

Prepared (also subject responsible if other)		No.		
MICJOHH		1/1301-BMR 640 5001 Uen		
Approved	Checked	Date	Rev	Reference
MPM/BK/P (Margaretha Anderzén)	QDEGBEN	2006-04-2804	B	

General Information

Ordering Information

See Contents for individual product ordering numbers.

Reliability

The Mean Time Between Failure (MTBF) is calculated at full output power and an operating ambient temperature (T_A) of +40°C, which is a typical condition in Information and Communication Technology (ICT) equipment. Different methods could be used to calculate the predicted MTBF and failure rate which may give different results. Ericsson Power Modules currently uses one method Telcordia SR332.

Predicted MTBF for the series is:

- 3.7 million hours according to Telcordia SR332, issue 1, Black box technique.

The Ericsson failure rate data system is based on field tracking data. The data corresponds to actual failure rates of components used in Information Technology and Telecom (IT&T) equipment in temperature controlled environments ($T_A = -5...+65^\circ\text{C}$). Telcordia SR332 is a commonly used standard method intended for reliability calculations in IT&T equipment. The parts count procedure used in this method was originally modelled on the methods from MIL-HDBK-217F, Reliability Predictions of Electronic Equipment. It assumes that no reliability data is available on the actual units and devices for which the predictions are to be made, i.e. all predictions are based on generic reliability parameters.

Compatibility with RoHS requirements

The products are compatible with the relevant clauses and requirements of the RoHS directive 2002/95/EC and have a maximum concentration value of 0.1% by weight in homogeneous materials for lead in other applications other than lead in solder, lead in high melting temperature type solder, lead in glass of electronics components, lead in electronic ceramic parts and lead as an alloying element in copper containing up to 4% lead by weight, mercury, hexavalent chromium, PBB and PBDE and of 0.01% by weight in homogeneous materials for cadmium.

Exemptions in the RoHS directive utilized in the products:

- Lead as an alloying element in copper alloy containing up to 4% lead by weight (used in connection pins made of Brass)
- Lead in high melting temperature type solder (used to

- solder the die in semiconductor packages)
- Lead in glass of electronics components and in electronic ceramic parts (e.g. fill material in chip resistors)
- Lead in solder for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunication
 (Note: the products are manufactured in lead-free soldering processes and the lead present in the solder is only located in the terminal plating finishes on some components)

Quality Statement

The products are designed and manufactured in an industrial environment where quality systems and methods like ISO 9000, 6 σ (sigma), and SPC are intensively in use to boost the continuous improvements strategy. Infant mortality or early failures in the products are screened out and they are subjected to an ATE-based final test. Conservative design rules, design reviews and product qualifications, plus the high competence of an engaged work force, contribute to the high quality of our products.

Warranty

Warranty period and conditions are defined in Ericsson Power Modules General Terms and Conditions of Sale.

Limitation of Liability

Ericsson Power Modules does not make any other warranties, expressed or implied including any warranty of merchantability or fitness for a particular purpose (including, but not limited to, use in life support applications, where malfunctions of product can cause injury to a person's health or life).

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Safety Specification

General information

Ericsson Power Modules DC/DC converters and DC/DC regulators are designed in accordance with safety standards IEC/EN/UL60950, *Safety of Information Technology Equipment*.

IEC/EN/UL60950 contains requirements to prevent injury or damage due to the following hazards:

- Electrical shock
- Energy hazards
- Fire
- Mechanical and heat hazards
- Radiation hazards
- Chemical hazards

On-board DC-DC converters are defined as component power supplies. As components they cannot fully comply with the provisions of any Safety requirements without "Conditions of Acceptability". It is the responsibility of the installer to ensure that the final product housing these components complies with the requirements of all applicable Safety standards and Directives for the final product.

Component power supplies for general use should comply with the requirements in IEC60950, EN60950 and UL60950 "*Safety of information technology equipment*".

There are other more product related standards, e.g. IEEE802.3af "Ethernet LAN/MAN Data terminal equipment power", and ETS300132-2 "Power supply interface at the input to telecommunications equipment; part 2: DC", but all of these standards are based on IEC/EN/UL60950 with regards to safety.

The flammability rating for all construction parts of the products meets requirements for V-0 class material according to IEC 60695-11-10.

The products should be installed in the end-use equipment, in accordance with the requirements of the ultimate application. Normally the output of the DC/DC converter is considered as SELV (Safety Extra Low Voltage) and the input source must be isolated by minimum Double or Reinforced Insulation from the primary circuit (AC mains) in accordance with IEC/EN/UL60950.

24 V DC systems

The input voltage to the DC/DC converter is SELV (Safety Extra Low Voltage) and the output remains SELV under normal and abnormal operating conditions.

48 and 60 V DC systems

If the input voltage to Ericsson Power Modules DC/DC converter is 75 Vdc or less, then the output remains SELV (Safety Extra Low Voltage) under normal and abnormal operating conditions.

Single fault testing in the input power supply circuit should be performed with the DC/DC converter connected to demonstrate that the input voltage does not exceed 75 Vdc.

If the input power source circuit is a DC power system, the source may be treated as a TNV2 circuit and testing has demonstrated compliance with SELV limits and isolation requirements equivalent to Basic Insulation in accordance with IEC/EN/UL60950.

Non-isolated DC/DC regulators

The input voltage to the DC/DC regulator is SELV (Safety Extra Low Voltage) and the output remains SELV under normal and abnormal operating conditions.

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Product Specification Template

