1. General Requirements

All components have to be mounted according to the drawing: GBA26800MX
The bare board is specified as: GBA610ADB

2. Revision History

Version	Date	Revised by	Description
1.0	2010-APR-13	A. Tutat	Initial Version
1.1	2010-MAY-28	A. Tutat	some limits adapted, CA47A-000528
1.2	2010-DEC-28	A. Tutat	test cases PTC not required, CA47A-000528
1.3	2011-JAN-06	A. Tutat	SMPS load resistors (2k), CA47A-000528
1.4	2013-JAN-18	A. Tutat	version MX3, MX4 inserted, CN376610
1.5	2014-DEC-15	A. Tutat	Power Supply: IGBT Gate Driver max. voltage changed from 29V to 30V and colour code legend inserted, CN628653
1.6	2015-JUN-12	A. Tutat	SMPS SWITCHING FREQUENCY tolerance increased, CN685046

3. Code Requirements

The board has been laid out according to the requirements in EN81, VDE110-1 (Transient Voltage 4kV; Inhomogeneous Field, Pollution Degree 2 and Safety relevant areas to other areas: Pollution Degree 3; Clearance Distance: Table2; Creepage Distance: Table

Date	Changes	Name	Test Requirement for PBX_BIDI	GBA26800MX_TR		
2015-JUN-12	SMPS SWITCHING FREQUENCY tolerance increased	A. Tutat		12 SHEETS - SHEET 1		
			OTIS Elevator Company Enigneering Center Berlin	RESP	2010-APR-13	A. Tutat
				CHK	2010-APR-13	M. Dehmlow
				AUT	2010-APR-13	CA47A-000528

4. Data logging Requirements for the purpose of statistical analysis.

All measurement results should be written together with the PCB serial number and production-date into a file.
The time-interval to produce a back-up of the file should be determined by the factory. Also must be determined how many records are captured per file.

Construction of the file:
1. PCB serial number
2. production-date
3. all measurement results, The variable-names should consist of a combination of Symbol-Name and Parameter-Name.)
Visual separation through special character, for example: **********.

5. Electrical Requirements

Unless otherwise noted MIN/MAX values are valid for temperatures between +0degC and +70degC.
All typical values are calculated for an ambient temperature of Ta=25degC.

DC values have to be measured with an average reading meter. AC values have to be measured with a true-RMS meter.
DC values are marked with the unit V or A, AC values are marked with Vrms or Arms.

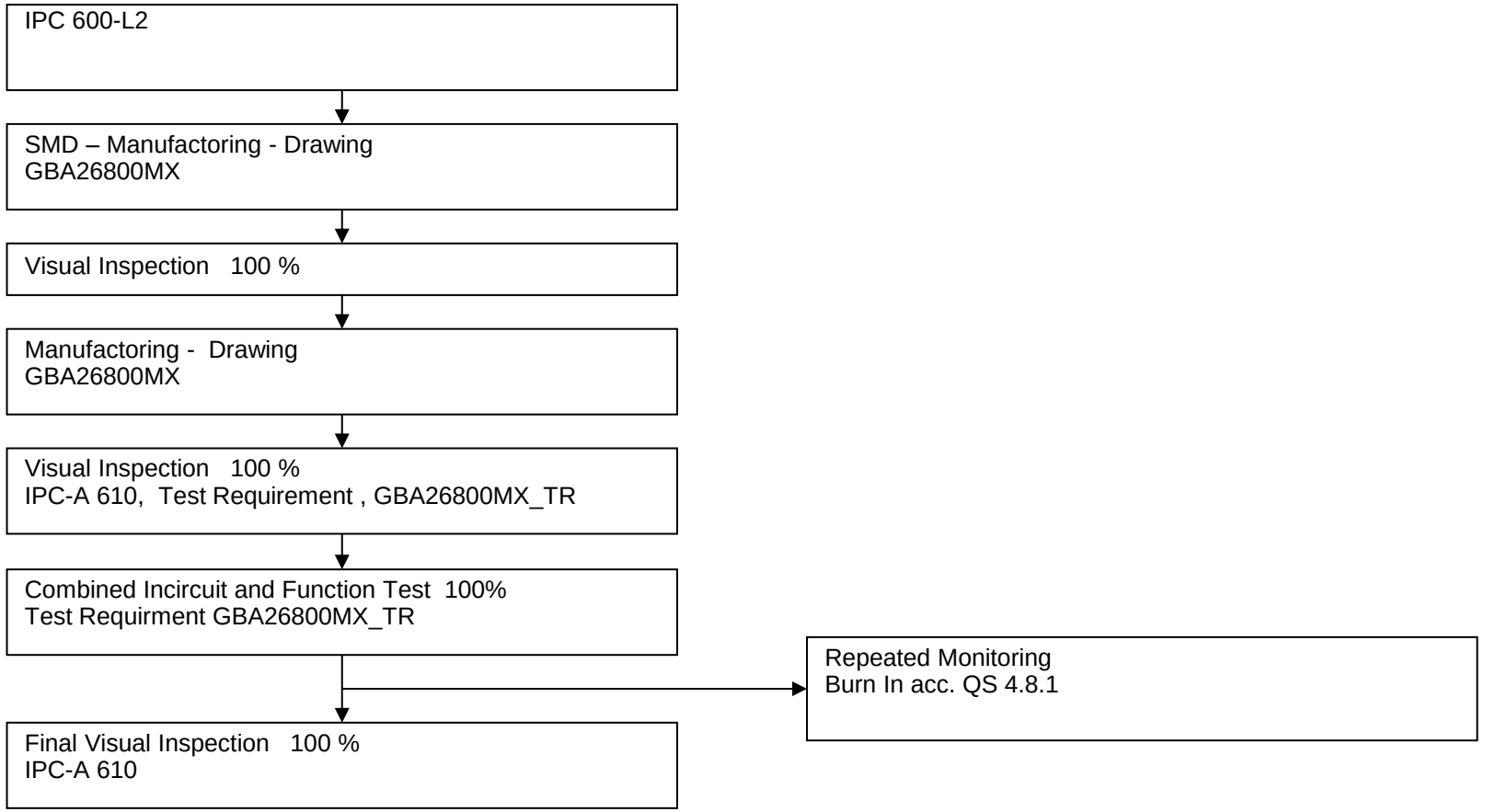
The remark “Logic Level” (LL) relates to HCMOS standard: “High” = 3.5V ... 5.7V and “Low”=-0.7V ... 1.0V.

