Features

- **Push-pull Output Stage for 4A Peak Current**
- **Low R_{dson} < 2Ω**
- **12V Push-pull Output Stage for Pulse Shaping**
- **Super Short Propagation Delay Input-output 50 ns**
- **Super Fast Rise/Fall Time of Output Stage 12 ns**
- **Monitoring Circuit with 60 ns Switch-off Delay and 20 ms Lockout**
- **Undervoltage Lockout 40 ms**
- **Wide Supply Voltage Range from16V up to 30V**
- **Fully Integrated Charge Pump**

Pb Lead Free

Electrostatic sensitive device.
Observe precautions for handling.

High Speed Power Driver IC

ATA6821

1. Description

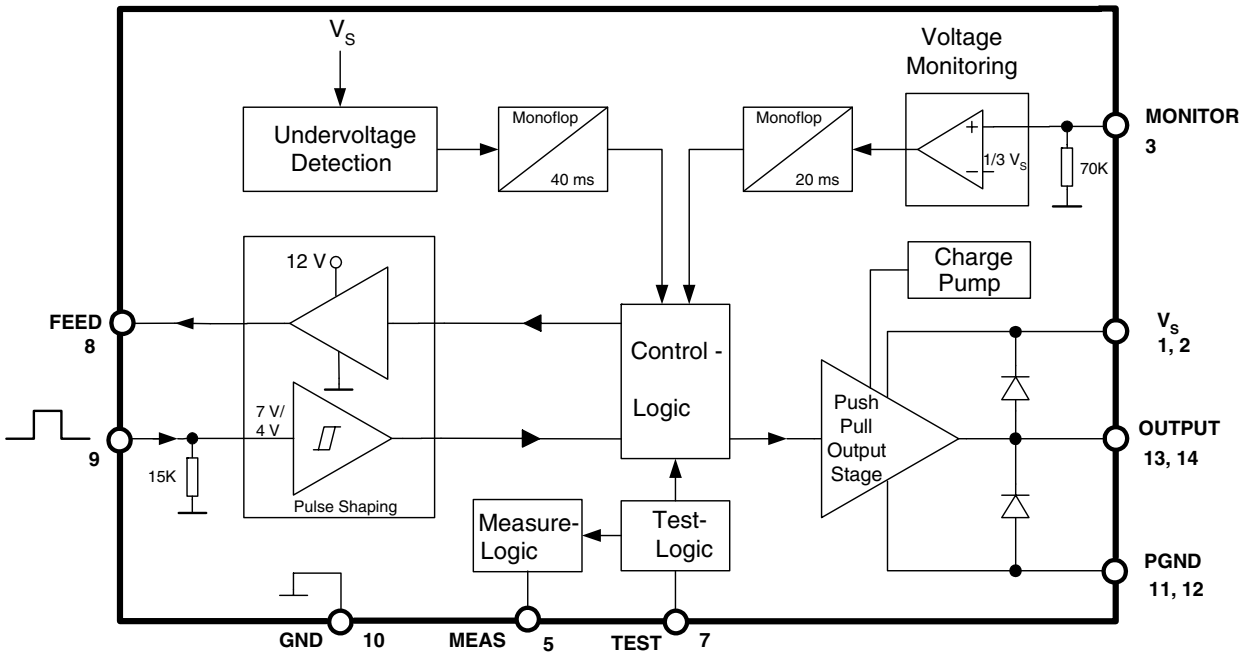
The ATA6821 is a single-channel high-speed power driver IC designed with Atmel's 0.8 µm BCDMOS technology. With its extremely short propagation delay and super fast slew rates, the ATA6821 is ideally suited to control MOSFETs or IGBTs in a wide range of automotive and industrial high-speed applications. The push-pull output stage is capable of driving peak currents of 4A.

The ATA6821 is designed to control high currents as they can be found in electrical machines or in power converters. The ATA6821 is tailored to control low resistance switching devices by a potential-free input signal.

The ATA6821's full automotive qualification, ESD protection and protection against transients according to ISO/TR 7637/1 guarantees security for all kind of applications.

