QME48T35120 Quarter-Brick DC-DC Converter

The new high performance 35A **QME48T35120** DC-DC converter provides a high efficiency single output, in a 1/4 brick package. Specifically designed for operation in systems that have limited airflow and increased ambient temperatures, the QME48T35120 converter utilizes the same pin-out and Input/Output functionality of the industry-standard quarter-bricks. In addition, a baseplate feature is available (-xxxBx suffix) that provides an effective thermal interface for coldplate and heat sinking options.

The QME48T35120 converter thermal performance is accomplished through the use of patent-pending circuits, packaging, and processing techniques to achieve ultra-high efficiency, excellent thermal management, and a low-body profile.

Low-body profile and the preclusion of heat sinks minimize impedance to system airflow, thus enhancing cooling for both upstream and downstream devices. The use of 100% automation for assembly, coupled with advanced electronic circuits and thermal design, results in a product with extremely high reliability.

Operating from a wide-range 36-75V input, the QME48T35120 converter provides a fully regulated 12.0V output voltage. Employing a standard power pin-out, the QME48T35120 converter is an ideal drop-in replacement for existing high current quarter-brick designs. Inclusion of this converter in a new design can result in significant board space and cost savings. The designer can expect reliability improvement over other available converters because of the QME48T35120 optimized thermal efficiency.

Key Features & Benefits

- RoHS lead-free solder and lead-solder-exempted products are available
- Delivers up to 35 A (420 Watts)
- Industry-standard quarter-brick pinout
- On-board input differential LC-filter
- Startup into pre-biased load
- No minimum load required
- Meets Basic Insulation requirements of EN60950-1
- Withstands 100 V input transient for 100 ms
- Fixed frequency operation
- Fully protected (OTP, OCP, OVP, UVLO) with automatic recovery
- Positive or negative logic ON/OFF option
- Low height of 0.430" (10.4mm)
- Weight: 1.75 oz (49.6g), 2.15 oz (61.0g) w/baseplate
- High reliability: MTBF approx. 18.8 million hours, calculated per Telcordia TR-332, Method I Case 1
- Approved to the following Safety Standards: UL/CSA60950-1, EN60950-1, and IEC60950-1
- Designed to meet Class B conducted emissions per FCC and EN55022
 when used with external filter
- All materials meet UL94, V-0 flammability rating







1. ELECTRICAL SPECIFICATIONS

Conditions: $T_A = 25^{\circ}C$, Airflow = 300 LFM (1.5 m/s), Vin = 48 VDC, unless otherwise specified.

Absolute Maximum Pathings 0 80 VDC Input Voltage 00 ms 0 80 VDC Operating Ambient Temperature (Tr.) -40 85 "C" Operating Baseplate Temperature (Tr.) -40 85 "C" Operating Gampore Temperature (Tr.) -40 105 "C" Storage Temperature (Tr.) -40 105 "C" Operating Gampore Temperature (Tr.) -40 105 "C" Storage Temperature (Tr.) -40 105 "C" Operating Input Voltage Lockout Non-latching "S" "D" Turn-oft Threshold Non-latching 31.5 34 35.5 "D" Input Voltage Lockout Non-latching 30 33 34.5 "D" Turn-oft Threshold converter disabled 10 mADC Input Voltage Lockout Hysteresis Voltage SADC, 12 VDC Out @ 36 VDC In 11.6 "MD Input Stand-by Current S5 ADC, 12 VDC Out @ 36 VDC In 10 "MDC Input Voltage Ripple Rejection 1	PARAMETER $T_A = 25^{\circ}C$, Airliow = 300 LF	CONDITIONS / DESCRIPTIO		MIN	TYP	MAX	UNITS
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Storage Temperature -55 125 °C Input Characteristics Storage Temperature 36 48 75 VDC Input Under Voltage Lockout Non-latching 31.5 34 35.5 VDC Turn-on Threshold 30 33 34.5 VDC Lockout Hysteresis Voltage 0.5 2 VDC Lockout Hysteresis Voltage 0.5 2 VDC VDC VDC VDC VDC Maximum Input Current 35 ADC, 12 VDC Out @ 36 VDC In 12.3 ADC Input Stand-by Current converter disabled 10 mADC MADC Input Stand-by Current converter disabled 95 mADC MADC Input Reflected-Ripple Current, le (Figure 39) 25 MHz bandwidth, lo = 35 Amperes (Figure 39) 100 mAer.ex mAer.ex Input Voltage Riple Rejection 120 Hz 45 dB 0Uput Voltage Riple Rejection 12.0 12.0 MAR.ex Input Reflected-Ripple Current, le (Figure 39) 25 MHz bandwidth, lo = 35 Amperes (Figure 39) 11.6 ±120 mV	Operating Component Temperature (Tc)			-40		125	°C
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Input Reflected-Ripple Current, is Input Voltage Ripple Rejection(Figure 39)100mAPK-PKInput Voltage Ripple Rejection120 Hz45dBOutput CharacteristicsOutput Voltage Set Point (no load)111.7612.0012.24VDCOutput Regulation111.7612.0012.24VDCOver LineVin = 39 to 75VDC [lour = 35Amps] ± 60 ± 120 mVOver Load ± 60 ± 120 mVOutput Voltage Range1Over line (39 to 75VDC), load and temp.211.6412.36VDCOutput Voltage Range1Over line (36 to 75VDC), load and temp.211.0015.0mVPrk-PKOutput Ripple and Noise - 20 MHz bandwidth $bur = 35Amps$ 10015.0mVPrk-PKExternal Load CapacitanceFull Load (resistive) $C_{EXT} = 0$ 0 20.000 μF Output Current RangeSon-latching, Short = 10 m25570A	Input Reflected-Ripple Current, ic	25 MHz bandwidth Io - 35 Am	noros		1250		тА рк-рк
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Over Load ±60 ±120 mV Output Voltage Range1 Over line (39 to 75VDC), load and temp. ² 11.64 12.36 VDC Output Voltage Range1 Over line (36 to 75VDC), load and temp. ² 11.00 12.36 VDC Output Ripple and Noise - 20 MHz bandwidth Iour = 35Amps 100 150 mVPK.PK External Load Capacitance Full Load (resistive) CEXT 0 20.000 μF Output Current Range Non-latching 110 143 %Iomax Peak Short-Circuit Current ³ Non-latching, Short = 10 mΩ 55 70 A	Output Regulation ¹						
Output Voltage Range1Over line (39 to 75VDC), load and temp.211.6412.36VDCOutput Ripple and Noise - 20 MHz bandwidth $lout = 35Amps$ 100150mVPK-PKCext = 10 µF tantalum + 1 µF ceramic60mVrmsExternal Load CapacitanceFull Load (resistive) C_{EXT} 020.000µFOutput Current RangeNon-latching110143%lomaxPeak Short-Circuit Current3Non-latching, Short = 10 mΩ5570A	Over Line	Vin = 39 to 75VDC $[I_{OUT} = 35An$	nps]		±60	±120	mV
Output Voltage Range 1Over line (36 to 75VDC), load and temp.211.0012.36VDCOutput Ripple and Noise - 20 MHz bandwidthlout = 35Amps100150mVPK.PK $C_{EXT} = 10 \ \mu$ F tantalum + 1 \ \muF ceramic60mVrmsExternal Load CapacitanceFull Load (resistive) C_{EXT} 020.000 μ FOutput Current RangeS10035ADCCurrent Limit InceptionNon-latching110143%lomaxPeak Short-Circuit Current 3Non-latching, Short = 10 mΩ5570A	Over Load				±60	±120	mV
$\begin{array}{c} \mbox{loss} - 20 \mbox{ MHz bandwidth} & \mbox{loss} - 10 \mbox{ \mu F tantalum + 1 \mbox{ \mu F caramic}} & \mbox{ 60 mVrms} & \mbox{ 60 mVrms} & \mbox{ 60 mVrms} & \mbox{ 60 mVrms} & \mbox{ mn } \m$	Output Voltage Range ¹	Over line (39 to 75VDC), load a	11.64		12.36	VDC	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			nd temp. ²	11.00	400		
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Current Limit InceptionNon-latching110143%IomaxPeak Short-Circuit Current ³ Non-latching, Short = 10 mΩ5570A	External Load Capacitance					20.000	-
Peak Short-Circuit Current ³ Non-latching, Short = $10 \text{ m}\Omega$ 5570A	Output Current Range					35	ADC
	Current Limit Inception	Non-latching	110		143	%lomax	
RMS Short-Circuit Current Non-latching 5 Arms	Peak Short-Circuit Current ³	Non-latching, Short = $10 \text{ m}\Omega$		55	70	А	
	RMS Short-Circuit Current	Non-latching		5		Arms	



