



Vincotech

# 10-E112PMA060MS-L928A76Z

target datasheet

flowPIM E1

1200 V / 60 mΩ

## Topology features

- Converter+Brake+Inverter
- Open Emitter configuration
- SiC MOSFET
- Temperature sensor

## Component features

- High Blocking Voltage with low drain source on state resistance
- High speed SiC-MOSFET technology
- Resistant to Latch-up

## Housing features

- Base isolation: Al<sub>2</sub>O<sub>3</sub>
- Convex shaped substrate for superior thermal contact
- Compact housing
- CTI600 housing material
- Thermo-mechanical push-and-pull force relief
- Solder pin

## Target applications

- Embedded Drives
- HVAC
- Industrial Drives

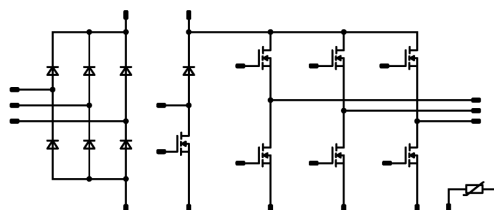
## Types

- 10-E112PMA060MS-L928A76Z

## flow E1 12 mm housing



## Schematic





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## Maximum Ratings

$T_j = 25\text{ °C}$ , unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|-----------|--------|------------|-------|------|
|-----------|--------|------------|-------|------|

### Brake Switch

|                              |            |                                       |          |    |
|------------------------------|------------|---------------------------------------|----------|----|
| Drain-source voltage         | $V_{DS}$   |                                       | 1200     | V  |
| Drain current (DC current)   | $I_D$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 25       | A  |
| Peak drain current           | $I_{DM}$   | $t_p$ limited by $T_{jmax}$           | 80       | A  |
| Total power dissipation      | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 59       | W  |
| Gate-source voltage          | $V_{GS}$   | static                                | -5 / 18  | V  |
|                              |            | dynamic                               | -10 / 22 | V  |
| Maximum Junction Temperature | $T_{jmax}$ |                                       | 175      | °C |

### Brake Diode

|                                        |            |                                                                      |      |                  |
|----------------------------------------|------------|----------------------------------------------------------------------|------|------------------|
| Peak repetitive reverse voltage        | $V_{RRM}$  |                                                                      | 1600 | V                |
| Forward current (DC current)           | $I_F$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$                                | 49   | A                |
| Surge (non-repetitive) forward current | $I_{FSM}$  | Single Half Sine Wave,<br>$t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$ | 200  | A                |
| Surge current capability               | $I^2t$     |                                                                      | 200  | A <sup>2</sup> s |
| Total power dissipation                | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$                                | 77   | W                |
| Maximum junction temperature           | $T_{jmax}$ |                                                                      | 175  | °C               |

### Rectifier Diode

|                                        |            |                                                                      |      |                  |
|----------------------------------------|------------|----------------------------------------------------------------------|------|------------------|
| Peak repetitive reverse voltage        | $V_{RRM}$  |                                                                      | 1600 | V                |
| Forward current (DC current)           | $I_F$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$                                | 49   | A                |
| Surge (non-repetitive) forward current | $I_{FSM}$  | Single Half Sine Wave,<br>$t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$ | 200  | A                |
| Surge current capability               | $I^2t$     |                                                                      | 200  | A <sup>2</sup> s |
| Total power dissipation                | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$                                | 77   | W                |
| Maximum junction temperature           | $T_{jmax}$ |                                                                      | 175  | °C               |



