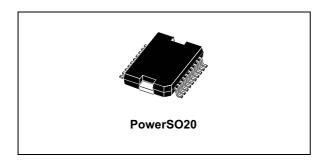


Three-phase motor driver

Datasheet - production data



Features

- Supply voltage from 7 to 52 V
- 5 A peak current
- R_{DSon} 0.3 Ω typ. value at 25 °C
- · Cross conduction protection
- · TTL compatible driver
- Operating frequency up to 150 kHz
- Thermal shutdown
- · Intrinsic fast free wheeling diodes
- Input and enable function for each half bridge
- 10 V external reference available

Description

The L6234 is a triple half bridge to drive a brushless DC motor.

It is realized in BCDmultipower technology which combines isolated DMOS power transistors with CMOS and bipolar circuits on the same chip.

By using mixed technology it has been possible to optimize the logic circuitry and the power stage to achieve the best possible performance.

The output DMOS transistors can sustain a very high current due to the fact that the DMOS structure is not affected by the second breakdown effect, the RMS maximum current is practically limited by the dissipation capability of the package.

All the logic inputs are TTL, CMOS and μP compatible. Each channel is controlled by two separate logic inputs.

The L6234 device is available in a 20-pin PowerSO20 package.

Table 1. Device summary

Order code	Package	Packing
L6234PD	PowerSO20	Tube
L6234PD013TR	PowerSO20	Tape and reel

Contents L6234

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L6234 Block diagram

1 Block diagram

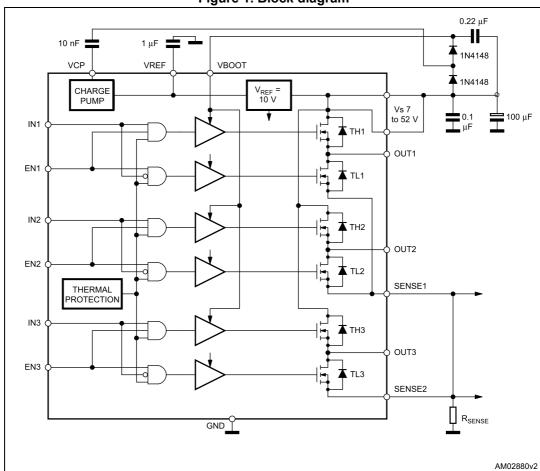


Figure 1. Block diagram

Pin connections L6234

2 Pin connections

Figure 2. Pin connections

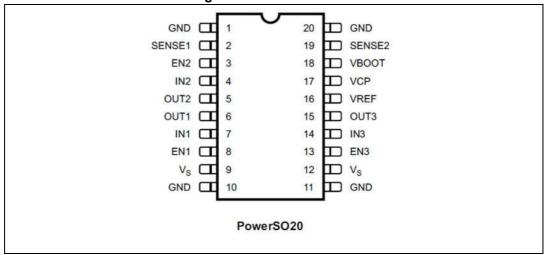


Table 2. Pin functions

Pin no.	Name	Function	
1, 10 11, 20	GND	Common ground terminal. In the PowerSO package these pins are used to dissipate the heat forward the PCB.	
2	SENSE1	A sense resistor connected to this pin provides feedback for motor current control for the bridges 1 and 2.	
3 8 13	EN 2 EN 1 EN 3	Enable of the channels 1/2/3. A logic LOW level on this pin switches off both power DMOS of the related channel.	
4 7 14	IN 2 IN 1 IN 3	Logic input of channels 1/2/3. A logic HIGH level (when the corresponding EN pin is HIGH) switches ON the upper DMOS power transistor, while a logic LOW switches ON the corresponding low side power DMOS.	
5 6 15	OUT 2 OUT 1 OUT 3	Output of the channels 1/2/3.	
9, 12	Vs	Power supply voltage.	
16	VREF	Internal voltage reference. A capacitor connected from this pin to GND increases the stability of the power DMOS drive circuit.	
17	VCP	Bootstrap oscillator. Oscillator output for the external charge pump.	
18	VBOOT	Overvoltage input to drive the upper DMOS	
19	SENSE2	A sense resistor connected to this pin provides feedback for motor current control for the bridge 3.	

L6234 Thermal data

3 Thermal data

Table 3. Thermal data

Symbol	Parameter	PowerSO20	Unit
R _{th j-case}	Thermal resistance junction case	1.5	°C/W

Maximum ratings L6234

4 Maximum ratings

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _S	Power supply voltage	52	V
V_{IN}, V_{EN}	Input enable voltage	- 0.3 to 7	V
I _{peak}	Pulsed output current ⁽¹⁾	5	Α
V _{SENSE}	Sensing voltage (DC voltage)	-1 to 4	V
V_{boot}	Bootstrap peak voltage	62	V
V _{OD}	Differential output voltage (between any of the 3 OUT pins)	60	V
f _C	Commutation frequency	150	kHz
V_{REF}	Reference voltage	12	٧
P _{tot}	Total power dissipation (T _A = 70 °C)	2.3	W
T _{stg} , T _j	Storage and junction temperature range	-40 to 150	°C

^{1.} Pulse width limited only by junction temperature and the transient thermal impedance.

Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Value	Unit
V _S	Supply voltage	7 to 42	V
V _{OD}	Peak to peak differential voltage (between any of the 3 out pins)	52	V
I _{out}	DC output current (T _A = 25 °C)	4	Α
V.	Sensing voltage (pulsed t _w < 300 nsec)	-4 to 4	٧
V _{SENSE}	Sensing voltage (DC)	-1 to 1	V
Tj	Junction temperature range	-40 to 125	°C

5 Electrical characteristics

 V_S = 42 V; T_j = 25 °C unless otherwise specified.

Table 6. Electrical characteristics

Symbol	Parameter	Test condition	Min.	Тур.	Max.	Unit
V _S	Supply voltage	-	7	-	52	V
V _{ref}	Reference voltage	-	i	10	-	V
I _S	Quiescent supply current	-	-	6.5	-	mA
T _S	Thermal shutdown	-	150	-	-	°C
T _D	Dead time protection	-	-	300	-	ns
Output DM	OS transistor					
I _{DSS}	Leakage current	-	-	-	1	mA
R _{DSon}	ON resistance	-	i	0.3	-	Ω
Source dra	in diode					
V _{SD}	Forward ON voltage	I _{SD} = 4 A; EN = LOW	-	1.2	-	V
T _{RR}	Reverse recovery time	I _F = 4 A	-	900	-	ns
T _{pr}	Forward recovery time	-	-	200	-	ns
Logic levels						
V _{INL} , V _{ENL}	Input LOW voltage	-	-0.3	-	8.0	V
V _{INH} , V _{ENH}	Input HIGH voltage	-	2	-	7	V
I _{INL} , I _{ENL}	Input LOW current	V _{IN} , V _{EN} = L	-		-10	μA
I _{INH} , I _{ENH}	Input HIGH current	V _{IN} , V _{EN} = H	-	30	-	μΑ



Circuit description L6234

6 Circuit description

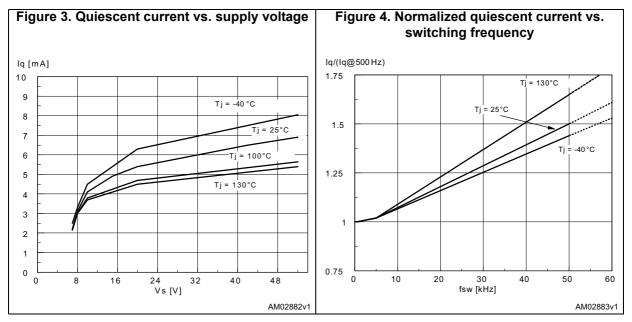
The L6234 is a triple half bridge designed to drive brushless DC motors. Each half bridge has 2 power DMOS transistors with R_{DSon} = 0.3 Ω .

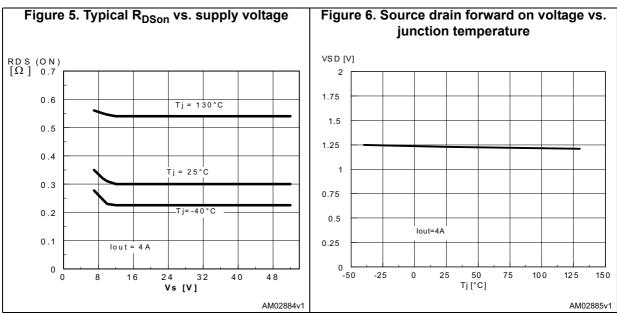
The 3 half bridges can be controlled independently by means of the 3 inputs IN1, IN2, IN3 and the 3 inputs EN1, EN2, and EN3. An external connection to the 3 common low side DMOS sources is provided to connect a sensing resistor for the constant current chopping application.

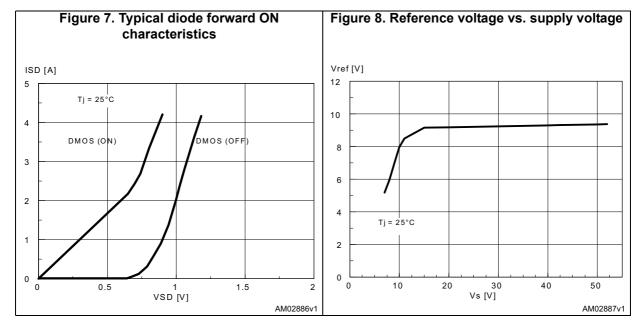
The driving stage and the logic stage are designed to work from 7 V to 52 V.