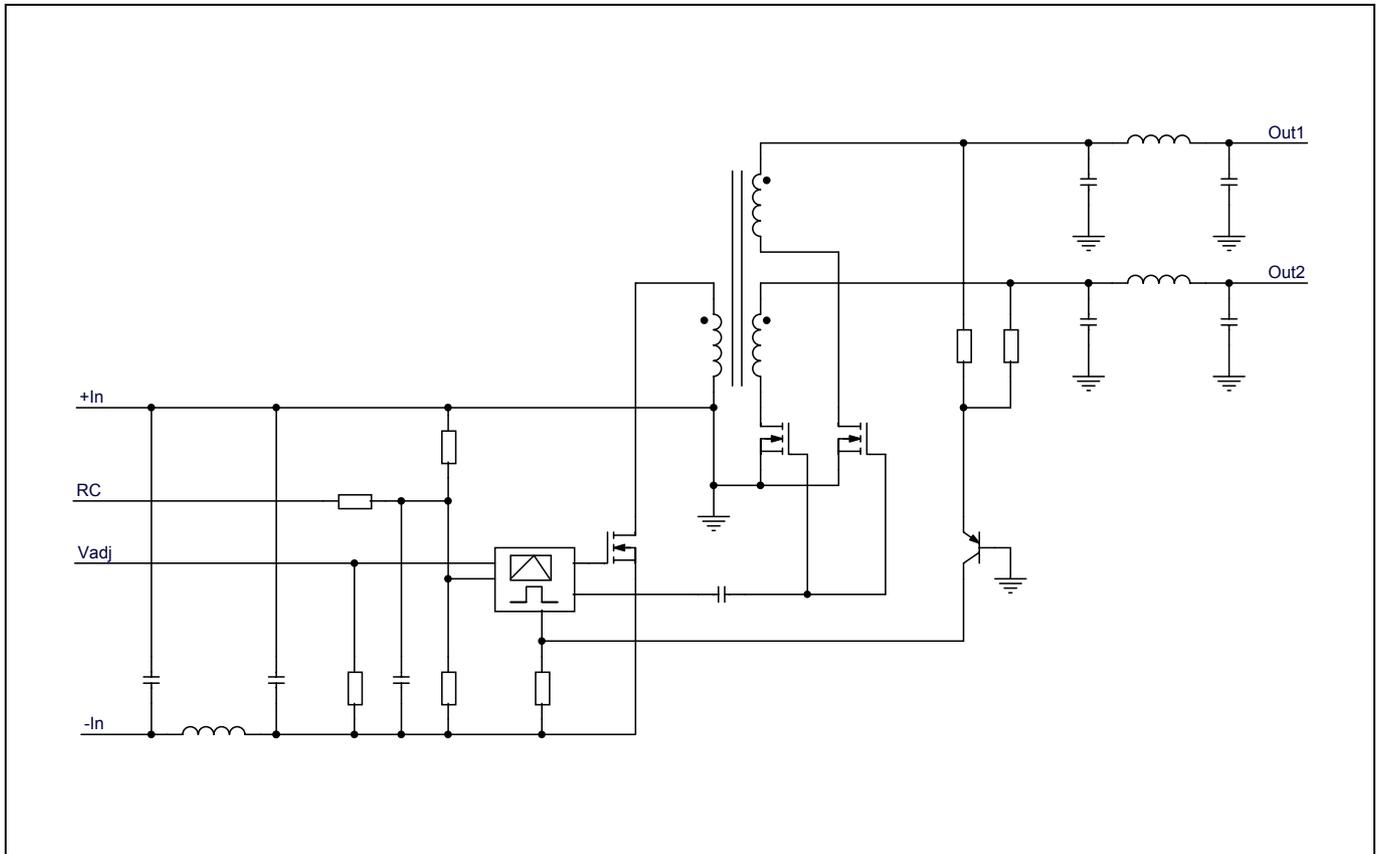
2/1301 - Electrical Design - Converters

Absolute Maximum Ratings

Characteristics		min	typ	max	Unit
T_{ref}	Operating Temperature (see Thermal Consideration section)	-40		+105	°C
T_s	Storage temperature	-55		+125	°C
V_I	Input voltage	-0.5		+75	V
V_{RC}	Remote Control pin voltage (see Operating Information section)	Positive logic option		+75	V
					V
V_{adj}	Adjust pin voltage (see Operating Information section)	-5		+40	V

Stress in excess of Absolute Maximum Ratings may cause permanent damage. Absolute Maximum Ratings, sometimes referred to as no destruction limits, are normally tested with one parameter at a time exceeding the limits of Output data or Electrical Characteristics. If exposed to stress above these limits, function and performance may degrade in an unspecified manner.

Fundamental Circuit Diagram



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3.3 V/2.8 A, 1.85 V/2.8 A Dual, Electrical Specification

$T_{ref} = -30$ to $+95^{\circ}\text{C}$, $V_I = 40$ to 72 V, unless otherwise specified under Conditions.

Typical values given at: $T_{ref} = +25^{\circ}\text{C}$, $V_I = 53$ V, max I_O unless otherwise specified under Conditions.

Characteristics		Conditions	min	typ	max	Unit
V_I	Input voltage range		40	53	72	V
V_{Ioff}	Turn-off input voltage	Decreasing input voltage		31		V
V_{Ion}	Turn-on input voltage	Increasing input voltage		35		V
C_I	Internal input capacitance			2		μF
P_O	Output power				14.4	W
η	Efficiency at 50% of max power	$I_{O1} = 0,75$ A, $I_{O2} = 2,8$ A		85		%
	Efficiency at max power	$I_{O1} = 2,8$ A, $I_{O2} = 2,8$ A		84		
P_d	Power Dissipation at max power	$I_{O1} = 2.8$ A, $I_{O2} = 2.8$ A		2.7		W
P_{II}	Input idling power	$I_O = 0$ A, $V_I = 53$ V		0.8		W
P_{RC}	Input standby power	$V_I = 53$ V (turned off with RC)		0.075		W
f_s	Switching frequency			510		kHz

			Output 1			Output 2			Unit
			min	typ	max	min	typ	max	
V_{O1}	Output voltage initial setting and accuracy	$T_{ref} = +25^{\circ}\text{C}$, $V_I = 53$ V, $I_{O1} = 2.8$ A, $I_{O2} = 2.8$ A		3.3			1.85		V
V_O	Output adjust range	See operating information	+10			+10			%
	Output voltage tolerance band	70-100% of max I_O	3.13		3.47	1.76		1.94	V
	Idling voltage	$I_O = 0$ A		3.3			1.89		V
	Line regulation	$I_{O1} = 2.8$ A, $I_{O2} = 2.8$ A		12			4		mV
	Load regulation output 1	$V_I = 53$ V, $I_{O1} = 10$ -100% of max, $I_{O2} = 2.8$ A		180					mV
	Load regulation output 2	$V_I = 53$ V, $I_{O1} = 2.8$ A, $I_{O2} = 10$ -100% of max					80		
V_{tr}	Load transient voltage deviation	$V_I = 53$ V, Load step I_{O1} 25-75-25% of max, $I_{O2} = 2.8$ A. $di/dt = 0.2$ A/ μs . 100 μF external capacitors (electrolytic) on both outputs		+150 - 130			+100 - 100		mV
t_{tr}	Load transient recovery time			50			50		μs
t_r	Ramp-up time (from 10-90% of V_{O1})			1			1		ms
t_s	Start-up time (from V_I connection to 90% of V_{O1})	$I_{O1} = I_{O2} = 100$ % of max I_O		5			5		ms
t_{RC}	RC start-up time	$I_{O1} = I_{O2} = 50$ % of max I_O		4.6			4.6		ms
I_O	Output current		0		2.8	0		2.8	A
I_{lim}	Current limit threshold	$T_{ref} < \max T_{ref}$, see Note 1		4.6			5.6		A
I_{sc}	Short circuit current	$T_{ref} = 25^{\circ}\text{C}$, see Note 2		7			9		A
V_{Oac}	Output ripple & noise	$I_{O1} = I_{O2} = 100$ % of max I_O See Note 3		6	30		4	30	mVp-p

