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STK822

N-channel 25 V - 0.00175 Ω - 38 A - PolarPAK[®]
STripFET[™] Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	R _{DS(on)} *Q _g	P _{TOT}
STK822	25 V	<0.00215 Ω	58 nC*m Ω	5.2 W

- Ultra low top and bottom junction to case thermal resistance
- Very low on resistance
- 100% R_g tested
- Fully encapsulated die
- 100% matte tin finish (in compliance with the 2002/95/EC european directive)
- PolarPAK[®] is a registered trademark of VISHAY

Application

- Switching applications

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, moreover the double sides cooling package with ultra low junction to case thermal resistance allows to handle higher levels of current.

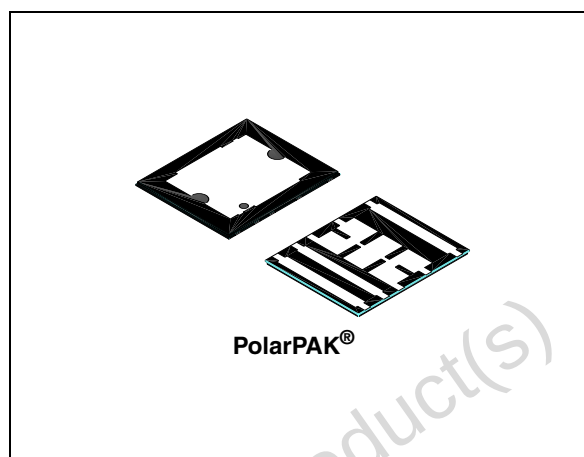


Figure 1. Internal schematic diagram

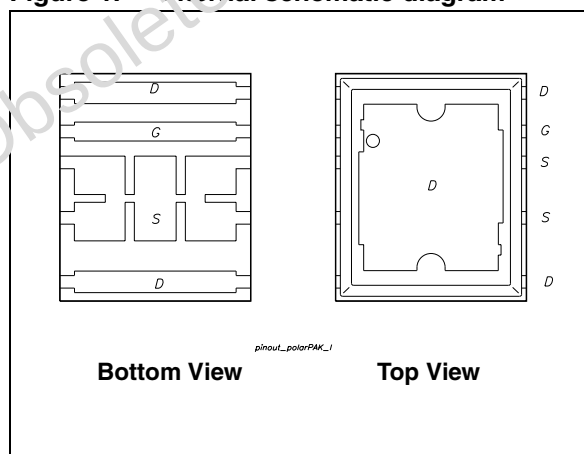


Table 1. Device summary

Order code	Marking	Package	Packaging
STK822	K822	PolarPAK [®]	Tape & reel

Contents

1	Electrical ratings	3
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Electrical ratings

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	25	V
$V_{GS}^{(1)}$	Gate-source voltage	± 16	V
$V_{GS}^{(2)}$	Gate-source voltage	± 18	V
$I_D^{(4)}$	Drain current (continuous) at $T_A = 25\text{ }^{\circ}\text{C}$	38	A
$I_D^{(4)}$	Drain current (continuous) at $T_A = 100\text{ }^{\circ}\text{C}$	23.75	A
$I_{DM}^{(3)}$	Drain current (pulsed)	152	A
$P_{TOT}^{(4)}$	Total dissipation at $T_A = 25\text{ }^{\circ}\text{C}$	5.2	W
	Derating factor	0.0416	W/ $^{\circ}\text{C}$
$E_{AS}^{(5)}$	Single pulse avalanche energy	500	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 150	$^{\circ}\text{C}$

1. Continuous mode
2. Guaranteed for test time $\leq 15\text{ ms}$
3. Pulse width limited by package
4. When mounted on FR-4 board of 1 inch^2 , 2 oz Cu and $\leq 10\text{ sec}$
5. Starting $T_j = 25\text{ }^{\circ}\text{C}$, $I_D = 19\text{ A}$, $V_{DD} = 25\text{ V}$

