2SI0400T2A3C-33
SCALE-iFlex™ Driver Family

Isolated Master Control Gate Driver for Half-Bridge Power Modules in high voltage package up to 3300 V
Electrical Interface

Product Highlights

Highly Integrated, Compact Footprint

- Dual channel gate driver
- Optimized to be used with up to 4 Module Adapted Gate Driver 2SM0120D2xxC
- Electrical interface
- Flexible input supply voltage with 15 V_{DC} or wide-range input with 23.5 V_{DC} to 49.0 V_{DC}
- Up to 6 W output power per channel at maximum ambient temperature
- -40 °C to 85 °C operating ambient temperature

Protection / Safety Features

- Short-circuit protection with Advanced Soft Shut Down (ASSD)
- Undervoltage lock-out (UVLO) protection for primary-side (low-voltage) and secondary-side (high-voltage)
- NTC temperature sensing with reinforced isolated digital output signal (PWM-coded signal)
- DC-link voltage measurement with reinforced isolated digital output signal (PWM-coded signal)
- Applied double sided conformal coating

Comprehensive Safety and Regulatory Compliance

- 100% production test for partial discharge and HIPOT test of transformer
- Creepage and clearance distances between primary and secondary sides meets IEC 61800-5-1 and EN 50124-1 reinforced isolation requirements
- RoHS compliant

Applications

- Wind and photovoltaic power
- Traction inverter
- Industrial drives
- Other industrial applications

Description

The SCALE-iFlex™ gate driver family consists of an Isolated Master Control (IMC) unit that supports Module Adapted Gate Drivers (MAGs) together with a cable set. The IMC is designed to operate with power modules that have a rated blocking voltage of up to 3300 V. The MAGs come in different formats, that match individual power modules from different suppliers.

The 2SI0400T2A3C-33 driver supports 2SM0120D2A1C, 2SM0120D2C1C and 2SM0120D2D1C MAGs which are respectively designed for LinPak/nHPD2, XHP™2/LV100 and XHP™3 modules packages.

SCALE-iFlex enables easy paralleling of up to 4 power modules providing high flexibility and system scalability.

Figure 1. Product Picture

This Product is Covered by Patents and/or Pending Patent Applications.

Pin Functional Description

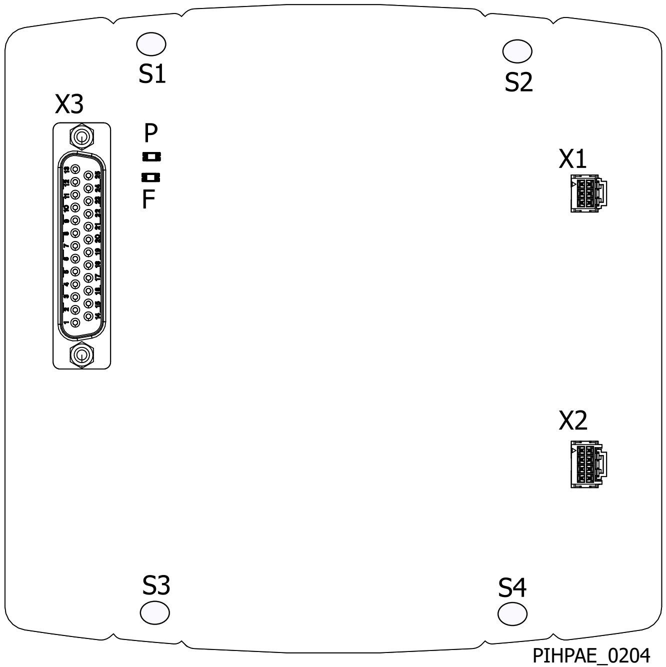

Figure 2. Pin Configuration.

Connector X1

IMC to MAG AMPHENOL FCI connector for gate driver channel 1. Part number: 10075025-G02-06ALF.

Connector X2

IMC to MAG AMPHENOL FCI connector for gate driver channel 2.

Part number: 10075025-G02-08ALF.

Connector X3

Deltron D-sub connector from IMC to superior controller.

Part number: DTS25PY/2M86UNB6.

GND (Pins 1 - 13)
These pins are the connection for the primary-side ground potential. All primary-side signals refer to these pins.

VCC (Pin 14, Pin 15)
These pins are the primary-side supply voltage connection for the wide range supply. Either VCC or V15 has to be used for supplying the SCALE-iFlex gate driver.