Rev. 4778B–AUTO–09/05

Figure 1-1. Block Diagram



2. Pin Configuration

Figure 2-1. Pinning SO14

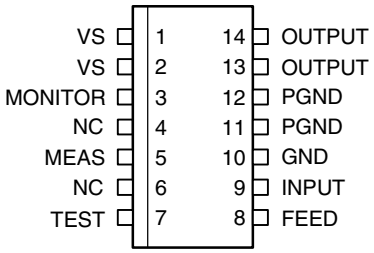


Table 2-1. Pin Description

Pin	Symbol	Function
1	VS	Supply voltage
2	VS	Supply voltage
3	MONITOR	Voltage monitoring input
4	NC	Not connected
5	MEAS	Measurement pin
6	NC	Not connected
7	TEST	Test pin
8	FEED	Feed output
9	INPUT	Input
10	GND	Ground(1)
11	PGND	Power ground(1)
12	PGND	Power ground(1)
13	OUTPUT	Output
14	OUTPUT	Output

Note: 1. All ground pins must be connected together by short external connections.
The measurement pin (pin 5) and the test pin (pin 7) must be connected to the ground pins.

3. Functional Description

The ATA6821 controls a push-pull power output stage for an external power device and a feedback output stage. If the voltage at the input pin is > 7V, both outputs are at “high-level”, if the input voltage falls below the switch-off threshold of 4V, both outputs are switched to ground.

If a rectangular input signal is fed to the input, the feedback output “Feed” is not used and pin 8 needs no external connection.

In case the input signal, however, comes from a transformer (potential-free control; see Figure 7-5 on page 12), the integrated pulse shaping circuit is used to achieve a reliable feedback configuration at the input. This ensures correct switching of the output stage even if the input signal is very noisy.

For the timing of input and output signals and the slew rates, please refer to Figure 7-1 on page 9. The timing diagram is based on the following test conditions: A 2 kΩ resistor is connected between pin 8 and ground; a 2 kΩ resistor and a 1 nF capacitor are used as load for the power output (pins 13 and 14) simulating identical conditions as a power MOSFET, which is usually connected to the output.

3.1 Undervoltage Detection

During power-up and power-down of the supply voltage, the internal undervoltage circuit suppresses uncontrolled output pulses. In case of undervoltage (V_S < 16V), the feedback output and the power output are switched off and locked for 40 ms.

When the supply voltage has reached the switch-on-threshold of about 17V, both output stages are enabled after a delay time of 40 ms.

3.2 Voltage Monitoring

An effective short-circuit detection of the external device is achieved by a drain-source voltage monitor.

The voltage monitor comparator (pin 3) has a threshold of 1/3 × V_S. If the voltage applied to pin 3 exceeds this voltage, both output stages are switched off immediately and locked for 20 ms. With a hysteresis of 200 mV, the outputs are enabled again after a delay time of 20 ms. A voltage divider connected to V_S is used to feed the input voltage to pin 3. A decoupling diode is recommended if the external power device‘s drain source voltage exceeds 30V (see Figure 7-3 on page 10).

With the help of an external capacitor, connected to pin 3, the switching characteristic of the voltage monitor comparator can be varied according to the rising edge of the input signal at pin 9. During the off cycle, the capacitor is discharged, during the on-cycle, it is charged again.

If the voltage monitoring function is not used, pin 3 should be connected to ground (see Figure 7-2 on page 10).

3.3 Application Hints

Due to high peak output currents, the layout of the PC board is essential. Appropriate decoupling capacitors should be used, otherwise, the performance of the driver degrades severely. It is strongly recommended to connect the blocking capacitors (low ESR types) as close as possible to the power supply and the ground pins. If necessary, two or more capacitors of different types may be connected in parallel.

The two power ground pins, the ground pin, the two output pins and the two supply pins should be externally connected together as close as possible to the pins.

The measurement pin (pin 5) and the test pin (pin 7) must not be used in any application and need to be tied to ground.

4. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameters	Pin	Symbol	Min.	Max.	Unit
Supply voltage	1, 2	V_S	–0.3	30	V
Input voltage, voltage monitoring	3	$V_{Monitor}$	–0.3	V_S + 0.3	V
Output voltage	13, 14	V_{Out}	–0.3	V_S + 0.3	V
Output voltage FEED	8	V_{FEED}	–0.3	15	V
Input voltage	9	V_{Input}	–0.3	40	V
Input voltage measurement	5	V_{Meas}	–0.3	V_S + 0.3	V
Input voltage TEST pin	7	V_{Test}	–0.3	5	V
Output current FEED	8	I_{FEED}	–10	10	mA
Output current	13, 14	I_{Out}	–200	200	mA
Output current $t \leq 100$ µs	13, 14	i_{Out}	–4	4	A
Ambient temperature range		T_{amb}	–40 to +100		°C
Junction temperature range		T_j	–40 to +150		°C
Storage temperature range		T_{stg}	–40 to +150		°C

5. Thermal Resistance

Parameters	Symbol	Value	Unit
Junction to ambient	R_{thJA}	130	K/W

6. ESD Protection

Parameters	Test Conditions	Value
ESD (Human Body Model)	MIL-STD-883D Method 3015.7	±2 kV (pins 3 and 9: 1 kV)
ESD CDM (Charged Device Model)	STM 5.3.1 - 1999	±500V

7. Electrical Characteristics

Conditions:
$16V < V_S < 30V$; $-40°C < T_A < 100°C$
$V_1 = V_2 = V_{S,}\ V_{13} = V_{14} = V_{Out,}\ V_4 = V_5 = V_6 = V_7 = 0V$
$V_{10} = V_{11} = V_{12}$ = GND = Reference point, unless otherwise specified

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1	**Supply Voltage Range**								
1.1	Supply voltage		1, 2	V_S	16		30	V	C
2	Current Consumption	$V_s \leq 30V$; no load at "Feed" and "Output"	1, 2	I_{VS}			6	mA	A
3	**Undervoltage Detection (UVD)**								
3.1	Switch-on threshold UVD		1, 2	V_{Son}	16	17	18	V	A
3.2	Hysteresis UVD		1, 2	dV_{Son}		300		mV	A
3.3	Timeout after undervoltage		1, 2	t_{offUVD}	30	40	50	ms	A
4	**Voltage Monitoring (VM)**								
4.1	Input Resistance		3	Ri_{VM}	30	70	150	kΩ	A
4.2	Switch-off threshold VM		3	V_{Toff}	$V_S/3$ –2%	$V_S/3$	$V_S/3$ + 4%	V	A
4.3	Hysteresis VM		3	dV_S		200		mV	A
4.4	Switch-off-delay monitor-output		3 to 13, 14	td_{offVM}		60		ns	A
4.5	Timeout after switch-off by voltage monitoring		3 to 13, 14	t_{offVM}	15	20	25	ms	A
5	**Input Stage**								
5.1	Input Resistance		9	Ri_{Input}		15		kΩ	A
5.2	Switch-on-threshold		9	V_{INON}	6		8	V	A
5.3	Switch-off-threshold		9	V_{INOFF}	3		5	V	A
5.4	Propagation delay-time "Input - Feed"		8, 9	$t_{dIn\text{-}Feed}$		30		ns	A
5.5	Propagation delay-time "Input - Output"		9 to 13	$t_{dIn\text{-}Out}$		50		ns	A
6	**Feed Output**								
6.1	High voltage Feed, no load	Pin 8 open, $V_9 \geq 8V$	8	V_{Feed0}		13		V	A
6.2	Output resistance high	$I_{Feed} = -5$ mA, $V_9 \geq 8V$	8	R_{FeedHi}		500	1000	Ω	A
6.3	Output resistance low	$I_{Feed} = 5$ mA, $V_9 \leq 3V$	8	R_{FeedLo}		100	500	Ω	A
6.4	Rise time (10% to 90%)	R_{Feed} external = 2 kΩ, Rising edge at pin 9	8	t_{rFeed}		20		ns	A
6.5	Fall time (10% to 90%)	R_{Feed} external = 2 kΩ, Falling edge at pin 9	8	t_{fFeed}		10		ns	A