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## Maximum Ratings

$T_j = 25\text{ °C}$ , unless otherwise specified

| Parameter                    | Symbol     | Conditions                            | Value    | Unit |
|------------------------------|------------|---------------------------------------|----------|------|
| <b>Inverter Switch</b>       |            |                                       |          |      |
| Drain-source voltage         | $V_{DS}$   |                                       | 1200     | V    |
| Drain current (DC current)   | $I_D$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 25       | A    |
| Peak drain current           | $I_{DM}$   | $t_p$ limited by $T_{jmax}$           | 80       | A    |
| Total power dissipation      | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 59       | W    |
| Gate-source voltage          | $V_{GS}$   | static                                | -5 / 18  | V    |
|                              |            | dynamic                               | -10 / 22 | V    |
| Maximum Junction Temperature | $T_{jmax}$ |                                       | 175      | °C   |

## Module Properties

### Thermal Properties

|                                                 |           |  |                            |    |
|-------------------------------------------------|-----------|--|----------------------------|----|
| Storage temperature                             | $T_{stg}$ |  | -40...+125                 | °C |
| Operation temperature under switching condition | $T_{jop}$ |  | -40...+( $T_{jmax} - 25$ ) | °C |

### Isolation Properties

|                            |            |                                    |       |    |
|----------------------------|------------|------------------------------------|-------|----|
| Isolation voltage          | $V_{isol}$ | DC Test Voltage $t_p = 2\text{ s}$ | 6000  | V  |
| Creepage distance          |            |                                    | >12,7 | mm |
| Clearance                  |            |                                    | >12,7 | mm |
| Comparative Tracking Index | CTI        |                                    | ≥ 600 |    |



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## Characteristic Values

| Parameter | Symbol | Conditions |                              |                                           |                                     |            | Values |     |     | Unit |
|-----------|--------|------------|------------------------------|-------------------------------------------|-------------------------------------|------------|--------|-----|-----|------|
|           |        |            | $V_{GE}$ [V]<br>$V_{GS}$ [V] | $V_{CE}$ [V]<br>$V_{DS}$ [V]<br>$V_F$ [V] | $I_C$ [A]<br>$I_D$ [A]<br>$I_F$ [A] | $T_j$ [°C] | Min    | Typ | Max |      |

### Brake Switch

#### Static

|                                  |              |                       |       |      |       |    |     |      |      |    |
|----------------------------------|--------------|-----------------------|-------|------|-------|----|-----|------|------|----|
| Drain-source on-state resistance | $r_{DS(on)}$ |                       | 18    |      | 20    | 25 |     | 60   | 90   | mΩ |
| Gate-source threshold voltage    | $V_{GS(th)}$ |                       |       |      | 0,002 | 25 | 1,7 | 2,25 | 2,75 | V  |
| Gate to Source Leakage Current   | $I_{GSS}$    |                       | 22    | 0    |       | 25 |     |      | 100  | nA |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    |                       | 0     | 1200 |       | 25 |     |      | 10   | μA |
| Internal gate resistance         | $r_g$        |                       |       |      |       |    |     | 2    |      | Ω  |
| Gate charge                      | $Q_g$        |                       | -5/18 | 800  | 20    | 25 |     | 57   |      | nC |
| Short-circuit input capacitance  | $C_{iss}$    | $f = 500 \text{ kHz}$ | 0     | 800  | 0     | 25 |     | 1330 |      | pF |
| Short-circuit output capacitance | $C_{oss}$    |                       |       |      |       |    |     | 74   |      |    |
| Reverse transfer capacitance     | $C_{rss}$    |                       |       |      |       |    |     | 3    |      |    |
| Diode forward voltage            | $V_{SD}$     |                       | 0     |      | 20    | 25 |     | 4,1  |      | V  |

#### Thermal

|                                     |               |                                               |  |  |  |  |  |     |  |     |
|-------------------------------------|---------------|-----------------------------------------------|--|--|--|--|--|-----|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4 \text{ W/mK}$<br>(PSX) |  |  |  |  |  | 1,6 |  | K/W |
|-------------------------------------|---------------|-----------------------------------------------|--|--|--|--|--|-----|--|-----|