Table 3. Thermal data

Symbol	Parameter	Typ.	Max.	Unit
$R_{thj-amb}^{(1)}$	Thermal resistance junction-amb	20	24	$^{\circ}\text{C/W}$
$R_{thj-c}^{(2)}$	Thermal resistance junction-case (top drain)	0.8	1	$^{\circ}\text{C/W}$
$R_{thj-c}^{(3)}$	Thermal resistance junction-case (source)	2.2	2.7	$^{\circ}\text{C/W}$

1. When mounted on FR-4 board of 1 inch^2 , 2 oz Cu and $\leq 10\text{ sec}$
2. Steady state
3. Measured at Source pin when the device is mounted on FR-4 board in steady state

Electrical characteristics

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2 Electrical characteristics

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

Table 4. On/off

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 1 mA, V _{GS} = 0	25			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = 20 V V _{DS} = 20 V, T _c = 125 °C			1 10	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{GS} = ±16 V			±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1		2.5	V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10 V, I _D = 19 A V _{GS} = 4.5 V, I _D = 19 A		0.00175 0.0022	0.00215 0.003	Ω Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0		6060		pF
C _{oss}	Output capacitance			1366		pF
C _{rss}	Reverse transfer capacitance			136		pF
Q _g	Total gate charge	V _{DD} = 12.5 V, I _D = 38 A		33		nC
Q _{gs}	Gate-source charge	V _{GS} = 4.5 V		13.2		nC
Q _{gd}	Gate-drain charge	(see Figure 14)		11.3		nC
Q _{gs1}	Pre V _{th} gate-to-source charge	V _{DD} = 12.5 V, I _D = 12 A		8		nC
Q _{gs2}	Post V _{th} gate-to-source charge	V _{GS} = 4.5 V (see Figure 19)		5.2		nC
R _G	Gate input resistance	f = 1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain		1.1		Ω

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Electrical characteristics

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=12.5\text{ V}$, $I_D=19\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=4.5\text{ V}$ (see Figure 16)		30.7		ns
t_r	Rise time			60		ns
$t_{d(off)}$	Turn-off delay time	$V_{DD}=15\text{ V}$, $I_D=19\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=4.5\text{ V}$ (see Figure 16)		43.5		ns
t_f	Fall time			13		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current				38	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				152	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=19\text{ A}$, $V_{GS}=0$			1.2	V
t_{rr}	Reverse recovery time	$I_{SD}=38\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$, $V_{DD}=20\text{ V}$, $T_j=150\text{ }^\circ\text{C}$ (see Figure 15)		41		ns
Q_{rr}	Reverse recovery charge			45		nC
I_{RRM}	Reverse recovery current			2.2		A

1. Pulse width limited by package

2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Thermal impedance

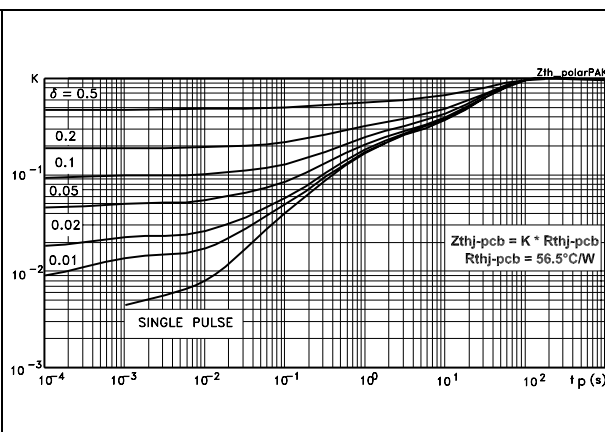
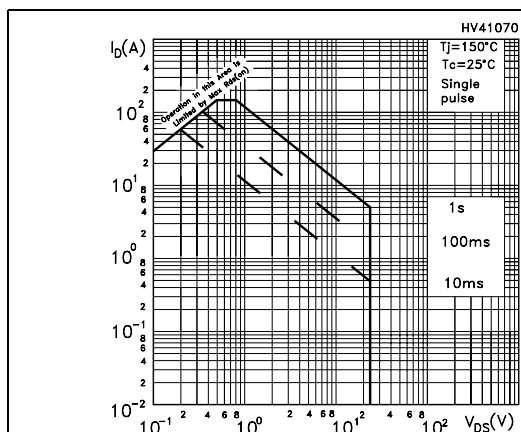


