



STV270N4F3

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

Features

Type	V _{DSS}	R _{DS(on) max}	I _D (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.

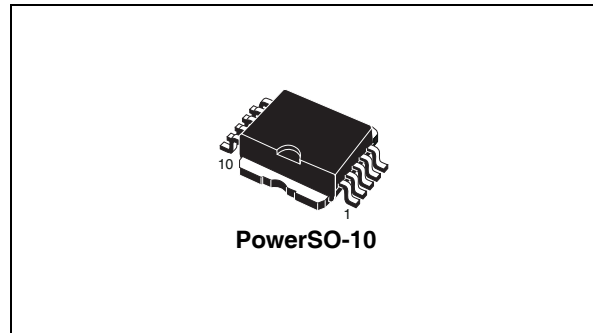


Figure 1. Internal schematic diagram and connection diagram (top view)

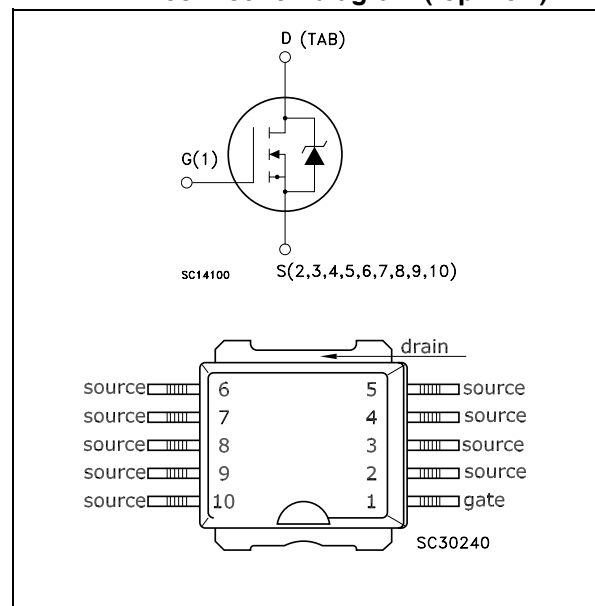


Table 1. Device summary

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

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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	± 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 inch² FR-4 2 oz Cu.

2 Electrical characteristics

(T_{case} = 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	I _D = 250 μA, V _{GS} = 0	40			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = Max rating, V _{DS} = Max rating, T _c = 125 °C			10 100	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{DS} = ± 20 V			±200	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		1.25	1.5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward transconductance	V _{DS} = 10 V, I _D = 100 A	-	200		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0	-	7500 1900 50		pF pF pF
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 <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 _{d(on)} t _r	Turn-on delay time Rise time	V _{DD} = 20 V, I _D = 80 A R _G = 4.7 Ω, V _{GS} = 10 V <i>Figure 13</i>	-	25 180	-	ns ns
t _{d(off)} t _f	Turn-off delay time Fall time	V _{DD} = 20 V, I _D = 80 A R _G = 4.7 Ω, V _{GS} = 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	$I_{SD} = 160 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$	-	70		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 32 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	-	225		nC
I_{RRM}	Reverse recovery current	Figure 15	-	3.2		A

