AMT49105

Three-Phase MOSFET Driver System IC

FEATURES AND BENEFITS

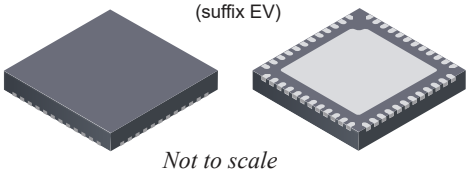
- 3-phase bridge MOSFET driver
- Bootstrap gate drive for N-channel MOSFET bridge
- Cross-conduction protection with adjustable dead time
- Charge pump for low supply voltage operation
- Programmable gate drive voltage and strength
- 5.5 to 50 V supply voltage operating range
- Integrated logic supply
- Current sense amplifier with programmable gain and offset
- SPI-compatible serial interface
- Bridge control by direct logic inputs or serial interface
- Integrated bemf state comparators
- LIN/PWM physical interface with Wake
- Programmable logic supply regulator with current limit
- MCU Window watchdog and reset
- Ignition switch interface
- Diagnostics, status, voltage, and temperature feedback
- Developed in accordance with ISO 26262:2011

APPLICATIONS

- Automotive fuel, oil, and urea pumps
- Automotive fans and blowers

PACKAGES:

48-pin QFN with exposed thermal pad and wettable flank (suffix EV)



Not to scale

DESCRIPTION

The AMT49105 is an N-channel power MOSFET driver capable of controlling MOSFETs connected in a three-phase bridge arrangement and is specifically designed for automotive applications with high-power inductive loads such as BLDC motors. Full control over all six power MOSFETs in the three-phase bridge is provided, allowing motors to be driven with block commutation or sinusoidal excitation.

The AMT49105 is designed to provide the gate drive, supply, and peripheral functions in a system where a small microcontroller provides the motor control, communication interface to a central ECU and intelligent fault and status handling. The AMT49105 provides the supply and watchdog for the microcontroller and the high voltage interfaces between the microcontroller and the central ECU and ignition switch. An ISO17987 (LIN 2.X) and SAE J2602 compliant physical interface is provided for systems using LIN bus communications. This can also operate as a PWM interface for PWM communication systems.

A unique charge pump regulator provides the supply for the MOSFET gate drive for battery voltages down to 7 V and allows the AMT49105 to operate with a reduced gate drive down to 5.5 V. A bootstrap capacitor is used to provide the above-battery supply voltage required for N-channel MOSFETs.

A single sense amplifier with programmable gain and offset provides current sensing using a single low-side resistive shunt.

Integrated diagnostics provide indication of undervoltage, overtemperature, and power bridge faults and can protect the power switches under most short-circuit conditions.

The AMT49105 is supplied in a 48-terminal wettable flank QFN package (suffix EV). This package is lead (Pb) free with 100% matte-tin leadframe plating.

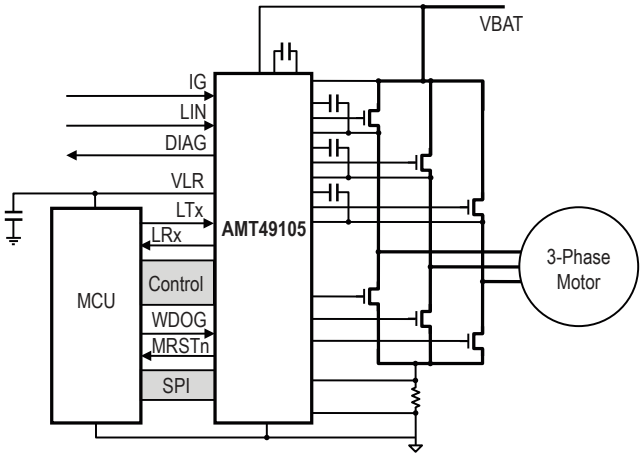


Figure 1: Typical Application

SELECTION GUIDE

Part Number	Packing	Package
AMT49105KEVTR-J	1000 pieces per 7-inch reel	7 mm × 7 mm, 0.9 mm nominal height 48-terminal QFN with exposed thermal pad and wettable flank

Table of Contents

Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

ABSOLUTE MAXIMUM RATINGS [1][2]

Characteristic	Symbol	Notes	Rating	Unit
Supply Voltage	V_{BB}	VBB	–0.3 to 50	V
Between Ground Terminals	–	Connect GND terminals together at package	–0.1 to 0.1	V
Pumped Regulator Terminal	V_{REG}	VREG	–0.3 to 16	V
Charge Pump Capacitor Terminal	V_{CP1}	CP1	–0.3 to 16	V
Charge Pump Capacitor Terminal	V_{CP2}	CP2	–0.3 to 16	V
Logic Regulator Output	V_{LR}	VLR	–0.3 to 6	V
LIN Bus Interface	V_{LIN}	LIN	–40 to 50	V
Logic Inputs	–	All logic inputs except IG	–0.3 to 6	V
Logic Input	V_{IG}	IG	–4 to 50	V
Logic Outputs	–	All logic outputs except DIAG	–0.3 to 6	V
Logic Output	V_{DIAG}	DIAG	–0.3 to 50	V
Bridge Drain Monitor Terminals	V_{BRG}	VBRG	–5 to 55	V
Switched Bridge Terminal	V_{BRS}	BRSW	–0.3 to 55	V
Bootstrap Supply Terminals	V_{Cx}	CA, CB, CC	–0.3 to V_{REG}+50	V
High-Side Gate Drive Output Terminals	V_{GHx}	GHA, GHB, GHC	V_{CX} – 16 to V_{Cx} + 0.3	V
		GHA, GHB, GHC (Transient)	–18 to V_{Cx} + 0.3	V
Motor phase terminals	V_{Sx}	SA, SB, SC	V_{CX} – 16 to V_{Cx} + 0.3	V
		SA, SB, SC (Transient)	–18 to V_{Cx} + 0.3	V
Low-side gate drive output terminals	V_{GLx}	GLA, GLB, GLC	V_{REG} – 16 to 18	V
		GLA, GLB, GLC (Transient)	–18 to V_{Cx} + 0.3	V
Bridge low-side source terminals	V_{LSS}	LSSA, LSSB, LSSC	V_{REG} – 16 to 18	V
		LSSA, LSSB, LSSC (Transient)	–8 to 18	V
Sense Amplifier Inputs	V_{CSI}	CSP, CSM	–4 to 6.5	V
Sense Amplifier Output	V_{CSI}	CSO	–0.3 to 6.5	V
Ambient Operating Temperature Range	T_A		–40 to 150	°C
Maximum Continuous Junction Temperature	$T_{J(max)}$		165	°C
Transient Junction Temperature	T_{Jt}	Over temperature event not exceeding 10 seconds, lifetime duration not exceeding 10 hours, guaranteed by design characterization.	180	°C
Storage Temperature Range	T_{stg}		–55 to 150	°C

[1] With respect to GND. Ratings apply when no other circuit operating constraints are present.
[2] Lowercase “x” in terminal names and symbols indicates a variable sequence character.

THERMAL CHARACTERISTICS: May require derating at maximum conditions

Characteristic	Symbol	Test Conditions [4]	Value	Unit
EV Package Thermal Resistance	$R_{\theta JA}$	4-layer PCB based on JEDEC standard	24	°C/W
		2-layer PCB with 3.8 $in.^2$ of copper area each side	44	°C/W
	$R_{\theta JP}$		2	°C/W

[4] Additional thermal information available on the Allegro website.

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