

SLA6845MZ

March, 2015

General Description

The SLA6845MZ provides a highly-integrated solution by incorporating key components into one package – IGBTs in a 3-phase full-bridge configuration, built-in protection functions such as UVLO (undervoltage lockout) and TD (thermal detection) circuits, and pre-driver ICs with 7.5 V regulator output. The SLA6845MZ employs three LS terminals to configure a 3-shunt current detection system. The product is supplied in a SIP package with Al heatsink.

Applications

Include motor control for:

- Air conditioner fan
- Air purifier fan
- Washer-dryer fan
- Dishwasher pump

Features and Benefits

- CMOS-compatible input (3.3 or 5 V)
- Built-in protection circuit for controlling power supply voltage drop (UVLO)
- Built-in overheat detection circuit (TD)
- Regulator output: 7.5 V, 35 mA
- Small SIP (SLA, 24 pins)
- 3-shunt current detection

Package

- Package Name: SLA
- Pin Pitch: 1.27 mm
- External Size: 31 × 16 × 4.8 mm



Leadform 2171



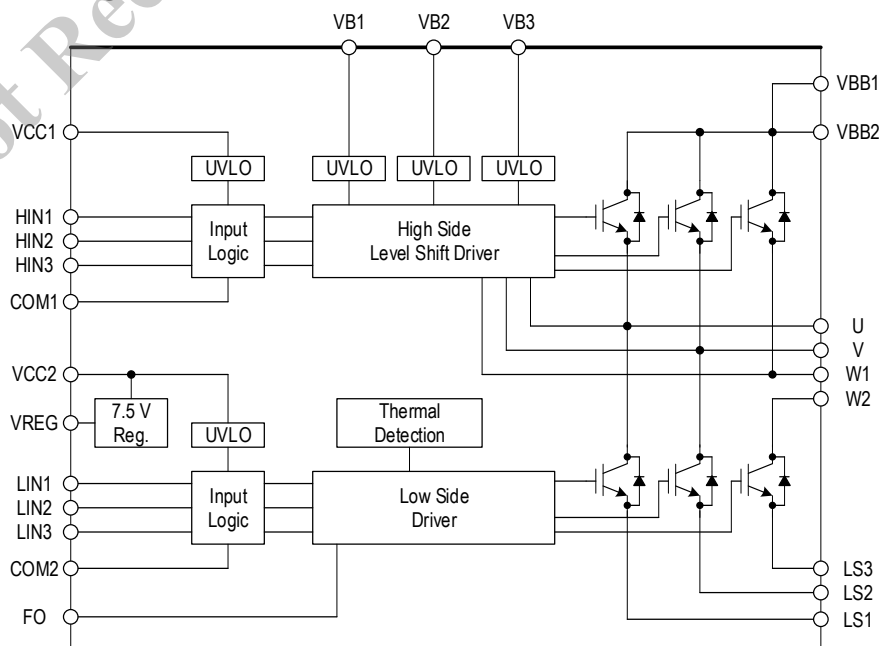
Leadform 2175

Not to scale

Product Specifications

Part Number	IGBT Breakdown Voltage, V_{CES} (V)	Output Current (Continuous), I_O (A)	IGBT Saturation Voltage, $V_{CE(sat)}$ (V Typ.)	Package
SLA6845MZ	600	3.0	1.75	Al heatsink

Functional Block Diagram



SLA6845MZ

March, 2015

1. Scope

The specifications described in this document shall apply to the SLA6845MZ, a high-voltage 3-phase motor driver IC.

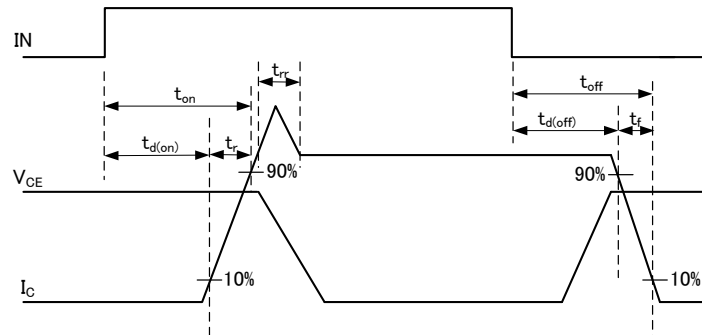
2. Absolute Maximum Ratings, valid at $T_A = 25^\circ\text{C}$

Characteristics	Symbol	Remarks	Ratings	Unit
IGBT Breakdown Voltage	V_{CES}	$V_{CC} = 15\text{ V}$, $I_C = 1\text{ mA}$, $V_{IN} = 0\text{ V}$	600	V
Logic Supply Voltage	V_{CC}	Between VCC and COM	20	V
Bootstrap Voltage	V_{BS}	Between VB and phase U, V, or W	20	V
Output Current (Continuous)	I_O	$T_C = 25^\circ\text{C}$	3.0	A
Output Current (Pulsed)	I_{OP}	$T_C = 25^\circ\text{C}$, $P_W \leq 100\text{ }\mu\text{s}$	4.5	A
Output Current for Regulator	I_{REG}		35	mA
Input Voltage	V_{IN}	HIN and LIN pins	-0.5 to 7	V
Allowable Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	32.8	W
Thermal Resistance (Junction-to-Case)	$R_{(j-c)Q}$	All elements operating (IGBT)	3.8	$^\circ\text{C/W}$
	$R_{(j-c)F}$	All elements operating (FWD)	4.2	$^\circ\text{C/W}$
Thermal Resistance (Junction-to-Ambient)	R_{j-a}	All elements operating (IGBT and FWD)	25	$^\circ\text{C/W}$
Case Operating Temperature	$T_{C(OP)}$		-20 to 100	$^\circ\text{C}$
Junction Temperature	T_j		150	$^\circ\text{C}$
Storage Temperature	T_{stg}		-40 to 150	$^\circ\text{C}$

