

# 55 A VRPower® Integrated Power Stage

(Datasheet in Brief)

## DESCRIPTION

The SiC652 is a high frequency integrated power stage optimized for synchronous buck applications to offer high current, high efficiency, and high power density performance with very low shutdown current. Packaged in Vishay's proprietary 5 mm x 5 mm MLP package, SiC652 enables voltage regulator designs to deliver up to 55 A continuous current per phase.

The internal power MOSFETs utilize Vishay's latest TrenchFET® technology that delivers industry benchmark performance to significantly reduce switching and conduction losses.

The SiC652 incorporates an advanced MOSFET gate driver IC that features high current driving capability, adaptive dead-time control, an integrated bootstrap switch, and user selectable zero current detection to improve light load efficiency. The driver is also compatible with a wide range of PWM controllers, supports tri-state PWM, and 5 V and 3.3 V PWM logic.

The device also supports PS4 mode to reduce power consumption when the system is in standby state.

The SiC652 offers operating temperature monitoring, protection features, and warning flags that improve system monitoring and reliability.

## APPLICATIONS

- Multi-phase VRDs for computing, graphics card and memory
- Intel core processor power delivery
  - $V_{CORE}$ ,  $V_{GRAPHICS}$ ,  $V_{SYSTEM\ AGENT}$
  - $V_{CCGI}$
- Up to 24 V rail input DC/DC VR modules

## FEATURES

- Highly efficient
  - Thermally enhanced PowerPAK® MLP55-31L package
  - Vishay's latest TrenchFET technology and low side MOSFET with integrated Schottky diode
  - Integrated, low impedance, bootstrap switch
  - Power MOSFETs optimized for 19 V input stage
  - Supports PS4 mode light load requirement with low shutdown supply current (5 V, 3  $\mu$ A)
  - Zero current detection for improved light load efficiency
- Highly versatile
  - 5 V and 3.3 V PWM logic with tri-state and hold-off timer
  - 5 V DSBL#, ZCD\_EN# logic with PS4 state support
  - High frequency operation up to 2 MHz
- Robust and reliable
  - Delivers in excess of 55 A continuous current, 70 A, peak (10 ms) and 100 A, peak (10  $\mu$ s)
  - Over current protection
  - Over temperature flag
  - Over temperature protection
  - Undervoltage lockout protection
  - High side MOSFET short detection
- Effective monitoring and reporting
  - Accurate temperature reporting
  - Warnings and faults reporting flag
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## TYPICAL APPLICATION DIAGRAM

