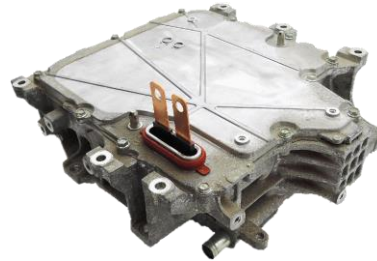




2018 Tesla Model 3



2019 Nissan Leaf



2019 Audi e-tron



2019 Jaguar I-PACE



2020 Tesla Model Y – Front & Rear

Coming Soon!

NEW

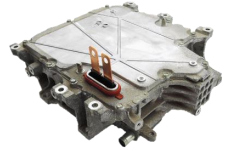
Inverter Benchmark & Cost Report

\$24,000 USD
(Model 3 & Nissan Leaf)

Munro's Inverter Report provides a detailed analysis of Battery Electric Vehicles (BEV) inverters.

The Benchmark Report is highly advantageous for OEMs or suppliers looking to effectively expand and compete in new EV markets.

The report is a comprehensive analysis of each Inverter. This report contains descriptive and pictorial detail on every facet of the inverters dimensional data, manufacturing process, schematics, block diagrams and detailed cost analysis.



Inverter Benchmark Report Content

- ❖ Those who purchase the report will receive a single report containing:
 - a. Executive Summary
 - b. Side by Side Summary
 - c. Inverter views, dimensions, mounting approach, cooling strategy
 - d. PCB circuit diagrams, schematics and block diagrams
 - e. PCB bill of material
 - f. Costed Bill of Material

Tesla Model 3- In Depth Electronic Analysis

Inverter Circuit Block Diagram

Tesla Model 3- In Depth Electronic Analysis

Schematic Deep Dive

Tesla Model 3- Inverter Electronic Analysis

TMS320F28377, LT1494H

Tesla Model 3- Inverter Architecture

Phase Lead Terminal

Side-by-Side Comparison

Battery Electric Vehicles (BEV)- Inverter

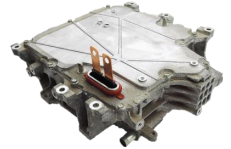
Side-by-Side Comparison

Electric Drive- PM Motor

Tesla Model 3 Inverter		Nissan Leaf Inverter		Jaguar I-Pace Inverter	
Cost	Weight (kg)	Cost	Weight (kg)	Cost	Weight (kg)
\$ xxxx	4.81	\$ xxxx	11.14	\$ xxxx	8.10

• Cost and weights include: Housing, PCBA, IGBT Module & Cooling Structure, DC-link Capacitor, Motor Phase Lead, Connectors, Self-contained structural and connected components.

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Inverter Costed Bill of Material

- ❖ The costed bill of materials (CBOM) are a consolidated view of the cost information presented in the reports. A CBOM report is included for each inverter analyzed in PDF format.
- ❖ The CBOM and media BOM are an indented format and include:
 - Part Name
 - Part Number
 - Material
 - Total Cost
 - Weight
 - Quantity
 - Total Weight

Tesla Model 3 Inverter - CBOM

Level	Type	Name	Number	Material Name	Total Cost* (Each)	Qty	Total Cost*
3	Process	TM3 Plastic Shield 1, Busbar FETs to Cap Bank	TM3 Plastic Shield 1, Busbar FETs to Cap Bank	_PA66 GF-30	\$0.06	1	\$0.06
4	Process	Process TM3 Plastic Shield 1, Busbar FETs to Cap	×	×	\$0.06	1	\$0.06
3	Process	TM3 Plastic Shield 2, Busbar FETs to Cap Bank	TM3 Plastic Shield 2, Busbar FETs to Cap Bank	_PA66 GF-30	\$0.04	1	\$0.04
4	Process	Process TM3 Plastic Shield 2, Busbar FETs to Cap	×	×	\$0.04	1	\$0.04
3	Assemble	Assemble Bus Bar, FETs to Capacitor Bank	×	×	\$0.39	1	\$0.39
2	TM3 Phase Lead Terminal Assembly	TM3 Phase Lead Terminal Assembly	Multiple	Multiple	\$7.63	1	\$7.63