Note 1: 70% constant current load at opposite output

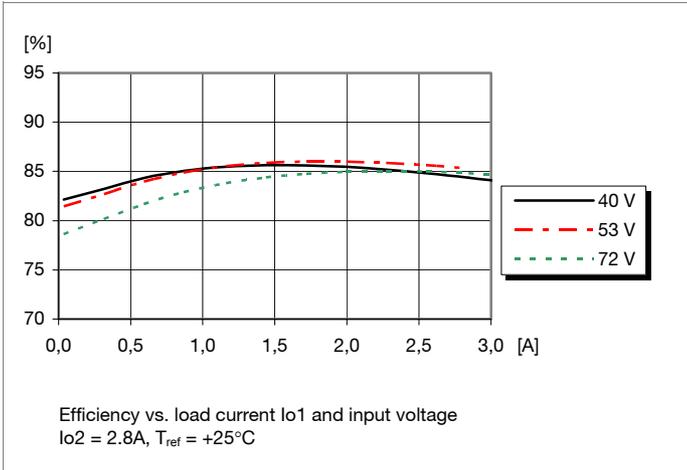
Note 2: 70% constant current load at opposite output, $V_O = 0.5$ V

Note 3: Output filter capacitor: 0.1 μF ceramic/10 μF Tantalum

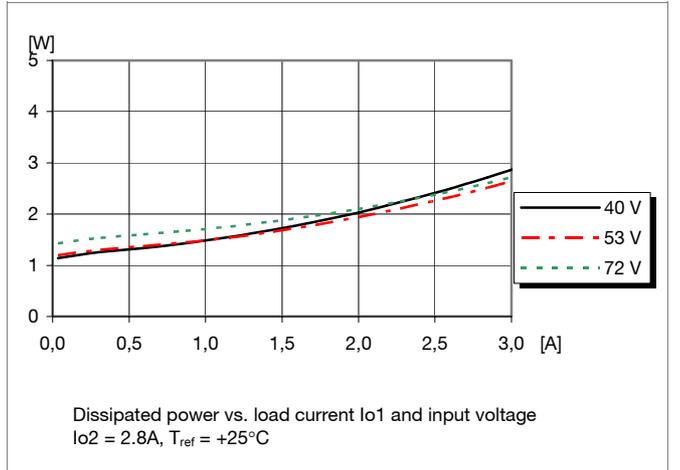
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		Reference	