5.1. Power supply

If within the test cases no other supply voltages are indicated,
the board has to be supplied with the following voltages:

24V_HL2	+24V / current limitable to max. 500mA at P5.46 (referenced to HL2)
HL2	at P5.44
24V_SE	+24V / current limitable to max. 500mA at P1.1 (referenced to 24V_SE_RTN)
24V_SE_RTN	at P1.2
24V_SW	+24V / current limitable to max. 500mA at P4.1 (referenced to 24V_SW_RTN)
24V_SW_RTN	at P4.2
24V_SENSE	+24V / current limitable to max. 500mA at P5.50 (referenced to 24V_SENSE_RTN)
24V_SENSE_RTN	at P5.48
V+15V	+15V / current limitable to max. 200mA at P3.40 (referenced to AGND)
V-15V	-15V / current limitable to max. 200mA at P3.39 (referenced to AGND)
AGND	at P3.38
VCC	+5V / current limitable to max. 200mA at P3.13 (referenced to GND)
GND	at P3.12

6. Test Flow



Date	Changes	Name	Test Requirement for PBX_BIDI	GBA26800MX_TR		
2015-JUN-12	SMPS SWITCHING FREQUENCY tolerance increased	A. Tutat				
				12 SHEETS - SHEET 4		
			OTIS Elevator Company Enigneering Center Berlin	RESP	2010-APR-13	A. Tutat
				CHK	2010-APR-13	M. Dehmlow
				AUT	2010-APR-13	CA47A-000528

Test Requirement for PBX_BIDI GBA26800MX

1. All measuring instruments must be calibrated!!!
2. As an additional document, the circuit diagram of the PCBA is required.
3. All measuring points : reference points are described in kind of netnames, test points or component designator.
4. PBX_BIDI alternatively assembled with CONVERTER- or INVERTER-FUNCTIONALITY
   test cases **only** for PBX_BIDI, **INVERTER**-FUNCTIONALITY, GBA26800**MX1, MX3**, marked with note: **1**
   test cases **only** for PBX_BIDI, **CONVERTER**-FUNCTIONALITY, GBA26800**MX2**, **MX4**, marked with note: **2**
   test cases **not required for GBA26800MX1, MX2, MX3**, **MX4,** marked with note: **4**
5. **H**ighly **A**ccelerated **L**ife **T**est, test cases required for **HALT**, marked with note: **3**

Samples

Value range

Lower **S**pecification **L**imit
Upper **S**pecification **L**imit

colour code legend

- white: Testcases description, preparation
- darkgreen: Hardware calibration parameter handling and EEPROM parameter store addresses
- lightgreen: Measuring points, specified conditions, equations
- lightblue: transfer gain K3 (plausibility) check for HW calibration
- darkgreen: Hardware calibration relevant measuring points, specified conditions, equations, EEPROM parameter store addresses

colour code legend

- white: Individual measured value

colour code legend

- lightyellow: Allowed value range

Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
Power Supply: IGBT Gate Driver PHASE R(U)	**1**		quiescent current consumption: 24V_SW @ 24VDC												*180,00*	*236,00*	*290,00*
	2		quiescent current consumption: 24V_SE @ 24VDC	mA											*180,00*	*236,00*	*360,00*
SMPS characteristic			**current: IGBT driver SMPS, SENSING SMPS**														
Switched **M**ode **P**ower **S**upply			PWM_VCC_RU : 24V_DRIVER_RTN	V											*10,00*	*11,00*	*13,00*
			I_SENSE_RU : 24V_DRIVER_RTN												*0,10*	*0,60*	*0,90*
Power Fail Detection			SWITCHING ON-DUTY-CYCLE w/o any additional load	%											*5,00*	*20,00*	*30,00*
			SWITCHING FREQUENCY PWM CONTROLLER output pin or MOSFET DRAIN GATE_SENSE_RU : 24_DRIVER_RTN DRAIN_RU : 24_DRIVER_RTN	kHz											*85,00*	*170,00*	*260,00*
preparation: **Please add additional load resistors (2k) to:** **1.)** **+27V_RU_P : +27V_RU_P_RTN** **2.)** **+27V_RU_N : +27V_RU_N_RTN**	**3**		+27V_RU_P : +27V_RU_P_RTN												*26,00*	*27,00*	*30,00*
	3		+27V_RU_N : +27V_RU_N_RTN												*26,00*	*27,00*	*30,00*
			REF_3V9_RU_P : +27V_RU_P_RTN												*6,50*	*7,00*	*7,50*
			REF_2V5_RU_P : +27V_RU_P_RTN												*2,38*	*2,50*	*2,63*
			PF_IGBT threshold voltage Increase **+27V_RU_P** from 0V until output a transition occurs: HIGH to LOW MX1: PF_IGBT_INV : GND MX2: PF_IGBT_CONV : GND **preparation:** disconnect primary 24V_SW and 24V_SE supply, add an adjustable supply only on +27V_RU_P referenced to +27V_RU_P_RTN	V											*2,00*	*2,40*	*3,10*
			REF_3V9_RU_N : +27V_RU_N_RTN												*6,50*	*7,00*	*7,50*
			REF_2V5_RU_N : +27V_RU_N_RTN												*2,38*	*2,50*	*2,63*
			PF_IGBT threshold voltage Increase **+27V_RU_N** from 0V until output a transition occurs: HIGH to LOW MX1: PF_IGBT_INV : GND MX2: PF_IGBT_CONV : GND **preparation:** disconnect primary 24V_SW and 24V_SE supply, add an adjustable supply only on +27V_RU_N referenced to +27V_RU_N_RTN												*2,00*	*2,40*	*3,10*