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Tesla Model 3 Inverter - Media BOM

Name	Number	Material	Weight (g)	Quantity
Media: Timing Crystal	TM3LPTXL02160R	Commodity Item	0.0000	1
Media: LOO Regulator 8-Pin VSGOP	TMG LM2009M-5.0/NOPB	Commodity Item	0.0000	1
Media: Precision Monopower Series Voltage Reference, SOT	TMG LM4128D-1.2/NOPB	Commodity Item	0.0000	1
Media: Quad Operational Amplifier, 14-Pin SOIC	TMG LMV344M/NOPB	Commodity Item	0.0000	1
Media: IC Operational Amplifier GP 2.7PH2 RRD-ESD	TMG LT1494GSP#F	Commodity Item	0.0000	1
Media: Diode Schottky 40V 1A Automotive 2-Pin SOD-123FL	TMG MBR145FT35	Commodity Item	0.0000	1
Media: Trans Darlington PNP 100V 8A3 Pin-QTAL01 DPAK	TMG MUD1275	Commodity Item	0.0000	6

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Please Note: The costed bill of material is provided in pictorial / PDF format and will not be available in Excel.



Cost Estimates

- ❖ The costs of the inverters include the housings and the internal electrical componentry. Munro used their proprietary software and methodologies to establish a should cost to manufacture the various parts found in each inverter.
- ❖ Cost models are established by disassembling and analyzing the inverter assemblies. The components are documented in detail, capturing the assembly operations and weight. Costs are assigned to materials, purchased parts, and processes.
- ❖ All the inverters are costed with the USA as the country of origin.

Tesla Model 3 Inverter - CBOM

Level	Type	Name	Quantity	Material Name	Total Cost* (Each)	Qty	Total Cost**
3	Process	TM3 Plastic Shield 1, Busbar FETs to Cap Bank	1	FABG QF-30	\$0.06	1	\$0.06
4	Process	Process TM3 Plastic Shield 1, Busbar FETs to Cap Bank	1		\$0.04	1	\$0.04
3	Process	TM3 Plastic Shield 2, Busbar FETs to Cap Bank	1	FABG QF-30	\$0.04	1	\$0.04
4	Process	Process TM3 Plastic Shield 2, Busbar FETs to Cap Bank	1		\$0.04	1	\$0.04
3	Process	Assemble Bus Bar, FETs to Capacitor Bank	1		\$0.29	1	\$0.29
2	Process	TM3 Phase Lead Terminal Assembly	1	Multiple	\$7.63	1	\$7.63
3	Process	TM3 Phase Lead Terminal Overmold	1	Multiple	\$4.36	1	\$4.36
4	Process	TM3 Phase Lead Terminal 1	1	Multiple	\$2.27	1	\$2.27
5	Process	TM3 Phase Lead Terminal Out 1	1	Copper Alloy C11000 - Cold	\$0.96	1	\$0.96

Inverter / Converter

Assembly Summary

Zone	Zone 4: Powertrain & Battery Pack
System	Inverter / Converter
Part	Inverter Converter Module Assy, HV Motor

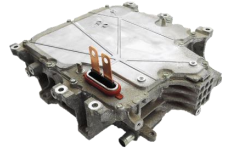
Supplier Name/Code

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Technical Disclaimer: The goal of this analysis is to establish a should cost value for manufacturing the vehicle and its sub-systems. These cost totals do not include tooling, Engineering Research and Development (ER&D), testing and calibration, or logistics.



FAQ (Frequently Asked Questions)

- ❖ Were Manufactures involved in the study?
No, OEM or Supplier proprietary information or costs were used in this study.
- ❖ Is there any OEM or Tier One propriety (stolen) IP in this report?
No. All data was developed through Munro's proven methodologies from the purchased production components.
- ❖ Are the inverters costed using only NAFTA costing centers?
Yes, Munro includes labor, factory floor cost, taxes and SG&A for OEM or Tier Suppliers.
- ❖ Is this a Costing or Pricing report?
This is a Costing Report. Pricing has too many variables.

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