3. Electrical Characteristics

3-1. Electrical Characteristics, valid at $T_a = 25^\circ\text{C}$, $V_{CC} = 15\text{ V}$

Characteristics	Symbol	Remarks	Ratings			Unit
			Min.	Typ.	Max.	
Logic Supply Current	I_{CC}	$I_{REG} = 0\text{ A}$	—	4	6	mA
Bootstrap Supply Current	I_{BS}	$V_{BS} = 15\text{ V}$, $HIN = 5\text{ V}$	—	135	380	μA
Input Voltage	V_{IH}	Output ON	—	2.0	2.5	V
	V_{IL}	Output OFF	1.0	1.5	—	V
	V_{HYS}	Hysteresis	—	0.5	—	V
Input Current	I_{IH}	$V_{IN} = 5\text{ V}$	—	50	100	μA
Undervoltage Lockout (Bootstrap)	V_{UVHL}	Between VB and U, V, or W	9.0	10.0	11.0	V
	V_{UVHH}	Between VB and U, V, or W	9.5	10.5	11.5	V
	V_{UVhys}	Between VB and U, V, or W; hysteresis	—	0.5	—	V
Undervoltage Lockout (Logic Supply)	V_{UVLL}	Between VCC and COM	10.0	11.0	12.0	V
	V_{UVLH}	Between VCC and COM	10.5	11.5	12.5	V
	V_{UVhys}	Between VCC and COM; hysteresis	—	0.5	—	V
FO Terminal Output Voltage	V_{FOL}	$V_{CC} = 15\text{ V}$, $I_{FO} = -1\text{ mA}$	0	—	1.0	V
	V_{FOH}	$V_{CC} = 15\text{ V}$, $I_{FO} = 1.6\text{ mA}$	4.0	—	5.5	V
IGBT Leakage Current	I_{CES}	$V_{CE} = 600\text{ V}$, $V_{IN} = 0\text{ V}$, $V_{CC} = 15\text{ V}$	—	—	1	mA
IGBT Saturation Voltage	$V_{CE(sat)}$	$V_{CC} = 15\text{ V}$, $I_{CE} = 3\text{ A}$, $V_{IN} = 5\text{ V}$	—	1.75	2.1	V
Diode Forward Voltage	V_F	$V_{CC} = 15\text{ V}$, $I_F = 3\text{ A}$, $V_{IN} = 0\text{ V}$	—	1.65	2.0	V
Switching Time, High Side	$t_{d(on)}$	$V_{BB} = 300\text{ V}$, $V_{CC} = 15\text{ V}$, $I_C = 3\text{ A}$, $HIN = 0 \rightarrow 5\text{ V}$ or $5 \rightarrow 0\text{ V}$, inductive load	—	315	—	ns
	t_r		—	50	—	
	t_{Tr}		—	80	—	
	$t_{d(off)}$		—	375	—	
	t_f		—	165	—	
Switching Time, Low Side	$t_{d(on)}$	$V_{BB} = 300\text{ V}$, $V_{CC} = 15\text{ V}$, $I_C = 3\text{ A}$, $LIN = 0 \rightarrow 5\text{ V}$ or $5 \rightarrow 0\text{ V}$, inductive load	—	395	—	ns
	t_r		—	60	—	
	t_{Tr}		—	75	—	
	$t_{d(off)}$		—	395	—	
	t_f		—	170	—	



Switching Characteristics Definitions

SLA6845MZ

March, 2015

3-2. Recommended Operating Conditions

Characteristics	Symbol	Remarks	Ratings			Unit
			Min.	Typ.	Max.	
Main Supply Voltage	V_{DC}	Between VBB and LS	—	300	450	V
Logic Supply Voltage	V_{CC}	Between VCC and COM	13.5	—	16.5	V
Dead Time	t_{dead}		1.5	—	—	μs
Minimum Input Pulse Width	$t_{INmin(on)}$		0.5	—	—	μs
	$t_{INmin(off)}$		0.5	—	—	μs

3-3. Truth Table

Mode	HIN	LIN	High-Side IGBT	Low-Side IGBT
Normal ¹⁾	L	L	OFF	OFF
	H	L	ON	OFF
	L	H	OFF	ON
	H	H	ON	ON
OCP	L	L	OFF	OFF
	H	L	ON	OFF
	L	H	OFF	OFF
	H	H	ON	OFF
UVLO (VCC) ²⁾	L	L	OFF	OFF
	H	L	OFF	OFF
	L	H	OFF	OFF
	H	H	OFF	OFF
UVLO (VB) ³⁾	L	L	OFF	OFF
	H	L	OFF	OFF
	L	H	OFF	ON
	H	H	OFF	ON

¹⁾ An arm short-circuit may occur when inputs on the HIN and LIN pins for the same phase are all logic high. Therefore, extra attention should be paid to prevent a condition in which the pins for the same phase are fully ON at once.

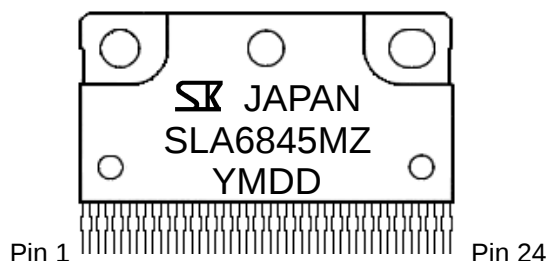
²⁾ When returning to the Normal operation mode from a V_{CC} UVLO state, high-side and low-side IGBTs resume switching on the rising edge of an HIN input (positive edge triggering).