V15 (Pin 16, Pin 17)
These pins are the primary-side supply voltage connection for supply voltage levels of 15V. Either VCC or V15 has to be used for supplying the SCALE-iFlex gate driver.

V15 Sense (Pin 18)
This pin can be used to sense V15 to adjust it to the right value (4-wire measurement) if V15 is used to supply the gate driver. If not used, it can be connected to Pins 16 and 17.

GND Sense (Pin 19)
This pin can be used to sense GND to adjust V15 to the right value (4-wire measurement) if V15 is used to supply the gate driver. If not used, it can be connected to Pins 1 to 13.

IN1 (Pin 22)
This pin is the command input for channel 1 (high-side switch).

SO1 (Pin 23)
This pin is the status output for channel 1 (high-side switch).

IN2 (Pin 20)
This pin is the command input for channel 2 (low-side switch).

SO2 (Pin 21)
This pin is the status output for channel 2 (low-side switch).

DLK (Pin 25)
This is measurement output for the DC-link voltage.

TPM (Pin 24)
This is the measurement output for the NTC temperature sensing.

Terminals S1 to S4

Dome positions for mechanical fixation of the IMC.

LED

P

White optical indicator for monitoring the supply voltage V_{V15}. During absence of V_{V15}, the indicator is OFF.

F

Red optical indicator for monitoring the short-circuit and UVLO detection. Refer to the "LED Monitoring" section for more details.

Functional Description

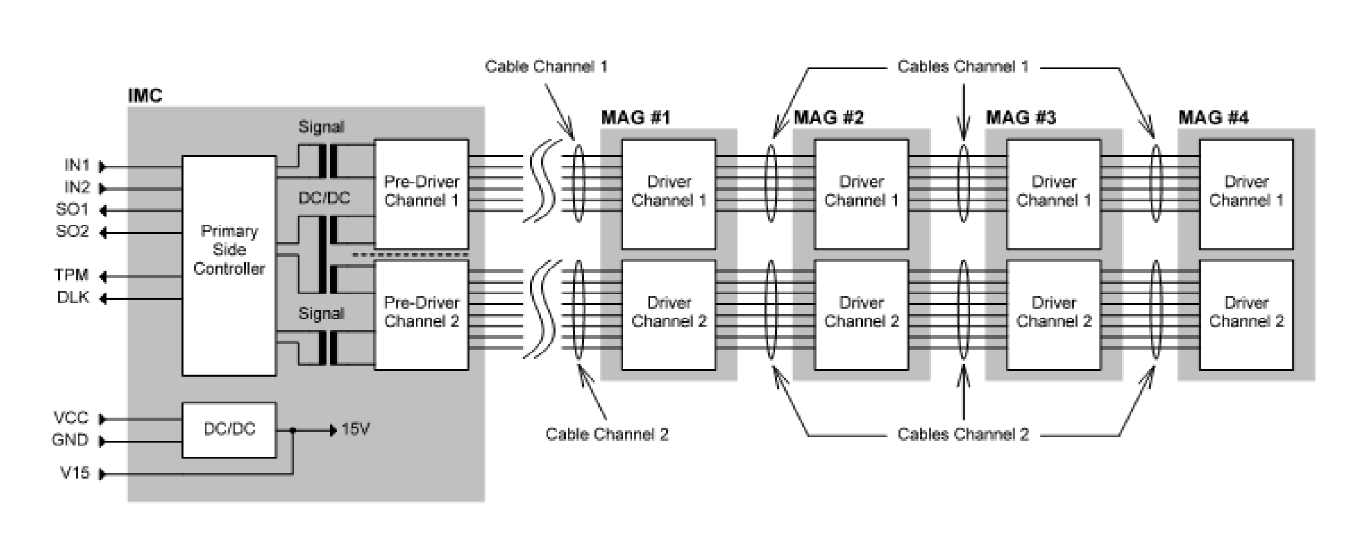

Figure 3. Functional Block Diagram.

The SCALE-iFlex is a dual channel gate driver, which consists of three parts according to Figure 3:

- Isolated Master Control (IMC)
- Module Adapted Gate Drivers (MAG)
- Cable set without ferrite beads (IMC connection to the first MAG)
- Cable set with ferrite beads (connection from MAG to MAG)

The IMC 2SI0400T2A3C-33 is independent of the actual target power module voltage class. It operates with various power modules up to a blocking voltage of 3300 V and provides reinforced isolation between primary and either secondary sides as well as basic isolation between both secondary sides.

