2.5-5V 6A Non-isolated DC-DC Converter

Features

- High Efficiency
- Low profile
- Remote On/Off
- Input under-voltage protection
- Output over-current protection
- Monotonic start-up
- All components meet UL 94V-0

Part Numbering System

NPS	1	025	N	006	S	2	□
Series Name	**Input Voltage**	**Output Voltage**	**Enabling Logic**	**Rated Output Current**	**Pin**	**Electrical Option**	**Mechanical Option** **Lead-free (ROHS-6 Compliant)**
	1: 8-36V	**025:** 2.5V	**N:** Negative	**006:** 6A	**S:** SMT	**2:** Auto-restart	**5:** Surface mount **8:** Pin terminal

Absolute Maximum Rating

Excessive stresses over these absolute maximum ratings can cause permanent damage to the converter. Operation should be limited to the conditions outlined under the Electrical Specification Section.

Parameter	Min	Max	Unit
Input Voltage (continuous)	-0.3	50	V
ON/OFF	-0.3	15	V
Operating Ambient Temperature	-40	85	˚C
Storage Temperature	-55	125	˚C

Electrical Specifications

These specifications are valid over the converter's full range of input voltage, resistive load, and temperature unless noted otherwise.

Parameter	Min	Typical	Max	Unit
Input Specifications				
Input Voltage	8	24	36	V
Input Current	-	-	6	A
Quiescent Input Current (typical Vin)	-	18	-	mA
Output Specifications				
Output Voltage Set Point (typical Vin; full load; Ta = 25°C)	-	2.5	-	V
Output Voltage Set Point Accuracy (over all conditions)	-3.0	-	+3.0	%Vo
Output Regulation: Line Regulation (full range input voltage, 1/2 full load) Load Regulation (full range load, typical Vin)	 - -	 - -	 2 2	%Vo
Output Ripple and Noise Voltage RMS Peak-to-peak (5 Hz to 20 MHz bandwidth, typical Vin)	 - -	 - -	 20 100	 mVrms mVp-p
Output Current	0	-	6	A
Output Power	0	-	30	W
Efficiency (typical Vin; full load; Ta = 25°C)	-	93	-	%
External Load Capacitance	220	-	1,000	µF
Output Over Current Protection Set Point	7	-	11	A
Output Voltage Trim Range	2.5	-	5.0	V
Dynamic Response (typical Vin; Ta = 25°C; load transient 0.5A/µs) Load steps from 50% to 100% of full load: Peak deviation Load step from 100% to 50% of full load Peak deviation	 - -	 150 150	 - -	 mV mV
General Specifications				
Remote Enable Logic Low (ON): Logic High (OFF) Float (OFF)	 -0.3 3.5	 - -	 0.7 12	 V V

Characteristic Curves

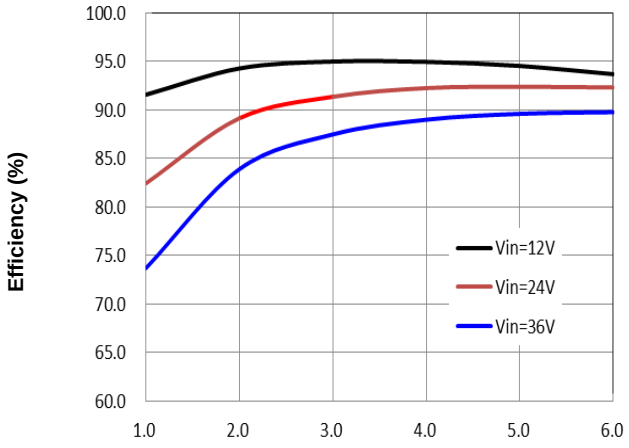


Figure 1. Efficiency vs. Load Current (25°C, Vo=2.5V)

