# 62EM1-Programmable 62mm Electrical Series

# Optimized for Silicon Carbide (SiC) MOSFET Modules

# Overview

# The AgileSwitch 62EM1-62mm Electrical driver provides monitoring and fault reporting information to enable better control and analysis of SiC MOSFET-based power systems. The 62EM1 provides up to 20 Amps of peak current at an operating frequency up to 200 kHz. The driver includes isolated HI and LO Side DC/DC converters and provides 7 fault conditions that are reported as a combination of the 3 fault lines via the 20 pin control header. All AgileSwitch drivers use automotive temperature grade components and allow for modifying settings of gate resistors.

# Software Programmable Features

* Augmented Turn-OffTM (ATOff) (Patented)
* Power supply under-voltage lockout (UVLO)
* Power supply over-voltage lockout (OVLO)
* Desaturation detection settings
* Dead time
* Fault lockout settings
* Automatic Reset settings

# Key Switch Driver Features

* UL Complaint - 1200V & 1700V SiC
* Single-ended (5V, 15V) or Differential (RS-422 Compatible) logic
* Temperature Monitoring, PWM
* Isolated High Voltage Monitoring, PWM
* 2 X 10W output power
* RoHs compliant
* Configurable Gate Output Voltages
* Up to 7 Unique Fault Conditions

# 

# Applications

* High Speed Trains/Traction
* Motor Drives
* HEV/EV
* Induction Welding, Cutting and Heating
* Solar/PV inverters
* Wind Turbines
* UPS
* Frequency Conversion

# System Overview

The basic topology of the driver is shown in Figure 1.