³⁾ When returning to the Normal operation mode from a V_B UVLO state, a high-side IGBT resumes switching on the rising edge of an HIN input (positive edge triggering).

SLA6845MZ

March, 2015

4. Pin-out Diagram



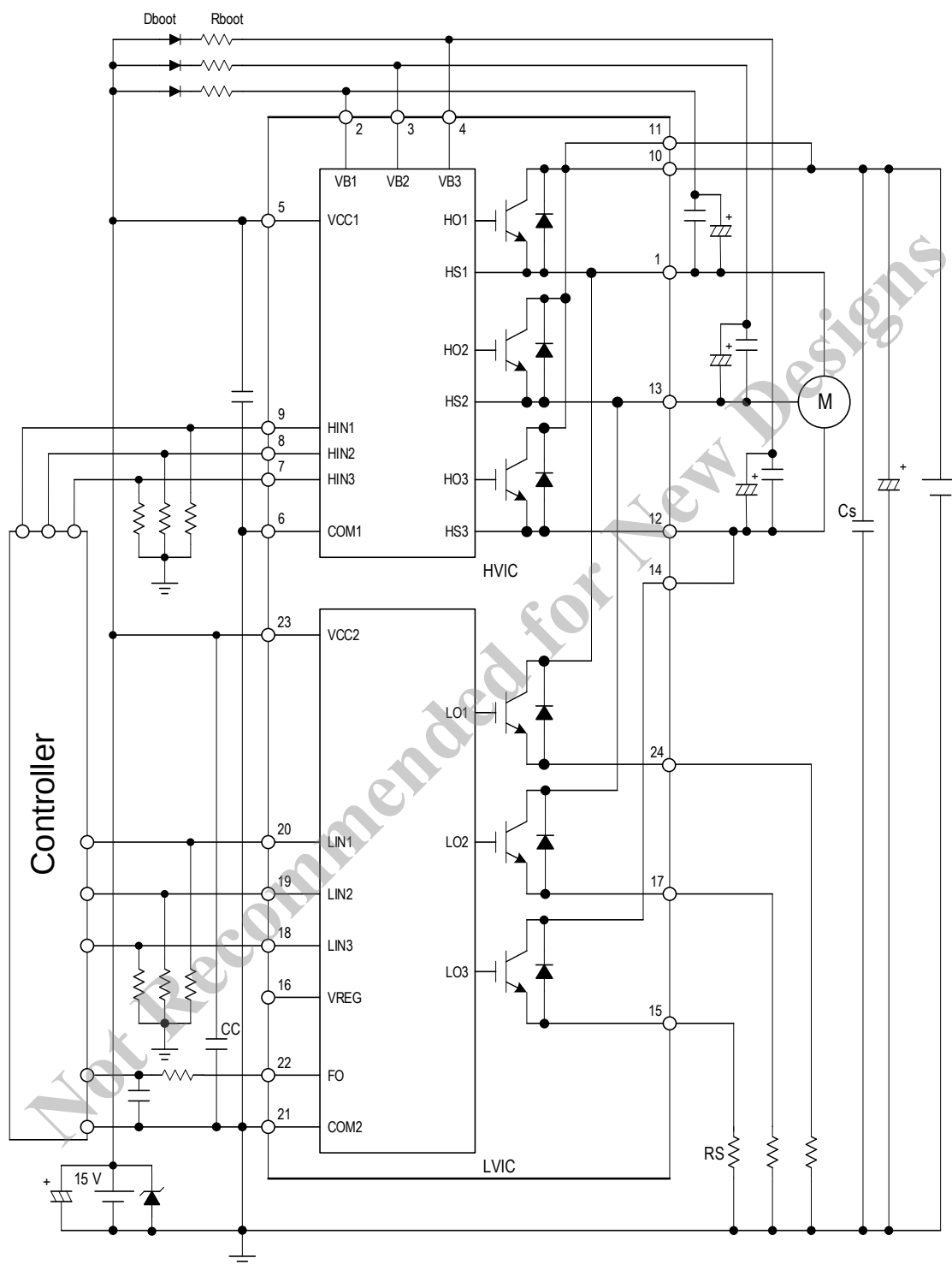
Terminal List Table

Pin Number	Pin Name	Functions	I/O
1	U	Phase U output	Output
2	VB1	High-side bootstrap (phase U)	—
3	VB2	High-side bootstrap (phase V)	—
4	VB3	High-side bootstrap (phase W)	—
5	VCC1	High-side logic supply voltage	—
6	COM1	High-side logic GND	—
7	HIN3	High-side input (phase W)	Input
8	HIN2	High-side input (phase V)	Input
9	HIN1	High-side input (phase U)	Input
10	VBB1	Main supply voltage 1 (connected to VBB2 externally)	—
11	VBB2	Main supply voltage 2 (connected to VBB1 externally)	—
12	W1	Phase W output (connected to W2 externally)	Output
13	V	Phase V output	Output
14	W2	Phase W output (connected to W1 externally)	Output
15	LS3	Low-side emitter (phase W)	—
16	VREG	Internal regulator output	Output
17	LS2	Low-side emitter (phase V)	—
18	LIN3	Low-side input (phase W)	Input
19	LIN2	Low-side input (phase V)	Input
20	LIN1	Low-side input (phase U)	Input
21	COM2	Low-side logic GND	—
22	FO	Overheat detection and UVLO protection fault-signal output	Output
23	VCC2	Low-side logic supply voltage	—
24	LS1	Low-side emitter (phase U)	—