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Isolation Capacitance Input-to-Output & Baseplate-to-Input/Output 100 MD Ot Isolation (suffix '=xx8kx) Input-to-Output & Baseplate-to-Input/Output 1.500 VDC Isolation Capacitance Input-to-Output & Baseplate-to-Input/Output 1.500 VDC Isolation Capacitance Input-to-Output & Baseplate-to-Input/Output 10 VDC Solation Capacitance Non-latching Inf 20 VDC Solation Capacitance formers Inf 20 VDC VDC Duput Overollage Protection Non-latching 117 12 VDC VDC Duput Overollage Protection Non-latching 13 25 MDC Duru-On Time Including Rise Time Non-latching 3 5 10 VDC Ium-On Time from VNo (VCFC control Time from UVLO to V=9996Vout/NOM)	Isolation Characteristics					
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Isolation Capacitance Input-to-Output & Baseplate-to-Input/Output 1300 PF Isolation Resistance Input-to-Output & Baseplate-to-Input/Output 10 MQ Secture Characteristics	Isolation Resistance		10			MΩ
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Converter On (logic high) -20 0.8 VDC Opnamic Response -20 0.8 VDC Converter On (logic high) -20 0.8 VDC Opnamic Response -20 0.8 VDC Coad Change 50%-75%-50%, di/dt = 0.1A/µs Co = 1 µF ceramic + 10µF tantalum 200 360 mV di/dt = 1.0 A/µs Co = 1 µF ceramic + 10µF tantalum 350 540 mV Settling Time to 1% of Vour 200 µs ps Efficiency 200 µs s 00% Load Vin = 39VDC 95 % 00% Load Vin = 39VDC 96 % Environmental 200 µs %	ON/OFF Control (Negative Logic)					
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Efficiency 95 % 00% Load Vin = 39VDC 95 % i0% Load Vin = 39VDC 96 % Environmental 95 %	$di/dt = 1.0 \text{ A}/\mu\text{s}$	$Co = 1 \ \mu F$ ceramic + $10 \mu F$ tantalum		350	540	mV
Vin = 39VDC 95 % 00% Load Vin = 39VDC 96 % 00% Load Vin = 39VDC 96 % Environmental 95 %	Settling Time to 1% of VOUT			200		μs
i0% LoadVin = 39VDC96%Environmental95%	Efficiency					
Environmental Deperating Humidity Non-condensing 95 %	100% Load	Vin = 39VDC		95		%
Dperating Humidity Non-condensing 95 %	50% Load	Vin = 39VDC		96		%
	Environmental					
Non-condensing95%	Operating Humidity	Non-condensing			95	%
	Storage Humidity	Non-condensing			95	%



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Mechanical						
Weight	No baseplate With baseplate	1.75 [49.6] 2.15 [61.0]	oz [g]			
Vibration	GR-63-CORE, Sect. 5.4.2	1	g			
Shocks	Half Sinewave, 3-axis	50	g			
Reliability						
MTBF	Telcordia SR-332, Method I Case 1 50% electrical stress, 40°C components	18.8	MHrs			
EMI and Regulatory Compliance						
Conducted Emissions	CISPR 22 B with external EMI filter network (See Fig. 41)					

- ¹⁾ Measured at the output pins of the converter.
- ²⁾ Operating ambient temperature range of -40 °C to 85 °C for converter.
- ³⁾ Peak currents exist for approximately 500uSec per 200msec period.
- ⁴⁾ This functionality not provided, however the unit is fully regulated.