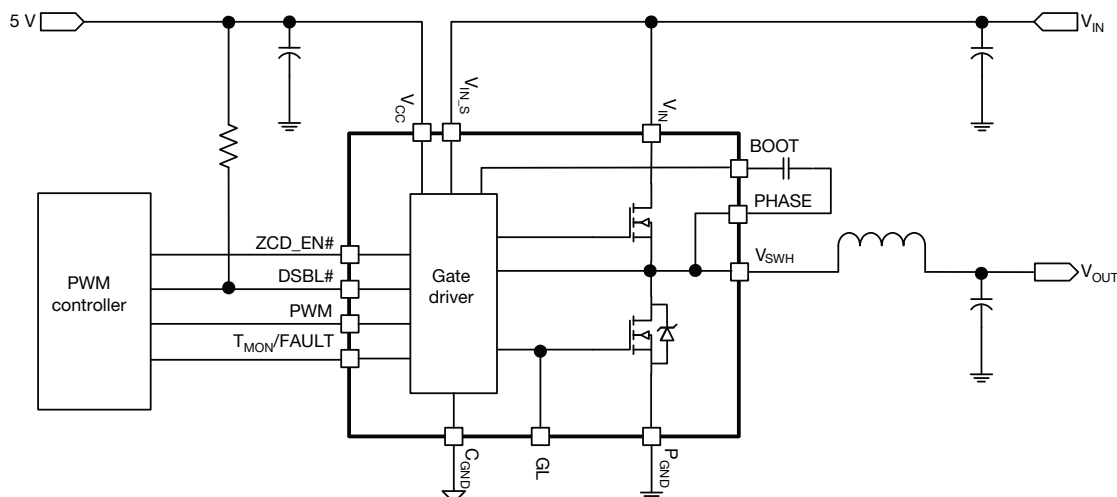


Fig. 1 - Typical Application Diagram



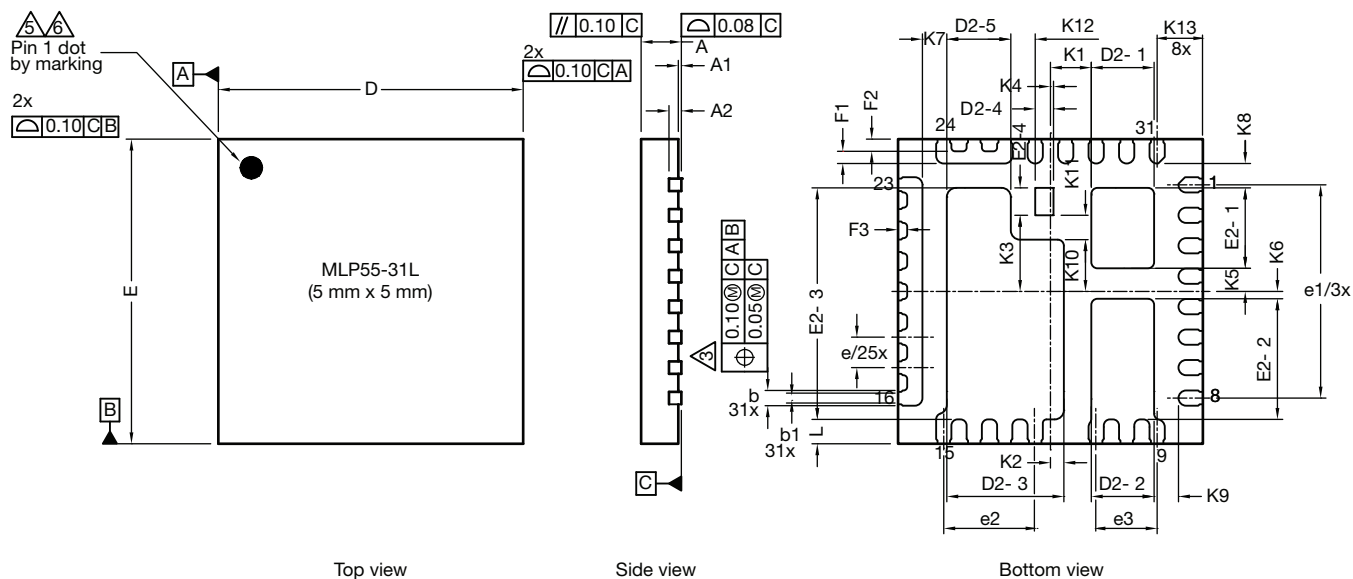
| PRODUCT SUMMARY                    |                                                                                               |                                                                                                 |
|------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Part number                        | SiC652                                                                                        | SiC652A                                                                                         |
| Description                        | 55 A power stage plus, 4.5 V <sub>IN</sub> to 24 V <sub>IN</sub> , 5 V PWM with ZCD, PS4 mode | 55 A power stage plus, 4.5 V <sub>IN</sub> to 24 V <sub>IN</sub> , 3.3 V PWM with ZCD, PS4 mode |
| Input voltage min. (V)             | 4.5                                                                                           | 4.5                                                                                             |
| Input voltage max. (V)             | 24                                                                                            | 24                                                                                              |
| Continuous current rating max. (A) | 55                                                                                            | 55                                                                                              |
| Switch frequency max. (kHz)        | 2000                                                                                          | 2000                                                                                            |
| Enable (yes / no)                  | Yes                                                                                           | Yes                                                                                             |
| Monitoring features                | T <sub>MON</sub>                                                                              | T <sub>MON</sub>                                                                                |
| Protection                         | UVLO, OCP, OTP, HS-short                                                                      | UVLO, OCP, OTP, HS-short                                                                        |
| Light load mode                    | ZCD, PS4                                                                                      | ZCD, PS4                                                                                        |
| Pulse-width modulation (V)         | 5                                                                                             | 3.3                                                                                             |
| Package type                       | PowerPAK MLP55-31L                                                                            | PowerPAK MLP55-31L                                                                              |
| Package size (W, L, H) (mm)        | 5.0 x 5.0 x 0.75                                                                              | 5.0 x 5.0 x 0.75                                                                                |
| Status code                        | 1                                                                                             | 1                                                                                               |
| Product type                       | VRPower (DrMOS)                                                                               | VRPower (DrMOS)                                                                                 |
| Applications                       | Computer, industrial, networking                                                              | Computer, industrial, networking                                                                |