In contrast, the MAGs 2SM0120D2A1C, 2SM0120D2C1C and 2SM0120D2D1C are particularly designed to operate with specific power modules. Their characteristics match the requirements of the individual power modules. For more details, refer to the related datasheet.

The interconnection between the external system controller and the IMC, from the IMC to the first MAG as well as between the MAGs is established with cables to allow a large degree of mechanical flexibility for the positioning of the devices.

The SCALE-iFlex gate driver provides the highest flexibility and is able to operate single or up to four power modules in parallel depending on actual application conditions and selected MAGs.

The operation of channel 1 and channel 2 of the gate driver is independent of each other. The insertion of dead-time, to avoid synchronous or overlapping switching of the driven power switches, has to be generated in the external system controller.

Note: Synchronous or overlapping switching of top and bottom switches within a half-bridge leg may damage or destroy the driven power switche(s) and, in conjunction as secondary failure, the attached MAG and/or IMC.

Power Supplies (Primary-Side X3)

The 2SI0400T2A3C-33 provides two independent power supply inputs. The first input VCC accepts a non-isolated wide input supply voltage range V_{VCC}, whereas the second input V15 accepts a non-isolated fix supply voltage V_{V15}.

Only one supply input is allowed to be used at any time. In case the wide input supply range terminal VCC is used, a regulated voltage of typical 15 V is present at terminal V15. It represents the internal reference voltage for all primary-side functions. Additionally, it can be used as a 15 V output. Accordingly, an external load is allowed at V15 in case the VCC terminal is used as a supply and the external load together with the gate output loads does not exceed the power rating of the IMC.

It should be mentioned that when input supply V15 is used, the VCC terminal must be left floating.

Undervoltage Monitoring

The supply voltages are closely monitored. In case of an under voltage condition (UVLO), a failure signal will be provided on the status output SO1/SO2 of the gate driver. If the UVLO is present on the primary-side supply V15, both status output signals will be set to GND and all gate driver channels will be turned off synchronously.

In case of an UVLO on the secondary-side of the IMC, the status signal of the respective channel will be set to GND and the corresponding power semiconductor(s) will be turned off.

Note: An UVLO event on a MAG will only turn off the affected MAG immediately. All other paralleled power semiconductors of the related channel are turned off after the delay $t_{OFF(MAG)}$.

Signal Inputs (Primary-Side X3)

The input logic of IN1 and IN2 is designed to work with 15 V logic levels to provide a sufficient signal/noise ratio. Both inputs have positive logic and are edge-triggered.

Gate driver signals are transferred from the IN1 and IN2 pins to the gate of the attached MAG(s) with a propagation delay of $t_{P(LH)}$ for the turn-on and $t_{P(HL)}$ for the turn-off commands.

Status Outputs (Primary-Side X3)

The status feedback signals SO1 and SO2 stay at V15 under no-fault conditions. In case of a fault, e.g. detected short-circuit of the driven power module or an under voltage lock-out (UVLO) condition on the secondary-side or any MAG, the status feedback is set to GND potential for a duration of t_{BLK}. In the case of a primary-side UVLO condition, both status feedback signals remain at GND during the UVLO and are extended by t_{BLK}. During this time, no gate signals will be transmitted to the respective gate driver channel.

IMC Output (Secondary-Side X1, X2)
The IMC provides per channel an output connector towards the first MAG. Details on recommended routing and general mounting are given in section "Mounting Instruction".

Short-Circuit Detection
In case of a detected short-circuit of the driven power module the monitored semiconductor is switched off immediately and a fault signal is transmitted to the status output SOx after a delay t_{SOx}.

The fault feedback is automatically reset after the blocking time t_{BLK}. The semiconductor is turned-on again as soon as the next turn-on command signal is applied to the respective inputs after the fault status has disappeared.

DC-Link Voltage Measurement
The DC-link voltage is measured at the first MAG, i.e. the one which is directly connected to the IMC. The measured signal is forwarded to the IMC and can be accessed at DLK. The DC-link voltage signal at terminal DLK is pulse-width modulated with a fix carrier frequency f_{DLK}. To eliminate unintended noise, a filter is implemented in the read-out circuitry. The resulting filter time is given with t_{DLK}. Additionally, a transmission delay of $t_{DLK,dly}$ applies from DC-link voltage measurement to DLK.