3.3 V/2.8 A, 1.85 V/2.8 A Dual, Typical Characteristics

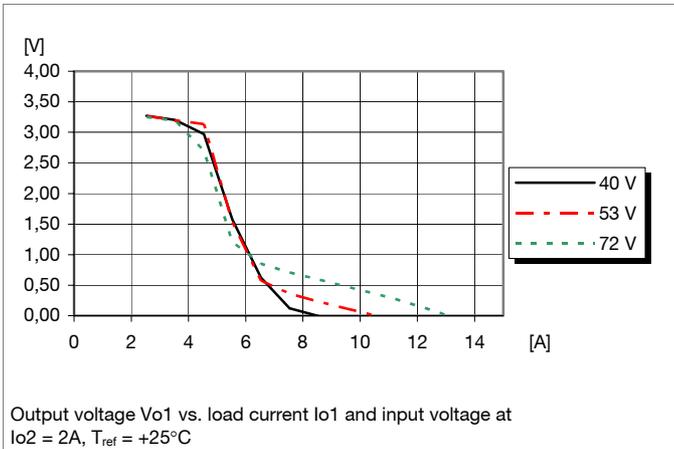
Efficiency



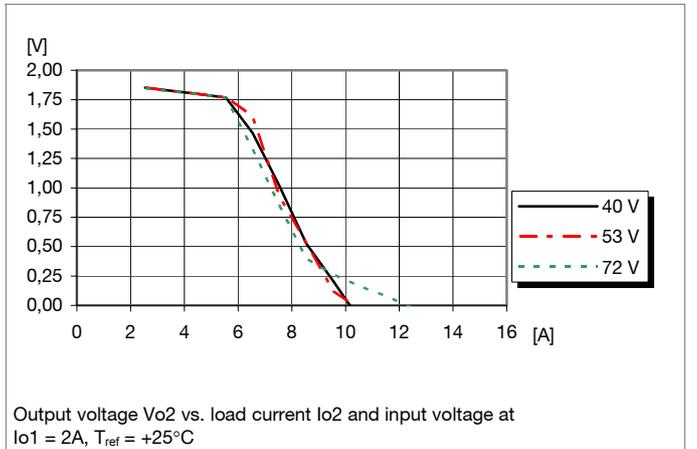
Power Dissipation



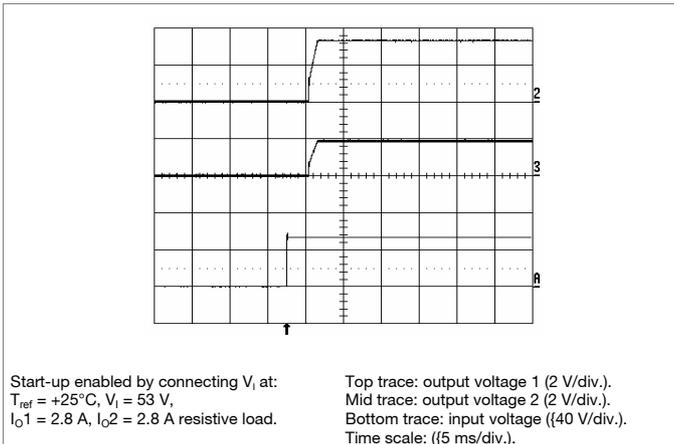
Current Limit Characteristic, Output 1



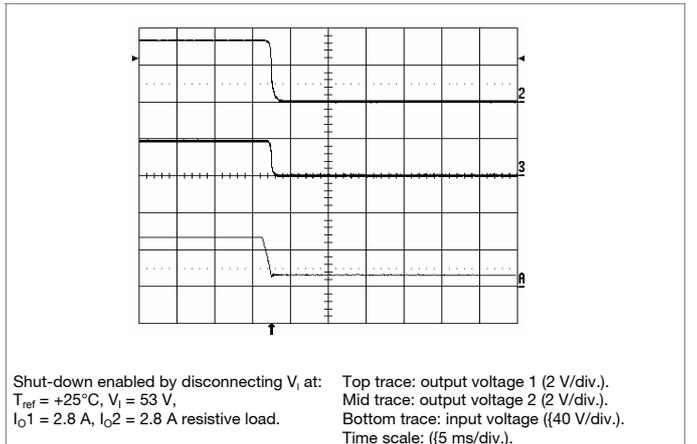
Current Limit Characteristic, Output 2



Start-up

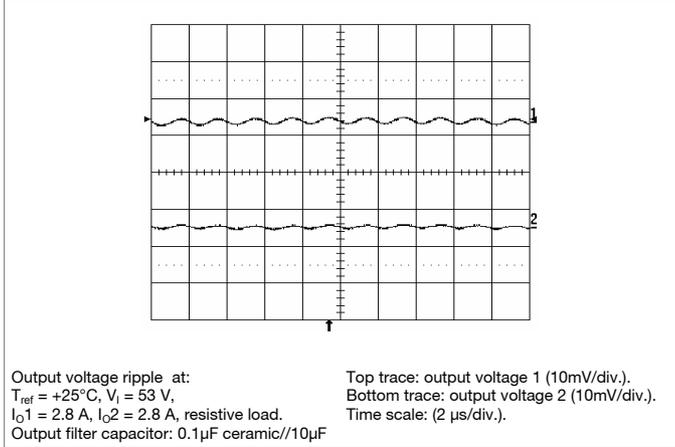


Shut-down

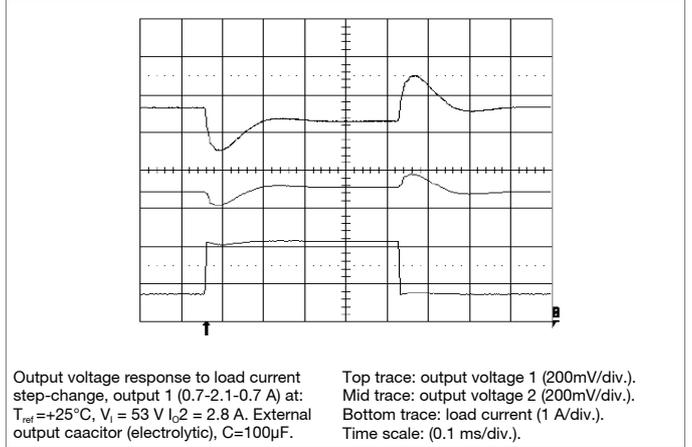


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Output Ripple & Noise



Output Load Transient Response



Output Voltage Adjust (see operating information)

To increase output voltage:

A resistor is connected between Vadj pin and GND. The resistor value for an adjusted output voltage can be interpolated from table below.

Vout1	Radj
3,35V	153 kOhm
3,40V	65,4 kOhm
3,45V	36,2 kOhm
3,50V	21,5 kOhm
3,55V	12,8 kOhm
3,60V	7,0 kOhm

To decrease output voltage:

A resistor is connected between Vadj and Out 1 pins. The resistor value for an adjusted output voltage can be interpolated from table below.

Vout1	Radj
3,25V	769 kOhm
3,20V	368 kOhm
3,15V	233 kOhm
3,10V	166 kOhm
3,05V	125 kOhm
3,00V	98,3 kOhm

Both outputs are affected by adjustment, i.e. the ratio Vout1 / Vout2 remains constant.

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Revision history

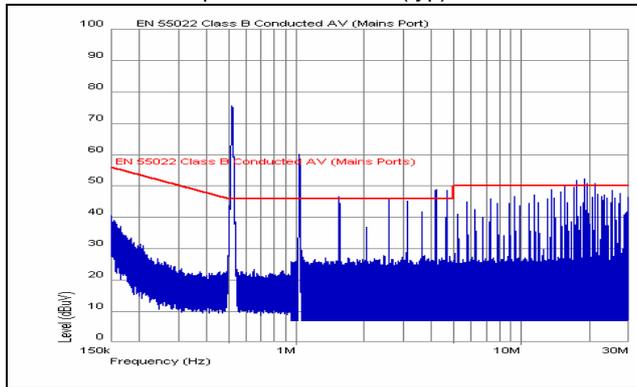
2006-05-02	A	First released revision
	B	Output Voltage Adjust information added. Fundamental Circuit Diagram redrawn. Changed value for Output Ripple & Noise (typ).

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		Reference	

EMC Specification

Conducted EMI measured according to EN55022, CISPR 22 and FCC part 15J (see test set-up). See Design Note 009 for further information. The fundamental switching frequency is 510 kHz for BMR 640 5001/1 @ $V_I = 53 V$, max I_O .

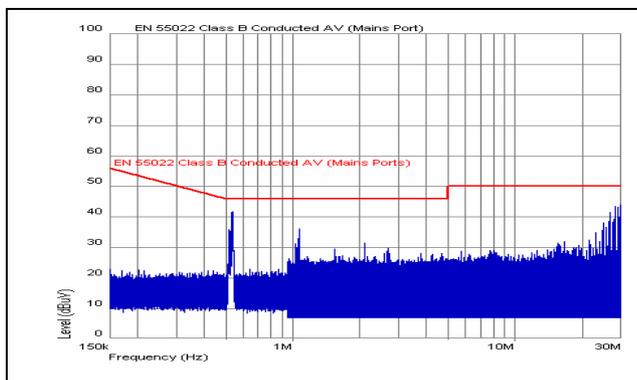
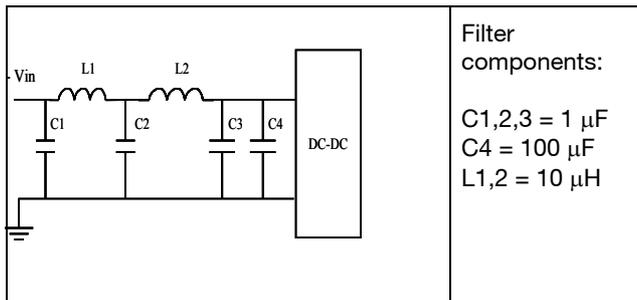
Conducted EMI Input terminal value (typ)



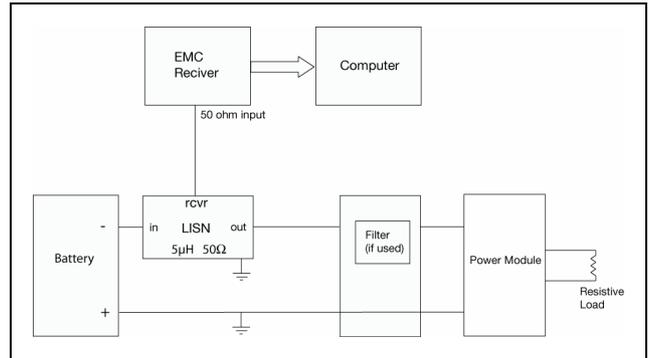
EMI without filter

External filter (class B)

Required external input filter in order to meet class B in EN 55022, CISPR 22 and FCC part 15J.



EMI with filter



Test set-up

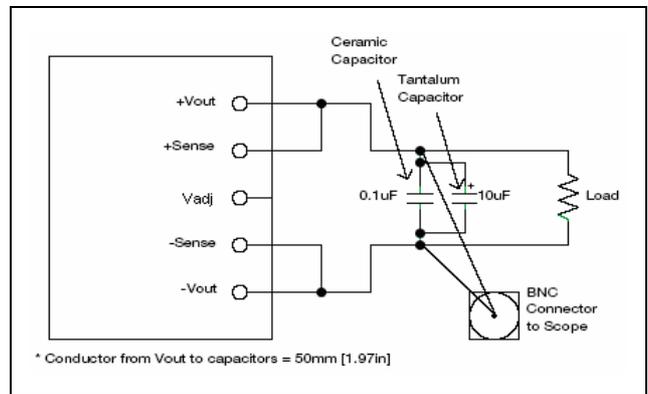
Layout recommendation

The radiated EMI performance of the DC/DC converter will depend on the PCB layout and ground layer design. It is also important to consider the stand-off of the DC/DC converter. If a ground layer is used, it should be connected to the output of the DC/DC converter and the equipment ground or chassis.