Test Requirement for PBX_BIDI GBA26800MX

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Samples

Value range
Lower **S**pecification **L**imit
Upper **S**pecification **L**imit

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darkgreen: Hardware calibration parameter handling and EEPROM parameter store addresses
lightgreen: Measuring points, specified conditions, equations
lightblue: transfer gain K3 (plausibility) check for HW calibration
darkgreen: Hardware calibration relevant measuring points, specified conditions, equations, EEPROM parameter store addresses

colour code legend
white: Individual measured value

colour code legend
lightyellow: Allowed value range

Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
Power Supply: IGBT Gate Driver PHASE S(V)			PWM_VCC_SV : 24V_DRIVER_RTN	V											*10,00*	*11,00*	*13,00*
			I_SENSE_SV : 24V_DRIVER_RTN												*0,10*	*0,60*	*0,90*
SMPS characteristic			SWITCHING ON DUTY CYCLE w/o any additional load	%											*5,00*	*25,00*	*50,00*
Switched Mode Power Supply			SWITCHING FREQUENCY PWM CONTROLLER output pin or MOSFET DRAIN GATE_SENSE_RU : 24_DRIVER_RTN DRAIN_RU : 24_DRIVER_RTN	kHz											*85,00*	*170,00*	*260,00*
Power Fail Detection		3	+27V_SV_P : +27V_SV_P_RTN	V											*26,00*	*27,00*	*30,00*
		3	+27V_SV_N : +27V_SV_N_RTN												*26,00*	*27,00*	*30,00*
preparation:			REF_3V9_SV_P : +27V_SV_P_RTN												*6,50*	*7,00*	*7,50*
Please add additional load resistors (2k) to:			REF_2V5_SV_P : +27V_SV_P_RTN												*2,38*	*2,50*	*2,63*
1.)			**PF_IGBT threshold voltage** Increase **+27V_SV_P** from 0V until output a transition occurs: HIGH to LOW MX1: PF_IGBT_INV : GND MX2: PF_IGBT_CONV : GND **preparation:** disconnect primary 24V_SW and 24V_SE supply, add an adjustable supply only on +27V_SV_P referenced to +27V_SV_P_RTN												*2,00*	*2,40*	*3,10*
+27V_SV_P : +27V_SV_P_RTN																	
2.)																	
+27V_SV_N : +27V_SV_N_RTN																	
			REF_3V9_SV_N : +27V_SV_N_RTN												*6,50*	*7,00*	*7,50*
			REF_2V5_SV_N : +27V_SV_N_RTN												*2,38*	*2,50*	*2,63*
			PF_IGBT threshold voltage Increase **+27V_SV_N** from 0V until output a transition occurs: HIGH to LOW MX1: PF_IGBT_INV : GND MX2: PF_IGBT_CONV : GND **preparation:** disconnect primary 24V_SW and 24V_SE supply, add an adjustable supply only on +27V_SV_N referenced to +27V_SV_N_RTN												*2,00*	*2,40*	*3,10*

Test Requirement for PBX_BIDI GBA26800MX

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Samples

Value range

Lower **S**pecification **L**imit
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colour code legend