NTC Temperature Measurement
Each MAG senses the NTC temperature of the attached power module. This signal is forwarded to the IMC and can be accessed at TPM on X3 interface connector. If more than one MAG is used, only the signal of the highest NTC temperature is considered. The temperature signal at terminal TPM is pulse-width modulated with a fixed carrier frequency f_{TPM}. To eliminate unintended noise, a filter is implemented in the read-out circuitry. The resulting filter time is given with t_{TPM}. Additionally, a transmission delay of $t_{TPM,dly}$ applies from NTC temperature measurement to TPM.

Note: The NTC temperature does not represent the junction temperature of any of the semiconductor dies within the power module. Instead, it is a good indication of the baseplate temperature of the power module.

DLK and TPM Status Information
The DLK and TPM measurement outputs provide PWM signals with frequencies of f_{DLK} and f_{TMP} in normal operation. Additionally, they provide the following status:

- When NTC is not connected to the MAG, the TPM signal is set to V15.
- When an internal communication error occurs, both DLK and TPM signals are set to GND.
- When an error is detected during the internal self-test of the driver, the DLK output is set to V15, and the TPM output is set to GND.

Cables
SCALE-iFlex gate driver requires a set of cables to establish the electrical connection between the IMC and the first MAGs as well as between paralleled MAGs. The usage of cables allows for flexible positioning of the IMC within the application. Furthermore, it allows adapting to various pitches between paralleled power modules. For instance, forced air-cooled systems require a larger pitch than liquid-cooled systems due to the difference in heat spreading.

Several cable connections have to be established for proper system operation. These are:

- Cable from the system level controller to the primary-side IMC interface X3.
- Cables from the secondary-side IMC interface to the first MAG (one per channel).
- In case of paralleling of power modules, the cables from one MAG to another MAG (one per channel).

The cables between IMC and MAG and between MAGs are IMCCS-050-1 and MAGCS-015-1 respectively. For more details, refer to related datasheets of each cable.

It is important to note that these cables are at high voltage (secondary-side potential). The user is responsible for applying sufficient isolation to all cables.

All connections shall be assembled in non-powered status of the system. The interface cable to X3 connector is not part of the SCALE-iFlex gate driver and has to be provided by the designer of the system. It is recommended to route the cable with minimum parasitic coupling from the controller to the IMC. Parasitic coupling in particular to any potential of the secondary-side of the IMC has to be avoided. Otherwise, increased common-mode currents may circulate, which may cause interferences with the command, measurement and/or status feedback signals.

The cable from the IMC (connectors X1/X2) to the first MAG has to be isolated from surrounding potentials including the frame of the converter system. The minimum required distance to such potentials is 30 mm. A larger distance might be required depending on actual application conditions and applied isolation standards. The maximum length of the cable is 0.5 m. Beyond this length, degradation or timing variations of the command and/or status feedback signals may occur. The isolation can be established for instance with spacers or isolation sleeves.

Note: Partial discharge may occur within the cable and/or isolation sleeve depending on actual application conditions, which might lead to a degradation of the isolation. Proper routing of the cable and selection of the isolation sleeve are mandatory.

The cable connection from one MAG to another MAG should be kept as small as technically feasible. By this, typically no particular requirements concerning the isolation are given. In case the cable is in close proximity to other potentials (e.g. corresponding opposite channel, system frame), additional measures to ensure proper isolation distances have to be established. In any case, a minimum distance of 30 mm is required for such potentials. A larger distance might be required depending on actual application conditions and applied isolation standards. Using an isolation sleeve at reduced distances is not allowed due to capacitive coupling effects.

Note: Missing cable connections especially between MAGs will not lead to a failure signal at the IMC terminal X3 and will therefore not be detected by the gate driver.

Screw Terminals
The 2SI0400T2A3C-33 can be mounted within the system using screws at locations S1 to S4.

LED Monitoring
The gate driver is equipped with two LEDs as optical indicators for easy monitoring. The white LED (P) lights on when the IMC is supplied. The Red LED (F) lights on when a short circuit or UVLO is detected. Its state is latched under the following conditions:

- a short circuit is detected on one secondary side channel.
- UVLO is detected on one secondary side channel.
- UVLO is detected on the primary side.

The red LED will be OFF when a transition from turn-off to turn-on is detected on the input logic of IN1 or IN2 if all fault conditions on the driver's primary side have disappeared (both status output signals have been reset).