### Brake Diode

#### Static

|                         |       |                        |  |  |    |           |  |   |            |    |
|-------------------------|-------|------------------------|--|--|----|-----------|--|---|------------|----|
| Forward voltage         | $V_F$ |                        |  |  | 18 | 25        |  | 1 | 1,5        | V  |
| Reverse leakage current | $I_R$ | $V_r = 1600 \text{ V}$ |  |  |    | 25<br>150 |  |   | 50<br>1000 | μA |

#### Thermal

|                                     |               |                                               |  |  |  |  |  |      |  |     |
|-------------------------------------|---------------|-----------------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4 \text{ W/mK}$<br>(PSX) |  |  |  |  |  | 1,23 |  | K/W |
|-------------------------------------|---------------|-----------------------------------------------|--|--|--|--|--|------|--|-----|



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## Characteristic Values

| Parameter | Symbol | Conditions |                              |                                           |                                     |            | Values |     |     | Unit |
|-----------|--------|------------|------------------------------|-------------------------------------------|-------------------------------------|------------|--------|-----|-----|------|
|           |        |            | $V_{GE}$ [V]<br>$V_{GS}$ [V] | $V_{CE}$ [V]<br>$V_{DS}$ [V]<br>$V_F$ [V] | $I_C$ [A]<br>$I_D$ [A]<br>$I_F$ [A] | $T_j$ [°C] | Min    | Typ | Max |      |

### Rectifier Diode

#### Static

|                         |       |                |  |  |    |           |  |   |            |         |
|-------------------------|-------|----------------|--|--|----|-----------|--|---|------------|---------|
| Forward voltage         | $V_F$ |                |  |  | 18 | 25        |  | 1 | 1,5        | V       |
| Reverse leakage current | $I_R$ | $V_r = 1600$ V |  |  |    | 25<br>150 |  |   | 50<br>1000 | $\mu$ A |

#### Thermal

|                                     |               |                                       |  |  |  |  |  |      |  |     |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK<br>(PSX) |  |  |  |  |  | 1,23 |  | K/W |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

### Thermistor

#### Static

|                                |                |                          |  |  |  |     |     |      |     |            |
|--------------------------------|----------------|--------------------------|--|--|--|-----|-----|------|-----|------------|
| Rated resistance               | $R$            |                          |  |  |  | 25  |     | 5    |     | k $\Omega$ |
| Deviation of R100              | $\Delta_{R/R}$ | $R_{100} = 499$ $\Omega$ |  |  |  | 100 | 3,2 |      | 3,3 | %          |
| Power dissipation              | $P$            |                          |  |  |  | 25  |     | 130  |     | mW         |
| Power dissipation constant     | $d$            |                          |  |  |  | 25  |     | 1,3  |     | mW/K       |
| B-value                        | $B_{(25/50)}$  | Tol. $\pm 1$ %           |  |  |  |     |     | 3380 |     | K          |
| Vincotech Thermistor Reference |                |                          |  |  |  |     |     |      | V   |            |



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## Characteristic Values

| Parameter | Symbol | Conditions |                              |                                           |                                     |            | Values |     |     | Unit |
|-----------|--------|------------|------------------------------|-------------------------------------------|-------------------------------------|------------|--------|-----|-----|------|
|           |        |            | $V_{GE}$ [V]<br>$V_{GS}$ [V] | $V_{CE}$ [V]<br>$V_{DS}$ [V]<br>$V_F$ [V] | $I_C$ [A]<br>$I_D$ [A]<br>$I_F$ [A] | $T_j$ [°C] | Min    | Typ | Max |      |