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colour code legend

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Test cases					Board Serial Number										LSL	Typical	USL
Description	note	note	measuring point : reference point @ specified condition	unit													
Power Supply: IGBT Gate Driver PHASE T(W)			PWM_VCC_TW : 24V_DRIVER_RTN	V											*10,00*	*11,00*	*13,00*
			I_SENSE_TW : 24V_DRIVER_RTN												*0,10*	*0,60*	*0,90*
SMPS characteristic			SWITCHING ON-DUTY-CYCLE w/o any additional load	%											*5,00*	*20,00*	*30,00*
Switched Mode Power Supply			SWITCHING FREQUENCY PWM CONTROLLER output pin or MOSFET DRAIN GATE_SENSE_TW : 24_DRIVER_RTN DRAIN_TW : 24_DRIVER_RTN	kHz											*85,00*	*170,00*	*260,00*
Power Fail Detection																	
	3		+27V_TW_P : +27V_TW_P_RTN												*26,00*	*27,00*	*30,00*
preparation:	3		+27V_TW_N : +27V_TW_N_RTN												*26,00*	*27,00*	*30,00*
Please add additional load resistors (2k) to:			REF_3V9_TW_P : +27V_TW_P_RTN												*6,50*	*7,00*	*7,50*
1.)			REF_2V5_TW_P : +27V_TW_P_RTN												*2,38*	*2,50*	*2,63*
+27V_TW_P : +27V_TW_P_RTN			**PF_IGBT threshold voltage** Increase **+27V_TW_P** from 0V until output a transition occurs: HIGH to LOW MX1: PF_IGBT_INV : GND MX2: PF_IGBT_CONV : GND **preparation:** disconnect primary 24V_SW and 24V_SE supply, add an adjustable supply only on +27V_TW_P referenced to +27V_TW_P_RTN	V											*2,00*	*2,40*	*3,10*
2.)																	
+27V_TW_N : +27V_TW_N_RTN			REF_3V9_TW_N : +27V_TW_N_RTN												*6,50*	*7,00*	*7,50*
			REF_2V5_TW_N : +27V_TW_N_RTN												*2,38*	*2,50*	*2,63*
			PF_IGBT threshold voltage Increase **+27V_TW_N** from 0V until output a transition occurs: HIGH to LOW MX1: PF_IGBT_INV : GND MX2: PF_IGBT_CONV : GND **preparation:** disconnect primary 24V_SW and 24V_SE supply, add an adjustable supply only on +27V_RU_N referenced to +27V_RU_N_RTN												*2,00*	*2,40*	*3,10*

Test Requirement for PBX_BIDI GBA26800MX

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Samples

Value range

Lower **S**pecification **L**imit
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colour code legend

white: Individual measured value

colour code legend

lightyellow: Allowed value range

Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
Power Supply: SENSING **SMPS characteristic** **S**witched **M**ode **P**ower **S**upply	1		quiescent current consumption: 24V_SENSE @ 24VDC **current: SENSING SMPS**	mA											*20,00*	*100,00*	*200,00*
			VCC_PWM_CONTROLLER : 24V_SMPS_SENSE_RTN	V											*10,00*	*12,00*	*15,00*
			I_SENSE_PWM_CONTROLLER : 24V_SMPS_SENSE_RTN												*0,00*	*0,60*	*0,90*
	1		SWITCHING ON-DUTY-CYCLE PWM CONTROLLER output pin or MOSFET DRAIN SMPS_SENSE_GATE : 24V_SMPS_SENSE_RTN SMPS_SENSE_DRAIN : 24V_SMPS_SENSE_RTN	%											*22,00*	*27,00*	*32,00*
	2		SWITCHING ON-DUTY-CYCLE PWM CONTROLLER output pin or MOSFET DRAIN SMPS_SENSE_GATE : 24V_SMPS_SENSE_RTN SMPS_SENSE_DRAIN : 24V_SMPS_SENSE_RTN	%											*22,00*	*39,00*	*44,00*
			SWITCHING FREQUENCY PWM CONTROLLER output pin or MOSFET DRAIN SMPS_SENSE_GATE : 24V_SMPS_SENSE_RTN SMPS_SENSE_DRAIN : 24V_SMPS_SENSE_RTN	kHz											*85,00*	*170,00*	*260,00*
		3	**InvTempUref (Addr.: 0x10)** **CnvTempUref (Addr.: 0x10)** **measuring point: S+15V / SGND** **signal: +15V_SENSE / GND_SENSE**	mV											*14250,00*	*15000,00*	*15750,00*
		3	-15V_SENSE : GND_SENSE												*-15750,00*	*-15000,00*	*-14250,00*
Power Supply: PTC Temperature Measurement **SMPS characteristic** **S**witched **M**ode **P**ower **S**upply **preparation:** Please connect, the test cases referred resistors between the inputs: PTC_1 and PTC_6	4		quiescent current consumption: 24V_HL2 @ 24VDC **current: SENSING SMPS**	mA											*4,00*	*100,00*	*200,00*
			SW_TEMP_SENSOR : HL2	kHz											*180,00*	*200,00*	*220,00*
		3	5V_HL2 : HL2	V											*4,75*	*5,00*	*5,25*
			PTC_ADC: HL2 @ **open** PTC_1/PTC_6												*3,00*	*3,70*	*5,00*
			PTC_ADC: HL2 @ **1k, 1% resistor between** PTC_1/PTC_6												*1,00*	*1,20*	*1,80*
			PTC_ADC: HL2 @ **SHORT-CIRCUIT** PTC_1/PTC_6												*0,00*	*0,32*	*0,50*
			PTC_1 : PTC_6	mA											*4,00*	*4,60*	*5,60*
DC-Link-LED **acquisition via a LED sensor** **preparation:** 5VDC supply: DCP_LED referenced to DCN_LED_6 (NE555 Timer-pin1)			**Pilot LED flashing Frequency**	Hz											*5,00*	*7,00*	*15,00*
IGBT Gate Driver voltages **preparation:** **1.)** All drivers must be stimulated such that a connected IGBT would be switched on. Add an IGBT Gate-Emitter load, a **100nF±10%** ceramic or metal foil capacitor must be connected between the **measuring points:** **IGBT Gate to IGBT Emitter** **RUP_G11 : RUP_E11, RUN_G21 : RUN_E21** **SVP_G11 : SVP_E11, SVN_G21 : SVN_E21** **TWP_G11 : TWP_E11, TWN_G21 : TWN_E21** **short circuit: IGBT Collector to IGBT Emitter** **RUP_C1 : RUP_E11 : RUN_E21** **SVP_C1 : SVP_E11 : SVN_E21** **TWP_C1 : TWP_E11 : TWN_E21** **2.) only GBA26800MX**2 **OUT_EN_CONV:GND set to HIGH level**			RUP_G11:RUP_E11@PWM_RP, PWM_UP=HIGH:GND	V											*-16,00*	*-9,50*	*-5,00*
			RUP_G11:RUP_E11@PWM_RP, PWM_UP=**LOW**:GND												*14,00*	*15,70*	*17,00*
			RUN_G21:RUN_E21@PWM_RN, PWM_UN=HIGH:GND												*-16,00*	*-9,50*	*-5,00*
			RUN_G21:RUN_E21@PWM_RN, PWM_UN=**LOW**:GND												*14,00*	*15,70*	*17,00*
			SVP_G11:SVP_E11@PWM_SP, PWM_VP=HIGH:GND												*-16,00*	*-9,50*	*-5,00*
			SVP_G11:SVP_E11@PWM_SP, PWM_VP=**LOW**:GND												*14,00*	*15,70*	*17,00*
			SVN_G21:SVN_E21@PWM_SN, PWM_VN=HIGH:GND												*-16,00*	*-9,50*	*-5,00*
			SVN_G21:SVN_E21@PWM_SN, PWM_VN=**LOW**:GND												*14,00*	*15,70*	*17,00*
			TWP_G11:TWP_E11@PWM_TP, PWM_WP=HIGH:GND												*-16,00*	*-9,50*	*-5,00*
			TWP_G11:TWP_E11@PWM_TP, PWM_WP=**LOW**:GND												*14,00*	*15,70*	*17,00*
			TWN_G21:TWN_E21@PWM_TN, PWM_WN=HIGH:GND												*-16,00*	*-9,50*	*-5,00*
			TWN_G21:TWN_E21@PWM_TN, PWM_WN=**LOW**:GND												*14,00*	*15,70*	*17,00*