Figure 4. Output characteristics

Figure 5. Transfer characteristics

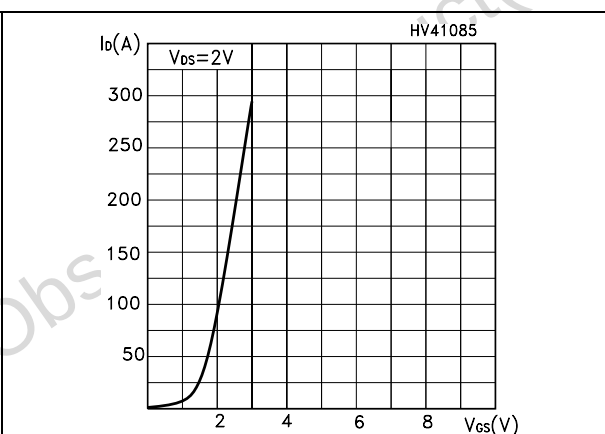
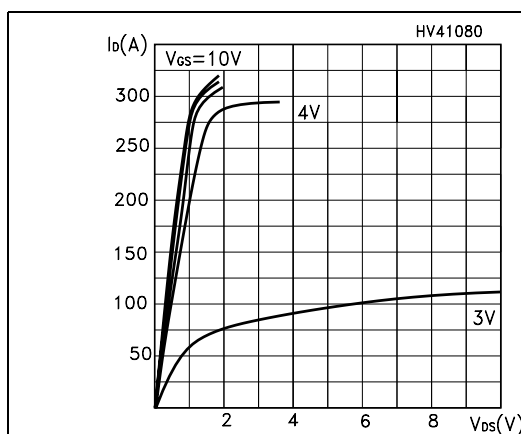
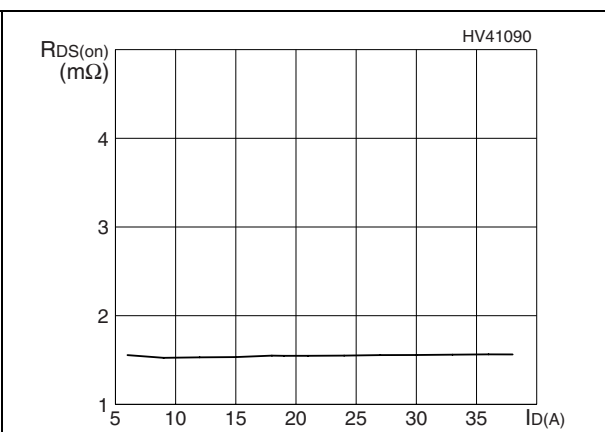
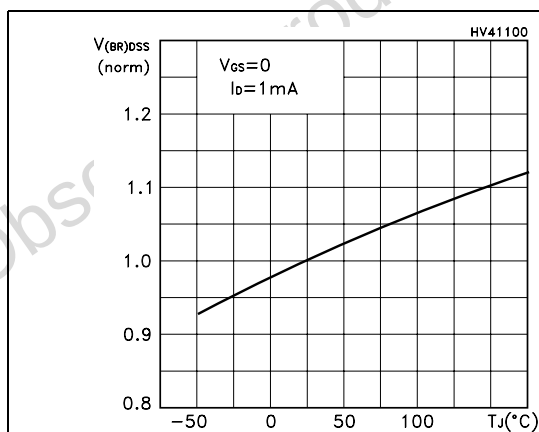