2. OPERATIONS

2.1 INPUT AND OUTPUT IMPEDANCE

These power converters have been designed to be stable with no external capacitors when used in low inductance input and output circuits.

In many applications, the inductance associated with the distribution from the power source to the input of the converter can affect the stability of the converter. The addition of a 150 μ F electrolytic capacitor with an ESR < 0.7 Ω across the input helps to ensure stability of the converter. In many applications, the user has to use decoupling capacitance at the load. The power converter will exhibit stable operation with external load capacitance up to 20,000 μ F.

Additionally, see the EMC section of this data sheet for discussion of other external components which may be required for control of conducted emissions.

2.2 ON/OFF (Pin 2)

The ON/OFF pin is used to turn the power converter on or off remotely via a system signal. There are two remote control options available, positive and negative logic, with both referenced to Vin(-). A typical connection is shown in Fig. 1.

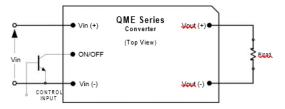


Figure 1. Circuit configuration for ON/OFF function.

The positive logic version turns on when the ON/OFF pin is at logic high and turns off when at logic low. The converter is on when the ON/OFF pin is left open. See the Electrical Specifications for logic high/low definitions.

The negative logic version turns on when the ON/OFF pin is at logic low and turns off when the ON/OFF pin is at logic high. The ON/OFF pin can be hardwired directly to Vin(-) to enable automatic power up of the converter without the need of an external control signal.

The ON/OFF pin is internally pulled up to 5 V through a resistor. A properly debounced mechanical switch, open-collector transistor, or FET can be used to drive the input of the ON/OFF pin. The device must be capable of sinking up to 0.2mA at a low level voltage of 0.8 V. An external voltage source (\pm 20 V maximum) may be connected directly to the ON/OFF input, in which case it must be capable of sourcing or sinking up to 1mA depending on the signal polarity. See the Startup Information section for system timing waveforms associated with use of the ON/OFF pin.

The converter's output overvoltage protection (OVP) senses the voltage across Vout(+) and Vout(-), so the resistance (and resulting voltage drop) between the output pins of the converter and the load should be minimized to prevent unwanted triggering of the OVP function.



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3. PROTECTION FEATURES

3.1 INPUT UNDERVOLTAGE LOCKOUT

Input under-voltage lockout is standard with this converter. The converter will shut down when the input voltage drops below a pre-determined voltage.

The input voltage must be typically 34 V for the converter to turn on. Once the converter has been turned on, it will shut off when the input voltage drops typically below 33 V. This feature is beneficial in preventing deep discharging of batteries used in telecom applications.

3.2 OUTPUT OVERCURRENT PROTECTION (OCP)

The converter is protected against overcurrent or short circuit conditions. Upon sensing an overcurrent condition, the converter will switch to constant current operation and thereby begin to reduce output voltage. When the output voltage drops below approx. 60% of the nominal value of output voltage, the converter will shut down.

Once the converter has shut down, it will attempt to restart nominally every 200 ms with a typical 3% duty cycle. The attempted restart will continue indefinitely until the overload or short circuit conditions are removed or the output voltage rises above 60% of its nominal value.

Once the output current is brought back into its specified range, the converter automatically exits the hiccup mode and continues normal operation.

3.3 OUTPUT OVERVOLTAGE PROTECTION (OVP)

The converter will shut down if the output voltage across Vout(+) (Pin 5) and Vout(-) (Pin 4) exceeds the threshold of the OVP circuitry. The OVP circuitry contains its own reference, independent of the output voltage regulation loop. Once the converter has shut down, it will attempt to restart every 200 ms until the OVP condition I removed.

3.4 **OVERTEMPERATURE PROTECTION (OTP)**

The converter will shut down under an over temperature condition to protect itself from overheating caused by operation outside the thermal derating curves, or operation in abnormal conditions such as system fan failure. After the converter has cooled to a safe operating temperature, it will automatically restart.

3.5 SAFETY REQUIREMENTS

The converters are safety approved to UL/CSA60950-1, EN60950-1, and IEC60950-1. Basic Insulation is provided between input and output.

The converters have no internal fuse. To comply with safety agencies requirements, an input line fuse must be used external to the converter. A 20-A fuse is recommended for use with this product.

The QME48T35120 converter is CSA approved for a maximum fuse rating of 20A.

3.6 ELECTROMAGNETIC COMPATIBILITY (EMC)

EMC requirements must be met at the end-product system level, as no specific standards dedicated to EMC characteristics of board mounted component dc-dc converters exist. However, Power Bel Solutions tests its converters to several system level standards, primary of which is the more stringent EN55022,

Information technology equipment - Radio disturbance characteristics-Limits and methods of measurement. An effective internal LC differential filter significantly reduces input reflected ripple current, and improves EMC. With the addition of a simple external filter, the QME48T35120 converter will pass the requirements of Class B conducted emissions per EN55022 and FCC requirements. Refer to Figures 41 and 42 for typical performance with external filter.

3.7 ABSENCE OF THE REMOTE SENSE PINS

Users should note that this converter does not have a Remote Sense feature. Care should be taken to minimize voltage drop on the user's motherboard.



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STARTUP INFORMATION (USING NEGATIVE ON/OFF) 3.8

Scenario #1: Initial Startup From Bulk Supply

ON/OFF function enabled, converter started via application of VIN. See Figure 2.

Time	ne Comments					
t ₀	ON/OFF pin is ON; system front-end power is					
	toggled on, V _{IN} to converter begins to rise.					