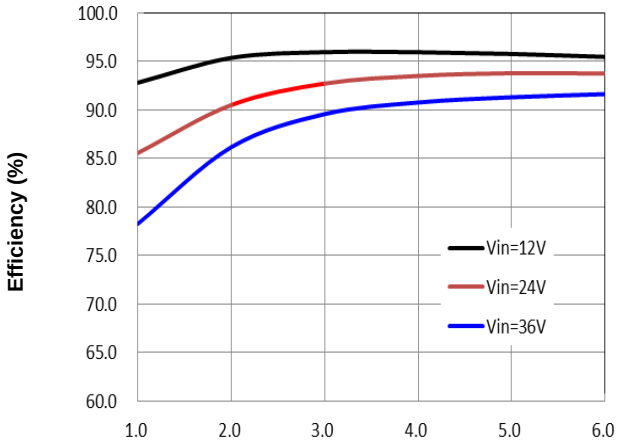


Figure 2. Efficiency vs. Load Current (25°C, Vo=3.3V)

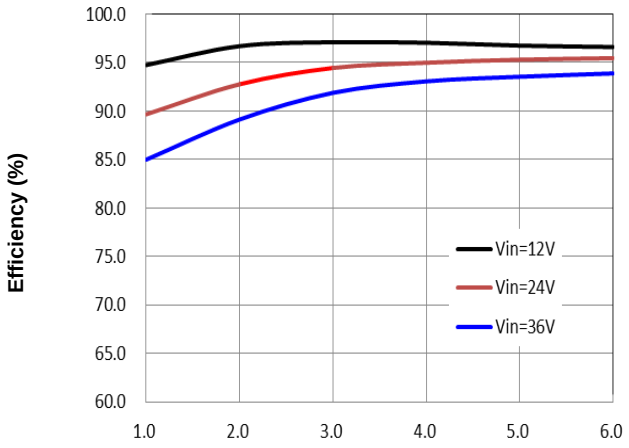


Figure 3. Efficiency Vs. Load Current (25°C, Vo=5V)

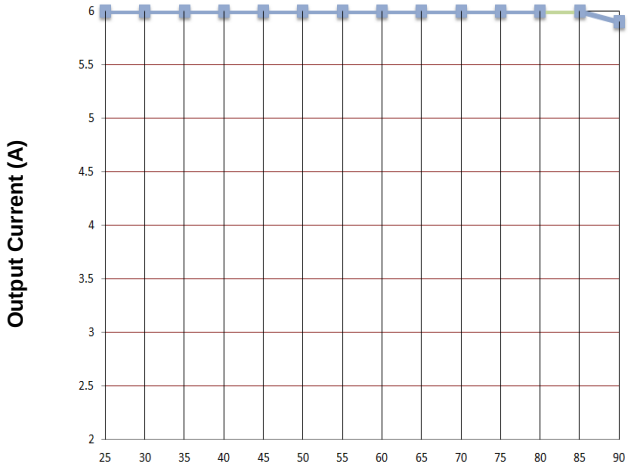


Figure 4. Current Derating Curve
(Vin=24V, Vo=3.3V)

Figure 5. Startup Waveform from ON/OFF Control
(Vin=12V; Vo=3.3V; Io=6A; Co,ex=220μF)

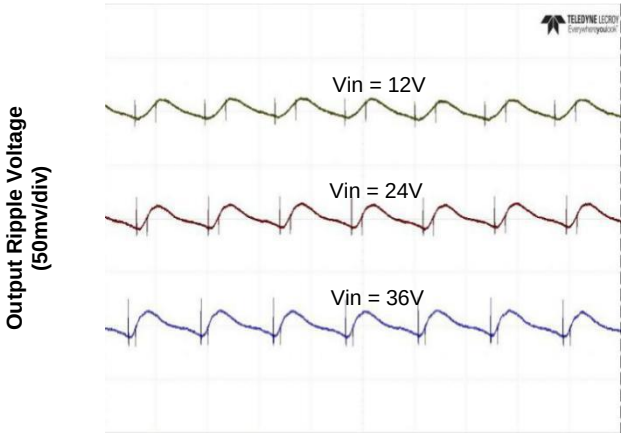


Figure 6. Output Ripple Voltage
(Vo=3.3V; Io=6A; Co,ex=220μF)