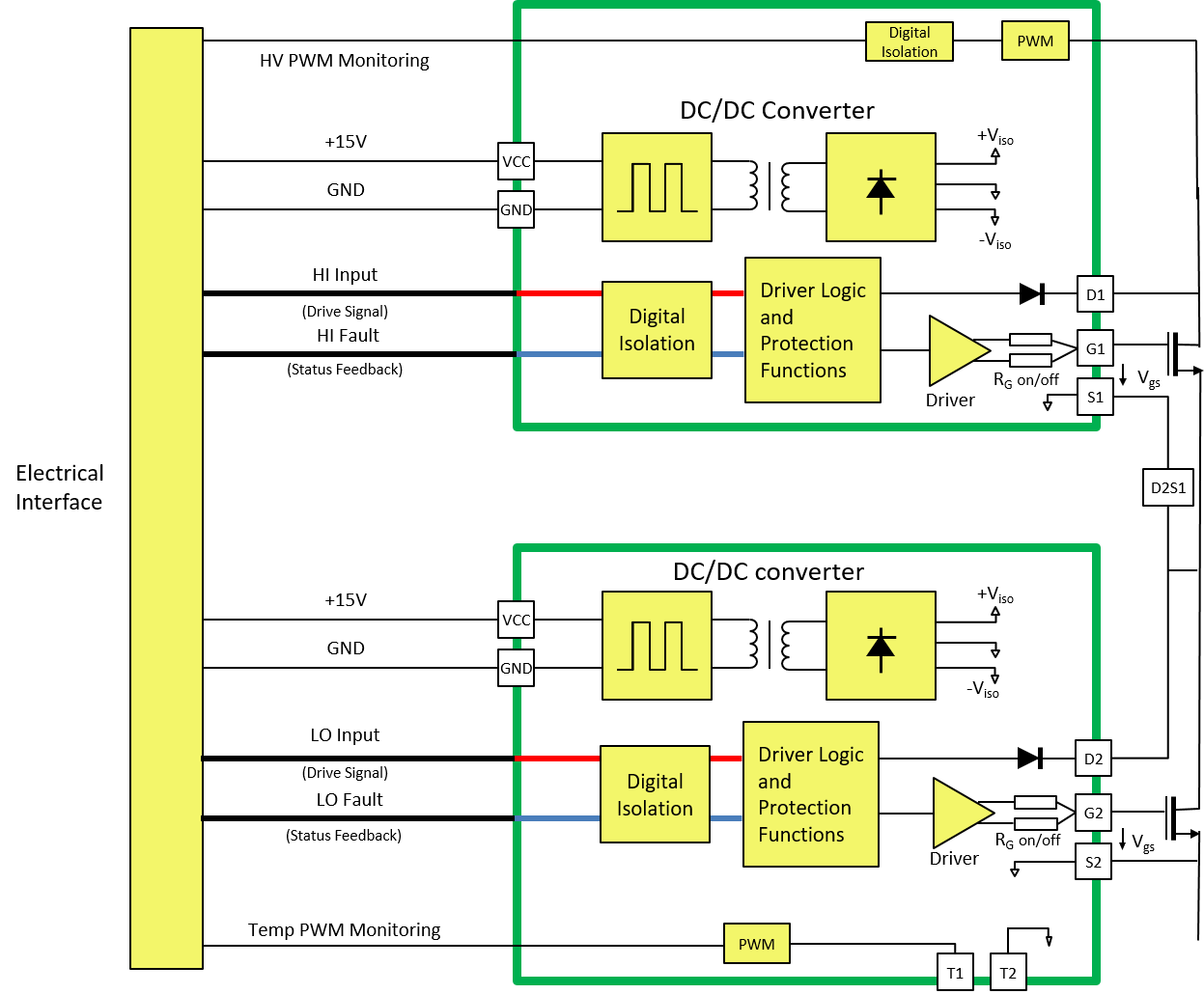


Figure 1: Basic schematic of the 62EM1-62mm Electrical Gate Driver

# Absolute Maximum Ratings

Interaction of maximum ratings is dependent on operating conditions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Description** | **Min** | **Max** | **Unit** |
| Supply Voltage | VCC to GND | 0 | 18 | V |
| Peak Gate Current | Note 1 | -20 | 20 | A |
| Input Logic Levels | To GND | -0.5 | 16 | V |
| Output Power per Gate |  |  | 10.0 | W |
| Switching Frequency | Note 2 |  | 200 | kHz |
| Isolation Voltage | Primary to Secondary VAC RMS 1 min |  | 4500 | V |
| Working Voltage | Primary to Secondary, Secondary to Secondary |  | 1200/1700 | V |
| Creepage Distance | Primary to Secondary Side | 12 |  | mm |
| \* | Rate of change input to output | 100 |  | kV/μs |
| Operating Temperature | Ambient Operating Temperature | -40 | +85 | °C |
| Storage Temperature |  | -40 | +90 | °C |

# Electrical Characteristics

Conditions: VSUP = +15.0 V, VIN\_LOGIC = 15V or 5V, MOSFET = CAS300M12BM2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Power Supply** | **Description** | **Min** | **Typ** | **Max** | **Unit** |
| Supply Voltage | VCC to GND | 14 | 15 | 16 | V |
| Supply Current | Without Load |  | 110 |  | mA |
| Supply Current | With Load, Note 3 |  |  | 1250 | mA |
| UVLO Level-HI and LO\* | Primary Side low voltage detect fault level | 13.5 | 14 |  | V |
| UVLO Level-HI and LO\* | Secondary Side low voltage detect fault level, Note 3 | 20 |  |  | V |
| OVLO Level-HI and LO\* | Primary Side high voltage detect fault level |  | 16 | 16.5 | V |
| VSOFT\* | 2-Level Turn Off, Note 3 |  | 1.5 |  | V |
| VsoftD1\* | DSAT 1st Level Turn Off Voltage, Note 3 |  | 9 |  | V |
| VsoftD2\* | DSAT 2nd Level Turn Off Voltage, Note 3 |  | 5 |  | V |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Signal I/O** | **Description** | **Min** | **Typ** | **Max** | **Unit** |
| Input Impedance | 5V - HI and LO side input |  | 500 |  | Ω |
| 15V - HI and LO side input |  | 3000 |  | Ω |
| 5V Differential – HI and LO side input |  | 1000 |  | Ω |
| VIN Low | 5V - Turn-off threshold |  |  | 1.25 | V |
| 15V - Turn-off threshold |  |  | 4 | V |
| VIN High | 5V – Turn-on Threshold | 3.5 |  |  | V |
| 15V - Turn-on threshold | 10 |  |  | V |
| VIN (differential option) | Difference between VIN+ to VIN- | 2 |  |  | V |
| Gate Output Voltage Low | Note 3 | -6 |  | -4 | V |
| Gate Output Voltage High | Note 3 | +17 |  | +21 | V |
| Fault Output Voltage | Fault lines are open collect with 5mA load | 0.3 |  |  | V |
| Fault Output Current | Note 4 |  |  | 10 | mA |
| Switching Frequency | Note 2 |  |  | 200 | kHz |
| DC Link & Temp Monitoring | High Voltage (HV) & Temp Monitoring Output | 0 |  | 5 | V |
| DC Link & Temp Monitoring | PWM Frequency |  | 31.5 |  | kHz |
| DC Link & Temp Monitoring | Output Impedance |  | 510 1% |  | Ω |
| DC Link Voltage |  | 880 |  | 920 | V |
| Temperature Trip |  |  | 125 |  | °C |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **MOSFET Short Protection** | **Description** | **Min** | **Typ** | **Max** | **Unit** |
| Desat Monitor Voltage\* | Between Drain and Sink of MOSFET, Note 3 |  | 8.25 |  | V |
| TDSAT\* | Activation after MOSFET Turn on |  | 1.5 |  | μs |
| Response Time after Fault |  |  |  | 200 | ns |

****Note 1**: Input signal should not be activated until 20 ms after power is applied to allow on board DC-DC converter to stabilize.**

