



## Features

- ▶ Lowest Rds(on)
- ▶ Current capability (300A)
- ▶ Very low package parasitics and inductances
- ▶ Paralleling & cooling reduction
- ▶ System cost reduction
- ▶ Compact design

## New Developments

- ▶ Side by side dual die capability
- ▶ Dual exposed pad for better thermal performance
- ▶ Thin wafer dicing with narrow saw streets
- ▶ Larger/higher density leadframe strips
- ▶ Environmentally friendly Pb-free solder paste
- ▶ Al wire interconnect

# TOLL

TOLL (TO-Leadless) is a highly efficient space saving package designed for currents up to 300A in automotive applications.

This package features:

- ▶ Very low parasitics and inductances resulting in world class package level Rds(on)
- ▶ Outstanding EMI behavior and excellent thermal performance
- ▶ Space reduction with a layout 30% smaller & 50% thinner than the 7 Id DDPAK package
- ▶ Package is offered with wettable flanks and is well suited to the automotive market
- ▶ This package is a registered JEDEC package outline

## Applications

TOLL is suitable for high-power applications, designed for low on-resistance and high-speed-switching MOSFETs:

- ▶ Automotive
- ▶ Telecom
- ▶ Point of Load (POL)
- ▶ Light Electric Vehicles (LEV)
- ▶ Battery management

## Reliability Qualification

Amkor devices are assembled with proven reliable semiconductor materials.

- ▶ All tests include pre-condition of: Ta = 85°C/RH = 85%, 72 hrs with IR reflow, Ta = 265°C, 3X
- ▶ High Temperature Storage, Ta = 150°C, 1000 hrs
- ▶ Pressure Cooker, Ta = 121°C/RH = 100%/P = 2 atm, 96 hrs
- ▶ Temperature Cycle, -65~150°C, 300 cycles

## Test Service

Amkor offers full turnkey business for all power discrete products, with the capability to test various types of power devices including MOSFETs, bipolar transistors, IGBTs, diodes and regulator ICs/intelligent power devices.

- ▶ Amkor power discrete test capability:
  - ▷ Static test (DC)
  - ▷ Dynamic test (AC, Switching/Trr, Capacitance/Rg)
  - ▷ Destruction test (Inductive load/VSUS, I Latch, Surge, Isolation/VIL)
  - ▷ Thermal Resistance ( $\Delta VDS$ ,  $\Delta mV$ , etc.)
- ▶ Program generation/conversion
- ▶ Failure analysis
- ▶ Available test/handling technology
- ▶ Integrated marking, vision inspection and tape & reel services

# TOLL

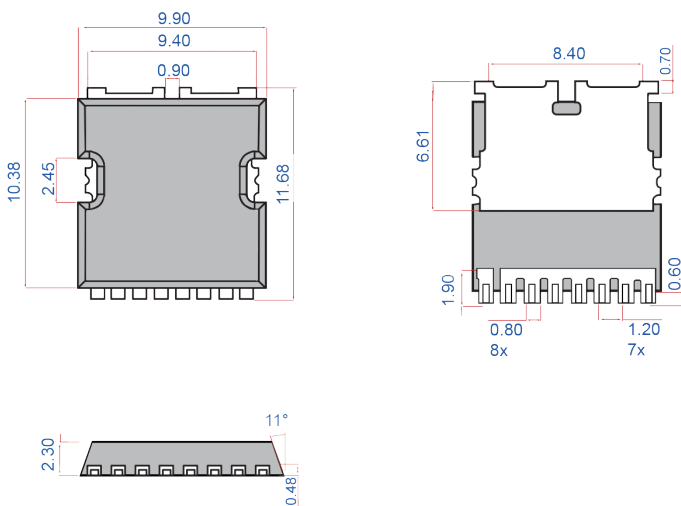
## Standard Materials

- ▶ Leadframe: Bare copper
- ▶ Die attach: Solder paste
- ▶ Interconnect (3 options):
  - ▷ Copper clip
  - ▷ Multiple Cu wires
  - ▷ Multiple Al wires (Under Development)
- ▶ Mold compound: Halogen free

## Shipping

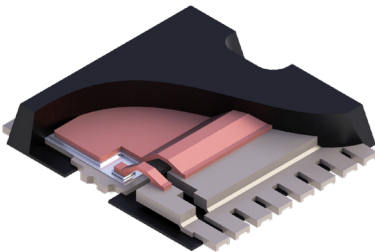
- ▶ Tape and reel packing
  - ▷ 1800 pcs per reel
  - ▷ Tape width 24 mm
  - ▷ Reel  $\Phi = 330$  mm
- ▶ Barcode packing label
- ▶ Drop ship

## Package Outline Drawing

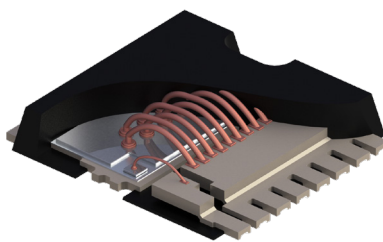


## Cross-section

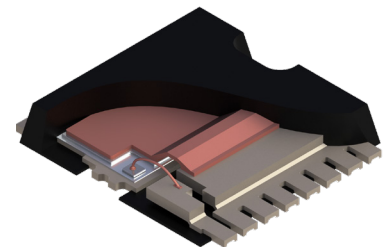
Copper Clip



Multiple Copper Wires



Copper Clip and Wire



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