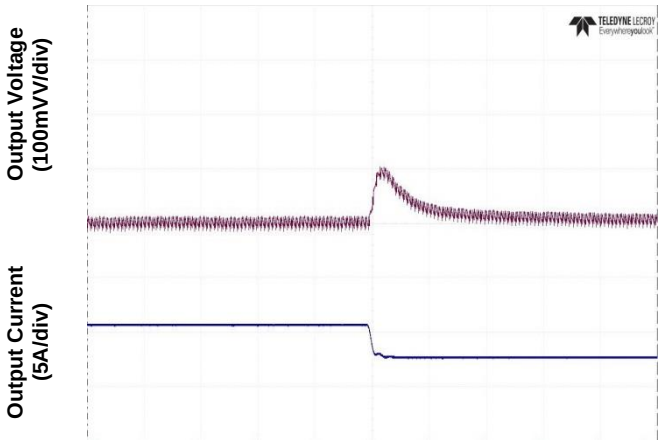


Figure 7. Transient Load Response at Vo=3.3V
(Vin=12V; Io=6A→3A@0.5A/us; Co,ex=220µF)

Figure 8. Transient Load Response at Vo=3.3V
(Vin=12V; Io=3A→6A@0.5A/us; Co,ex=220µF)

Feature Descriptions

Remote ON/OFF

The converter can be turned on and off by changing the voltage between the ON/OFF pin and GND.

The converter is ON when the ON/OFF pin is at a logic low level, and OFF when the ON/OFF pin is at a logic high level or floating.

Output Voltage Adjustment (Trim)

This converter is available with variable output. The converters are preset to a nominal 2.5V output voltage, and can be trimmed using an external trim resistor.

To increase the output voltage, a resistor should be connected between the TRIM pin and the SGND pin. The trim up resistance R_{trim_up} is determined by below equation:

$$R_{trim\_up} = \frac{28420}{\Delta V_o} - 511\ (\Omega)$$

Where,

$\Delta V_o = |V_o - V_{onom}|$ —— Difference between the preset nominal output voltage and the trimmed output voltage, unit volt.

Where Vo is the desired output voltage.

The circuit configuration for trim operation is shown in Figure 1.

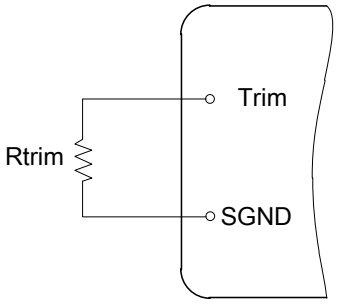


Figure 1. Circuit to Trim Output Voltage

Note: Don't connect SGND to GND.

Output Over-Current Protection (OCP)

As a standard feature, the converter turns off when the load current exceeds the current limit. If the over-current or short circuit condition persists, the converter will operate in a hiccup mode (repeatedly trying to restart) until the over-current condition is cleared.

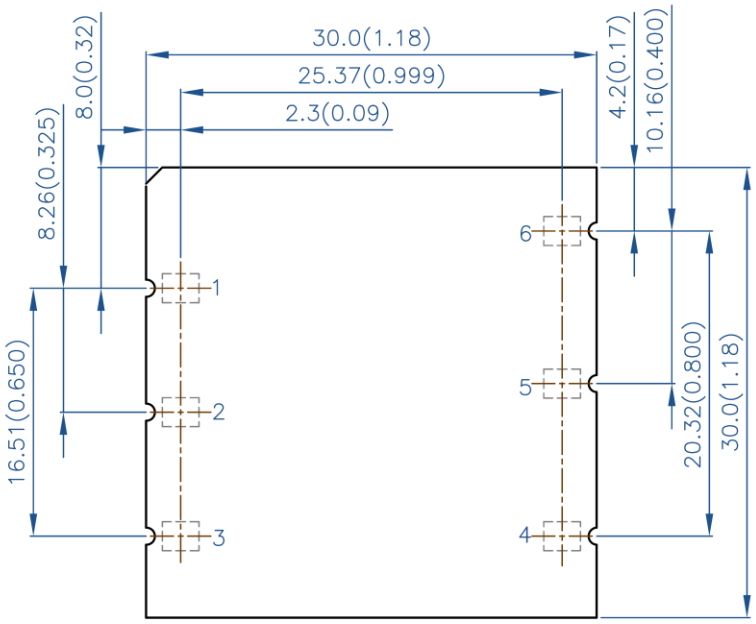
Design Considerations

Input Source Impedance and Filtering

The stability of the NPS converters, as with any DC-DC converter, may be compromised if the source impedance is too high or too inductive. It's desirable to keep the input source AC impedance as low as possible. To reduce ripple current getting into the input circuit (especially the ground/return conductor), it is desirable to place some low ESR capacitors at the input. Due to the existence of some inductance (such as the trace inductance, connector inductance, etc) in the input circuit, possible oscillation may occur at the input of the converter. A combination of ceramic capacitors and Tantalum/Polymer capacitors should be used at the input so that the relatively higher ERS of Tantalum/Polymer capacitors can help damp the possible oscillation between the ceramic capacitors and the inductance.