Test Requirement for PBX_BIDI GBA26800MX

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Value range

Lower **S**pecification **L**imit
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Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
DRIVER_RESET_N logic low pulse width **Description of the function:** HCPL316J FAULT* changes from a high impedance state to a logic low, if the voltage on the HCPL316J **DESAT** pin exceeding an internal reference voltage of 7.5V **while the IGBT is on**. HCPL316J FAULT* output remains low until HCPL316J RESET* is brought low. HCPL316J FAULT* output is an open collector which allows the FAULT* outputs from all HCPL-316Js to be connected together in a “wired OR” forming the signals: GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND When one of the six HCPL316J **FAULT* outputs** change to low, the HCPL316J **RESET* input** will **change to low after a time delay** of the "DRIVER_RESET_N logic low pulse width" **preparation:** 1.) All drivers must be stimulated such that a connected IGBT would be **switched on**. PWM_RP=**LOW**:GND, PWM_UP=**LOW**:GND PWM_RN=**LOW**:GND, PWM_UN=**LOW**:GND PWM_SP=**LOW**:GND, PWM_VP=**LOW**:GND PWM_SN=**LOW**:GND, PWM_VN=**LOW**:GND PWM_TP=**LOW**:GND, PWM_WP=**LOW**:GND PWM_TN=**LOW**:GND, PWM_WN=**LOW**:GND 2.) Add an IGBT Gate-Emitter load, a 100nF±10% ceramic or metal foil capacitor must be connected between the measure points: IGBT Gate to IGBT Emitter RUP_G11 : RUP_E11, RUN_G21 : RUN_E21 SVP_G11 : SVP_E11, SVN_G21 : SVN_E21 TWP_G11 : TWP_E11, TWN_G21 : TWN_E21 3.) **Realize the following possibility to change between:** short circuit / **open for approximate 1ms**: IGBT Collector to IGBT Emitter RUP_C1 : RUP_E11, RUP_E11 : RUN_E21 SVP_C1 : SVP_E11, SVP_E11 : SVN_E21 TWP_C1 : TWP_E11, TWP_E11 : TWN_E21 4.) only GAA26800MX2 OUT_EN_CONV:GND set to HIGH level **stimulation:** **DESAT pins are executed successively by open only one of the short circuit "IGBT Collector to IGBT Emitter" for approximate 60ms.** Keep a wait time condition to the next test case of approximate 500ms. All tests must be processed 2 times sequentially, in order to guarantee that no latch up effect appears.			GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND **HIGH pulse width** @open only short circuit RUP_C1 : RUP_E11	ms											200	360	500
			GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND **HIGH pulse width** @open only short circuit RUP_E11 : RUN_E21												200	360	500
			GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND **HIGH pulse width** @open only short circuit SVP_C1 : SVP_E11												200	360	500
			GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND **HIGH pulse width** @open only short circuit SVP_E11 : SVN_E21												200	360	500
			GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND **HIGH pulse width** @open only short circuit TWP_C1 : TWP_E11												200	360	500
			GBA26800MX**1**: **OCT_INV** referenced to GND GBA26800MX**2**: **CNV_OC_FLT** referenced to GND **HIGH pulse width** @open only short circuit TWP_E11 : TWN_E21												200	360	500