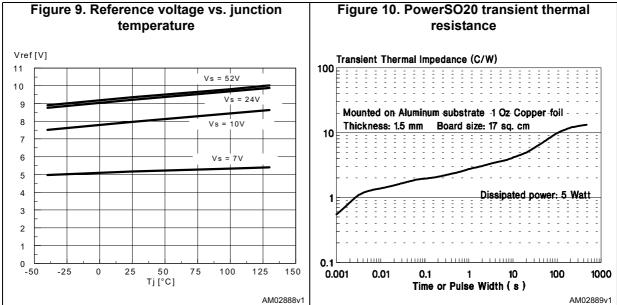


7 Typical characteristics









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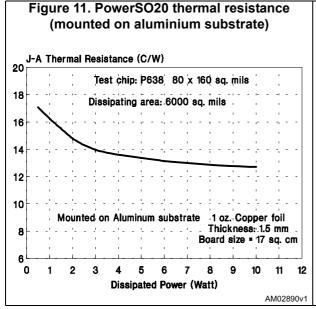


Figure 12. PowerSO20 thermal resistance (mounted on FR4 monolayer substrate) Rth(j-a) (C/W) Test chip: P638 80 x 160 sq. mils 58 Dissipating area: 6000 sq. mils 56 1 oz. Copper foil Mounted on FR4 monolayer substrate Thickness: 1.5 mm Board size = 40 sq. cm 0 0.5 1.5 2 2.5 3 **Dissipated Power (Watt)** AM02891v1

Figure 13. PowerSO20: with external heatsink DC = 0.5 E DC - 0.4 Ā DC - 0.3 TR DC 0.2 ANSIENT DC = 0.1 Pd = 3 Watt **PULSE WIDTH** R DC - DUTY CYCLE **PULSE PERIOD** h $(C/W)^{0.1}$ 1000 100 10000 TIME OR PULSE WIDTH (millisec.) AM02892v1

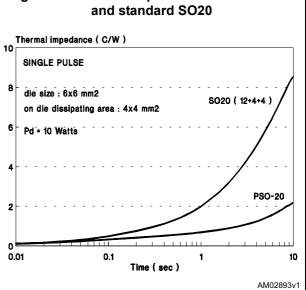


Figure 14. Thermal impedance of PowerSO20

Package information L6234

8 Package information

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.

8.1 PowerSO20 package information

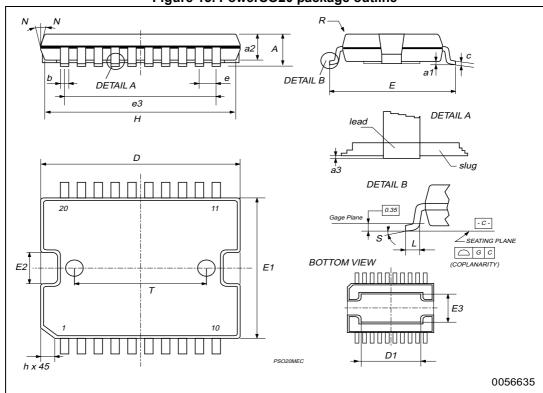


Figure 15. PowerSO20 package outline

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L6234 **Package information**

Table 7. PowerSO20 package mechanical data

Symbol		Dimensions (mm)	
	Min.	Тур.	Max.
Α	-	-	3.6
a1	0.1	-	0.3
a2	-	-	3.3
a3	0	-	0.1
b	0.4	-	0.53
С	0.23	-	0.32
D ⁽¹⁾	15.8	-	16
D1	9.4	-	9.8
E	13.9	-	14.5
е	-	1.27	-
e3	-	11.43	-
E1 ⁽¹⁾	10.9	-	11.1
E2	-	-	2.9
E3	5.8	-	6.2
G	0	-	0.1
Н	15.5	-	15.9
h	-	-	1.1
L	0.8	-	1.1
N	8° (typ.)		
S	8° (max.)		
Т	-	10	-

[&]quot;D" and "E1" do not include mold flash or protrusions.
- Mold flash or protrusions shall not exceed 0.15 mm (0.006").

Revision history L6234

9 Revision history

Table 8. Document revision history

Date	Revision	Changes
15-Nov-2011	10	Updated Features in coverpage and <i>Table 4</i> .
15-Mar-2017	11	Removed PowerDIP 20-pin package and all references throughout document. Updated Figure 1 on page 3 (replaced by new figure).
13-IVIAI-2017	11	Added note 1. below <i>Table 7 on page 13</i> . Minor modifications throughout document.

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