Figure 6. Normalized $B_{V_{DS}}$ vs. temperature

Figure 7. Static drain-source on resistance



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Electrical characteristics

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

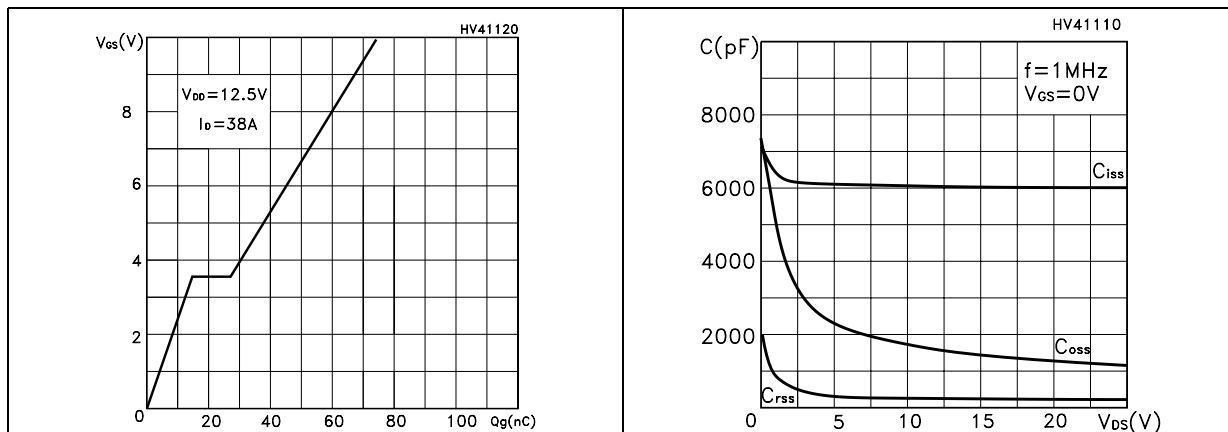


Figure 10. Normalized gate threshold voltage vs temperature **Figure 11. Normalized on resistance vs temperature**

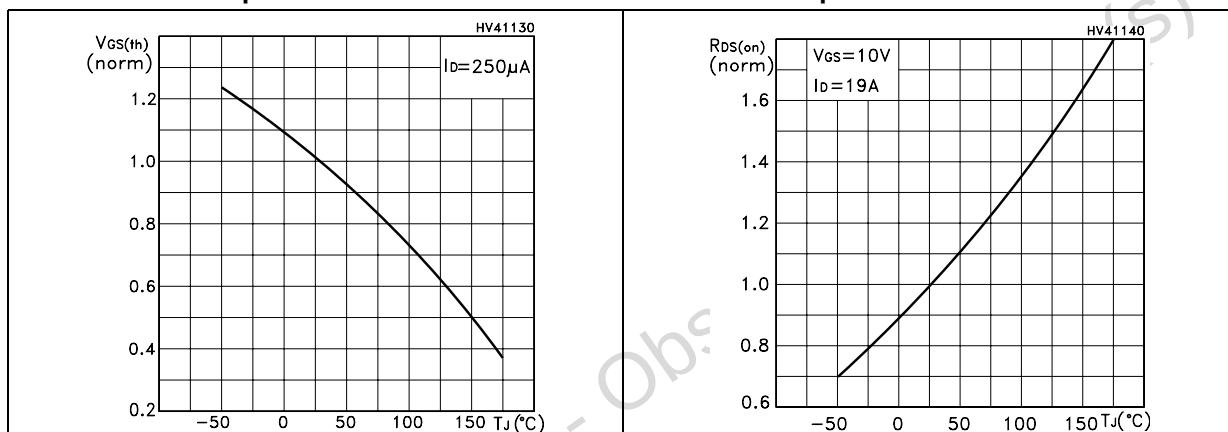
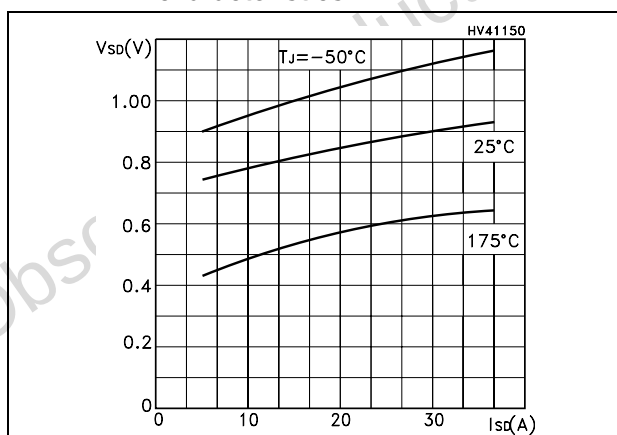