****Note 2**: Actual maximum switching speed is a function of gate capacitance.**

****Note 3**: SiC MOSFET dependant, conditions listed above assume CAS300M12BM2**

****Note 4**: Fault lines are open collector and require a pull-up resistor, 2KΩ recommended**

**\* Software configurable parameter**

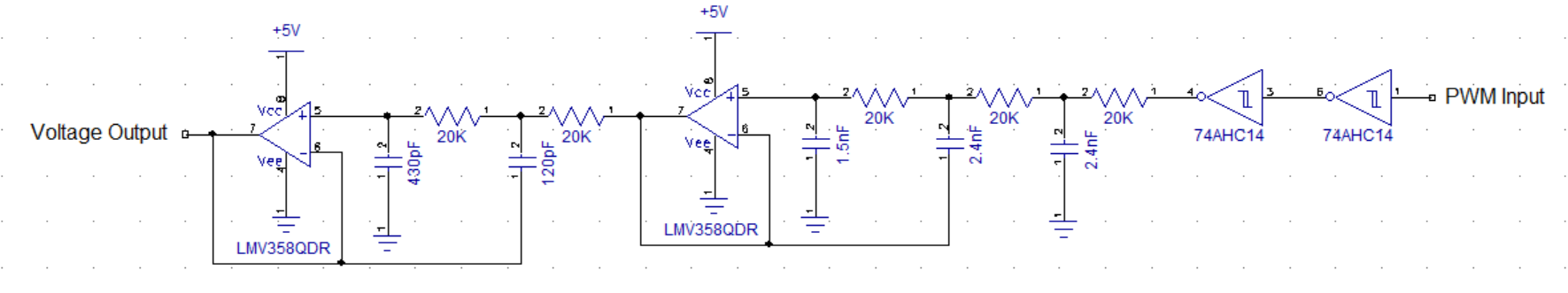
****Temperature and High Voltage PWM Monitoring:** The AgileSwitch 62EM1 Driver provides two 31.5 kHz, 5.0V PWM output signals that monitor the thermistor temperature (non-isolated) and the DC Link Voltage(isolated) (High Side drain to Low Side source) of the SiC MOSFET power module. The PWM signals have an output impedance of 510Ω. When combined with an external low pass filter, these signals represent a real time, isolated voltage for both High Voltage and Thermistor Temperature. A Sallen-Key active low pass filter can be used with these outputs as shown below with a 2 kHz cut-off frequency. The cut-off frequency can be optimized for your application. For simplicity, a simple RC low pass filter with 100 Hz cut-off frequency can also be used.**

Figure 2: Example of external 2 kHz low pass filter

### Interconnects

## Controller/Power to Driver Connectors

|  |  |  |  |
| --- | --- | --- | --- |
| **Connector** | **Type** | **Ref** | **Manufacturer Part Number** |
| Driver Board | 20 Pin | J1 | FCI 71918-220LF |
| Cable Assembly | 20 Pin |  | FCI 71600-120LF |

**Recommended Cable for High Noise Environments: Flat Ribbon Cable, Twisted Pair, Shielded (**[3M 1785/20 Series](http://multimedia.3m.com/mws/media/22246O/3mtm-shielded-jacketed-flat-cable-1785-series-ts0308.pdf)**)**

## Master to Slave Driver Connectors (Optional – Please specify if required, otherwise not populated)

|  |  |  |  |
| --- | --- | --- | --- |
| **Connector** | **Type** | **Ref** | **Manufacturer Part Number** |
| Driver Board | 5 Pin | J6 | JST B05B-PASK-1 |
| Cable Assembly | 5 Pin |  | JST PAP-05V-S |
| Driver Board | 4 Pin | J7 | JST B04B-PASK-1 |
| Cable Assembly | 4 Pin |  | JST PAP-04V-S |

**Thermistor Connector**

|  |  |  |  |
| --- | --- | --- | --- |
| **Connector** | **Type** | **Ref** | **Manufacturer Part Number** |
| Driver Board | 2 Pin | J5 | JST B02B-PASK-1 |
| Cable Assembly | 2 Pin |  | JST PAP-02V-S |

**Standard part is a vertical 2 pin header. Right-angle 2 pin header available upon request (P/N: JST S02B-PASK-2)**

**MOSFET Terminals**

|  |  |  |
| --- | --- | --- |
| **Ref ID** | **Type** | **Manufacturer Part Number** |
| G1, G2, S2, S1D2 | 2.8mm Quick Fit | Keystone 3534 |
| D1\* | 4.8mm Quick Fit | Keystone 1285-ST |

**\*Recommended Mate for D1 –** [Keystone 8291](http://keyelco.com/product.cfm/product_id/1165) **(Female Fully Insulated Quick Fit Terminal)**