A ground layer will increase the stray capacitance in the PCB and improve the high frequency EMC performance.

Output ripple and noise

Output ripple and noise measured according to figure below. See Design Note 022 for detailed information.



Output ripple and noise test setup

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Operating information

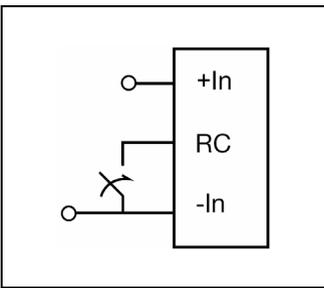
Input Voltage

The input voltage range 40 to 72 Vdc meets the requirements of the European Telecom Standard ETS 300 132-2 for normal input voltage range in -48 and -60 Vdc systems, -40.5 to -57.0 V and -50.0 to -72 V respectively. At input voltages exceeding 72 V, the power loss will be higher than at normal input voltage and T_{ref} must be limited to absolute max +105°C. The absolute maximum continuous input voltage is 75 Vdc.

Turn-off Input Voltage

The DC/DC converters monitor the input voltage and will turn on and turn off at predetermined levels. The minimum hysteresis between turn on and turn off input voltage is 3 V.

Remote Control (RC)



The products are fitted with a remote control function referenced to the primary negative input connection (-In). The RC function allows the converter to be turned on/off by an external device like a semiconductor or mechanical switch. The RC pin has an internal pull up resistor to + In.

The maximum required sink current is 1 mA. When the RC pin is left open, the voltage generated on the RC pin is 12 – 15 V. The converter will turn on when the input voltage is applied with the RC pin open. Turn off is achieved by connecting the RC pin to the - In. To ensure safe turn off the voltage difference between RC pin and the - In pin shall be less than 1V. The converter will restart automatically when this connection is opened.

See Design Note 021 for detailed information.

Input and Output Impedance

The impedance of both the input source and the load will interact with the impedance of the DC/DC converter. It is important that the input source has low characteristic impedance. The converters are designed for stable operation without external capacitors connected to the input or output. The performance in some applications can be enhanced by addition of external capacitance as described under External Decoupling Capacitors. If the input voltage source contains significant inductance, the addition of a 100 µF capacitor across the input of the converter will ensure stable operation. The capacitor is not required when powering the DC/DC converter from an input source with an inductance below 10 µH.

External Decoupling Capacitors

When powering loads with significant dynamic current

requirements, the voltage regulation at the point of load can be improved by addition of decoupling capacitors at the load. Applying external electrolytic capacitors of at least 100 µF on each output is recommended.

The most effective technique is to locate low ESR ceramic and electrolytic capacitors as close to the load as possible, using several parallel capacitors to lower the effective ESR. The ceramic capacitors will handle high-frequency dynamic load changes while the electrolytic capacitors are used to handle low frequency dynamic load changes. Ceramic capacitors will also reduce any high frequency noise at the load.

It is equally important to use low resistance and low inductance PCB layouts and cabling.

External decoupling capacitors will become part of the control loop of the DC/DC converter and may affect the stability margins. As a “rule of thumb”, 100 µF/A of output current can be added without any additional analysis. The ESR of the capacitors is a very important parameter. Power Modules guarantee stable operation with a verified ESR value of >10 mΩ across the output connections.

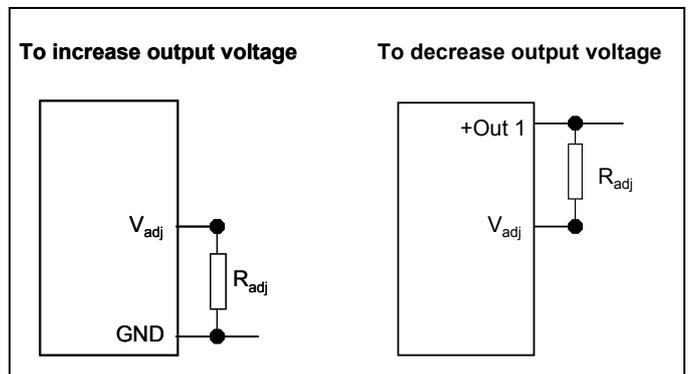
For further information please contact your local Ericsson Power Modules representative.

Output Voltage Adjust (V_{adj})

All converters have an Output Voltage Adjust pin (V_{adj}). This pin can be used to adjust the output voltage above or below Output voltage initial setting.

At increased output voltages the maximum power rating of the converter remains the same, and the max output current must be decreased correspondingly.

The output voltage can be increased or decreased by means of external resistors or other external circuitry. If other circuitry is used, the slew rate has to be limited to maximum 5V/ms. To increase the voltage the resistor should be connected between the V_{adj} pin and GND. To decrease the output voltage, the resistor should be connected between the V_{adj} and Out 1 pins. The resistors values of the Output voltage adjust function are set according to information given under the Output section.



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Operating information, cont.

Parallel Operation

It is not recommended to parallel the converters without using external current sharing circuits.

Over Load Protection (OLP)

The converters include load limiting circuitry for protection at continuous overload.
 The output voltages will decrease towards zero for output currents in excess of max output current (max I_o). The converter will resume normal operation after removal of the overload. The load distribution should be designed for the maximum output short circuit current specified.

Temperature Shutdown

The BMR 640 5001/1 DC/DC converter includes an internal over temperature shutdown circuit.
 When the temperature exceeds 130°C - 150°C on the control circuit the converter will shut down. The DC/DC converter will make continuous attempts to start up (non-latching mode) and resume normal operation automatically when the temperature has dropped >15°C below the temperature threshold.

Thermal Consideration

General

The converters are designed to operate in different thermal environments and sufficient cooling must be provided to ensure reliable operation.
 Cooling is achieved mainly by conduction, from the pins to the host board, and convection, which is dependant on the airflow across the converter. Increased airflow enhances the cooling of the converter.

The Output Current Derating graph found in the Output section for each model provides the available output current vs. ambient air temperature and air velocity at V_{in} = 53 V.

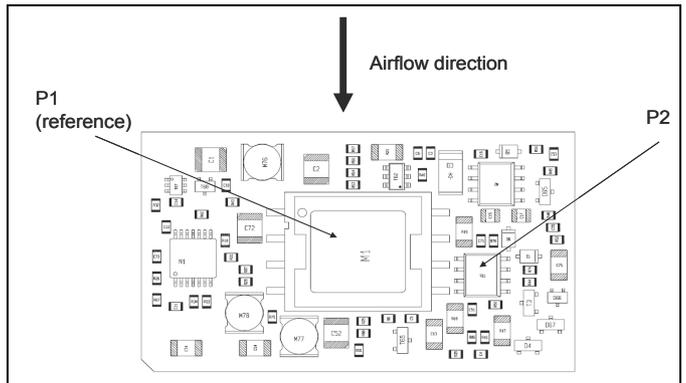
The DC/DC converter is tested on a 254 x 254 mm, 35 μm (1 oz), 8-layer test board mounted vertically in a wind tunnel with a cross-section of 305 x 305 mm.