Figure 12. Source-drain diode forward characteristics



Test circuits

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3 Test circuits

Figure 13. Switching times test circuit for resistive load

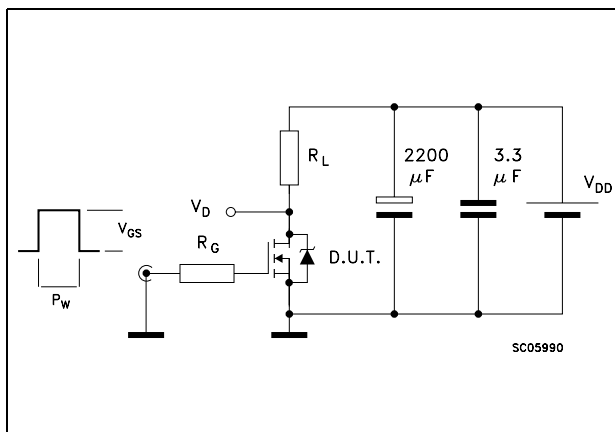


Figure 14. Gate charge test circuit

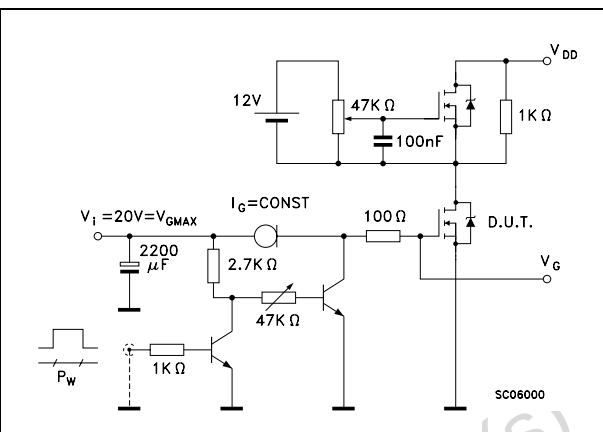


Figure 15. Test circuit for inductive load switching and diode recovery times

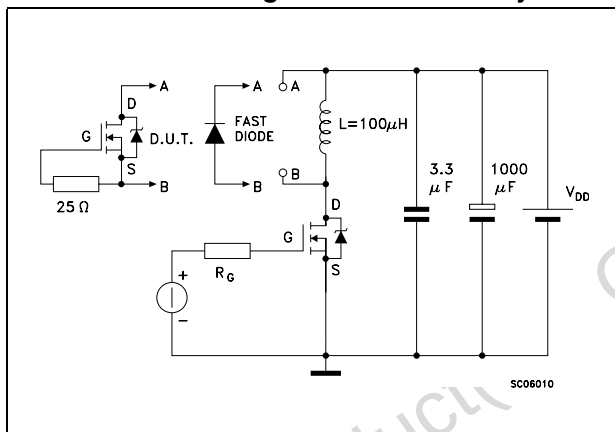


Figure 16. Unclamped inductive load test circuit