Test Requirement for PBX_BIDI GBA26800MX

1. All measuring instruments must be calibrated!!!
2. As an additional document, the circuit diagram of the PCBA is required.
3. All measuring points : reference points are described in kind of netnames, test points or component designator.
4. PBX_BIDI alternatively assembled with CONVERTER- or INVERTER-FUNCTIONALITY
   test cases **only** for PBX_BIDI, **INVERTER**-FUNCTIONALITY, GBA26800**MX1, MX3**, marked with note: **1**
   test cases **only** for PBX_BIDI, **CONVERTER**-FUNCTIONALITY, GBA26800**MX2**, **MX4**, marked with note: **2**
   test cases **not required for GBA26800MX1, MX2, MX3**, **MX4,** marked with note: **4**
5. **H**ighly **A**ccelerated **L**ife **T**est, test cases required for **HALT**, marked with note: **3**

Samples

Value range

Lower **S**pecification **L**imit
Upper **S**pecification **L**imit

colour code legend

white: Testcases description, preparation
darkgreen: Hardware calibration parameter handling and EEPROM parameter store addresses
lightgreen: Measuring points, specified conditions, equations
lightblue: transfer gain K3 (plausibility) check for HW calibration
darkgreen: Hardware calibration relevant measuring points, specified conditions, equations, EEPROM parameter store addresses

colour code legend

white: Individual measured value

colour code legend

lightyellow: Allowed value range

Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
POWER FAIL MONITORING thresholds **PFAIL_RS_CONV signal changes from** **1.) statical LOW level** **2.) TOGGLE between LOW and HIGH** **3.) statical HIGH level** **Umax_line_to_line=480V*1.1** **resultant max. voltage range: ±3.7V (Vpp=7.4V)** **Umin_line_to_line=340V** **resultant min. voltage: Vpp=4.76V** **preparation:** adjustable sinus voltage supply **7.4Vpp**@50Hz, offset=0V to US / GND_SENSE	**2**		**PFAIL_RS_CONV / GND threshold toggle** Decrease US from **7.4Vpp** until PFAIL_RS_CONV threshold changes from **statical LOW to TOGGLE**	Vpp											*1,00*	*1,30*	*4,76*
			PFAIL_RS_CONV / GND threshold statical LOW Decrease US from **7.4Vpp** until PFAIL_RS_CONV threshold changes from **TOGGLE to statical HIGH**												*0,30*	*0,70*	*1,00*
Hall Effect Current Sensor LEM: LA200-P TAMURA: S26P200D15Y VAC: T60404-N4646-X201 **current conversion ratio: 1:2000** measure the output-current at a given input-current **preparation:** Apply **R=60ohm** between: SENSE_IR, SENSE_IU and GNDA SENSE_IS, SENSE_IV and GNDA **Input-current source cable put through the hole once.** Polarity markings: A positive measuring output-current is obtained on terminal M (pin 2), when the primary input-current flows in the direction of the arrow.			SENSE_IR, SENSE_IU : GNDA output-current @ 0A	mA											*-1,00*	*0,00*	*1,00*
			SENSE_IR, SENSE_IU : GNDA LEM_IR_output-current @ 2A												*0,80*	*1,00*	*1,20*
			SENSE_IR, SENSE_IU : GNDA LEM_IR_output-current @ **-2A**												*-1,20*	*-1,00*	*-0,80*
			SENSE_IS, SENSE_IV : GNDA LEM_IS_output-current @ 0A												*-1,00*	*0,00*	*1,00*
			SENSE_IS, SENSE_IV : GNDA LEM_IS_output-current @ 2A												*0,80*	*1,00*	*1,20*
			SENSE_IS, SENSE_IV : GNDA LEM_IS_output-current @ **-2A**												*-1,20*	*-1,00*	*-0,80*
CHG-RELAY contact resistance **preparation:** **OUT_EN_INV:GND set to HIGH level** **OUT_EN_CONV:GND set to HIGH level** **REL1, REL2: contacts closed** CHRG_N:GND to LOW **REL1, REL2: contacts opened** CHRG_N:GND to HIGH	**2**		R_RES:RUO@REL1, REL2: contacts opened	YES or NO											contacts opened		
			R_RES:RUO@REL1, REL2: contacts closed												contacts closed		
			S_RES:SVO@REL1, REL2: contacts opened												contacts opened		
			S_RES:SVO@REL1, REL2: contacts closed												contacts closed		

Test Requirement for PBX_BIDI GBA26800MX

1. All measuring instruments must be calibrated!!!
2. As an additional document, the circuit diagram of the PCBA is required.
3. All measuring points : reference points are described in kind of netnames, test points or component designator.
4. PBX_BIDI alternatively assembled with CONVERTER- or INVERTER-FUNCTIONALITY
   test cases **only** for PBX_BIDI, **INVERTER**-FUNCTIONALITY, GBA26800**MX1, MX3**, marked with note: **1**
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   test cases **not required for GBA26800MX1, MX2, MX3**, **MX4,** marked with note: **4**
5. **H**ighly **A**ccelerated **L**ife **T**est, test cases required for **HALT**, marked with note: **3**