SLA6845MZ

March, 2015

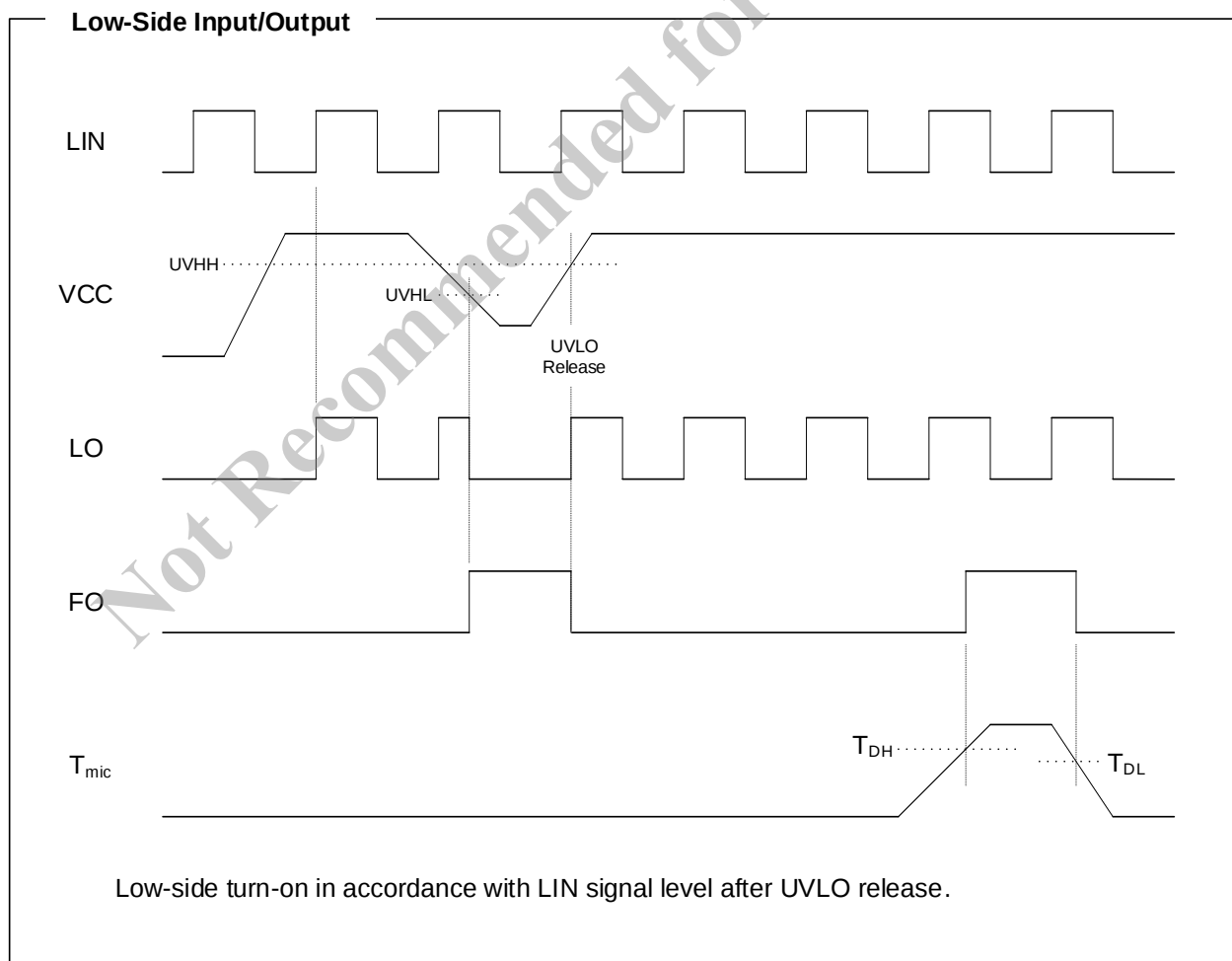
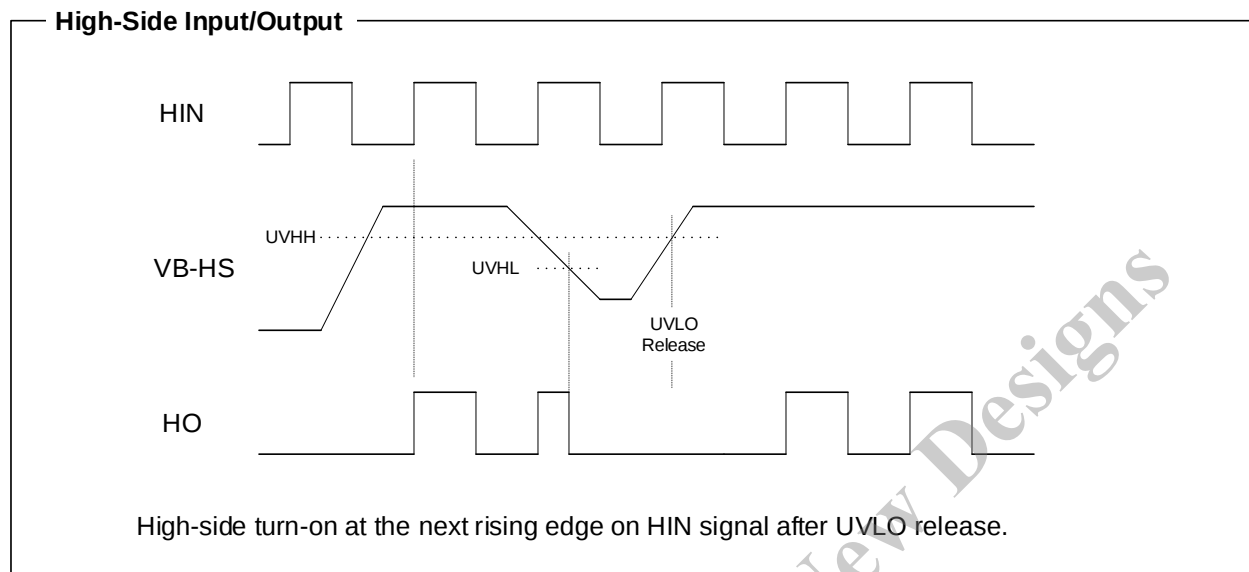
5. Application Example



NOTES:

- All of the input pins are connected to GND with internal pull-down resistors rated at 100 k Ω . However, an external pull-down resistor may be required to secure stable condition of the inputs if high impedance conditions are applied to them.
- The external electrolytic capacitors should be placed as close to the IC as possible, in order to avoid malfunctions from external noise interference. Put a ceramic capacitor in parallel with the electrolytic capacitor if further reduction of noise susceptibility is necessary.