To request the full version of the datasheet, please contact: [ICmarketing@vishay.com](mailto:ICmarketing@vishay.com)

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## PowerPAK® MLP55-31L Case Outline



| DIM. | MILLIMETERS |      |      | INCHES     |       |       |
|------|-------------|------|------|------------|-------|-------|
|      | MIN.        | NOM. | MAX. | MIN.       | NOM.  | MAX.  |
| A    | 0.70        | 0.75 | 0.80 | 0.027      | 0.029 | 0.031 |
| A1   | 0.00        | -    | 0.05 | 0.000      | -     | 0.002 |
| A2   | 0.20 ref.   |      |      | 0.008 ref. |       |       |
| b    | 0.20        | 0.25 | 0.30 | 0.078      | 0.098 | 0.011 |
| b1   | 0.15        | 0.20 | 0.25 | 0.006      | 0.008 | 0.010 |
| D    | 4.90        | 5.00 | 5.10 | 0.193      | 0.196 | 0.200 |
| e    | 0.50 BSC    |      |      | 0.019 BSC  |       |       |
| e1   | 3.50 BSC    |      |      | 0.138 BSC  |       |       |
| e2   | 1.50 BSC    |      |      | 0.060 BSC  |       |       |
| e3   | 1.00 BSC    |      |      | 0.040 BSC  |       |       |
| E    | 4.90        | 5.00 | 5.10 | 0.193      | 0.196 | 0.200 |
| L    | 0.35        | 0.40 | 0.45 | 0.013      | 0.015 | 0.017 |
| D2-1 | 0.98        | 1.03 | 1.08 | 0.039      | 0.041 | 0.043 |
| D2-2 | 0.98        | 1.03 | 1.08 | 0.039      | 0.041 | 0.043 |
| D2-3 | 1.87        | 1.92 | 1.97 | 0.074      | 0.076 | 0.078 |
| D2-4 | 0.30 BSC    |      |      | 0.012 BSC  |       |       |
| D2-5 | 1.05        | 1.10 | 1.15 | 0.041      | 0.043 | 0.045 |
| E2-1 | 1.27        | 1.32 | 1.37 | 0.050      | 0.052 | 0.054 |
| E2-2 | 1.93        | 1.98 | 2.03 | 0.076      | 0.078 | 0.080 |
| E2-3 | 3.75        | 3.80 | 3.85 | 0.148      | 0.150 | 0.152 |
| E2-4 | 0.45 BSC    |      |      | 0.018 BSC  |       |       |
| F1   | 0.15        | 0.20 | 0.25 | 0.006      | 0.008 | 0.010 |
| F2   | 0.20 ref.   |      |      | 0.008 ref. |       |       |
| F3   | 0.15 ref.   |      |      | 0.006 ref. |       |       |