- VIN crosses Under-Voltage Lockout protection circuit t1 threshold; converter enabled.
- Converter begins to respond to turn-on command t2 (converter turn-on delay).

Comments

Converter VOUT reaches 100% of nominal value t3

For this example, the total converter startup time (t₃- t₁) is typically 8 ms.

Scenario #2: Initial Startup Using ON/OFF Pin

VINPUT at nominal value.

End of converter turn-on delay.

enabled).

See Figure 3. Time

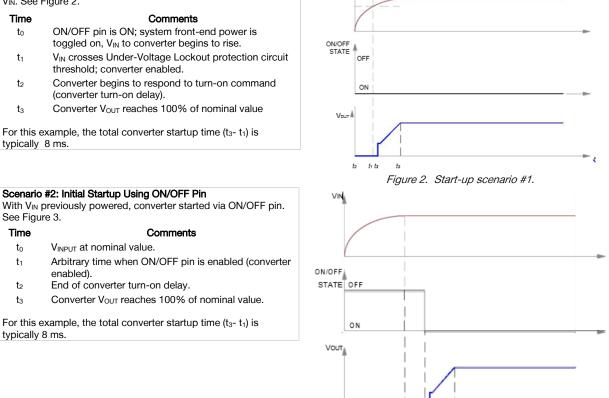
 t_0

t1

t2

tз

typically 8 ms.

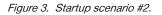


to t1 t2

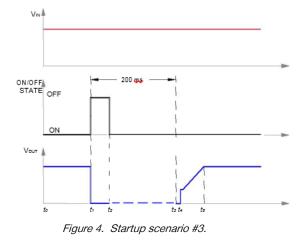
VIN

Scenario #3: Turn-off and Restart Using ON/OFF Pin With VIN previously powered, converter is disabled and then enabled via ON/OFF pin. See Figure 4. Time Comments VIN and VOUT are at nominal values; ON/OFF pin ON. to ON/OFF pin arbitrarily disabled; converter output falls t1 to zero; turn-on inhibit delay period (200 ms typical) is initiated, and ON/OFF pin action is internally inhibited. ON/OFF pin is externally re-enabled. t2 If (t₂- t₁) ≤ 200 ms, external action of ON/OFF pin is locked out by startup inhibit timer. If (t2- t1) > 200 ms, ON/OFF pin action is internally enabled. Turn-on inhibit delay period ends. If ON/OFF pin is t3 ON, converter begins turn-on; if off, converter awaits

- ON/OFF pin ON signal; see Figure 4. t_4 End of converter turn-on delay.
- Converter VOUT reaches 100% of nominal value. t5



ts





For the condition, $(t_2 - t_1) \le 200 \text{ ms}$, the total converter startup time $(t_5 - t_2)$ is typically 208 ms. For $(t_2 - t_1) > 200 \text{ ms}$, startup will be typically 8 ms after release of ON/OFF pin.

4. CHARACTERIZATION

4.1 GENERAL INFORMATION

The converter has been characterized for many operational aspects, to include thermal derating (maximum load current as a function of ambient temperature and airflow) for vertical and horizontal mountings, efficiency, startup and shutdown parameters, output ripple and noise, transient response to load step-change, overload, and short circuit.

4.2 TEST CONDITIONS

All data presented were taken with the converter soldered to a test board, specifically a 0.060" thick printed wiring board (PWB) with four layers. The top and bottom layers were not metalized. The two inner layers, comprised of two-ounce copper, were used to provide traces for connectivity to the converter.

The lack of metallization on the outer layers as well as the limited thermal connection ensured that heat transfer from the converter to the PWB was minimized. This provides a worst-case but consistent scenario for thermal derating purposes.

All measurements requiring airflow were made in the vertical and horizontal wind tunnel using Infrared (IR) thermography and thermocouples for thermometry.

Ensuring components on the converter do not exceed their ratings is important to maintaining high reliability. If one anticipates operating the converter at or close to the maximum loads specified in the derating curves, it is prudent to check actual operating temperatures in the application. Thermographic imaging is preferable; if this capability is not available, then thermocouples may be used. The use of AWG #36 gauge thermocouples is recommended to ensure measurement accuracy. Careful routing of the thermocouple leads will further minimize measurement error. Refer to Fig. 5 for the optimum measuring thermocouple location.

4.3 THERMAL DERATING

Thermal characterization is provided for the hotspot temperatures of both 120°C and 125°C. Load current vs. ambient temperature and airflow rates are shown in Fig. 6, Fig. 8, Fig. 10 and Fig. 12. Ambient temperature was varied between 25°C and 85°C, with airflow rates from 30 to 500 LFM (0.15 to 2.5 m/s). For each set of conditions, the maximum load current was defined as the lowest of: Case I : T_c (Hotspot) \leq 120°C

- (i) The output current at which any FET junction (T_J) temperature does not exceed a maximum temperature of 120°C as indicated by the thermal measurement, or
- (ii) The output current at which the temperature at the thermocouple locations TC do not exceed 120°C. (Fig. 5)
- (iii) The nominal rating of the converter (35 A).

Case II : T_C (Hotspot) ≤ 125°C

- (i) The output current at which any FET junction (TJ) temperature does not exceed a maximum temperature of 125°C as indicated by the thermal measurement, or
- (ii) The output current at which the temperature at the thermocouple locations TC do not exceed 125°C. (Fig. 5)
- (iii) The nominal rating of the converter (35 A).



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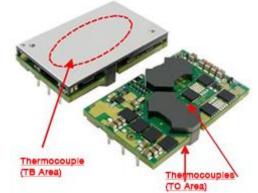


Figure 5. Location of the thermocouples for thermal testing

4.4 OUTPUT POWER

The output power vs. ambient temperature and airflow rates are given in Fig. 7 and Fig. 9 w/o baseplate. The output power vs. ambient temperature and airflow rates are given in Fig. 11 and Fig. 13 with baseplate. The ambient temperature varies between 25°C and 85°C with airflow rates from 30 to 500 LFM (0.15 to 2.5 m/s).