Proper cooling of the DC/DC converter can be verified by measuring the temperature at positions P1(reference) and P2. The temperature at these positions should not exceed the max values provided in the table below.

Note that the max value is the absolute maximum rating (non destruction) and that the electrical Output data is guaranteed up to T_{ref} 95°C.

See Design Note 019 for further information.

Position	Device	Designation	max value
P1	Transformer	T _{ref}	105° C
P2	Mosfet	T _{B1}	120° C



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Thermal Consideration continued

Definition of reference temperature (T_{ref})

The reference temperature is used to monitor the temperature limits of the product. Temperatures above maximum T_{ref} are not allowed and may cause degradation or permanent damage to the product. T_{ref} is also used to define the temperature range for normal operating conditions. T_{ref} is defined by the design and used to guarantee safety margins, proper operation and high reliability of the module.

Ambient Temperature Calculation

By using the thermal resistance the maximum allowed ambient temperature can be calculated.

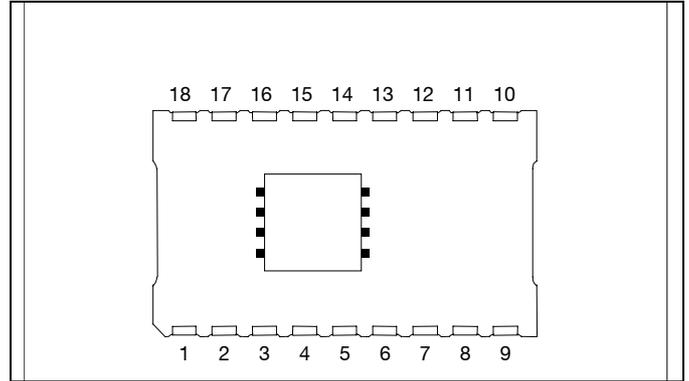
1. The power loss is calculated by using the formula $((1/\eta) - 1) \times \text{output power} = \text{power losses (Pd)}$.
 η = efficiency of converter. E.g 85 % = 0.85
2. Find the thermal resistance (Rth) in the Thermal Resistance graph found in the Output section for each model.
 Calculate the temperature increase (ΔT).
 $\Delta T = Rth \times Pd$
3. Max allowed ambient temperature is:
 Max Tref - ΔT .

E.g. The BMR 640 5001/1 at 1m/s :

- 1) $((\frac{1}{0.85}) - 1) \times 14.28 \text{ W} = 2.52 \text{ W}$
- 2) $2.52 \text{ W} \times 12.0 \text{ }^\circ\text{C/W} = 30.2^\circ\text{C}$
- 3) $105 \text{ }^\circ\text{C} - 30.2^\circ\text{C} = 74.8^\circ\text{C}$ (max ambient temperature)

The actual temperature will be dependent on several factors such as the PCB size, number of layers and direction of airflow.

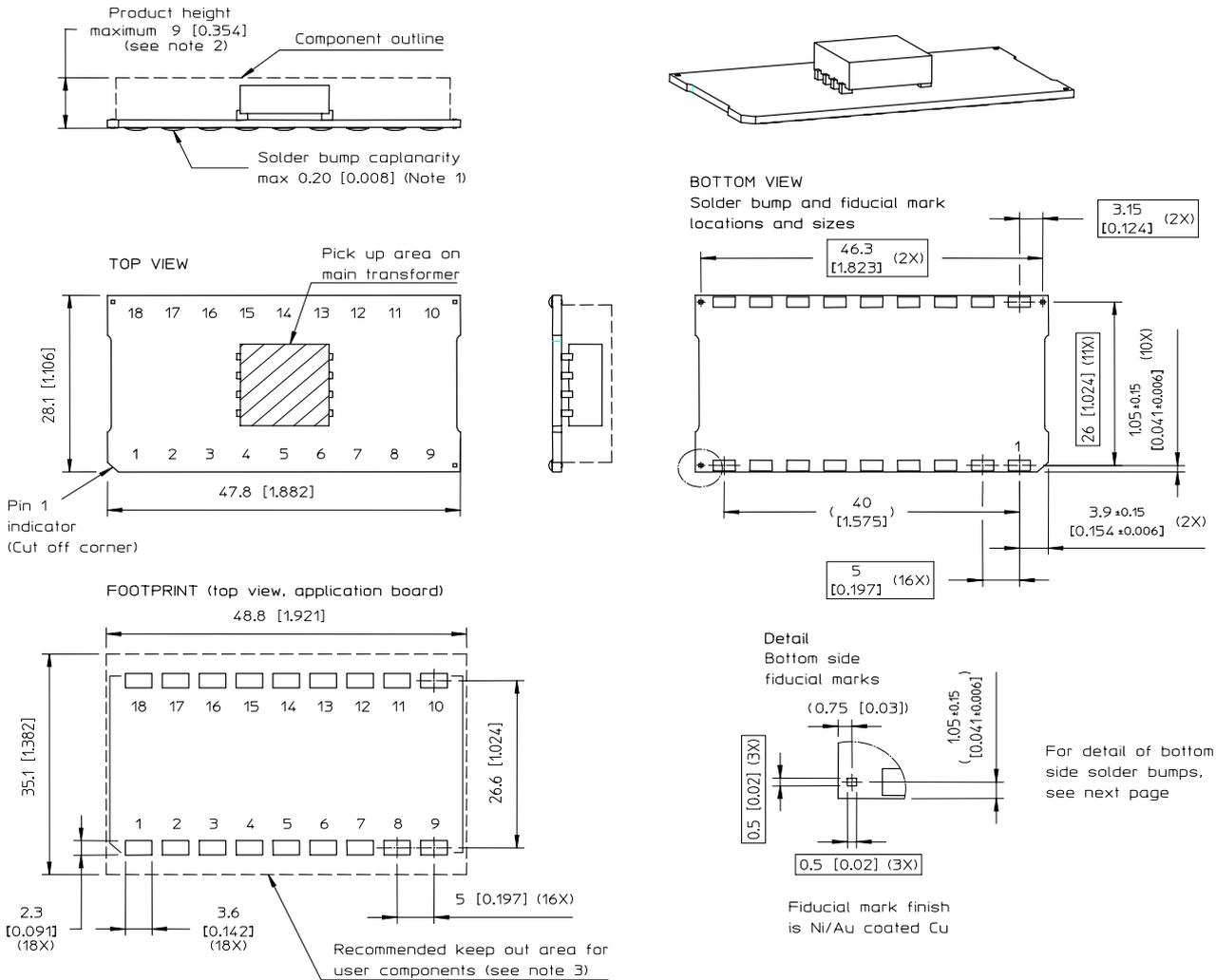
Connections



Pin	Designation	Function
1	Out 1	Output 1 (3.3V)
2	GND	Ground
3	Out 2	Output 2 (1.85V)
4	GND	Ground
5	NC	Not connected
6	NC	Not connected
7	GND	Ground
8	Vadj	Output voltage adjust
9	NC	Not connected
10	NC	Not connected
11	RC	Remote control. Used to turn-on/off output
12	GND	Ground
13	NC	Not connected
14	NC	Not connected
15	NC	Not connected
16	NC	Not connected
17	- In	Negative Input
18	+In	Positive input

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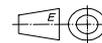
Mechanical Information - physical specifications



NOTES

- The solder bumps are designed to allow coplanarity compensation by melting of the solder bumps between the product and the application board. The coplanarity corresponds to the requirements for BGA low melt solder balls. (Jedec Publication 95, Design Guide 4.14 revision E, september 2005)
- Max product height is measured from bottom side of the product PCB but excluding the solder bump (reduced to solder joint thickness after assembly)
- Absolute keep out area = 48.8 × 29.1 based on mechanical outline and assembly tolerances. The recommended keep out area is +3 mm on each long side to facilitate repair (removal and re-mounting) with a hot air nozzle.