**\*D1 Quick Fit terminal on gate driver must be connected to the D1 terminal on the SiC MOSFET module.**

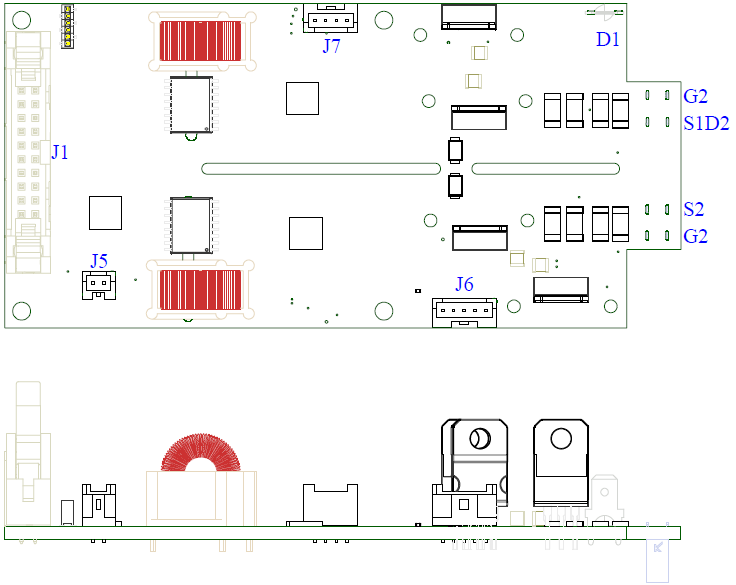


Figure 3: Interconnect Locations on PCB

**Pinout – Controller/Power to Driver Connection**

20 PIN – J1

|  |  |  |  |
| --- | --- | --- | --- |
| **Pin No** | **Signal** | **Pin No** | **Signal** |
| 1 | VCC – +15V Supply Voltage | 2 | GND |
| 3 | VCC – +15V Supply Voltage | 4 | GND |
| 5 | VCC – +15V Supply Voltage | 6 | GND |
| 7 | VCC – +15V Supply Voltage | 8 | GND |
| 9 | HI-F – HI-Fault | 10 | GND |
| 11 | HI-D (+) HI Drive In (+) | 12 | HI-D (-) HI Drive In (-) or GND |
| 13 | LO-F - LO Fault | 14 | GND |
| 15 | LO-D (+) LO Drive In (+) | 16 | LO-D (-) LO Drive In (-) or GND |
| 17 | AL-F – All Faults (Low when HI-F or LO-F) | 18 | HV-P – Isolated High Voltage Monitoring |
| 19 | F-RS – Fault Reset (Auto Reset Optional) | 20 | TE-P – Temperature Monitoring |