4.5 THERMAL DERATING – BASEPLATE COOLED

The maximum load current rating vs. baseplate temperature is provided for Baseplate Models with commercially available heatsinks attached. The various configurations, T_{C-MAX}(Hotspot) and Figure references, are listed below.

Note: T_C Hotspot ≈ T_J MOSFET

For a ¼" heatsink, AAvid Thermalloy PNU 241402B92200G, $T_C \le 120^{\circ}$ C, current derating is provided in Figure 14. Power Derating is provided in Figure 15.

For a ¼" heatsink, AAvid Thermalloy PNU 241402B92200G, $T_C \le 125^{\circ}C$, current derating is provided in Figure 16. Power Derating is provided in Figure 17.

For a $\frac{1}{2}$ " heatsink, AAvid Thermalloy PNU 241404B92200G, T_c \leq 120^oC, current derating is provided in Figure 18. Power Derating is provided in Figure 19.

For a $\frac{1}{2}$ " heatsink, AAvid Thermalloy PNU 241404B92200G, T_c \leq 125^oC, current derating is provided in Figure 20. Power Derating is provided in Figure 21.

For a 1" heatsink, AAvid Thermalloy PNU 241409B92200G, $T_c \le 120^{\circ}$ C, current derating is provided in Figure 22. Power Derating is provided in Figure 23.

For a 1" heatsink, AAvid Thermalloy PNU 241409B92200G, $T_c \le 125^{\circ}$ C, current derating is provided in Figure 24. Power Derating is provided in Figure 25.

4.6 THERMAL DERATING – COLDPLATE COOLED

The converter was shielded from air flow. The baseplate temperature was maintained $\leq 85^{\circ}$ C, with an airflow rate of ≥ 30 LFM (≥ 0.15 m/s). Thermocouple measurements (in Fig. 5) were recorded as T_C $\leq 120^{\circ}$ C and T_B $\leq 85^{\circ}$ C. Refer to Figure 26 and Figure 27.

4.7 EFFICIENCY

Efficiency vs. load current is showing in Fig. 28 for ambient temperature (T_A) of 25°C, airflow rate of 300LFM (1.5m/s) with vertical mounting and input voltages of 36V, 48V, and 75V. Also, a plot of efficiency vs. load current, as a function of ambient temperature with Vin = 48V, airflow rate of 200 LFM (1 m/s) with vertical mounting is shown in Fig. 29.



4.8 **POWER DISSIPATION**

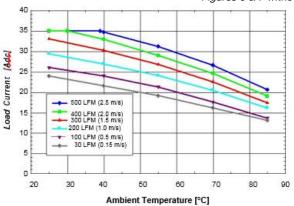
Power dissipation vs. load current is showing in Fig. 30 for $T_A = 25^{\circ}$ C, airflow rate of 300LFM (1.5m/s) with vertical mounting and input voltages of 36V, 48V, and 75V. Also, a plot of power dissipation vs. load current, as a function of ambient temperature with Vin = 48V, airflow rate of 200 LFM (1m/s) with vertical mounting is shown in Fig. 31.

4.9 START UP

Output voltage waveforms, during the turn-on transient using the ON/OFF pin for full rated load currents (resistive load) are shown without and with external load capacitance in Fig. 30 and Fig. 33, respectively.

4.10 RIPPLE AND NOISE

Fig. 36 show the output voltage ripple waveform, measured at full rated load current with a 10 μ F tantalum and 1 μ F ceramic capacitor across the output. Note that all output voltage waveforms are measured across a 1 μ F ceramic capacitor. The input reflected ripple current waveforms are obtained using the test setup shown in Fig. 37. The corresponding waveforms are shown in Fig. 38 and Fig. 39.



Figures 6 & 7 without Baseplate, $T_C \le 120$ °C.

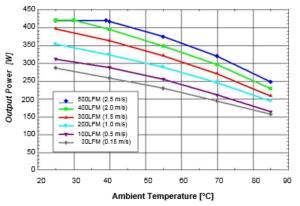


Figure 6. Available output current vs. ambient air temperature and airflow rates for converter w/o baseplate mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C., Vin = 48 V.

Figure 7. Available output power vs. ambient air temperature and airflow rates for converter w/o baseplate mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C., Vin = 48 V.

Figures 8 & 9 with Baseplate, $T_C \le 120 \ ^{\circ}C$.



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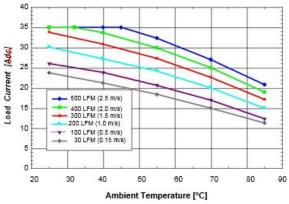
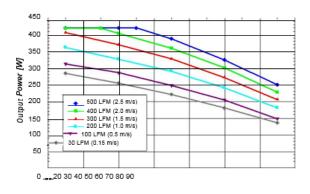
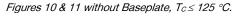


Figure 8. Available output current vs. ambient air temperature and airflow rates for converter with baseplate mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C., Vin = 48 V.



Ambient Temperature [°C]

Figure 9. Available output power vs. ambient air temperature and airflow rates for converter with baseplate mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C, Vin = 48 V.



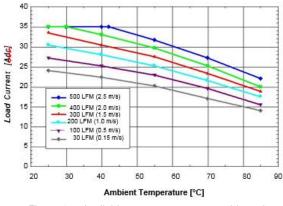
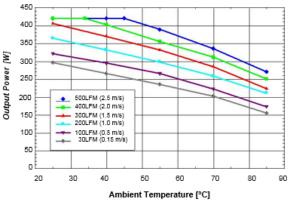
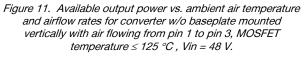


Figure 10. Available output current vs. ambient air temperature and airflow rates for converter w/o baseplate mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 °C , Vin = 48 V.





Figures 12 & 13 with Baseplate, $T_C \le 125 \ ^{\circ}C$.