6. Timing Diagrams for Protection Operations

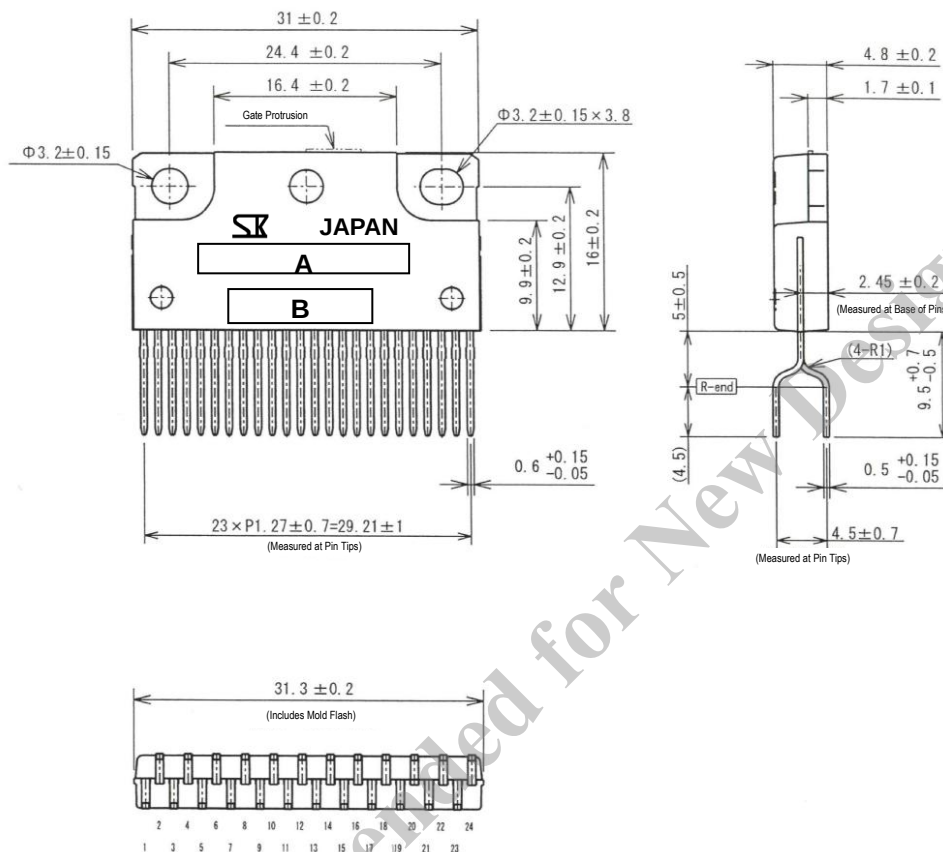


SLA6845MZ

March, 2015

7. Package Outline Drawing

7-1. Leadform 2171 (Dimensions in Millimeters)