**Recommended Interface Circuitry**

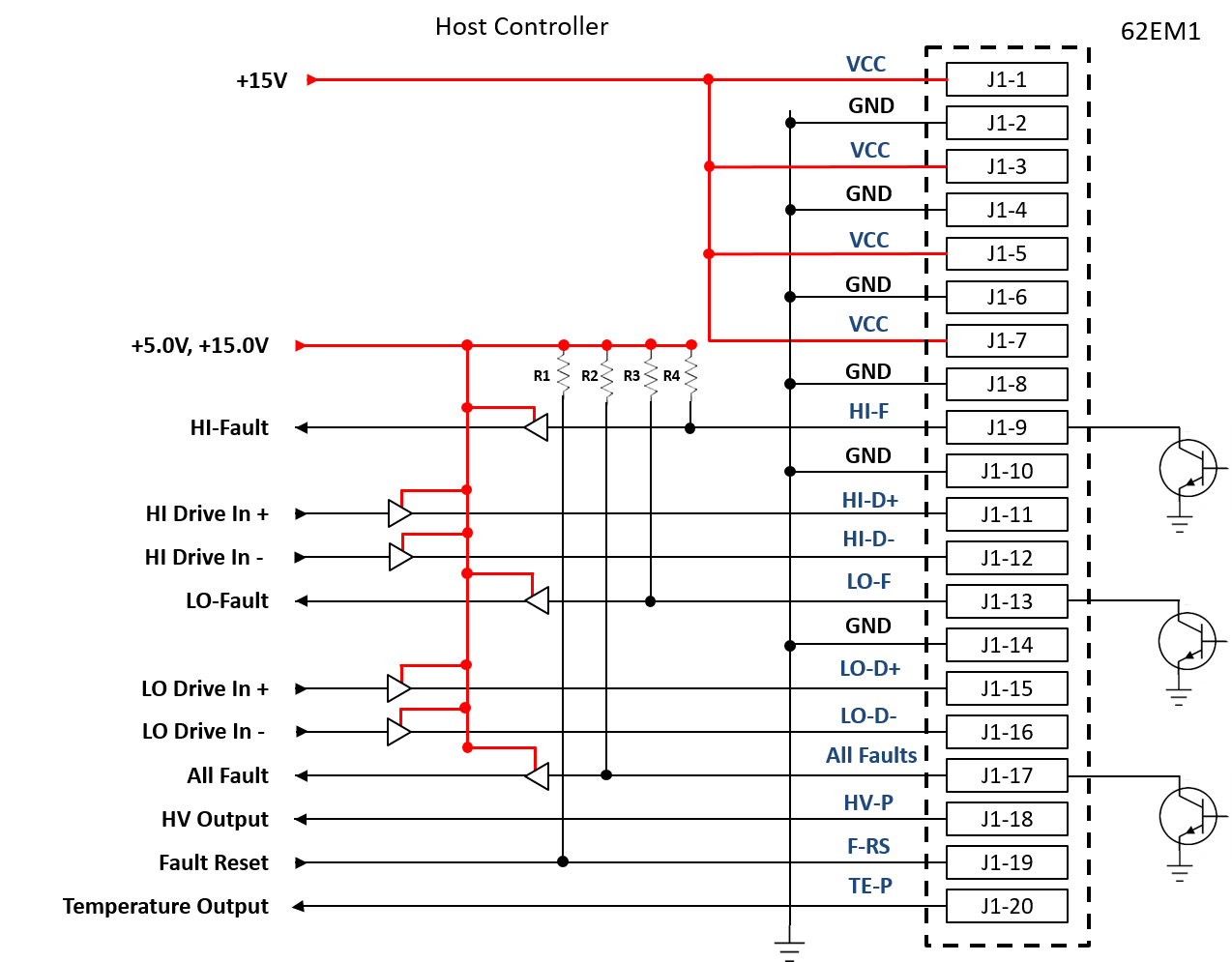


Figure 3: 20 pin pinout diagram for 62EM1-62mm Electrical Gate Driver

## Pinout – Master to Slave Driver Connectors

4 PIN – J7

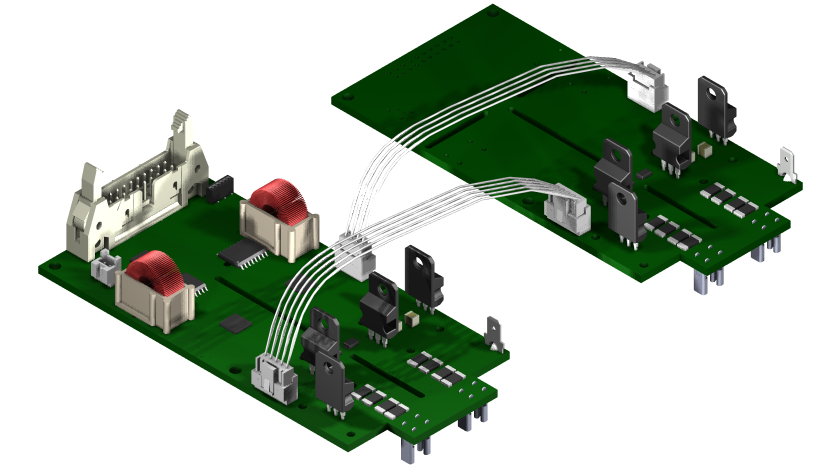
|  |  |
| --- | --- |
| **Pin No** | **Signal** |
| 1 | Positive Supply Voltage\* |
| 2 | HI Drive In |
| 3 | Negative Supply Voltage\* |
| 4 | GND |

5 PIN – J6

|  |  |
| --- | --- |
| **Pin No** | **Signal** |
| 1 | Positive Supply Voltage\* |
| 2 | LO Drive In |
| 3 | Negative Supply Voltage\* |
| 4 | GND |
| 5 | NC – No Connect |

\*Positive and Negative Supply Voltages provided by Master Gate Driver to the Slave Gate Driver

Figure 5: Typical Master-Slave Setup



Master

Slave

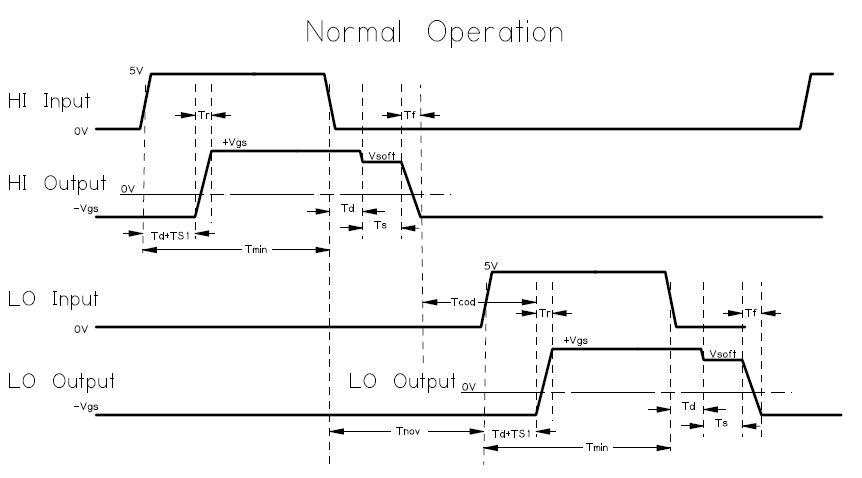
## Buffer Schematic for Single Ended Inputs on 62EM1