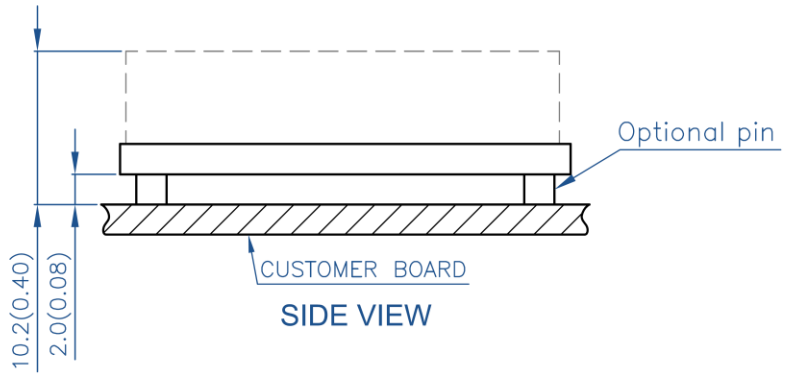
To further reduce the output voltage ripple and improve the transient response, additional output capacitors are often used in applications. When additional output capacitors are used, a combination of ceramic capacitors and tantalum/polymer capacitors shall be used to provide good filtering while assuring the stability of the converter.

Mechanical Drawing



TOP VIEW

*All Pads are 2.44(0.096)*1.93(0.076).
Optional pins are 2.01(0.079)*1.50(0.059).



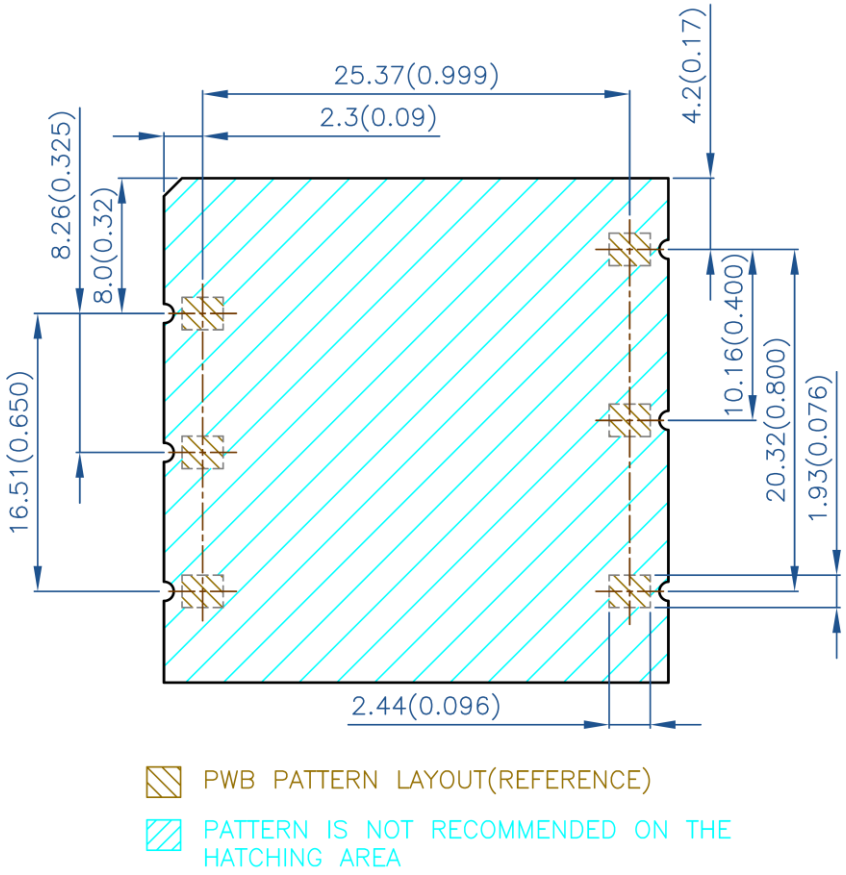
SIDE VIEW

Pin	Name	Function
1	ON/OFF	Remote control
2	SGND	Signal ground
3	Trim	Output voltage adjustment
4	Vout	Output voltage
5	GND	Ground
6	Vin	Input voltage