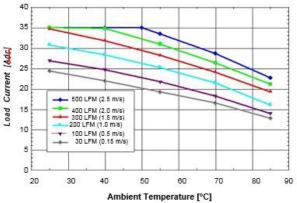
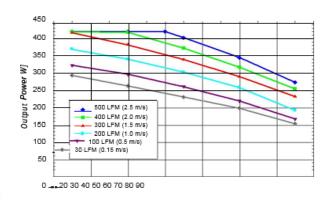
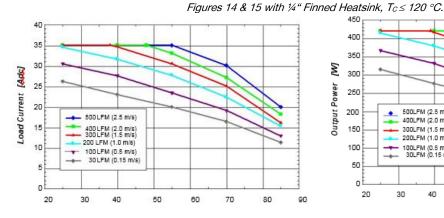


Figure 12. Available output current vs. ambient air temperature and airflow rates for converter with baseplate mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 °C, Vin = 48 V.



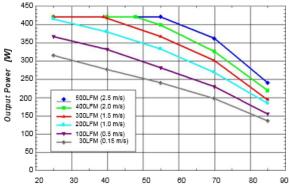
Ambient Temperature [°C]

Figure 13. Available output power vs. ambient air temperature and airflow rates for converter with baseplate vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 °C , Vin = 48 V.



Ambient Temperature [°C]

Figure 14. Available output current vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature \leq 120 °C, Vin = 48 V, χ " Heatsink.



Ambient Temperature [°C]

Figure 15. Available output power vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C, Vin = 48 V, ¼" Heatsink.

Figures 16 & 17 with ¼" Finned Heatsink, T_C ≤ 125 °C.



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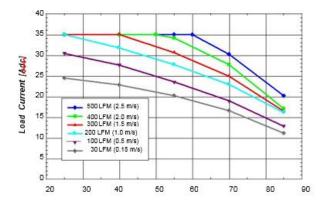
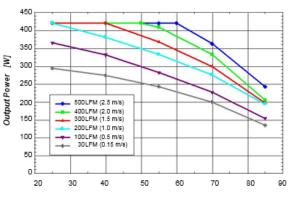


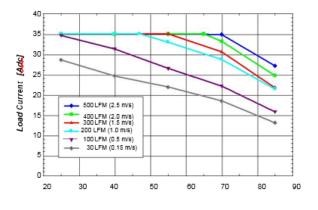


Figure 16. Available output current vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 °C, Vin = 48 V, ¼" Heatsink.



Ambient Temperature [°C]

Figure 17. Available output power vs. ambient air temperature and airflow rates for converter mounted vertically air flowing from pin 1 to pin 3, MOSFET temperature $\leq 125 \text{ °C}$, Vin = 48 V, ¼" Heatsink.



Figures 18 & 19 with $\frac{1}{2}$ " Finned Heatsink, $T_C \leq 120$ °C.

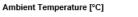
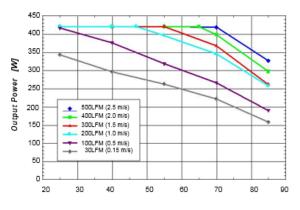


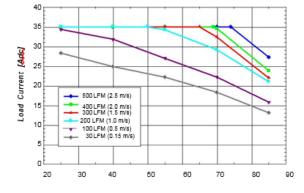
Figure 18. Available output current vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C, Vin = 48 V, ½" Heatsink.



Ambient Temperature [°C]

Figure 19. Available output power vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 120 °C , Vin = 48 V, ½" Heatsink.

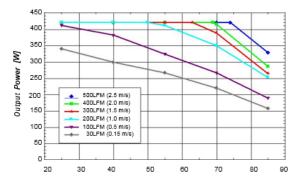




Figures 20 & 21 with $\frac{1}{2}$ " Finned Heatsink, $T_C \leq 125$ °C.

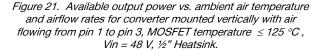
Ambient Temperature [°C]

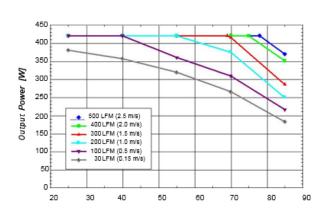
Figure 20. Available output current vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 °C, Vin = 48 V, ½" Heatsink.



13

Ambient Temperature [°C]





Ambient Temperature [°C]

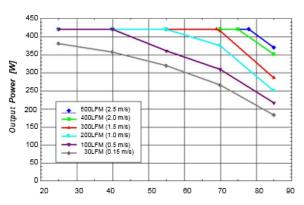
Figure 22. Available output current vs. ambient air

temperature and airflow rates for converter mounted vertically

with air flowing from pin 1 to pin 3, MOSFET temperature

 \leq 120 °C , Vin = 48 V, 1" Heatsink.

Figures 22 & 23 with 1" Finned Heatsink, $T_C \le 120$ °C.



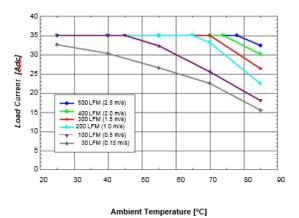
Ambient Temperature [°C]

Figure 23. Available output current vs. ambient air temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature $\leq 120 \ ^{\circ}C$, Vin = 48 V, 1" Heatsink.



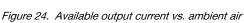
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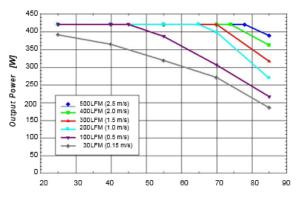


Figures 24 & 25 with 1" Finned Heatsink, $T_C \le 125 \ ^{\circ}C$.

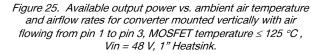
Figures 26 & 27 Coldplate Cooling $T_C \le 120$ °C.

