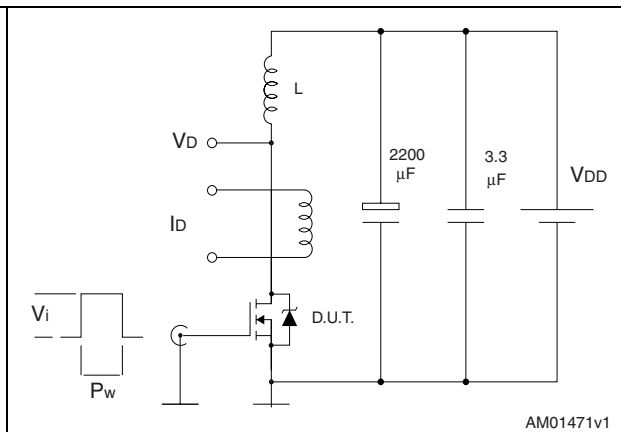
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**Figure 15. Test circuit for inductive load switching and diode recovery times**



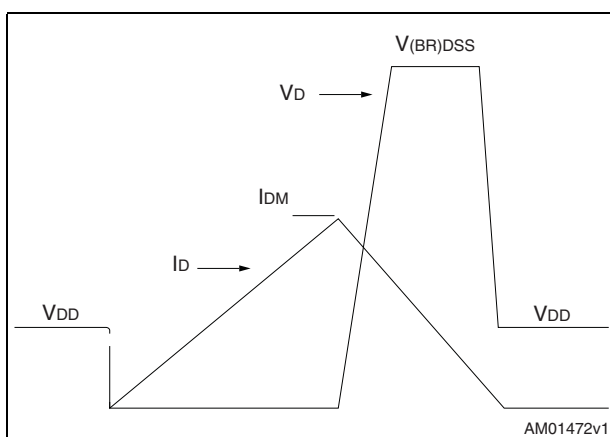
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**Figure 16. Unclamped inductive load test circuit**



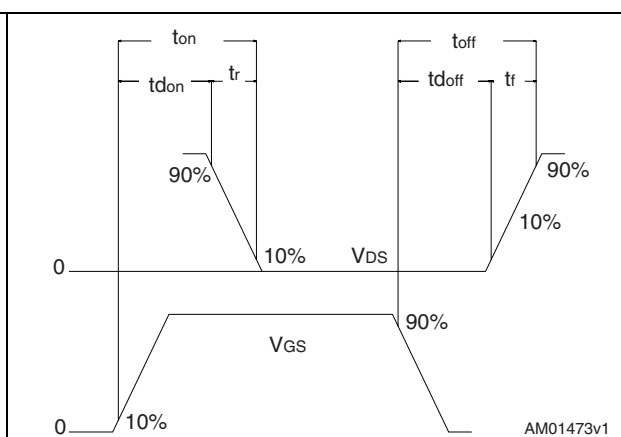
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**Figure 17. Unclamped inductive waveform**



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**Figure 18. Switching time waveform**



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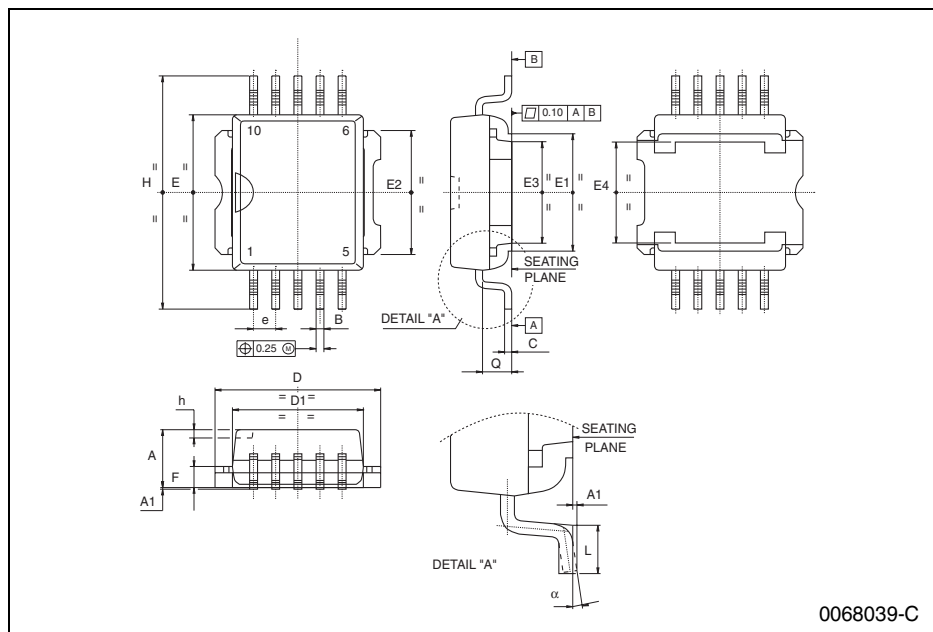


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

**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 <sub>D</sub> value has been updated.
01-Oct-2008	3	Document status promoted from preliminary data to datasheet

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