### Inverter Switch

#### Static

|                                  |              |                       |       |      |       |    |     |      |      |    |
|----------------------------------|--------------|-----------------------|-------|------|-------|----|-----|------|------|----|
| Drain-source on-state resistance | $r_{DS(on)}$ |                       | 18    |      | 20    | 25 |     | 60   | 90   | mΩ |
| Gate-source threshold voltage    | $V_{GS(th)}$ |                       |       |      | 0,002 | 25 | 1,7 | 2,25 | 2,75 | V  |
| Gate to Source Leakage Current   | $I_{GSS}$    |                       | 22    | 0    |       | 25 |     |      | 100  | nA |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    |                       | 0     | 1200 |       | 25 |     |      | 10   | μA |
| Internal gate resistance         | $r_g$        |                       |       |      |       |    |     | 2    |      | Ω  |
| Gate charge                      | $Q_g$        |                       | -5/18 | 800  | 20    | 25 |     | 57   |      | nC |
| Short-circuit input capacitance  | $C_{iss}$    | $f = 500 \text{ kHz}$ | 0     | 800  | 0     | 25 |     | 1330 |      | pF |
| Short-circuit output capacitance | $C_{oss}$    |                       |       |      |       |    |     | 74   |      |    |
| Reverse transfer capacitance     | $C_{rss}$    |                       |       |      |       |    |     | 3    |      |    |
| Diode forward voltage            | $V_{SD}$     |                       | 0     |      | 20    | 25 |     | 4,1  |      | V  |

#### Thermal

|                                     |               |                                               |  |  |  |  |  |     |  |     |
|-------------------------------------|---------------|-----------------------------------------------|--|--|--|--|--|-----|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4 \text{ W/mK}$<br>(PSX) |  |  |  |  |  | 1,6 |  | K/W |
|-------------------------------------|---------------|-----------------------------------------------|--|--|--|--|--|-----|--|-----|



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target datasheet

| Ordering Code                            |                              |
|------------------------------------------|------------------------------|
| Version                                  | Ordering Code                |
| Without thermal paste                    | 10-E112PMA060MS-L928A76Z     |
| With thermal paste (5,2 W/mK, PTM6000HV) | 10-E112PMA060MS-L928A76Z-/7/ |

| Marking |            |                              |                     |                |                   |        |
|---------|------------|------------------------------|---------------------|----------------|-------------------|--------|
|         | Text       | Name                         | Date code           | UL & VIN       | Lot               | Serial |
|         |            | NN-NNNNNNNNNNNNNNNN- TTTTIVV | WWYY                | UL VIN         | LLLLL             | SSSS   |
|         | Datamatrix | Type&Ver<br>TTTTTIVV         | Lot number<br>LLLLL | Serial<br>SSSS | Date code<br>WWYY |        |

## Outline

Pin table [mm]