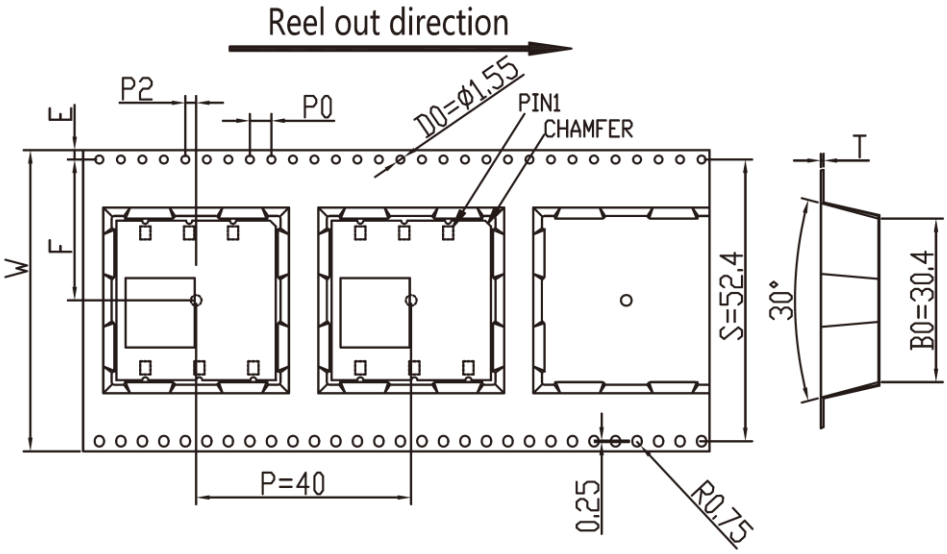
Notes:

1) All dimensions in mm (inches)
   Tolerances: .x ± .5 (.xx ± 0.02)
   .xx ± .25 (.xxx ± 0.010)
2) Optional pins are Copper Alloy, Gold finish with Nickel under plating.
3) Workmanship meets or exceeds IPC-A-610 Class II.

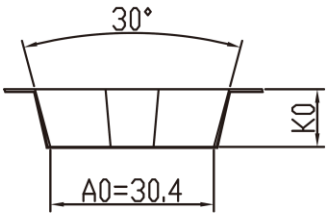
Recommended PCB Layout Drawing

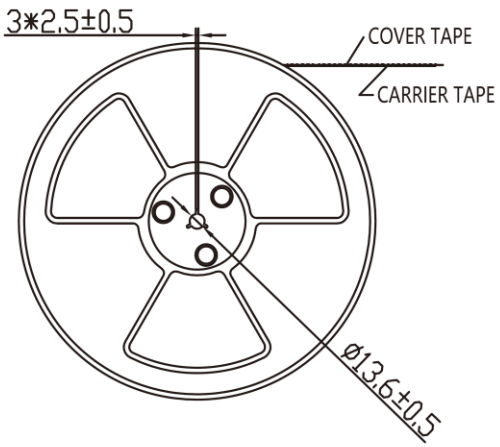


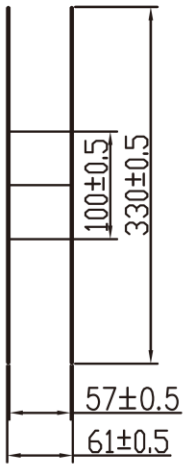
Tape and Reel Information



W	56.00±0.30
F	26.20±0.10
T	0.50±0.05
E	1.75±0.10
P	40.00±0.10
P0	4.00±0.10
P2	2.00±0.10
A0	30.40±0.10
B0	30.40±0.10
K0	10.70±0.10
D0	$\phi 1.55^{+0.10}_{-0.00}$
S	52.40±0.1