Samples

Value range
Lower **S**pecification **L**imit
Upper **S**pecification **L**imit

colour code legend
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darkgreen: Hardware calibration parameter handling and EEPROM parameter store addresses
lightgreen: Measuring points, specified conditions, equations
lightblue: transfer gain K3 (plausibility) check for HW calibration
darkgreen: Hardware calibration relevant measuring points, specified conditions, equations, EEPROM parameter store addresses

colour code legend
white: Individual measured value

colour code legend
lightyellow: Allowed value range

Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
VRS, VST **voltage gain calibration** **and** **transfer gain K3 (plausibility) check** Linear Optocoupler GAA629CL1 Vendor Vishay: IL300-EF-X017T transfer gain K3 = 0.851 - 1.061 ± 0.5% Tamb = 0 °C to 75 °C Vendor Agilent / Avago: HCNR201 transfer gain K3 = 0.93 - 1.07	2		REF_SEC / GNDA (±10%) equation: **5V*-0.4115*0.89111=-1.83356V**	mV											*-2017,40*	*-1834,00*	*-1650,60*
			measuring point: DC_VRS / SGND (±10%) **signal: VRS_DC_N / GND_SENSE**												*1852,20*	*2058,00*	*2263,80*
			measuring point: VRS / AGND (±25%) **signal: VRS_OUT_DC_N / GNDA** **equation: 2.0576V*0.89111=1.8335V**												*1375,50*	*1834,00*	*2292,50*
			measuring point: VRS_N / AGND **signal: VRS_OUT_N / GNDA**												*-1500,00*	*0,00*	*1500,00*
			transfer gain K3_VRS (plausibility) check **proceeding:** **calculate with the following equation:** **K3_VRS=VRS_OUT_DC_N / (0.89111*VRS_DC_N)**												*0,80*	*1,00*	*1,10*
			measuring point: DC_VST / SGND (±10%) **signal: VST_DC_N / GND_SENSE**	mV											*1852,20*	*2058,00*	*2263,80*
			measuring point: VST / AGND (+-25%) **signal: VST_OUT_DC_N / GNDA** **equation: 2.0576V*0.89111=1.8335V**												*1375,50*	*1834,00*	*2292,50*
			measuring point: VST_N / AGND **signal: VST_OUT_N / GNDA**												*-1500,00*	*0,00*	*1500,00*
			transfer gain K3_VST (plausibility) check **proceeding:** **calculate with the following equation:** **K3_VST= VST_OUT_DC_N / (0.89111*VST_DC_N)**												*0,80*	*1,00*	*1,10*
IGBT TEMPERATURE MEASUREMENT **and** **transfer gain K3 (plausibility) check** **preparation:** measure with connected resistor **5kohm, ±0.1%** between NTC1 / NTC2			NTC1:NTC2 (1.86V±10%)	mV											*1670,00*	*1860,00*	*2050,00*
			measuring point: TEMP_IGBT / GNDA **signal: TEMP_IGBT / GNDA** equation: typical: (3.107V*0.89111)-0.7258=2.04V with gain range IL300: 0.8..1.2 min.: (0.8*2.77V)-0.7258=1.49V (-3% = 1.445V) max.: (1.2*2.77V)-0.7258=2.6V (+3% = 2.68V)												*1445,00*	*2040,00*	*2680,00*
			InvTempUn (Addr.: 0x12) **CnvTempUn (Addr.: 0x12)** **measuring point: TEMP_UN / GNDA** **signal: TEMP_UN / GNDA**												*1080,00*	*1200,00*	*1320,00*
			InvTempUin (Addr.: 0x14) **CnvTempUin (Addr.: 0x14)** **preparation:** measure with connected resistor 5kohm between NTC1 / NTC2 **measuring point: NTC1 / SGND** **signal: NTC1 / GND_SENSE**												*2950,00*	*3110,00*	*3270,00*
			transfer gain K3_TEMP (plausibility) check **proceeding:** **calculate with the following equation:** **K3_TEMP=** **(TEMP_IGBT+(TEMP_UN*0.604)) / (NTC1*0.89111)**												*0,80*	*1,00*	*1,10*
DC-LINK VOLTAGE MEASUREMENT **and** **transfer gain K3 (plausibility) check** **preparation:** **1.)** **CALIBRATED precision DC voltage reference** OUTPUT VOLTAGE: **+1.2V** ±0.2% max LOW NOISE: 10µVPP max (0.1Hz to 10Hz) conecetd to **DCP_U_ME_1 / GND_SENSE** **2.)** **short circuit is needed between** **DCN_U_ME_1 / GND_SENSE**	1		**InvUdclUin (Addr.: 0x18)** **measuring point: DC_ME / GND_SENSE** **signal: DC_ME / GND_SENSE** equation: typical: 1.2V*2.4864=3V	mV											*2900,00*	*3000,00*	*3100,00*
			InvUdclUout (Addr.: 0x1A) **measuring point: UDCL / GNDA** **signal: UDCL / GNDA** **equation:** **typical: 3V*0.89111=2,673V** **with gain range IL300: 0.8..1.2** **min.: 0.8*2,673V=2.138V** **(-3% = 2.07V)** **max.: 1.2*2,673V=3.208V** **(+3% = 3.22V)**												*2070,00*	*2673,00*	*3220,00*
			transfer gain K3_UDC (plausibility) check **proceeding:** **calculate with the following equation:** **K3_UDC= UDCL / (0.89111*DC_ME)**												*0,80*	*1,00*	*1,10*

Test Requirement for PBX_BIDI GBA26800MX

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   test cases **only** for PBX_BIDI, **INVERTER**-FUNCTIONALITY, GBA26800**MX1, MX3**, marked with note: **1**
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   test cases **not required for GBA26800MX1, MX2, MX3**, **MX4,** marked with note: **4**
5. **H**ighly **A**ccelerated **L**ife **T**est, test cases required for **HALT**, marked with note: **3**