■ Branding Codes

A. Part number: SLA6845MZ

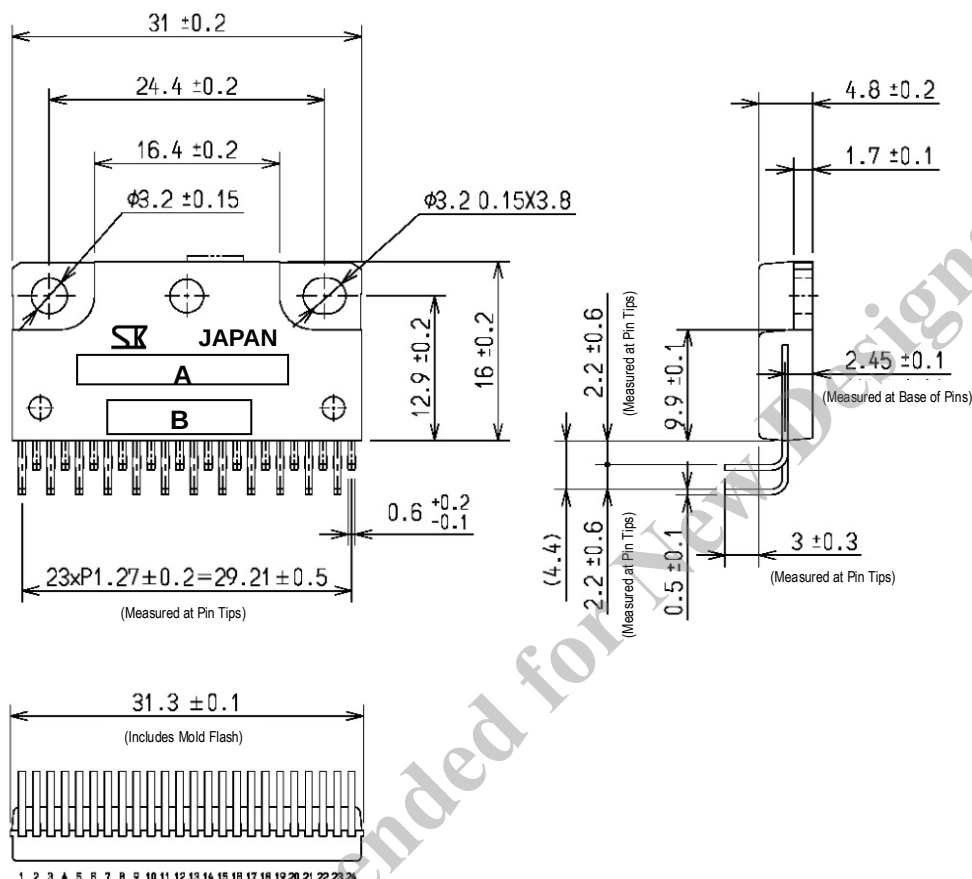
B. Lot number: YMDD#

- Y is the last digit of the year of manufacture
- M is the month of the year manufactured (1 to 9, O, N, or D)
- DD is the day of the month manufactured (01 to 31)
- # is the Sanken control number

SLA6845MZ

March, 2015

7-2. Leadform 2175 (Dimensions in Millimeters)



■ Branding Codes

A. Part number: SLA6845MZ

B. Lot number: YMDD#

- Y is the last digit of the year of manufacture
- M is the month of the year manufactured (1 to 9, O, N, or D)
- DD is the day of the month manufactured (01 to 31)
- # is the Sanken control number