Absolute Maximum Ratings

Parameter	Symbol	Conditions T_A = -40 °C to 85 °C	Min	Max	Units
Absolute Maximum Ratings[1]					
Primary-Side Supply Voltage	V_{VCC}	VCC to GND	0	50.4	V
	V_{V15}	V15 to GND	0	16	V
Primary-Side Supply Current	I_{VCC}	V_{VCC} = 23.5 V		700	mA
Logic Input Voltage (Command Signal)	V_{INx}	INx to GND	0	V_{V15} + 0.5	V
Logic Output Voltage (Status Signals, DC-link and NTC Output Signals)	V_{SOx}	SOx to GND	0	V_{V15} + 0.5	V
Status Output Current[2]	I_{SOx}	SOx to GND		20	mA
Output Power Per Channel[3]	P_x			6	W
Switching Frequency	f_{SW}			25	kHz
DC-link Measurement Output Current	I_{DLK}	From or to DLK	-10	10	mA
TPM Measurement Output Current	I_{TPM}	From or to TPM	-10	10	mA
Operating Voltage Primary-Side to Secondary-Side	V_{OP}	Transient only		3300	V
		Permanently applied		2500	V
Test Voltage Primary-Side to Secondary-Side	$V_{ISO(PS)}$	50 Hz, 60 s		9100	V
Test Voltage Secondary-Side to Secondary-Side	$V_{ISO(SS)}$	50 Hz, 60 s		6700	V
Common-Mode Transient Immunity	|dv/dt|			50	kV/μs
Storage Temperature[4]	T_{ST}		-40	50	°C
Operating Ambient Temperature	T_A		-40	85	°C
Surface Temperature[5]	T			125	°C
Relative Humidity	H_R	No condensation		93	%
Altitude of Operation[6]	A_{OP}			2000	m

Recommended Operating Conditions

Parameter	Symbol	Conditions T_A = -40 °C to 85 °C	Min	Typ	Max	Units
Power Supply						
Primary-Side Supply Voltage	V_{VCC}	VCC to GND	23.5		49	V
	V_{V15}	V15 to GND	14.5	15	15.5	V

Characteristics

Parameter	Symbol	Conditions T_A = 25 °C		Min	Typ	Max	Units
Power Supply							
Supply Current	I_{VCC}	V_{VCC} = 36 V, I_{VISO1} = 6 mA, I_{VISO2} = 20 mA			68		mA
		V_{VCC} = 36 V, I_{VISO1} = 203 mA, I_{VISO2} = 250 mA			344		mA
	I_{V15}	V_{V15} = 15 V, I_{VISO1} = 6 mA, I_{VISO2} = 20 mA			129		mA
		V_{V15} = 15 V, I_{VISO1} = 203 mA, I_{VISO2} = 250 mA			774		mA
Power Supply Monitoring Threshold (Secondary-Side)	$UVLO_{VISO}$	Referenced to respective terminal E1 or E2[7]	Clear fault (resume operation)	11.6	12.6	13.6	V
			Set fault (suspend operation)	11.0	12.0	13.0	
			Hysteresis	0.35			
	$UVLO_{COM}$		Clear fault (resume operation)		-5.15		V
			Set fault (suspend operation)		-4.85		
			Hysteresis		0.3		
Output Voltage (Secondary-Side)	V_{VISO}	V_{VCC} = 36 V, I_{VISO1} = 6 mA, I_{VISO2} = 20 mA			24.6		V
		V_{VCC} = 36 V, I_{VISO1} = 203 mA, I_{VISO2} = 250 mA			23.8		
Coupling Capacitance	C_{IO}	Primary-side to secondary-side	Channel 1 (high-side)		18		pF
			Channel 2 (low-side)		14		
Logic Inputs and Status Outputs							
Input Impedance	R_{INx}				4.5		kΩ
Turn-On Threshold	$V_{TH-ON(INx)}$	INx to GND			10.2		V
Turn-Off Threshold	$V_{TH-OFF(INx)}$	INx to GND			6.5		V
Turn-On Pulse Suppression[8]	$V_{PULSE(ON)(INx)}$	INx to GND			130		ns
Turn-Off Pulse Suppression[8]	$V_{PULSE(OFF)(INx)}$	INx to GND			85		ns
SOx Pull-Up Resistor to V15	R_{SOx}	On-board			4.7		kΩ
Status Output Voltage	V_{SOx}	Fault condition, SOAx current ≤ 5mA				0.2	V

NOTES:
1. Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device.
2. The status output current must be limited by external pull-up resistors located on the host board.
3. Actually achievable maximum power depends on several parameters and may be lower than the given value. It has to be validated in the final system. It is mainly limited by the maximum allowed surface temperature.
4. The storage temperature inside the original package or in case the coating material of coated products may touch external parts must be limited to the given value. Otherwise, it is limited to 85°C.
5. The component surface temperature, which may strongly vary depending on the actual operating conditions, must be limited to the given value to ensure long-term reliability of the product.
6. Operation above this level requires a voltage derating to ensure long-term reliability of the product.
7. Local emitter terminals are not routed outside of the IMC.
8. Pulse width shorter than the given values are suppressed (not processed up to the gate-emitter terminals).