Figure 6: Input buffers on 62EM1; schematics for 5V and 15V logic

## Buffer Schematic for Differential Inputs on 62EM1

Figure 7: Input buffer schematic - differential input

# Timing Diagrams

*Figure 8: Signal input and output timing diagram.*

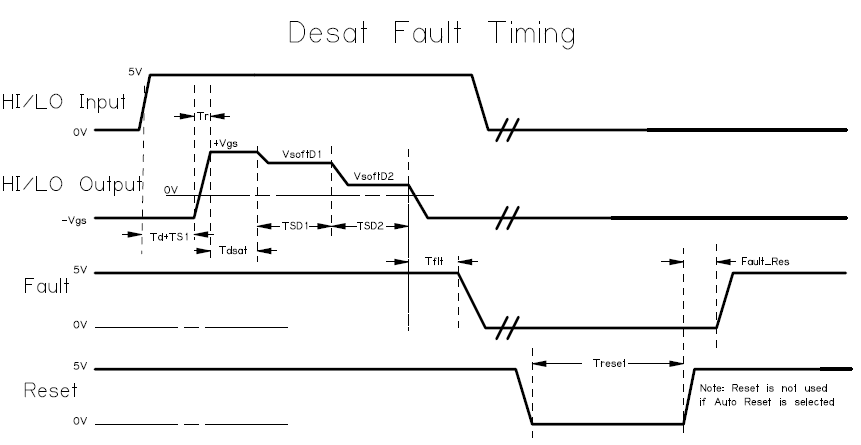


Figure 9: Signal desaturation and fault timing diagram.

## Timing Diagram Values

Conditions: VSUP = +15.0 V, VIN\_LOGIC = 15V or 5V, MOSFET = CAS300M12B2, Temp = 0 ºC to 85 ºC

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Description** | **Symbol** | **Min** | **Typ** | **Max** | **Unit** | **Notes** |
| Minimum Pulse Width | TMIN | 1000 |  |  | ns |  |
| Delay Time | TD |  |  | 250 | ns |  |
| De-Glitch Time |  |  | 200 |  | ns | Input signal de-glitch time |
| Rise Time | TR |  | 80 |  | ns | Measured from 10% to 90% points on edge Measurement Point 1 – Fig. 10 |
| Fall Time | TF |  | 90 |  | ns | Measured from 10% to 90% points on edge Measurement Point 2 – Fig. 10 |
| 2-Level Turn-Off Time | TS1 |  | 360 |  | ns | Software configurable |
| 2-Level Turn-Off Voltage | Vsoft |  | 1.5 |  | V | Software configurable |
| Desaturation Time | TDSAT | 1400 | 1500 | 1600 | ns | Software configurable |
| 1st DSAT V | Vsoft D1 |  | 9 |  | V | Multi-Level Turn-Off – First DSAT Step |
| First DSAT Time\* | TSD1 |  | 400 |  | ns | First DSAT 2-level turn-off time |
| 2nd DSAT V | Vsoft D2 |  | 5 |  | V | Multi-Level Turn-Off – Second DSAT Step |
| Second DSAT Time\* | TSD2 |  | 200 |  | ns | Second DSAT 2-level turn-off time |
| Fault Time Delay | TFLT |  | 5000 |  | ns |  |
| Fault Reset | Fault\_Res |  | 1000 |  | ns |  |
| Fault Response Time | TRESP |  | 200 |  | ns |  |
| Dead Time - Input | TNOV |  | 1000 |  | ns | Recommended Minimum Time between Inputs |
| Dead Time – Driver | Tcod | 1000 |  |  | ns | Minimum Time between drive signals allowed by driver, software configurable |
| Reset Timing | Treset | 1000 |  |  | ns | Minimum Reset Time |
| Automatic Reset (Optional) |  |  | 5 |  | ms | Standard setting of 5 ms |
| Master-Slave Timing Skew |  |  |  | 10 | ns | Timing difference between Master and Slave |

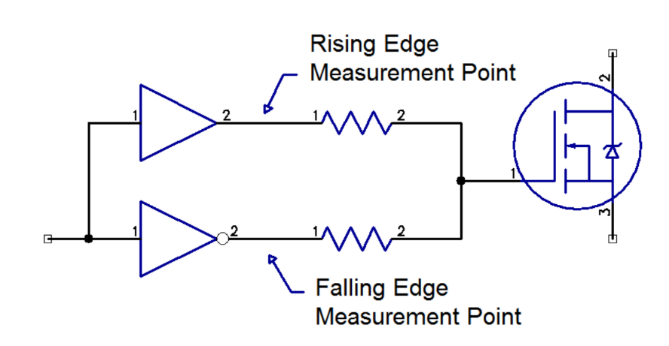
\*[Note 3](#_Electrical_Characteristics)

Figure 10: Measurement points for rise and fall time.

## Temperature Monitor

The following table describes the correlation between the Thermistor Temperature and Temperature Monitor PWM Output with 2kHz 4 pole filter. This is based on an NTC thermistor that measures 5kΩ @ 25°C. Recommended Thermistor P/N: USUR1000-502G.

|  |  |
| --- | --- |
| **Output Voltage [V]** | **Temperature [°C]** |
| 0.8 | -3 |
| 1.6 | 25 |
| 2.2 | 41 |
| 2.8 | 57 |
| 3.1 | 67 |
| 3.3 | 74 |
| 3.4 | 80 |
| 3.7 | 94 |
| 4.0 | 108 |
| 4.1 | 122 |
| 4.3 | 138 |
| 4.4 | 154 |

## DC Link Voltage Monitor – 1200V

The DC Link (HI Side drain to LO Side source) Monitor Output Voltage is 1% accurate from 25V to 975V. The PWM output is the ratio of the DC Link Voltage / 1000V. For example, a 500V DC Link Voltage, the PWM output will be 50%. The linear equation for the Voltage Monitor PWM Output with a 2 kHz 4 pole filter is:

## DC Link Voltage Monitor – 1700V

The DC Link (HI Side drain to LO Side source) Monitor Output Voltage is 1% accurate from 50V to 1650V. The PWM output is the ratio of the DC Link Voltage / 1700V. For example, an 825V DC Link Voltage, the PWM output will be 50%. The linear equation for the Voltage Monitor PWM Output with a 2 kHz 4 pole filter is:

# Generic Sample Factory Settings

AgileSwitch drivers are designed to provide safe, secure and efficient operation of the SiC MOSFET power module, as well as to provide unparalleled information on the condition of the overall system.

Generic samples are set at the factory to perform certain actions (e.g. turn off the HI side or LO side of the SiC MOSFET) and to report that a fault occurred based on performance parameters that occur outside of default ranges.

The tables below show the generic configuration.

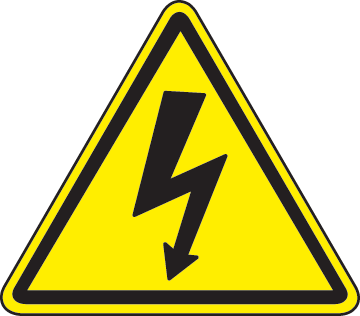
## Performance & Interconnect Settings

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Generic Factory Setting** | **Value** | **Unit** |
| Rgon (Turn-on Gate Resistance) | Populated | 1.1 | Ω |
| Rgoff (Turn-off Gate Resistance) | Populated | 1.1 | Ω |
| Desaturation Time | Enabled | 1.5 | µs |
| Dead Time | Enabled | 1 | µs |
| Fault Reset | Auto | 5 | ms |
| DC Link Voltage Fault | Enabled | 900 | V |
| Temperature Fault | Enabled | 125 | °C |
| UVLO Primary | Enabled | 13.2 | V |
| OVLO Primary | Enabled | 16.5 | V |
| J1 (20 pin Control/Power Header) | Populated | | |
| J5 (2 pin Thermistor Header) | Populated | | |
| J6 (5 pin Master/Slave Header) | Not Populated | | |
| J7 (4 pin Master/Slave Header) | Not Populated | | |

## Fault and Monitoring Conditions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fault Condition/Action** | **Generic Sample Default Trigger Values** | **Action on IGBT if Active (Default Setting)** | **HI Fault** | **LO Fault** | **All Faults** |
| NO FAULTS |  |  | HIGH | HIGH | HIGH |
| UVLO – HI | See Electrical Characteristics | Turn Off HI & LO Side | LOW | HIGH | HIGH |
| UVLO – LO | See Electrical Characteristics | Turn Off HI &LO Side | HIGH | LOW | HIGH |
| OVLO | See Electrical Characteristics | Turn Off HI & LO Side | HIGH | HIGH | LOW |
| Desat – HI | See Electrical Characteristics | Turn Off HI & LO Side | LOW | HIGH | LOW |
| Desat – LO | See Electrical Characteristics | Turn Off HI & LO Side | HIGH | LOW | LOW |
| Temperature Fault | 125 °C Thermistor Monitor | No Action | LOW | LOW | HIGH |
| DC Link Voltage Fault | DC Link Voltage above or below setting | Turn Off HI & LO Side | LOW | LOW | LOW |

# Important Precautions

**Caution: Handling devices with high voltages involves risk to life. It is imperative to comply with all respective precautions and safety regulations.**

**When installing the ribbon cable, please make sure that power is turned off. Multi-signal values are sent along this ribbon cable, thus hot swapping may cause damage to the IC components on the board.**

**AgileSwitch assumes that the gate drive board has been mounted on the SiC MOSFET prior to start-up testing. It is recommended that the user checks that the SiC MOSFET power modules are operating inside the Specified Operating Area (SOA) as specified by the module manufacturer including short circuit testing under very low load conditions.**

# Recommended Start-Up Testing

1. Connect the driver through the 20 pin control header to your drive electronics and supply the driver with +15V.
2. Send the fault reset pin, pin 19, a low signal. Return pin 19 to a high condition. (If the driver is configured for Auto Reset, you may ignore this step.)
3. Check the gate voltage:
4. For the off-state, the nominal gate voltage should be -6V to -4V. (Note 3)
5. For the on state, it is +17 to +21V. (Note 3)
6. Check that the supply current of the driver is within spec with inactive trigger signals and then at the desired switching frequency.
7. The system is now ready for application testing under load conditions.
8. Check thermal conditions to verify that the system is operating within specified temperature range.
9. Do NOT apply High Voltage to the SiC Module without first applying power to the GDB.