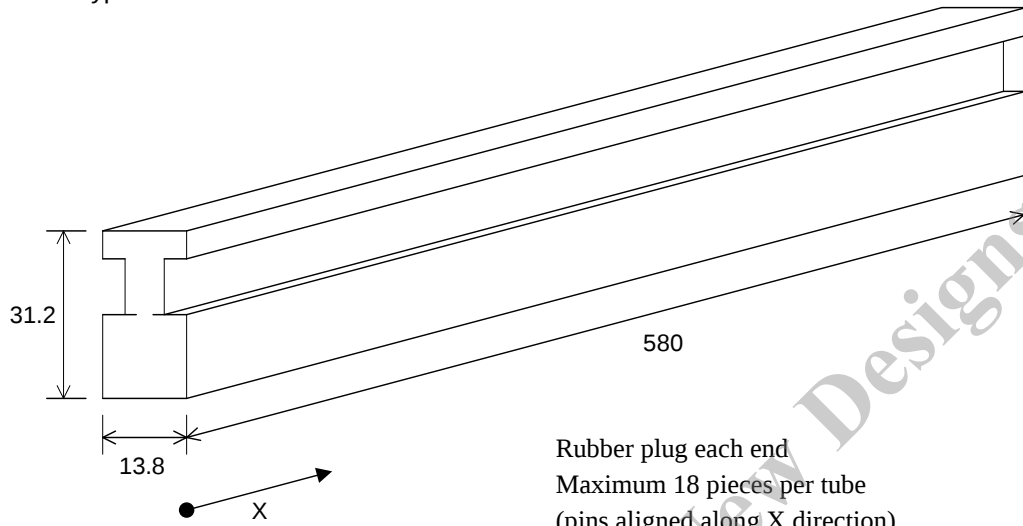
SLA6845MZ

March, 2015

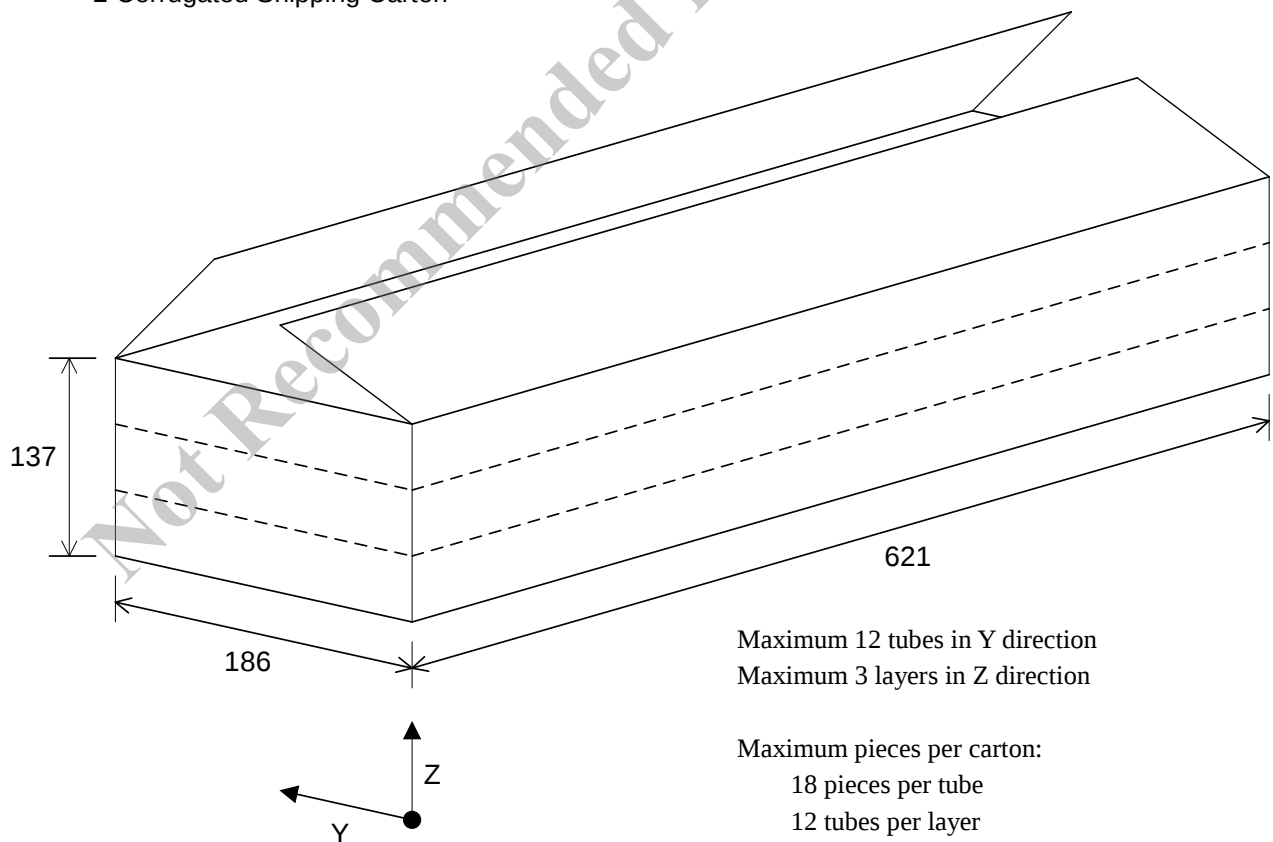
8. Packing Specifications

8-1. Leadform 2171 (Dimensions in Millimeters)