Characteristics (Cont.)

Parameter	Symbol	Conditions T_A = 25 °C	Min	Typ	Max	Units
Timing Characteristics						
Turn-On Delay	$t_{P(LH)}$	$V_{TH(ON)(INx)}$ to 50% of $V_{GE(ON)}$, no-load attached (from IMC input to MAG output)		280		ns
Turn-Off Delay	$t_{P(HL)}$	$V_{TH(OFF)(INx)}$ to 50% of $V_{GE(OFF)}$, no-load attached (from IMC input to MAG output)		190		ns
Turn-Off Delay After MAG Fault	$t_{OFF(MAG)}$	Delay from any MAG fault detection until turn-off of all other MAGs		11.5		µs
Transmission Delay of Fault State	t_{SOX}	From MAG short-circuit detection to SOx		6.3		µs
Blocking Time	t_{BLK}	After secondary-side fault detection		18		ms
DC-Link Measurement						
DC-Link Carrier Frequency	f_{DLK}			10		kHz
DC-Link Duty Cycle	DUT_{DLK}	$V_{DC\text{-}Link}$ = 0 V	5			%
		$V_{DC\text{-}Link}$ ≥ 2903 V (3300 V MAG) $V_{DC\text{-}Link}$ ≥ 1567 V (1700 V MAG)			95	
DC-Link Filter Time	t_{DLK}	Time to reach 95% of measured value, including MAGs, excluding pure transmission delay		1.4		ms
DC-Link Transmission Delay	$t_{DLK,dly}$	Pure transmission delay		2		ms
DC-Link Refresh Rate	S_{DLK}			980		Hz
DC-Link Measurement Tolerance		At full range		2		%
DC-Link Transmission Characteristics		5 % ≤ DUT_{DLK} ≤ 95 % (3300 V MAG)	$V_{DC\text{-}Link}$ = ((32.26 V) / %) · (DUT_{DLK} - 5%)			
		5 % ≤ DUT_{DLK} ≤ 95 % (1700 V MAG)	$V_{DC\text{-}Link}$ = ((17.41 V) / %) · (DUT_{DLK} - 5%)			
TPM Measurement						
TPM Carrier Frequency	f_{TPM}			10		kHz
TPM Duty Cycle	DUT_{TPM}	T_{TPM} ≤ 20 °C	5			%
		T_{TPM} ≥ 130 °C			95	
TPM Filter Time	t_{TPM}	Time to reach 95% of measured value, including MAGs, excluding pure transmission delay		15		ms
TPM Transmission Delay	$t_{TPM,dly}$	Pure transmission delay		20		ms
TPM Refresh Rate	S_{TPM}			98		Hz
TPM Measurement Tolerance		At 25°C, excluding TPM tolerance		3		K
Transmission characteristics		5 % ≤ DUT_{TPM} ≤ 95 %	T_{TPM} = ((1.222 °C) / %) · (DUT_{TMP} - 5%) + 20°C			

Characteristics (Cont.)

Parameter	Symbol	Conditions T_A = 25 °C	Min	Typ	Max	Units
Electrical Isolation						
Test Voltage[9]	$V_{ISO(PS)}$	Primary-side to secondary-side	9100			V_{RMS}
	$V_{ISO(SS)}$	Secondary-side to secondary-side	6700			V_{RMS}
Partial Discharge Extinction Voltage[10]	$P_{D(PS)}$	Primary-side to secondary-side	4125			V_{PK}
	$P_{D(SS)}$	Secondary-side to secondary-side	3670			V_{PK}
Creepage Distance	$CPG_{P-S(PCB)}$	Primary-side to secondary-side	50			mm
	$CPG_{S-S(PCB)}$	Secondary-side to secondary-side	25			mm
Clearance Distance	CLR_{P-S}	Primary-side to secondary-side	23.8			mm
	CLR_{S-S}	Secondary-side to secondary-side	14			mm
Mounting						
Mounting Holes	D_{HOLE}	Diameter of screw hole S1 – S4		4.3		mm
Bending	I_{BEND}	According to IPC			0.75	%

Mounting Instruction

The IMC can be mounted at a suitable location within the target application using the four screw holes S1 to S4. It is recommended to place the IMC out of any hot-spot area (e.g. heat sinks). Cable lengths between IMC and MAG of up to 0.5 m allow a high level of design freedom.