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

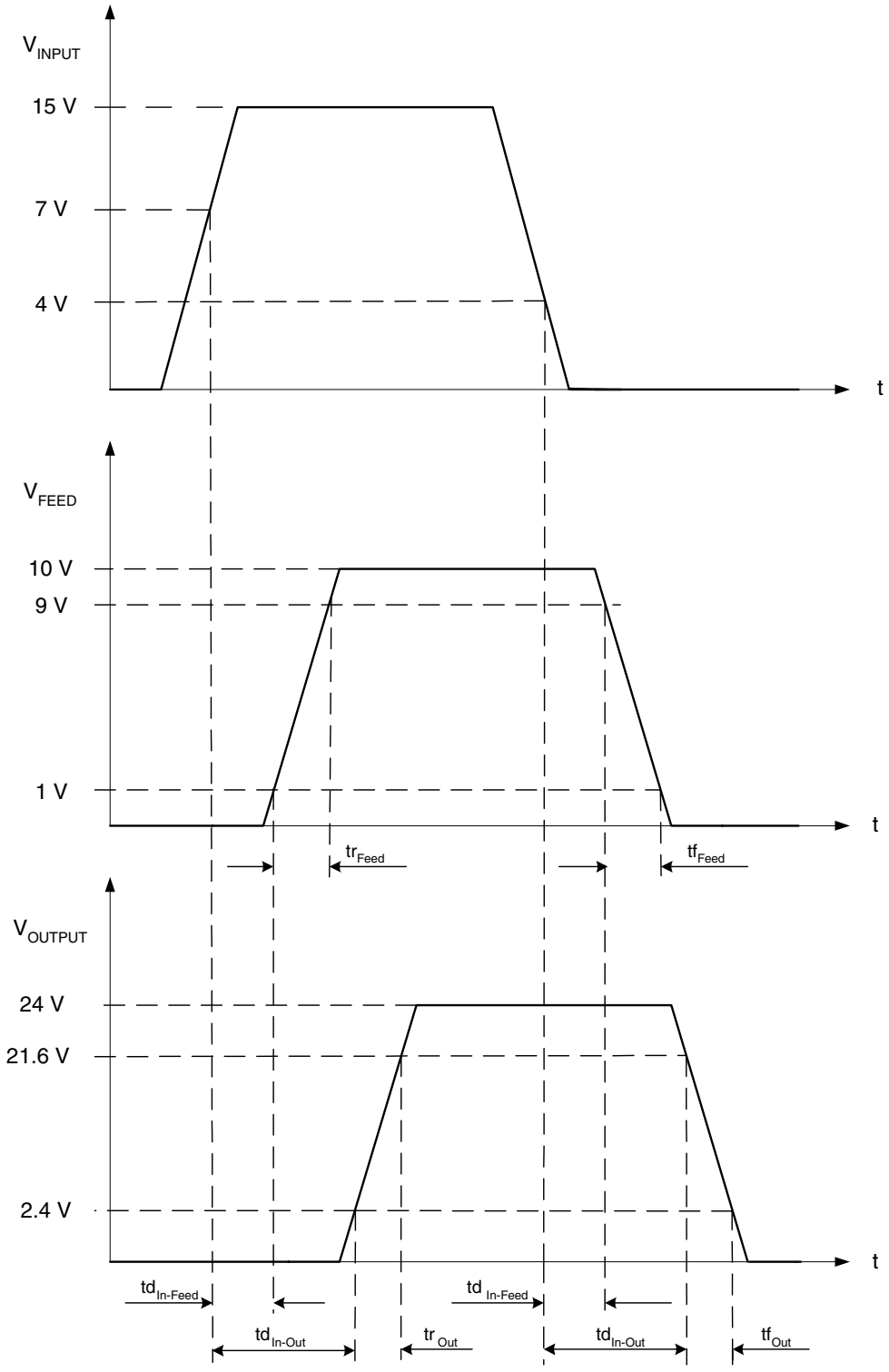
7. Electrical Characteristics (Continued)