- Tube Type: SLA-F



- Corrugated Shipping Carton

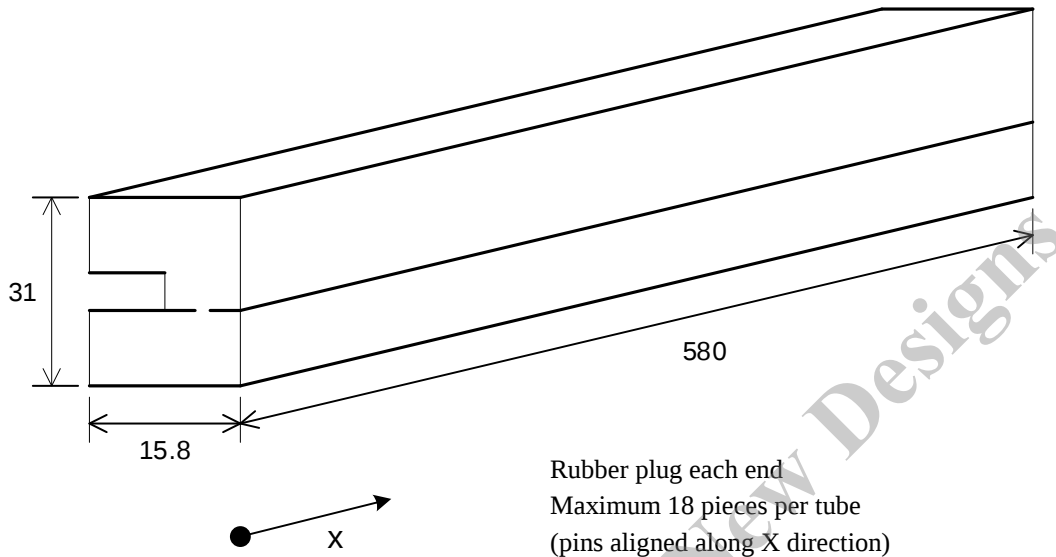


SLA6845MZ

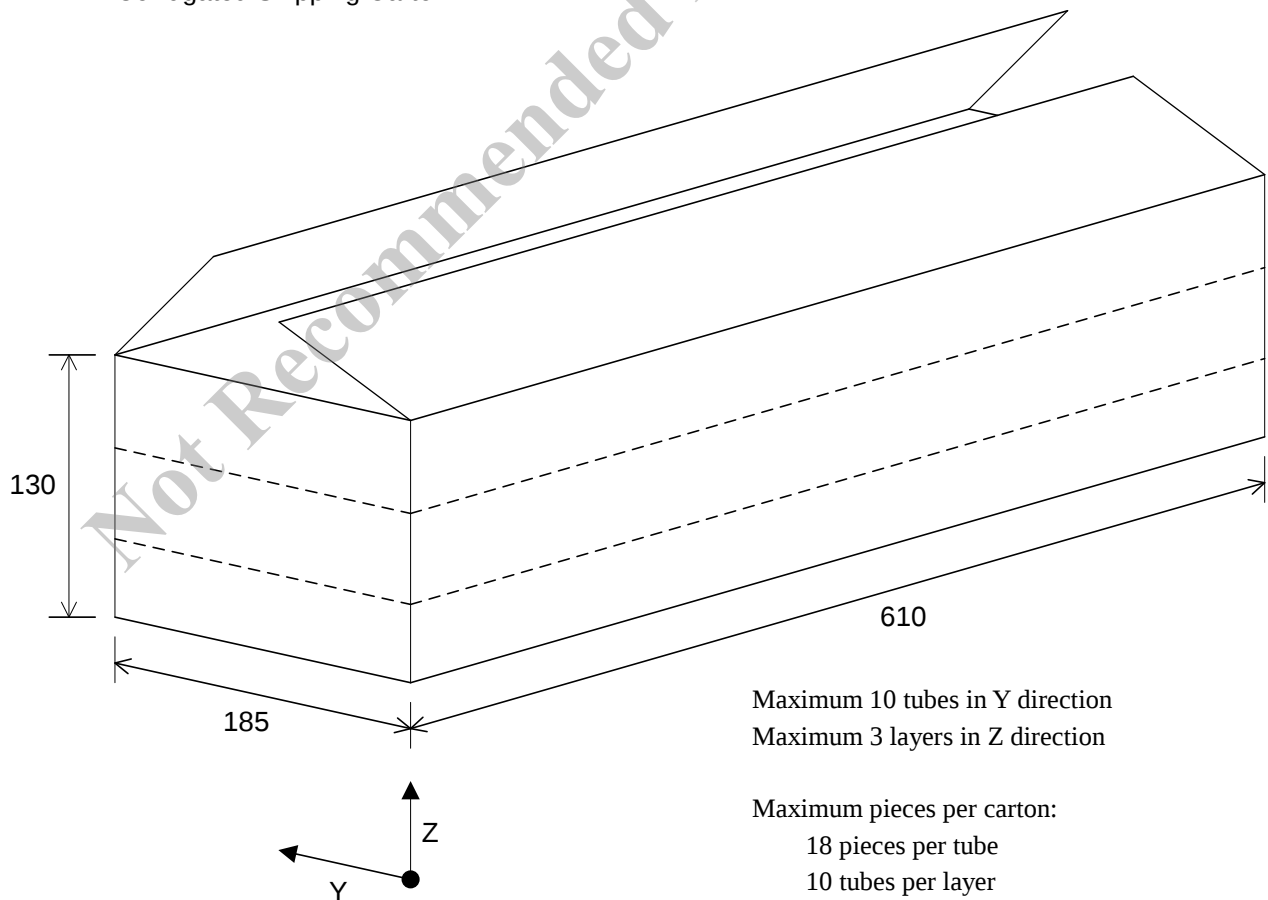
March, 2015

8-2. Leadform 2175 (Dimensions in Millimeters)

■ Tube Type: SLA-E



■ Corrugated Shipping Carton



Maximum pieces per carton:

18 pieces per tube

10 tubes per layer

× 3 layers of tubes

540 pieces per carton

IMPORTANT NOTES

- All data, illustrations, graphs, tables and any other information included in this document as to Sanken's products listed herein (the "Sanken Products") are current as of the date this document is issued. All contents in this document are subject to any change without notice due to improvement, etc. Please make sure that the contents set forth in this document reflect the latest revisions before use.
- The Sanken Products are intended for use as components of general purpose electronic equipment or apparatus (such as home appliances, office equipment, telecommunication equipment, measuring equipment, etc.). Prior to use of the Sanken Products, please put your signature, or affix your name and seal, on the specification documents of the Sanken Products and return them to Sanken. If considering use of the Sanken Products for any applications that require higher reliability (transportation equipment and its control systems, traffic signal control systems or equipment, disaster/crime alarm systems, various safety devices, etc.), you must contact a Sanken sales representative to discuss the suitability of such use and put your signature, or affix your name and seal, on the specification documents of the Sanken Products and return them to Sanken, prior to the use of the Sanken Products. Any use of the Sanken Products without the prior written consent of Sanken in any applications where extremely high reliability is required (aerospace equipment, nuclear power control systems, life support systems, etc.) is strictly prohibited.
- In the event of using the Sanken Products by either (i) combining other products or materials therewith or (ii) physically, chemically or otherwise processing or treating the same, you must duly consider all possible risks that may result from all such uses in advance and proceed therewith at your own responsibility.
- Although Sanken is making efforts to enhance the quality and reliability of its products, it is impossible to completely avoid the occurrence of any failure or defect in semiconductor products at a certain rate. You must take, at your own responsibility, preventative measures including using a sufficient safety design and confirming safety of any equipment or systems in/for which the Sanken Products are used, upon due consideration of a failure occurrence rate or derating, etc., in order not to cause any human injury or death, fire accident or social harm which may result from any failure or malfunction of the Sanken Products. Please refer to the relevant specification documents and Sanken's official website in relation to derating.
- No anti-radioactive ray design has been adopted for the Sanken Products.
- No contents in this document can be transcribed or copied without Sanken's prior written consent.
- The circuit constant, operation examples, circuit examples, pattern layout examples, design examples, recommended examples and evaluation results based thereon, etc., described in this document are presented for the sole purpose of reference of use of the Sanken Products and Sanken assumes no responsibility whatsoever for any and all damages and losses that may be suffered by you, users or any third party, or any possible infringement of any and all property rights including intellectual property rights and any other rights of you, users or any third party, resulting from the foregoing.
- All technical information described in this document (the "Technical Information") is presented for the sole purpose of reference of use of the Sanken Products and no license, express, implied or otherwise, is granted hereby under any intellectual property rights or any other rights of Sanken.
- Unless otherwise agreed in writing between Sanken and you, Sanken makes no warranty of any kind, whether express or implied, as to the quality of the Sanken Products (including the merchantability, or fitness for a particular purpose or a special environment thereof), and any information contained in this document (including its accuracy, usefulness, or reliability).
- In the event of using the Sanken Products, you must use the same after carefully examining all applicable environmental laws and regulations that regulate the inclusion or use of any particular controlled substances, including, but not limited to, the EU RoHS Directive, so as to be in strict compliance with such applicable laws and regulations.
- You must not use the Sanken Products or the Technical Information for the purpose of any military applications or use, including but not limited to the development of weapons of mass destruction. In the event of exporting the Sanken Products or the Technical Information, or providing them for non-residents, you must comply with all applicable export control laws and regulations in each country including the U.S. Export Administration Regulations (EAR) and the Foreign Exchange and Foreign Trade Act of Japan, and follow the procedures required by such applicable laws and regulations.
- Sanken assumes no responsibility for any troubles, which may occur during the transportation of the Sanken Products including the falling thereof, out of Sanken's distribution network.
- Although Sanken has prepared this document with its due care to pursue the accuracy thereof, Sanken does not warrant that it is error free and Sanken assumes no liability whatsoever for any and all damages and losses which may be suffered by you resulting from any possible errors or omissions in connection with the contents included herein.
- Please refer to the relevant specification documents in relation to particular precautions when using the Sanken Products, and refer to our official website in relation to general instructions and directions for using the Sanken Products.