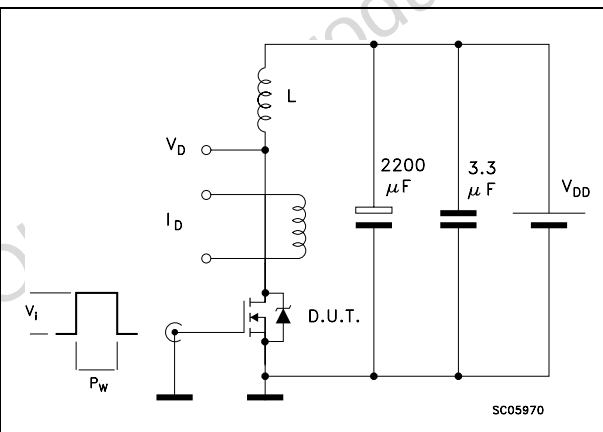


Figure 17. Unclamped inductive waveform

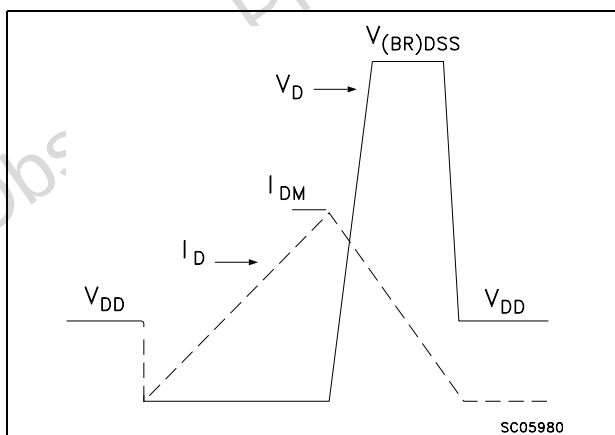
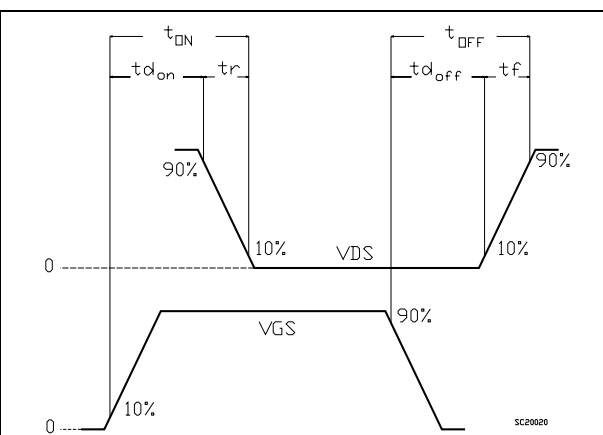


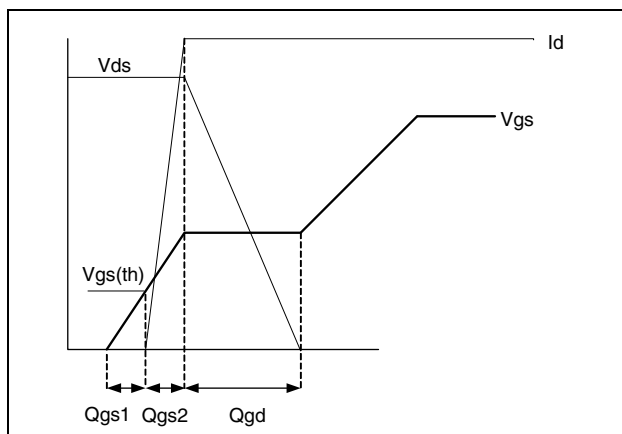
Figure 18. Switching time waveform



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Test circuits

Figure 19. Gate charge waveform



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

Obsolete Product(s) - Obsolete Product(s)