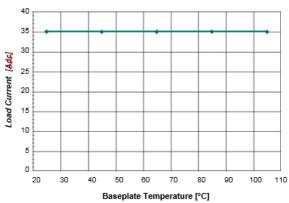


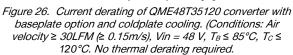
temperature and airflow rates for converter mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature $\leq 125 \text{ °C}$, Vin = 48 V, 1" Heatsink.

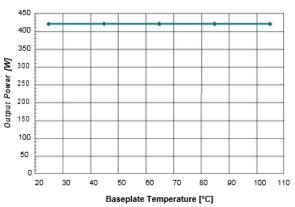


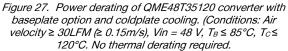
Ambient Temperature [°C]













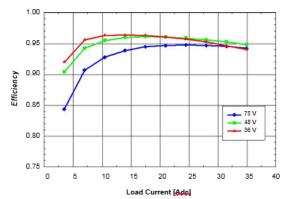


Figure 28. Efficiency vs. load current and input voltage for converter w/o baseplate mounted vertically with air flowing from pin 3 to pin 1 at a rate of 300 LFM (1.5 m/s) and Ta=25°C.

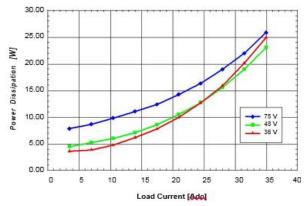


Figure 30. Power dissipation vs. load current and input voltage for converter w/o baseplate mounted vertically with air flowing from pin 3 to pin 1 at a rate of 300 LFM (1.5 m/s) and Ta = 25 °C.

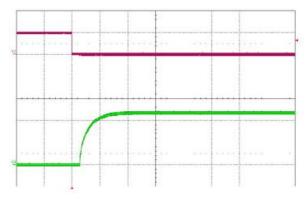


Figure 32. Turn-on transient at full rated load current (resistive) with no output capacitor at Vin = 48 V, triggered via ON/OFF pin. Top trace: ON/OFF signal (5 V/div.). Bottom trace: output voltage (5 V/div.). Time scale: 5 ms/div.



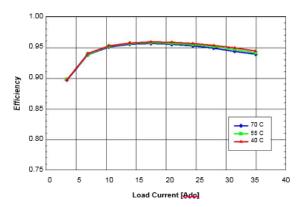


Figure 29. Efficiency vs. load current and ambient temperature for converter w/o baseplate mounted vertically with Vin=48V and air flowing from pin 3 to pin 1 at a rate of 200 LFM (1.0m/s).

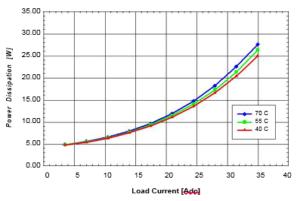


Figure 31. Power dissipation vs. load current and ambient temperature for converter w/o baseplate mounted vertically with Vin = 48 V and air flowing from pin 3 to pin 1 at a rate of 200 LFM (1.0 m/s).

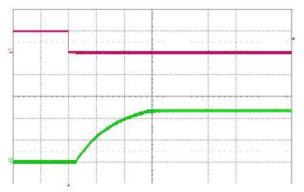


Figure 33. Turn-on transient at full rated load current (resistive) plus 20,000 μF at Vin = 48 V, triggered via ON/OFF pin. Top trace: ON/OFF signal (5 V/div.). Bottom trace: output voltage (5 V/div.). Time scale: 5 ms/div

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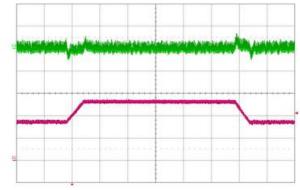


Figure 34. Output voltage response to load current stepchange (17.5 A – 26.25 A – 17.5 A) at Vin = 48 V. Top trace: output voltage (100 mV/div.). Bottom trace: load current (10 A/div.). Current slew rate: 0.1 A/μs. Co = 1 μF ceramic + 10 μF tantalum. Time scale: 200 μs/div.

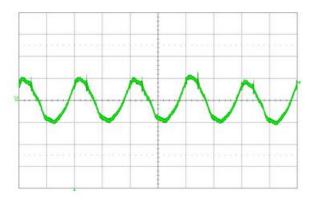


Figure 36. Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with Co = 10 μF tantalum + 1 μF ceramic and Vin = 48 V. Time scale: 2 μs/div.

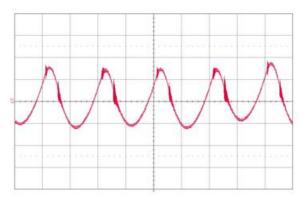


Figure 38. Input reflected ripple current, ic (500 mA/div.), measured at input terminals at full rated load current and Vin = 48 V. Refer to Fig. 37 for test setup. Time scale: 2 µs/div.

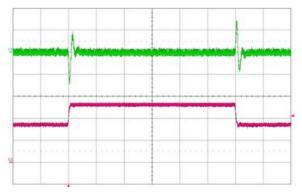


Figure 35. Output voltage response to load current stepchange (17.5 A – 26.25 A – 17.5 A) at Vin = 48 V. Top trace: output voltage (200 mV/div.). Bottom trace: load current (10 A/div.). Current slew rate: 1 A/μs. Co = 1 μF ceramic + 10 μF tantalum. Time scale: 200 μs/div.

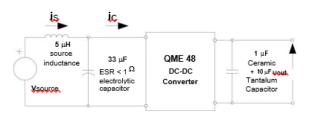


Figure 37. Test setup for measuring input reflected ripple currents, *l*c and *l*s.

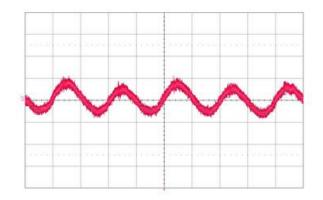


Figure 39. Input reflected ripple current, **i**s (50 mA/div.), measured through 5 μH at the source at full rated load current and Vin = 48 V. Refer to Fig. 37 for test setup. Time scale: 2 μs/div.