To avoid mechanical stress on the IMC during and after the mounting process, any bending or warping force imposed on the IMC must not lead to vaulting or twisting of the housing of 0.75 % per axis.

NOTES:
9. The transformer of every production sample has undergone 100% testing at the given value for 1s.
10. Partial discharge measurement is performed on each transformer.

Reliability and EMC Qualifications Items

Test Item	Test Methods and Conditions
Environmental Tests[11]	
Dry heat	IEC 60068-2-2, 85 °C, 240 h, DUT operated
Cold	IEC 60068-2-1, -40 °C, 96 h, DUT operated
Thermal cycling	IEC 60068-2-14, -40 °C and 85 °C, ramp: 5 °C/min, dwell: 30 min, DUT operated, 10 cycles
Endurance Tests[11]	
High temperature operating lifetime	IEC 60068-2-2, 85 °C, test duration 1000 h, DUT operated
Damp heat	IEC 60068-2-78, 85 °C / 85% R.H., 56d, DUT operated
Thermal cycling	IEC 60068-2-14, -40 °C, 125 °C (5 K/min, 100 cycles, DUT unpowered)
EMC Tests	
Burst immunity	IEC 61000-4-4, 5 kHz, ± 4 kV (60s), 15 ms per package, 300 ms per period
Conducted noise immunity	IEC 61000-4-6, frequency range 0.15 – 80 MHz and 27 – 68 MHz, log 1%, 80% AM (1 kHz), 20 V
Radiated noise immunity	IEC 61000-4-3, 80 - 6000 MHz, log 1%; 10V/m (2 s), vertical and horizontal
Radiated disturbances	EN 55016-2-1, frequency range 0.15 - 0.5 MHz, limit 99 dBμV QP and 0.5 - 30 MHz, limit 93 dBμV QP
Magnetic field immunity	IEC 61000-4-8, 1000 A/m (3 s), 3 axis
	IEC 61000-4-8, 100 A/m (60 s), 3 axis
	IEC 61000-4-9, 1000 A/m, (5 pulses), 3 axis
	IEC 61000-4-10, 100 kHz , 100 A/m (60s), 40/s
	IEC 61000-4-10, 1 MHz , 100 A/m (60s), 400/s
	IEC 61000-4-18, 100 kHz (60s), 40/s, 1 kV line to line, 2 kV lines to ground
	IEC 61000-4-18, 1 MHz (60s), 40/s, 1 kV line to line, 2 kV lines to ground
Mechanical Tests[11]	
Mechanical vibrations (sinusoidal)	IEC 60068-2-6, frequency range 200 - 500 Hz (± 3.3 mm displacement, 15 m/s², 10 sweep cycles), according to EN 60721-3-5, Cat. 5M2
Mechanical shock	IEC 60068-2-27, acceleration 300m/s², half sine, 3 axis, ±100 shocks per axis, according to EN 60721-3-5, Cat. 5M2
	IEC 61373, Class 1B, acceleration 30 m/s², duration 30 ms, vertical and transversal, half sine, ±100 shocks per axis
	IEC 61373, Class 1B, acceleration 50 m/s², duration 30 ms, longitudinal, half sine, ±100 shocks per axis
Mechanical vibration (random)	IEC 61373, Class 1B, 5 Hz - 150 Hz, 1 h, 3 axis
Mechanical vibrations (long-life)	IEC 61373, 5 Hz - 150 Hz, 5 h, 3 axis