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

2.1 Electrical characteristics

Figure 2. Safe operating area

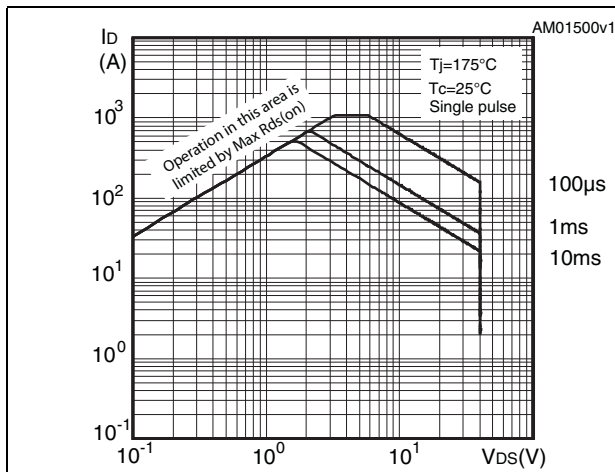


Figure 3. Thermal impedance

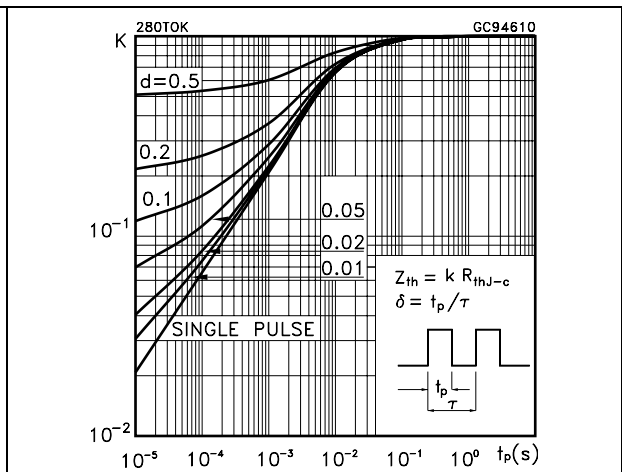


Figure 4. Output characteristics

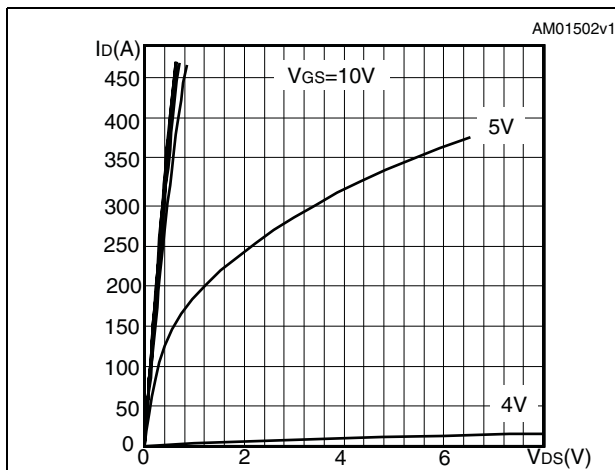


Figure 5. Transfer characteristics

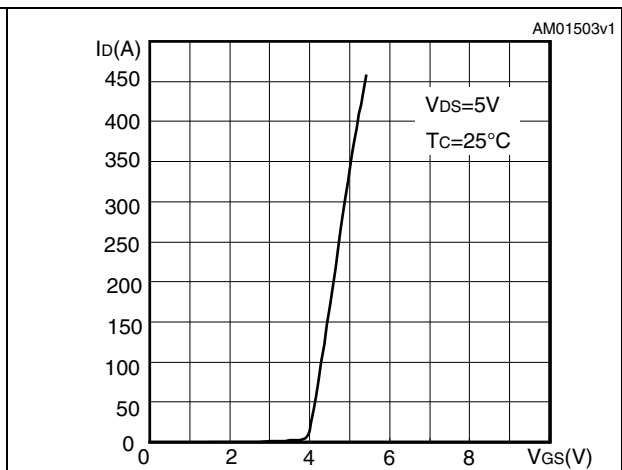