**Mechanical Dimensions**

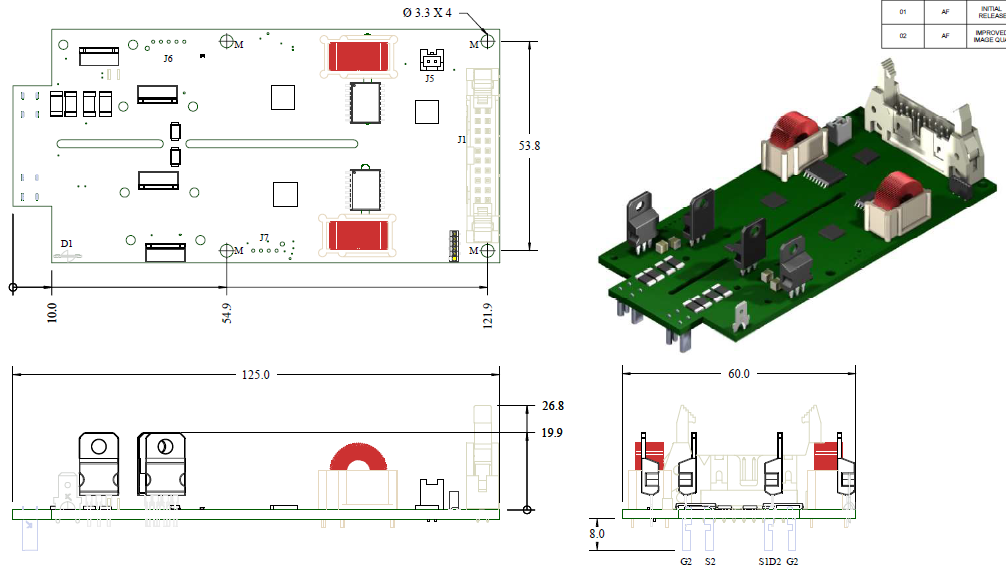


Figure 11: Dimensions of the 62EM1-62mm Electrical Gate Driver (+/- 0.1mm)

Dimensions are in mm.

Download the full drawing and model for additional details. Not all components are shown.

[62EM1 Drawing](http://nebula.wsimg.com/455223ddc45e8c766f4e8e1fd72e7c90?AccessKeyId=BC0B1B276D0949F895F5&disposition=0&alloworigin=1)

[62EM1 .STEP Model](https://www.dropbox.com/s/vkq5b1dm34ntwbo/62EM1-V04.STEP?dl=0)

# Revisions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Prepared By** | **Approved By** | **Version** | **Date** | **Description** |
| N. Satheesh  A. Fender | A. Charpentier | 01 | 10/14/2016 | Preliminary Release |
| N. Satheesh |  | 02 | 10/24/2016 | Added Patent Number |
| A. Fender |  | 03 | 1/16/2017 | Updated characteristics, mechanical drawing |
| A. Fender |  | 04 | 5/22/2017 | Updated mechanical drawing |
| A. Fender | N. Satheesh | 05 | 6/16/2017 | Added part number info. for thermistor connector, de-glitch time |
| N. Satheesh | A. Fender | 06 | 10/9/2017 | Beta Release to reflect lifetime & power testing |

# Legal Disclaimer

Information in this document is provided solely in connection with AGILESWITCH products. AGILESWITCH, LLC and its subsidiaries (“AGILESWITCH”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All AGILESWITCH products are sold pursuant to AGILESWITCH’s [terms and conditions of sale](http://dl.dropbox.com/u/18470390/AgileSwitch%20Terms%20and%20Conditions%20of%20Sale.pdf).

Purchasers are solely responsible for the choice, selection and use of AGILESWITCH products and services described herein, and AGILESWITCH assumes no liability whatsoever relating to the choice, selection or use of the AGILESWITCH products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by AGILESWITCH for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN AGILESWITCH’S TERMS AND CONDITIONS OF SALE AGILESWITCH DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF AGILESWITCH PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED AGILESWITCH REPRESENTATIVE, AGILESWITCH PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE.

AGILESWITCH PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of AGILESWITCH products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by AGILESWITCH for the AGILESWITCH product or service described herein and shall not create or extend in any manner whatsoever, any liability of AGILESWITCH.

AGILESWITCH, the AGILESWITCH logo, AgileStack, AgileStack Communications and Stack Black Box are trademarks or registered trademarks of AGILESWITCH, LLC in various countries. Any other names are the property of their respective owners.

EconoDual and PrimePACK are trademarks of Infineon Technologies AG.

Information in this document supersedes and replaces all information previously supplied.  
Specifications are subject to change without notice.

© 2010-2017 AGILESWITCH LLC - All rights reserved [www.AgileSwitch.com](http://www.AgileSwitch.com).

# Patent Notices

|  |  |
| --- | --- |
| Offering | Issued U.S. Patent Numbers |
| AgileStackTM Power Stack | 8,984,197 |
| Gate Drivers for WBG Power Semiconductors | 9,490,798 |
| Additional Patents Pending | |

# Manufacturer

AgileSwitch, LLC Tel: +1-484-483-3256 (US)

2002 Ludlow Street #4 +44 (0)1273 252994 (Europe)

Philadelphia, PA 19103

United States Email: info@AgileSwitch.com

Web: [www.AgileSwitch.com](http://www.AgileSwitch.com)