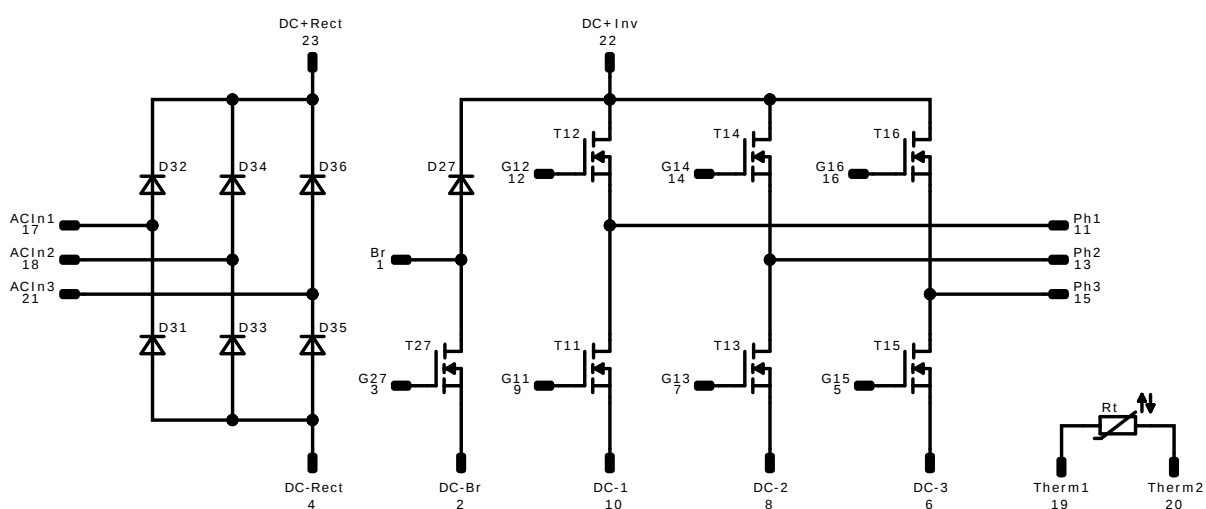
| Pin | X    | Y    | Function |
|-----|------|------|----------|
| 1   | 32   | 0    | Br       |
| 2   | 25,6 | 0    | DC-Br    |
| 3   | 22,4 | 0    | G27      |
| 4   | 19,2 | 0    | DC-Rect  |
| 5   | 16   | 0    | G15      |
| 6   | 12,8 | 0    | DC-3     |
| 7   | 9,6  | 0    | G13      |
| 8   | 6,4  | 0    | DC-2     |
| 9   | 3,2  | 0    | G11      |
| 10  | 0    | 0    | DC-1     |
| 11  | 0    | 25,6 | Ph1      |
| 12  | 3,2  | 25,6 | G12      |
| 13  | 9,6  | 25,6 | Ph2      |
| 14  | 12,8 | 25,6 | G14      |
| 15  | 19,2 | 25,6 | Ph3      |
| 16  | 22,4 | 25,6 | G16      |
| 17  | 32   | 25,6 | ACIn1    |
| 18  | 25,6 | 19,2 | ACIn2    |
| 19  | 19,2 | 16   | Therm1   |
| 20  | 16   | 16   | Therm2   |
| 21  | 25,6 | 12,8 | ACIn3    |
| 22  | 22,4 | 6,4  | DC+Inv   |
| 23  | 25,6 | 6,4  | DC+Rect  |

Tolerance of positions: ±0.05mm at the end of pins  
Dimension of coordinate axes is only of first without tolerance



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Pinout



Identification

| ID                           | Component  | Voltage | Current | Function        | Comment |
|------------------------------|------------|---------|---------|-----------------|---------|
| T11, T12, T13, T14, T15, T16 | MOSFET     | 1200 V  | 60 mΩ   | Inverter Switch |         |
| T27                          | MOSFET     | 1200 V  | 60 mΩ   | Brake Switch    |         |
| D27                          | Rectifier  | 1600 V  | 18 A    | Brake Diode     |         |
| D31, D32, D33, D34, D35, D36 | Rectifier  | 1600 V  | 18 A    | Rectifier Diode |         |
| Rt                           | Thermistor |         |         | Thermistor      |         |



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| Packaging instruction                 |      |          |      |        |
|---------------------------------------|------|----------|------|--------|
| Standard packaging quantity (SPQ) 100 | >SPQ | Standard | <SPQ | Sample |

| Handling instruction                                                         |
|------------------------------------------------------------------------------|
| Handling instructions for <i>flow</i> E1 packages see vincotech.com website. |

| Package data                                                        |
|---------------------------------------------------------------------|
| Package data for <i>flow</i> E1 packages see vincotech.com website. |

| Vincotech thermistor reference                                     |
|--------------------------------------------------------------------|
| See Vincotech thermistor reference table at vincotech.com website. |

| UL recognition and file number                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}\text{C}$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website. |



| Document No.:                  | Date:       | Modification:   | Pages |
|--------------------------------|-------------|-----------------|-------|
| 10-E112PMA060MS-L928A76Z-T1-14 | 6 Oct. 2025 | Initial Release |       |

| Product status definition |                        |                                                                                                                                                                                                              |
|---------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Datasheet Status          | Product Status         | Definition                                                                                                                                                                                                   |
| Target                    | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff. |

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