Figure 6. Static drain-source on resistance

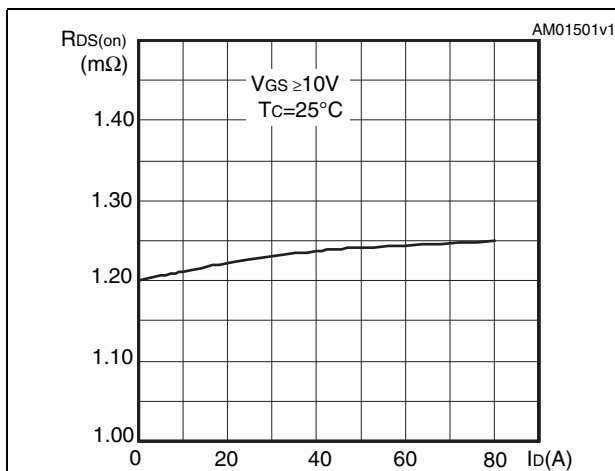


Figure 7. Normalized BV_{DSS} vs temperature

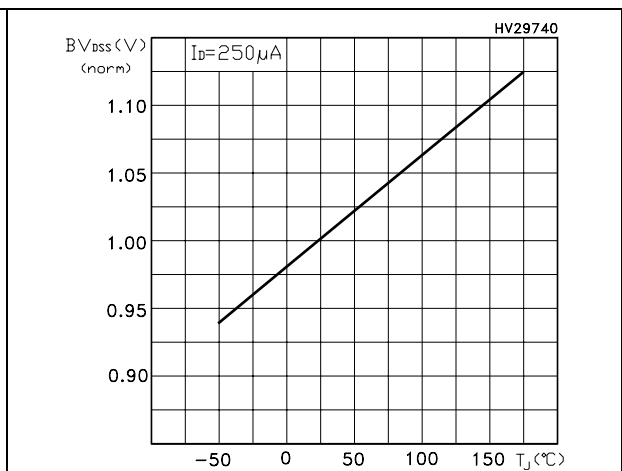


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

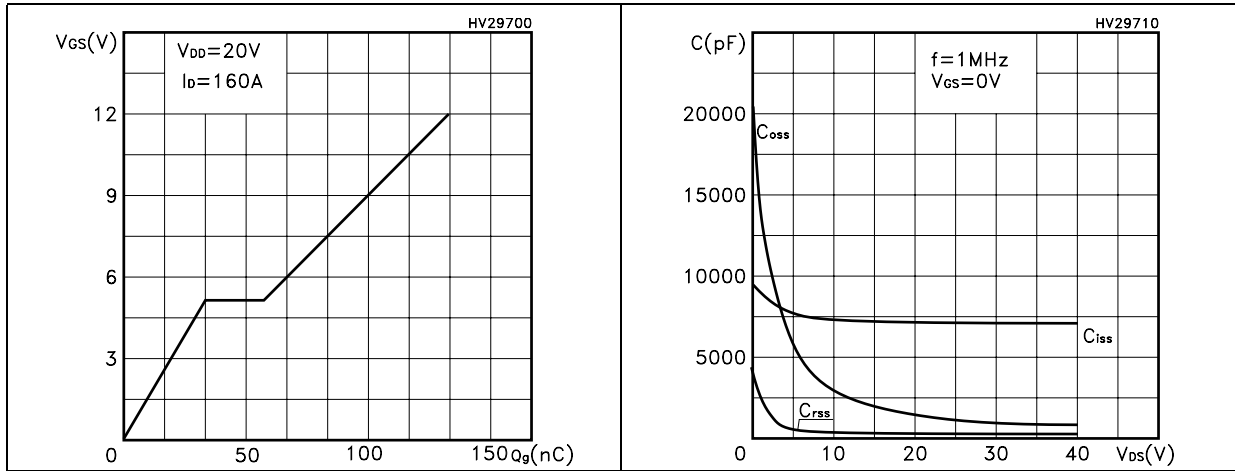


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

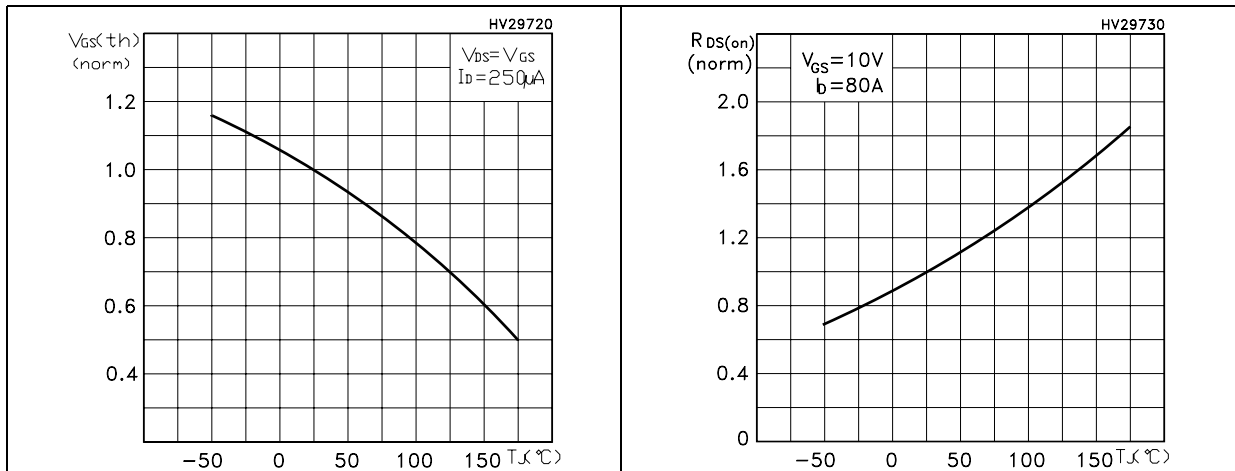
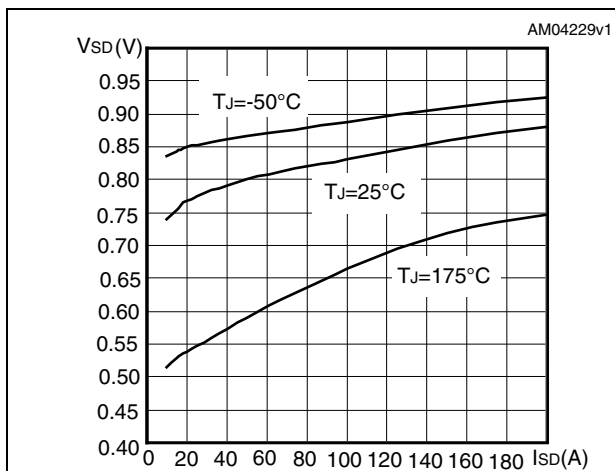