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Package mechanical data

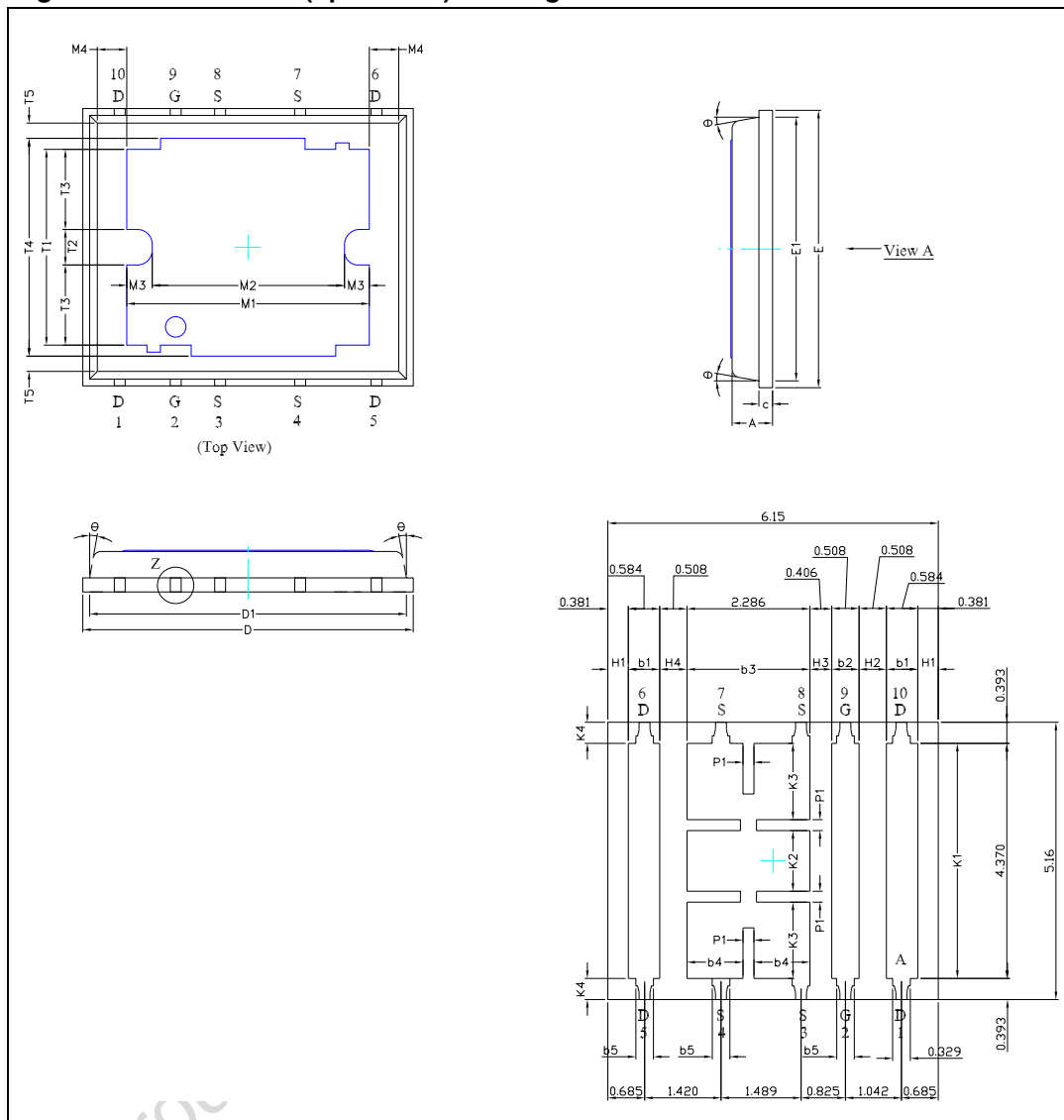
Table 8. PolarPAK® (option “L”) mechanical data

Ref.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.75	0.80	0.85	0.030	0.031	0.033
A1			0.05			0.002
b1	0.48	0.58	0.68	0.019	0.023	0.027
b2	0.41	0.51	0.61	0.016	0.020	0.024
b3	2.19	2.29	2.39	0.086	0.090	0.094
b4	0.89	1.04	1.19	0.035	0.041	0.047
b5	0.23	0.33	0.43	0.009	0.013	0.017
c	0.20	0.25	0.30	0.008	0.010	0.012
D	6	6.15	6.30	0.236	0.242	0.248
D1	5.74	5.89	6.04	0.226	0.232	0.238
E	5.01	5.16	5.31	0.197	0.203	0.209
E1	4.75	4.90	5.05	0.187	0.193	0.199
H1	0.23			0.009		
H2	0.45		0.56	0.018		0.022
H3	0.31	0.41	0.51	0.012	0.016	0.020
H4	0.45		0.56	0.018		0.022
K1	4.22	4.37	4.52	0.166	0.172	0.178
K2	1.08	1.13	1.18	0.043	0.044	0.046
K3	1.37			0.054		
K4	0.24			0.009		
M1	4.30	4.50	4.70	0.169	0.177	0.185
M2	3.43	3.58	3.73	0.135	0.141	0.147
M3	0.22			0.009		
M4	0.05			0.002		
P1	0.15	0.20	0.25	0.006	0.008	0.010
T1	3.48	3.64	4.10	0.137	0.143	0.161
T2	0.56	0.76	0.95	0.022	0.030	0.037
T3	1.20			0.047		
T4	3.90			0.154		
T5		0.18	0.36		0.007	0.014
<	0°	10°	12°	0°	10°	12°