Weight: 9-12 g
 All dimensions in mm [inch]
 Tolerances unless specified ± 0.26 [0.01]
 (not applied on footprint or typical values)

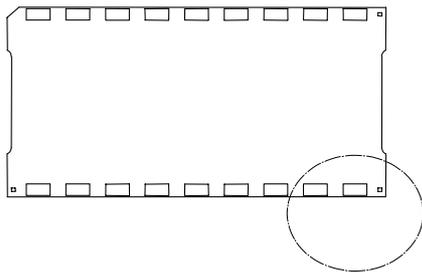


Boxed dimensions ±0.05 [±0.002]

Prepared (also subject responsible if other) MICKAOV		No. 4/1301-BMR 640 5001 Uen		
Approved MPM/BK/P (Margaretha Anderszén)	Checked See §1	Date 2006-11-29	Rev B	Reference

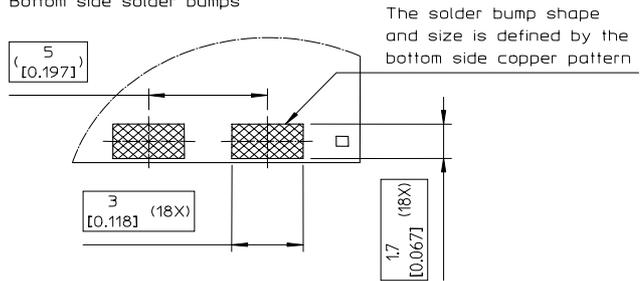
Mechanical Information – Assembly information

BOTTOM VIEW



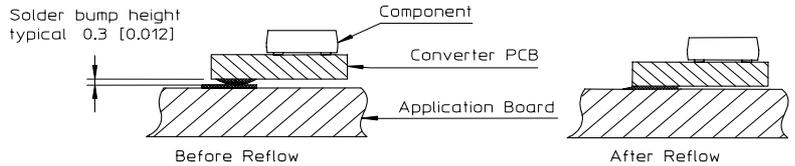
Detail

Bottom side solder bumps



Solder bump composition: no-clean SAC solder, approximate composition Sn96/Ag3/Cu1, melting range 217-221°C

APPLICATION VIEW (detail)



ALTERNATIVE FOOTPRINT, equal to the recommended PKF footprint (top view, application board)
 48.8 [1.921]

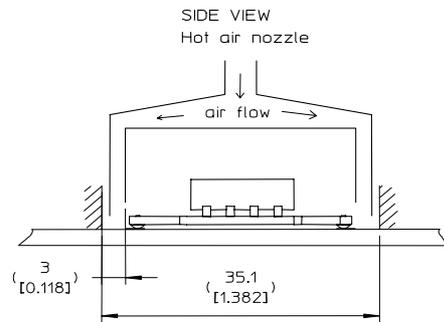
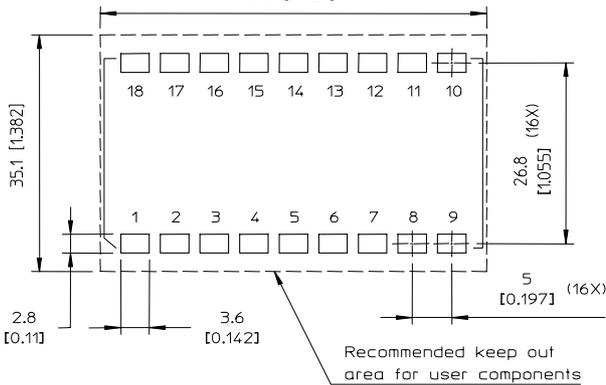
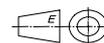


Illustration of a recommended design for a hot air repair nozzle for manual removal and re-mounting

The recommended footprint (see previous page) is optimised for the solder bump design. However, the standard PKF footprint will also accommodate this solder bump design. The only differences are the solder pad width (2.8 versus 2.3 mm) and the c-c distance between the two rows of connectors (26.8 versus 26.6 mm).

The absolute and recommended keep out areas are not affected by the differences in application board footprint.

Weight: 9-12 g
 All dimensions in mm [inch]
 Tolerances unless specified ± 0.26 [0.01]
 (not applied on footprint or typical values)



Boxed values: ±0.05 [±0.002]

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2 Revision history

Rev.	Date	Change	Reason for change
A	2006-04-26	New document	Mechanics not compliant to the PKR (BMR 6401 specification) because of different max height.
B	2006-11-29	New drawings	Product change from edge plated connectors to bottom only connectors.

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Soldering Information - Surface Mounting

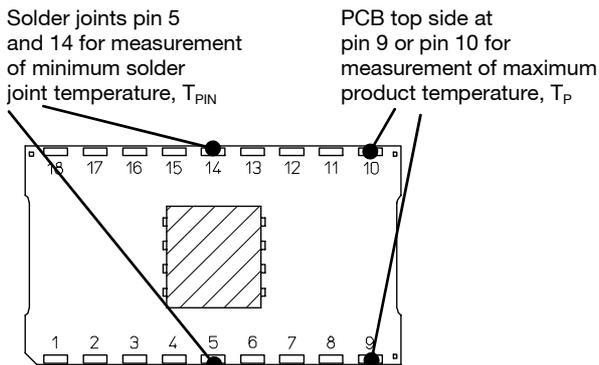
The product is intended for convection or vapor phase reflow in SnPb and Pb-free processes. To achieve a good and reliable soldering result, make sure to follow the recommendations from the solder paste supplier, to use state-of-the-art reflow equipment and reflow profiling techniques as well as the following guidelines.

When using and Sn/Pb solder in the host board assembly process, the composition of the mix of Pb- and Pb-free solder results in a higher melting temperature compared to standard Pb solder.

A no-clean flux is recommended to avoid entrapment of cleaning fluids in cavities inside the product or between the product and the host board. The cleaning residues may affect long time reliability and isolation voltage.