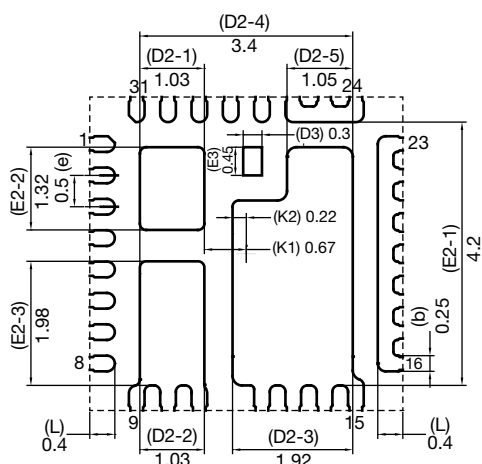
| DIM.                                         | MILLIMETERS |          |      | INCHES |           |      |
|----------------------------------------------|-------------|----------|------|--------|-----------|------|
|                                              | MIN.        | NOM.     | MAX. | MIN.   | NOM.      | MAX. |
| K1                                           |             | 0.67 BSC |      |        | 0.026 BSC |      |
| K2                                           |             | 0.22 BSC |      |        | 0.008 BSC |      |
| K3                                           |             | 1.25 BSC |      |        | 0.049 BSC |      |
| K4                                           |             | 0.10 BSC |      |        | 0.004 BSC |      |
| K5                                           |             | 0.38 BSC |      |        | 0.015 BSC |      |
| K6                                           |             | 0.12 BSC |      |        | 0.005 BSC |      |
| K7                                           |             | 0.40 BSC |      |        | 0.016 BSC |      |
| K8                                           |             | 0.40 BSC |      |        | 0.016 BSC |      |
| K9                                           |             | 0.40 BSC |      |        | 0.016 BSC |      |
| K10                                          |             | 0.85 BSC |      |        | 0.033 BSC |      |
| K11                                          |             | 0.40 BSC |      |        | 0.016 BSC |      |
| K12                                          |             | 0.40 BSC |      |        | 0.016 BSC |      |
| K13                                          |             | 0.75 BSC |      |        | 0.030 BSC |      |
| ECN: T17-0423-Rev. F, 21-Aug-17<br>DWG: 6025 |             |          |      |        |           |      |

**Notes**

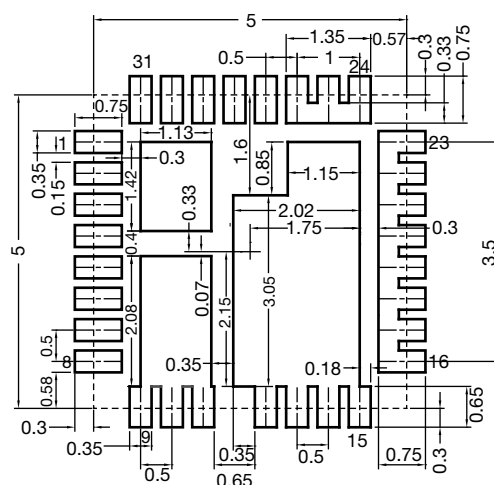
1. Use millimeters as the primary measurement
2. Dimensioning and tolerances conform to ASME Y14.5M. - 1994
3. Dimension b applies to plated terminal and is measured between 0.20 mm and 0.25 mm from terminal tip
4. The pin #1 identifier must be existed on the top surface of the package by using indentation mark or other feature of package body
5. Exact shape and size of this feature is optional
6. Package warpage max. 0.08 mm
7. Applied only for terminals

## Recommended Land Pattern

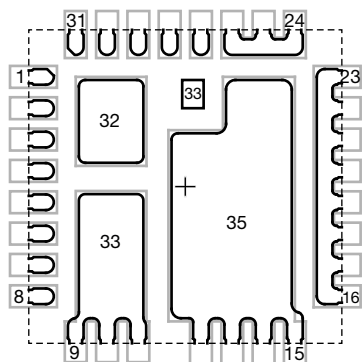
Top side transparent view  
(not bottom view)



Land pattern for MLP55-31L



All dimensions in millimeters



Component for MLP55-31L



Land pattern for MLP55-31L



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