Package mechanical data

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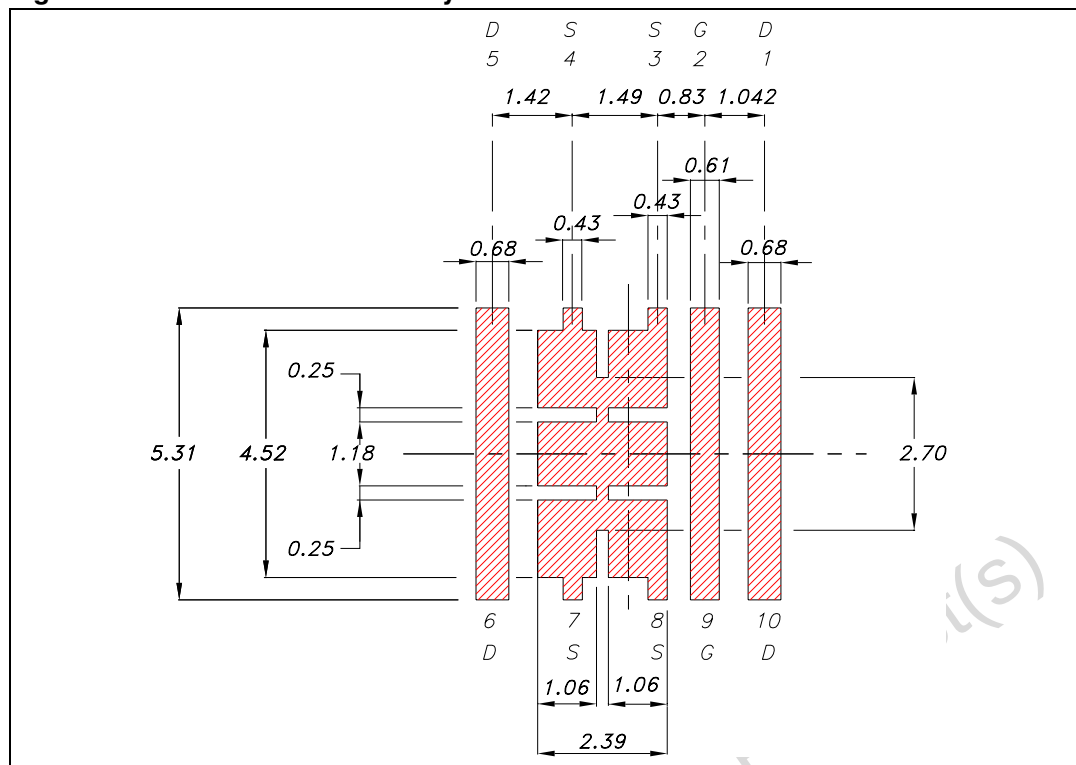
Figure 20. PolarPAK[®] (option “L”) drawings



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Package mechanical data

Figure 21. Recommended PAD layout



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
14-May-2007	1	First version
22-Jun-2007	2	V _{DSS} value changed on all document
03-Sep-2007	3	Updated mechanical data
13-Dec-2007	4	Document status promoted from preliminary data to datasheet.
14-Feb-2008	5	Updated Table 8 , Figure 20 and Figure 21

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