Minimum Pin Temperature Recommendations

Pin number 5 and 14 are chosen as reference locations for the minimum pin temperature recommendations since these will likely be the coolest solder joints during reflow.



SnPb solder processes

For Pb solder processes, a pin temperature (T_{PIN}) in excess of the solder melting temperature, (T_L , +183°C for Sn63/Pb37) for more than 30 seconds, and a peak temperature of +210°C is recommended to ensure a reliable solder joint.

Lead-free (Pb-free) solder processes

For Pb-free solder processes, a pin temperature (T_{PIN}) in excess of the solder melting temperature (T_L , +217 to +221 °C for Sn/Ag/Cu solder alloys) for more than 30 seconds, and a peak temperature of +235°C on all solder joints is recommended to ensure a reliable solder joint.

Peak Product Temperature Requirements

The top surface of the product PCB, at pins 9 or 10 are chosen as reference locations for the maximum (peak) allowed product temperature (T_P), since these will likely be the warmest parts of the product during the reflow process.

To avoid damage or performance degradation of the product, the reflow profile should be optimized to avoid excessive heating. A sufficiently extended preheat time is recommended to ensure an even temperature across the host PCB, for both small and large devices. To reduce the risk of excessive heating is also recommended to reduce the time in the reflow zone as much as possible.

SnPb solder processes

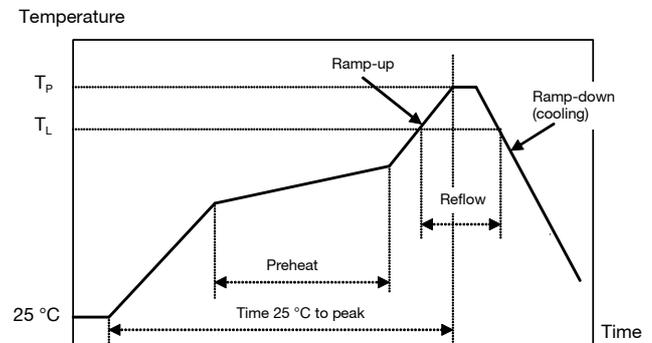
For conventional SnPb solder processes, the product is qualified for MSL 1 according to IPC/JEDEC standard J-STD-020C.

During reflow, T_P must not exceed +225 °C at any time.

Lead-free (Pb-free) solder processes

For Pb-free solder processes, the product is qualified for MSL 3 according to IPC/JEDEC standard J-STD-020C.

During reflow, T_P must not exceed +260 °C at any time.



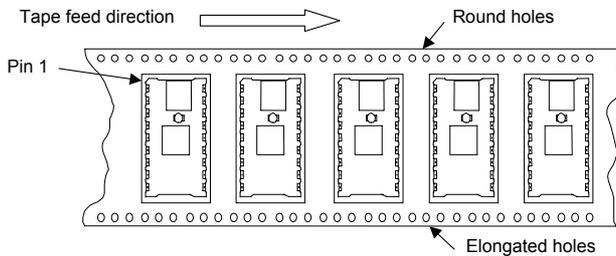
Profile features		Sn/Pb eutectic assembly	Pb-free assembly
Average ramp-up rate		3 °C/s max	3 °C/s max
Solder melting temperature (typical)	T_L	+183 °C	+221 °C
Peak product temperature	T_P	+225 °C	+260 °C
Average ramp-down rate		6 °C/s max	6 °C/s max
Time 25 °C to peak temperature		6 minutes max	8 minutes max

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Delivery Package Information

The products are delivered in antistatic carrier tape (EIA 481 standard)

Carrier Tape Specifications	
Material	Conductive polystyrene (PS)
Surface resistance	< 10 ⁷ ohm/square
Bakeability	The tape is not bakable
Tape width	72 mm [2.835] inch]
Pocket pitch	36 mm [1.417 inch]
Pocket depth	9.2 mm [0.362 inch]
Reel diameter	330 mm [13 inch]
Reel capacity	150 products /reel
Reel weight	Approximately 2.5 kg/full reel



Dry Pack Information

The product is delivered in trays and tape & reel. These inner shipment containers are dry packed in standard moisture barrier bags according to IPC/JEDEC standard J-STD-033 (Handling, packing, shipping and use of moisture/reflow sensitivity surface mount devices).

Using products in high temperature Pb-free soldering processes requires dry pack storage and handling. In case the products have been stored in an uncontrolled environment and no longer can be considered dry, the modules must be baked according to J-STD-033.

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Product Qualification Specification

Characteristics			
External visual inspection	IPC-A-610		
Operational life test	MIL-STD-202G method 108A With power cycling	T _{ref} Load Duration	According to Absolute maximum ratings Maximum output power 500 h
Vibration, broad band random	IEC 60068-2-64 Fh	Frequency Acceleration spectral density Crest factor Duration and directions	10 to 500 Hz 0.5 g ² /Hz 3 10 min in each 3 perpendicular directions
Vibration, sinusoidal	IEC 68-2-64 F _c	Frequency Amplitude Acceleration Sweep rate Duration	10 to 500 Hz 0.75 mm 10 g 1 octave/min 2 h in each 3 perpendicular directions
Mechanical shock	IEC 68-2-27 E _a	Peak acceleration Duration Pulse shape Directions Number of pulses	100 g 6 ms Half sine 6 18 (3 + 3 in each perpendicular direction)
Change of temperature (Temperature cycling)	IEC 60068-2-14 Na	Temperature range Number of cycles Dwell time	-40 to +100 °C 300 30 min
Robustness of terminations	IEC 68-2-21 U _{e1}	Depth of bending Time of remaining bent	3 mm 5 s
Solderability	IEC 68-2-58 T _d	Temperature, SnPb Eutectic Temperature, Pb free Preconditioning	215 ±5 °C 245 ±5 °C 240 h in 85°C/85%RH
Damp heat	IEC 60068-2-67 Cy with bias	Temperature Humidity Duration Preconditioning	+85 °C 85 % RH 500 hours Reflowed 3X according to IPC/JEDEC J-STD-020C MSL3 at 260°C
Moisture reflow sensitivity classification	J-STD-020C	SnPb Eutectic Pb free	MSL 1, peak reflow at 225 °C MSL 3, peak reflow at 260 °C
Immersion in cleaning solvents	IEC 68-2-45 XA Method 2	Water Isopropyl alcohol Glycol ether	+55 ±5 °C +35 ±5 °C +35 ±5 °C
Cold (in operation)	IEC 68-2-1 A _d	Temperature T _A Duration	-40 °C 72 h

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2 Revision history

Rev.	Date	Change
A	2006-04-26	New document
B	2007-03-27	<ul style="list-style-type: none"> Replaced <i>Product Qualification Specification</i> with new table from the PKR specification (document 5/1301-BMR 6401 revision B) since this is considered valid also for BMR 640 5001/1 with complementary type tests Cycled load and MSL tests. Reference: 174 51-BMR 640 5001/1 Changed reference location for maximum temperature measurements for maximum (peak) reflow temperature (from top of transformer to PCB corners). Reason: new strategy (PCB = generally weakest part).