Conditions:
$16V < V_S < 30V$; $-40°C < T_A < 100°C$
$V_1 = V_2 = V_S$, $V_{13} = V_{14} = V_{Out}$, $V_4 = V_5 = V_6 = V_7 = 0V$
$V_{10} = V_{11} = V_{12}$ = GND = Reference point, unless otherwise specified

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
7	**Push-pull-outputstage**								
7.1	On-resistance high	$I_{Out} = -1$ A, $V_9 \geq 8V$	13 - 1, 2	$R_{OutHigh}$			2	Ω	A
7.2	On-resistance low	$I_{Out} = 1A$, $V_9 \leq 3V$	13	R_{OutLow}			2	Ω	A
7.3	Peak output current high	$t \leq 100$ µs, rising edge at pin 9	13,14	$-i_{Out}$			4	A	D
7.4	Peak output current low	$t \leq 100$ µs, falling edge at pin 9	13,14	i_{Out}			4	A	D
7.5	Rise time (10% to 90%)	Rising edge at pin 9 external load: $C_{Out} = 1$ nF, $R_{Out} = 2$ kΩ	13,14	t_{rOut}		12		ns	A
7.6	Fall time (10% to 90%)	Falling edge at pin 9 external load: $C_{Out} = 1$ nF, $R_{Out} = 2$ kΩ	13,14	t_{fOut}		12		ns	A

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Figure 7-1. Timing Diagram[1] 1



Note: 1. A 2 kΩ resistor is connected between pin 8 and ground; a 2 kΩ resistor and a 1 nF capacitor are used as load for the power output (pins 13 and 14), simulating identical conditions as a power MOSFET, which is usually connected to the output.