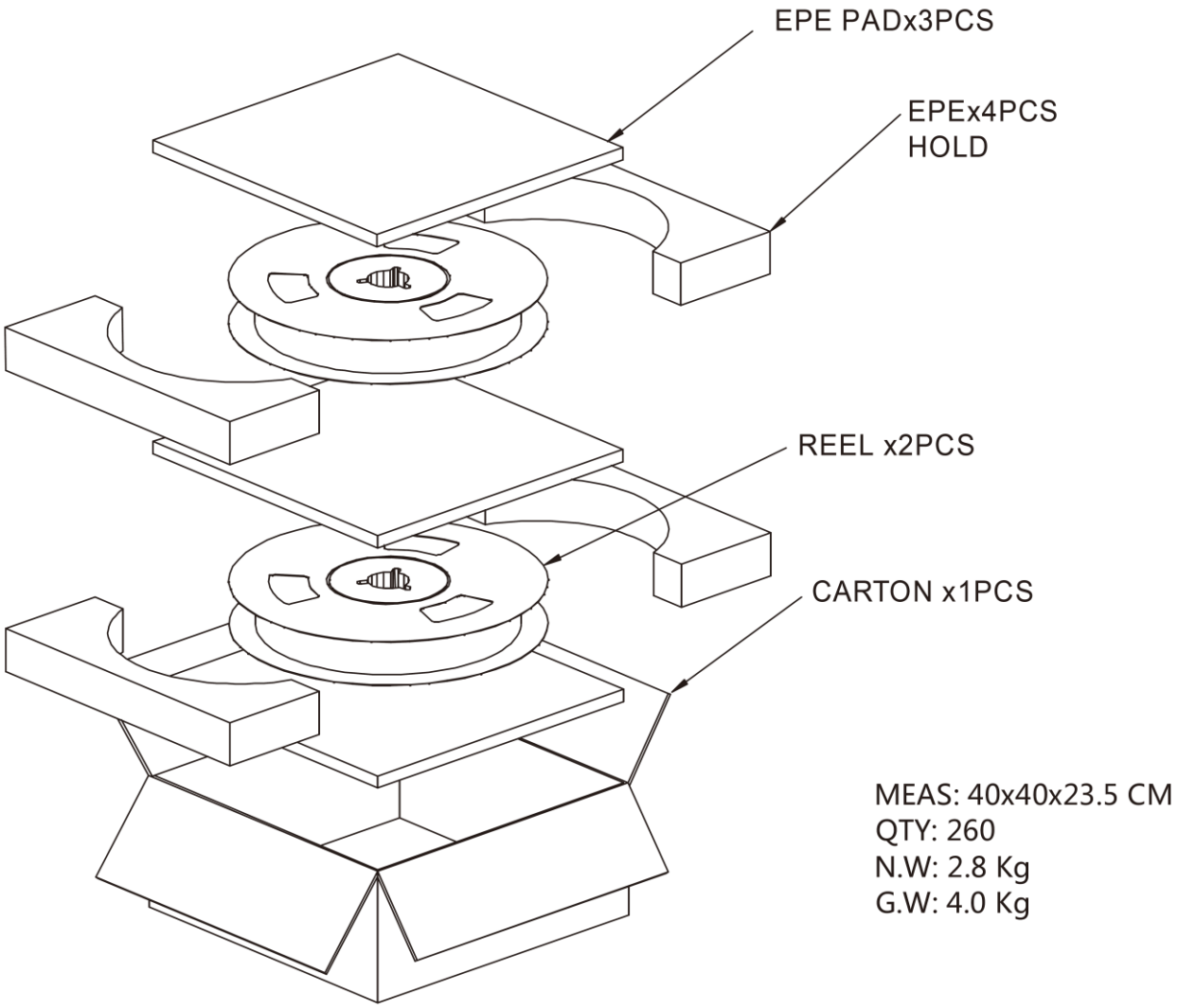






Notes:

1) All dimensions in mm
2) Packaging conforms to EIA-481
3) Quantity: 130 converters per reel


EPE PADx3PCS
EPEx4PCS
HOLD
REEL x2PCS
CARTON x1PCS
MEAS: 40x40x23.5 CM
QTY: 260
N.W: 2.8 Kg
G.W: 4.0 Kg