NOTES:
11. Qualification is ongoing

Product Dimensions

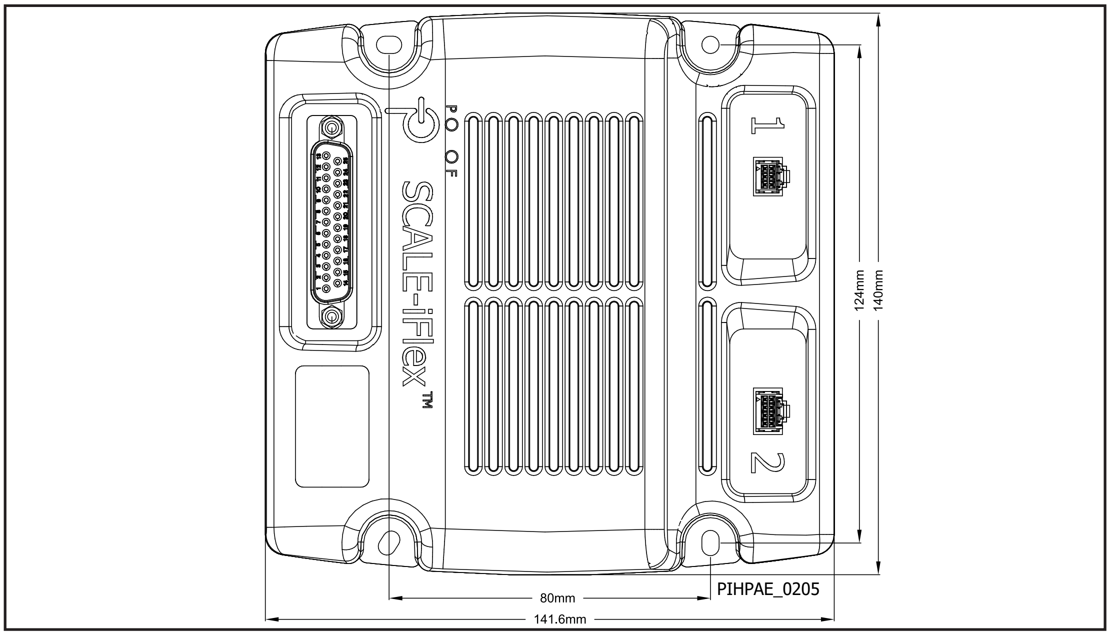

Figure 4. Top View

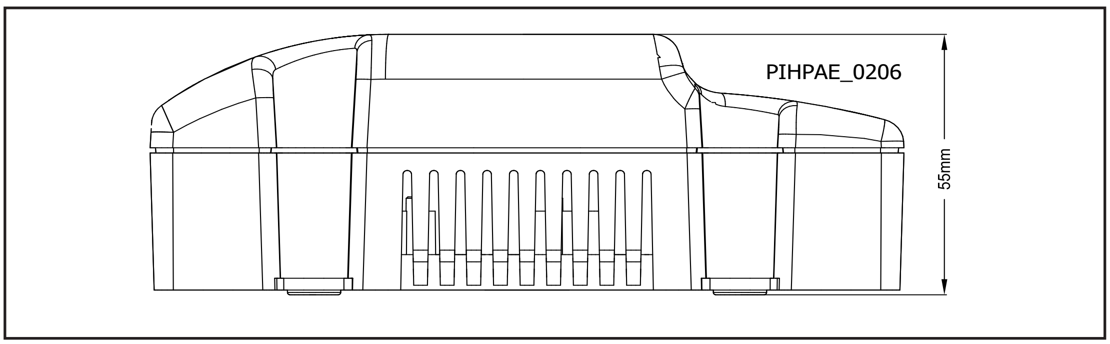

Figure 5. Side View.

Conformal Coating

The electronic components in the gate driver 2SI0400T2A3C-33 are protected by a layer of acrylic conformal coating on both sides of the PCB with a typical thickness of 50 µm using ELPEGUARD SL 1307 FLZ /2 from Lackwerke Peters. This coating layer increases product reliability when exposed to contaminated environments.

Note: Standing water (e.g. condensate water) on top of the coating layer must be prevented. This water will diffuse through the layer over time. If allowed to remain, it will eventually form a thin film between the PCB surface and coating layer, which will cause leakage currents to increase. Such currents will interfere with the performance of the gate driver.

Transportation and Storage Conditions

For transportation and storage conditions refer to Power Integrations' Application Note AN-1501.

RoHS Statement

We hereby confirm that the product supplied does not contain any of the restricted substances according to Article 4 of the RoHS Directive 2011/65/EU in excess of the maximum concentration values tolerated by weight in any of their homogeneous materials.

Additionally, the product complies with RoHS Directive 2015/863/EU (known as RoHS 3) from 31 March 2015, which amends Annex II of Directive 2011/65/EU.

Revision	Notes	Date
A	Final Datasheet.	02/23

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