Figure 7-2. Application Circuit 1: Power Driver with Minimum External Components

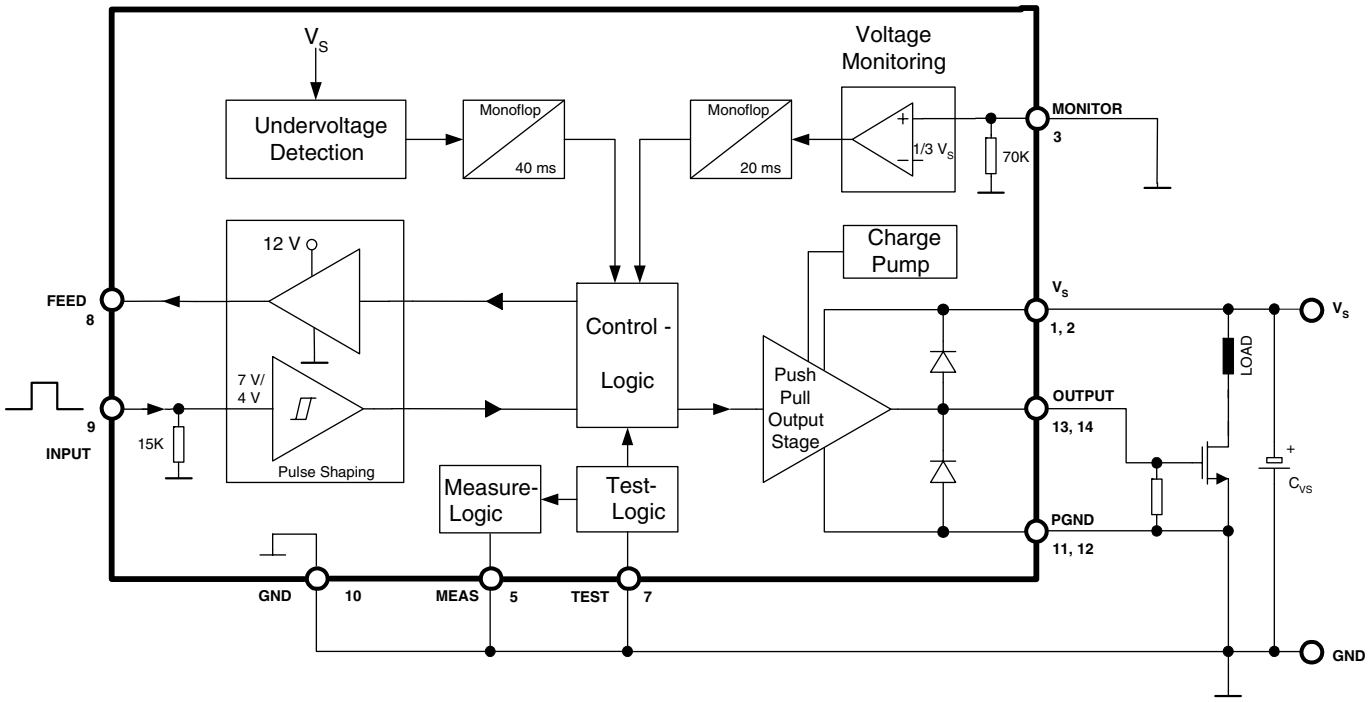


Figure 7-3. Application Circuit 2: Driver Circuit with Short-circuit Monitoring via the Drain-source Voltage of the Power Device

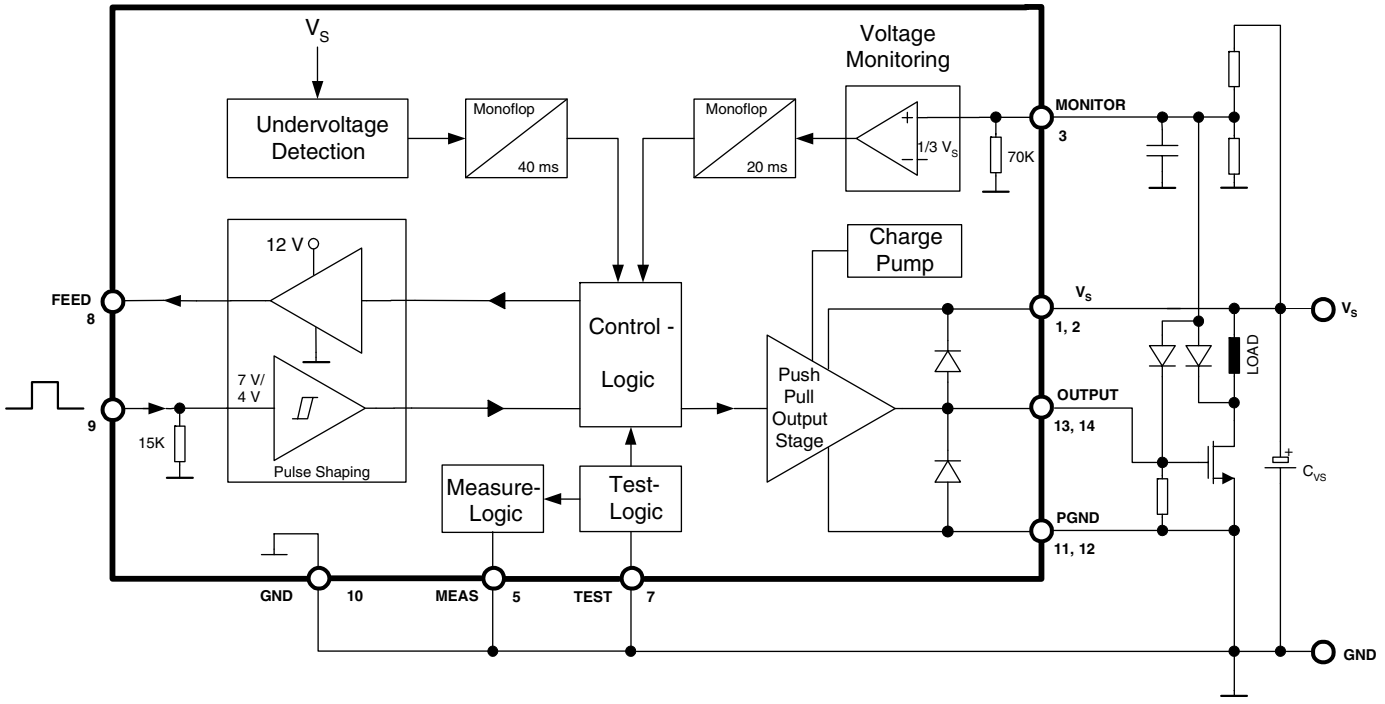


Figure 7-4. Application Circuit 3: Six ATA6821 Used to Control a Three-phase Asynchronous Machine