Figure 12. Source-drain diode forward characteristics



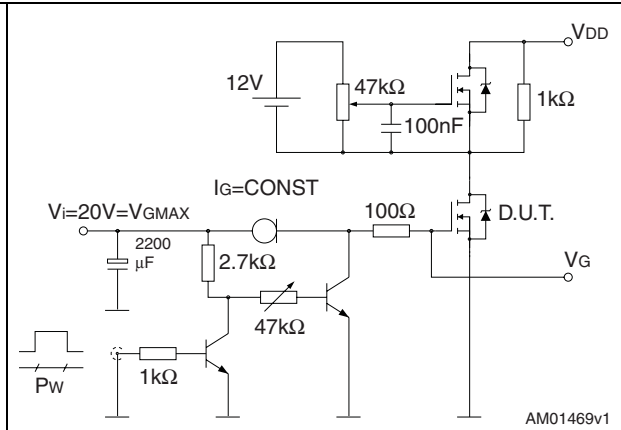
3 Test circuits

Figure 13. Switching times test circuit for resistive load



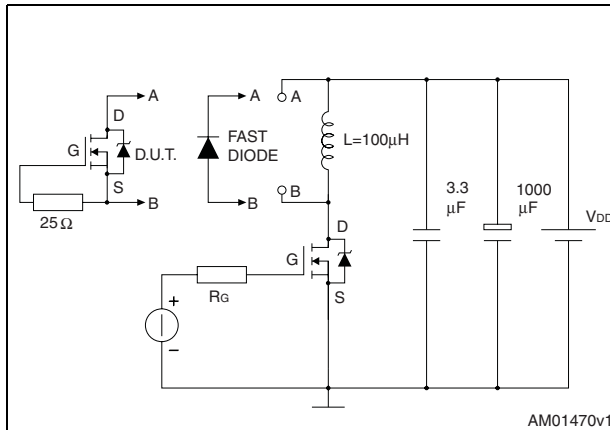
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Figure 14. Gate charge test circuit



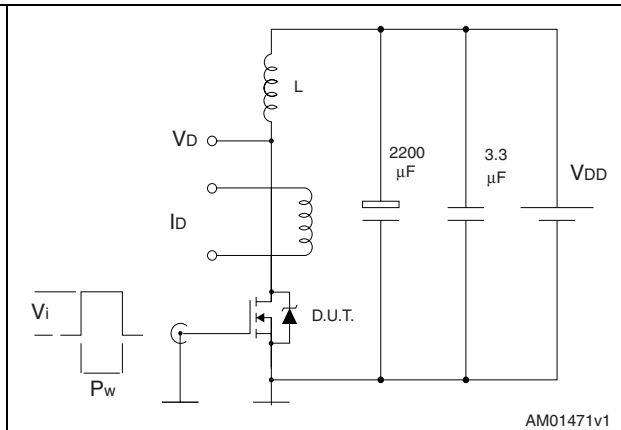
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Figure 15. Test circuit for inductive load switching and diode recovery times