Samples

Value range

Lower **S**pecification **L**imit
Upper **S**pecification **L**imit

colour code legend

white: Testcases description, preparation
darkgreen: Hardware calibration parameter handling and EEPROM parameter store addresses
lightgreen: Measuring points, specified conditions, equations
lightblue: transfer gain K3 (plausibility) check for HW calibration
darkgreen: Hardware calibration relevant measuring points, specified conditions, equations, EEPROM parameter store addresses

colour code legend

white: Individual measured value

colour code legend

lightyellow: Allowed value range

Test cases					Board Serial Number										LSL	Typical	USL
Description	**note**	**note**	**measuring point : reference point @ specified condition**	**unit**													
Hardware-dependent trimming values assumed measured values, see table above, **calculated on values in [mV]** to be storing in the EEPROM low bytes from trimming values must be written into the lower addresses. GBA26800MX**1,** MX**3**: I2C DEVICE Addr.: **# 2** GBA26800MX**2,** MX**4**: I2C DEVICE Addr.: **# 4** **I2C bus lines:** GBA26800MX**1,** MX**3**: I2C_SCL0_INV, I2C_DA0_INV GBA26800MX**2,** MX**4**: I2C_SCL0_CONV, I2C_DA0_CONV **also to be storing, informations from the board assigned label:**			**InvTempUref (Addr.: 0x10)** **CnvTempUref (Addr.: 0x10)** values margin: 14000..15000..16000														
			InvTempUn (Addr.: 0x12) **CnvTempUn (Addr.: 0x12)** values margin: 1000..1202..1500														
			InvTempUin (Addr.: 0x14) **CnvTempUin (Addr.: 0x14)** values margin: 1613..3107..3596														
			InvTempUout (Addr.: 0x16) **CnvTempUout (Addr.: 0x16)** values margin: 1100..2769..3784 **proceeding:** **calculate with the following equation:** InvTempUout= **TEMP_IGBT**+9060/15000***InvTempUn** CnvTempUout= **TEMP_IGBT**+9060/15000***CnvTempUn**														
	1		**InvUdclUin (Addr.: 0x18)** values margin: 2743..3000..3242														
	2		**CnvVrsUinDC (Addr.: 0x18)** **values margin: 4500..5000..5500** **proceeding:** **calculate with the following equation:** **CnvVrsUinDC=VRS_DC_N*2.43**														
	1		**InvUdclUout (Addr.: 0x1A)** values margin: 1870..2667..3412														
	2		**CnvVrsUoutDC (Addr.: 0x1A)** values margin: **3500..4455..5400** **proceeding:** **calculate with the following equation:** **CnvVrsUoutDC=VRS_OUT_DC_N*2.43**	mV													
	2		**CnvVrsUout (Addr.: 0x1C)** values margin: -1500..0..1500 constraint: if (**VRS_OUT_N** < 0) write (65536 - abs(**VRS_OUT_N**)) and if (**VRS_OUT_N** >= 0) then write CnvVrsUout equal to **VRS_OUT_N** with mV unit.														
	2		**CnvVstUinDC (Addr.: 0x1E)** values margin: **4500..5000..5500** **proceeding:** **calculate with the following equation:** **CnvVstUinDC=VST_DC_N*2.43**														
	2		**CnvVstUoutDC (Addr: 0x20)** values margin: **3500..4455..5400** **proceeding:** **calculate with the following equation:** **CnvVstUoutDC=VST_OUT_DC_N*2.43**														
	2		**CnvVstUout (Addr: 0x22)** values margin: -1500..0..1500 constraint: if (**VST_OUT_N** < 0) write (65536 - abs(**VST_OUT_N**)) and if (**VST_OUT_N** >= 0) then write CnvVstUout equal to **VST_OUT_N** with mV unit.														
	1		**InvManufTestId (addr: 0x1C)** must be set to enable the trimming parameter with set 0xDEC0 after end of hardware test&calibration **addr: 0x1C data: C0** **addr: 0x1D data: DE**	HEX													
	2		**CnvManufTestId (addr: 0x24)** must be set to enable the trimming parameter with set 0xDEC0 after end of hardware test&calibration **addr: 0x24 data: C0** **addr: 0x25 data: DE**														

GBA26800MX**1**, MX**3**: **Package code:**
0x00 = 20 (dez)

GBA26800MX**1**, MX**3**: **voltage_code:**
0x02 = 4 (dez)

GBA26800MX**1**: **MX3 power code:**
0x04 = 120 (dez) : **160 (dez)**

GBA26800MX**1**, MX**3**: **Drive version number:**
0x06 = 2 (dez)

PCB serial number S/N:
0x0100..0x010F
16-byte; ASCII string; left-aligned;
last bytes filled with spaces
barcode; Otis definition; e.g.
GBA26800MX**1**: "MX**1**093400021 "
GBA26800MX**2**: "MX**2**093400014 "
GBA26800MX**3**: "MX**3**093400021 "
GBA26800MX**4**: "MX**4**093400014 "

PCB part number P/N:
0x0120 bis 0x012F
16-byte; ASCII string; left-aligned;
last bytes filled with spaces
barcode; Otis definition; e.g.
GBA26800MX**1**: "GBA26800MX**1**A-LF "
GBA26800MX**2**: "GBA26800MX**2**A-LF "
GBA26800MX**3**: "GBA26800MX**3**A-LF "
GBA26800MX**4**: "GBA26800MX**4**A-LF "

preparation:
OUT_EN_INV:GND set to HIGH level
OUT_EN_CONV:GND set to HIGH level