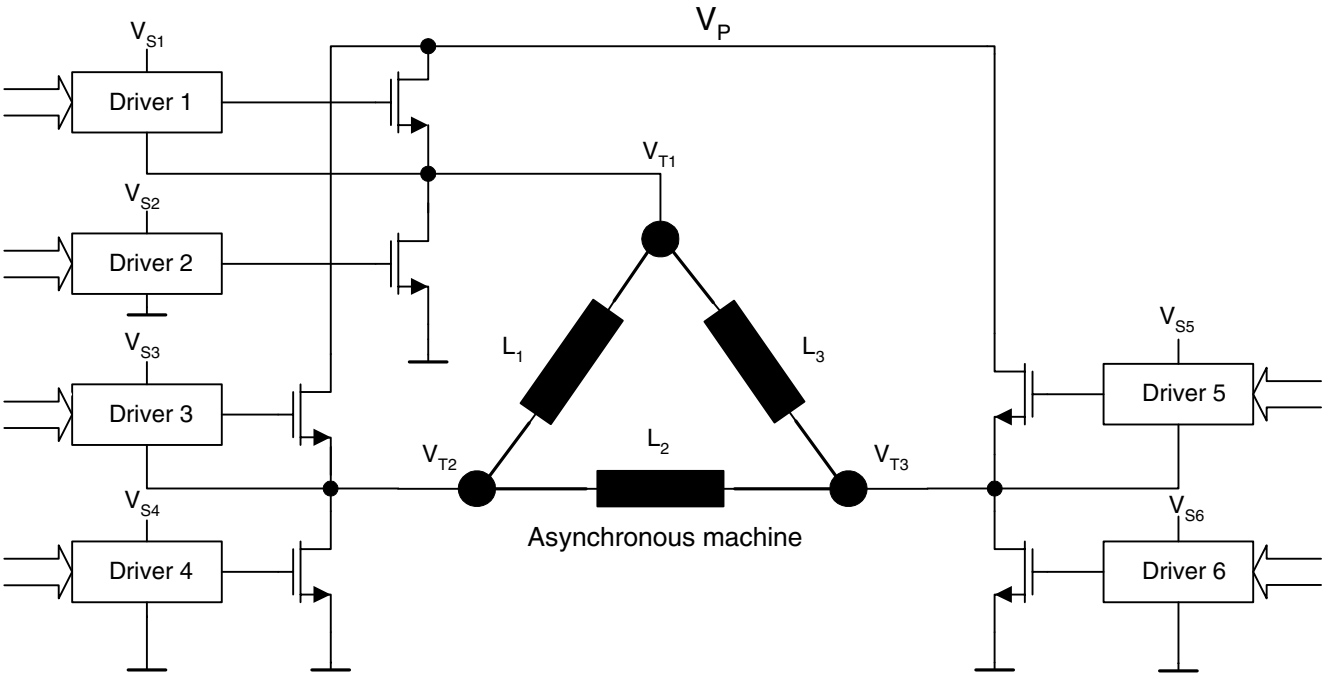
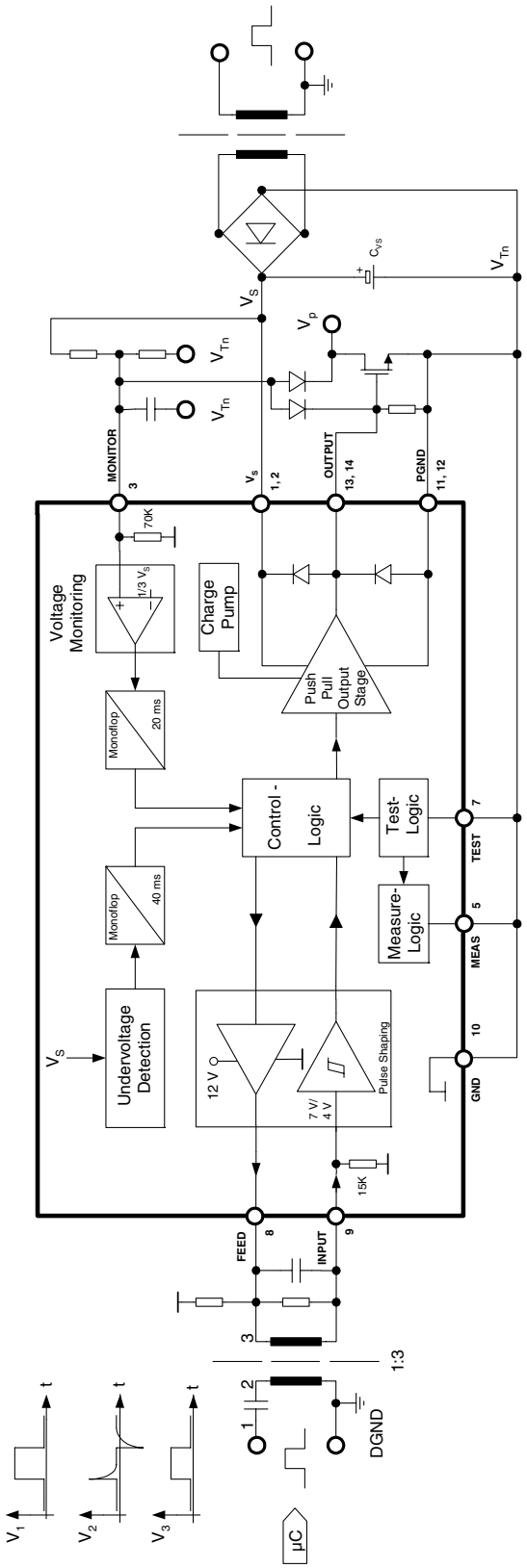