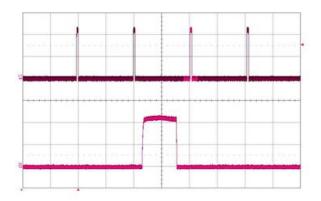
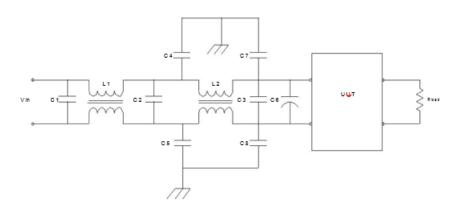


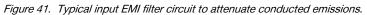
Figure 40. Load current (top trace, 20 A/div., 100 ms/div) into a 10 m Ω short circuit during restart, at Vin = 48 V. Bottom trace (20 A/div., 100 ms/div.) is an expansion of the on-time portion of the top trace.



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COMPONENT DESCRIPTION	DECSRIPTION
C1, C2, C3	2 x 1uF, 100 V Ceramic Capacitor
C4, C5, C7, C8	4700pF Ceramic Capacitor
C6	100uF, 100 V Electrolytic Capacitor
L1, L2	0.59mH, P0469NL Pulse Eng. Or, equiv

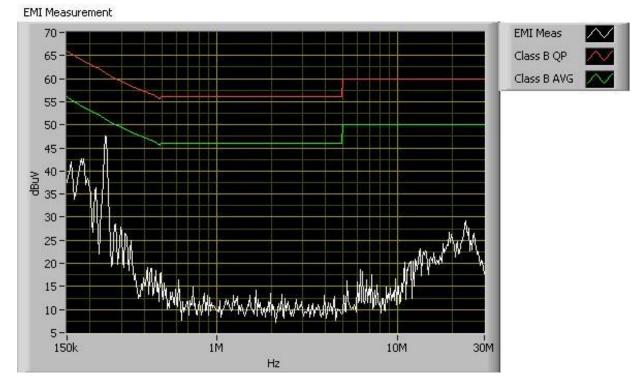


Figure 42. Input conducted emissions measurement (Typ.) of QME48T35120 with input filter shown in Figure 41. Conditions: V_{IN} =48VDC, I_{OUT} = 35AMPS



5. MECHANICAL PARAMETERS

HT (-x1xBx)

PI

QME48T35120 Pinout (Trough-hole) 2.300±0.020[58.42±0.50] PINS 1,2,3 Ø0.040±0.002 [Ø1.02±0.05] -2.000 [50.80]-WITH Ø0.076 [1.93] SHOULDER -0.145 [3.68] PINS 4,5 Ø 0.062±0.002 [Ø 1.57±0.05] WITH Ø0.096 [2.44] SHOULDER 0.430 [10.92] 1.450±0.020[36.83±0.50] PIN ASSIGNMENTS AND LOCATIONS 0.600 [15.24] 0.300 [7.62] 2X Ţ TOP VIEW SIDE VIEW NO HEAT SPREADER CL HT (-xJx0x) CUSTOMER PCB SIDE VIEW HEAT SPREADER VERSION

PAD/PIN CONNECTIONS						
Pad/Pin #	Function					
1	Vin (+)					
2	ON/OFF					
3	Vin (-)					
4	Vout (-)					
5	Vout (+)					

• All dimensions are in inches [mm]

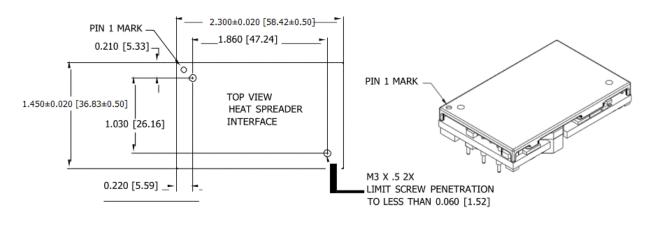
- Pins 1 3 are Ø 0.040" [1.02] with Ø 0.076" [1.93] shoulder
- Pins 4 and 5 are Ø 0.062" [1.57] with Ø 0.096" [2.44] shoulder
- Pin Material: Brass Alloy 360
- Pin Finish: Tin over NickelHeatsink Mounting Screw: 3 in Ib
- maximum torque

Height HT		(Minimum Clearance CL	Special Features	Pin otion	Pin Length PL ±0.005 [±0.13]	i
	0.430" [10.4] Max	0.028" [0.71]	0	A	0.188 [4.78]	
J	0.500" +/- 0.020 [12.70 +/- 0.51]	0.028" [0.71]	В	В	0.145 [3.68]	
				С	0.110 [2.79]	

Baseplate (Heat Spreader) Interface

CL

CUSTOMER PCB





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6. ORDERING INFORMATION

Product Series	Input Voltage	Mounting Scheme	Rated Load Current	Output Voltage		ON/OFF Logic	Maximum Height [HT]	Pin Length [PL]	Special Features	RoHS
QME	48	т	35	120	-	Ν	J	В	0	G
Quarter- Brick Format	36-75 V	Trough hole	35 A	$120 \Rightarrow 12 \text{ V}$		$N \Rightarrow$ Negative $P \Rightarrow$ Positive	$J \Rightarrow 0.430"$ for - xJx0x J $\Rightarrow 0.520"$ for - xJxBx	$\begin{array}{l} A \Rightarrow 0.188"\\ B \Rightarrow 0.145"\\ C \Rightarrow 0.110" \end{array}$	0 ⇒ STD B ⇒ Baseplate option	No Suffix \Rightarrow RoHS lead-solder- exemption compliant G \Rightarrow RoHS compliant for all six substances

The example above describes P/N QME48T35120-NJB0G: 36-75 V input, through-hole mounting, 35 A @ 12 V output, negative ON/OFF logic, a maximum height of 0.520", 0.145" pin length, with baseplate.. RoHS compliant for all 6 substances. Consult factory for availability of other options.

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems. TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.



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