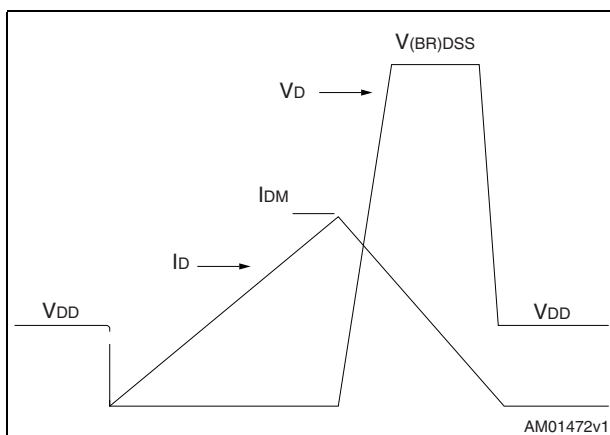
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Figure 16. Unclamped inductive load test circuit



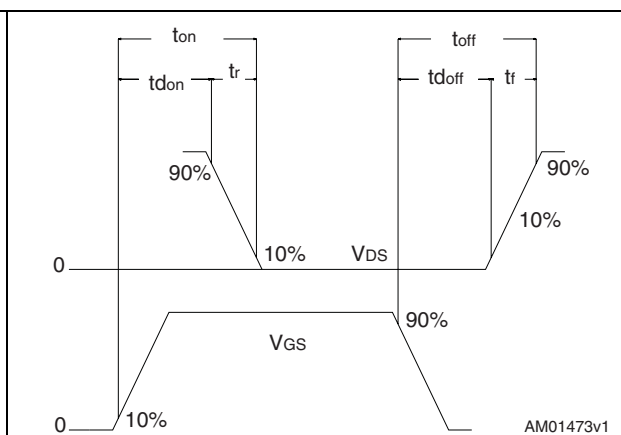
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



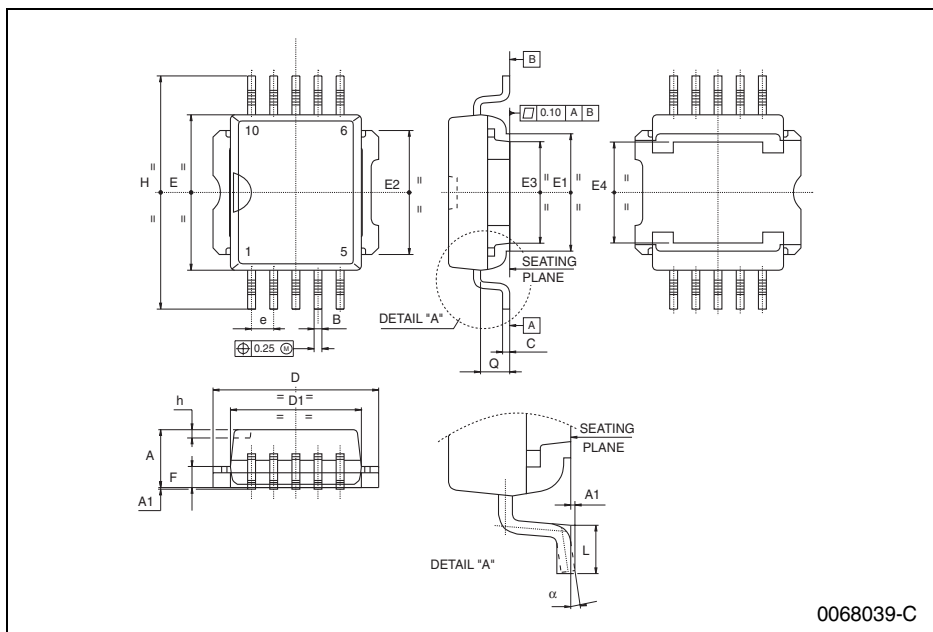
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4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in 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.

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	
α	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 Table 3: Thermal data .
05-May-2009	5	Changed: Description and Figure 12: Source-drain diode forward characteristics
17-Jun-2009	6	Corrected typing error on cover page

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