Figure 7-5. External Components for one ATA6821 in Application Circuit 3: Potential-free Control of a Three-phase Asynchronous Machine

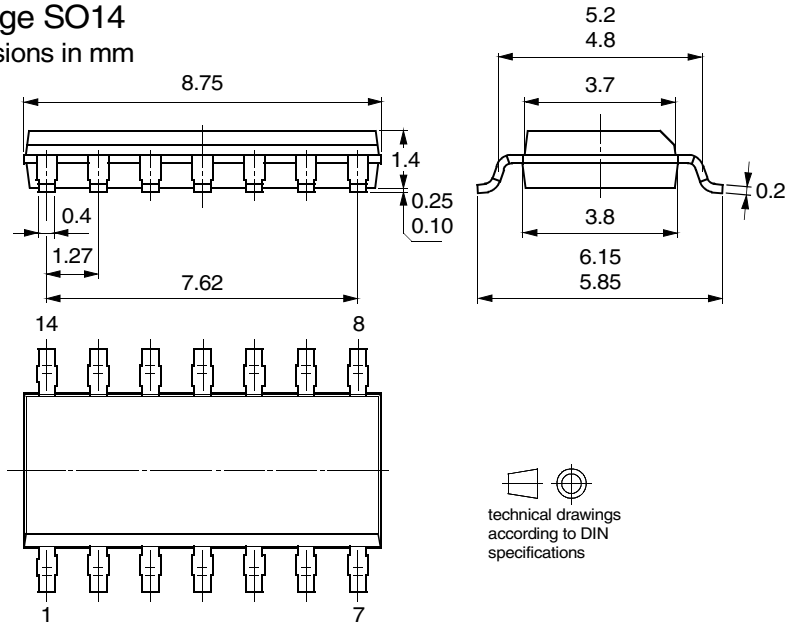


8. Ordering Information

Extended Type Number	Package	Remarks
ATA6821-TUSY	SO14	Tubed, Pb-free
ATA6821-TUQY	SO14	Taped and reeled, Pb-free

9. Package Information

Package SO14
Dimensions in mm



10. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
4778B-AUTO-09/05	• Put datasheet in a new template • Pb-free logo on page 1 added • Ordering Information on page 13 changed

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