# 10-EY122PA005ME-LU39F08T Datasheet

## Features
- C3M™ SiC MOSFET technology
- Standard industrial housing
- Low inductive design
- Optimized Rth(j-s) with Phase Change Material
- Built-in NTC

## Target applications
- Charging Stations
- Energy Storage Systems
- Power Supply
- Solar Inverters
- Welding & Cutting

## Types
- 10-EY122PA005ME-LU39F08T

## Schematic
### Maximum Ratings

- **$T_i = 25\, ^\circ\text{C}$**, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Half-Bridge Switch - Lo side</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain-source voltage</td>
<td>$V_{DSS}$</td>
<td></td>
<td>1200</td>
<td>V</td>
</tr>
<tr>
<td>Drain current (DC current)</td>
<td>$I_D$</td>
<td>$T_i = T_{j\text{max}}$; $T_s = 80, ^\circ\text{C}$</td>
<td>182</td>
<td>A</td>
</tr>
<tr>
<td>Peak drain current</td>
<td>$I_{D\text{tot}}$</td>
<td>$i_d$ limited by $T_{j\text{max}}$</td>
<td>720</td>
<td>A</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>$P_{\text{tot}}$</td>
<td>$T_i = T_{j\text{max}}$; $T_s = 80, ^\circ\text{C}$</td>
<td>303</td>
<td>W</td>
</tr>
<tr>
<td>Gate-source voltage</td>
<td>$V_{GS}$</td>
<td>dynamic</td>
<td>-8 / 19</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_{j\text{max}}$</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>

| **Half-Bridge Switch - Hi side** | | | | |
| Drain-source voltage | $V_{DSS}$ | | 1200 | V |
| Drain current (DC current) | $I_D$ | $T_i = T_{j\text{max}}$; $T_s = 80\, ^\circ\text{C}$ | 182 | A |
| Peak drain current | $I_{D\text{tot}}$ | $i_d$ limited by $T_{j\text{max}}$ | 720 | A |
| Total power dissipation | $P_{\text{tot}}$ | $T_i = T_{j\text{max}}$; $T_s = 80\, ^\circ\text{C}$ | 303 | W |
| Gate-source voltage | $V_{GS}$ | dynamic | -8 / 19 | V |
| Maximum Junction Temperature | $T_{j\text{max}}$ | | 175 | °C |

### Module Properties

#### Thermal Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td></td>
<td>-40...+125</td>
<td>°C</td>
</tr>
<tr>
<td>Operation temperature under switching condition</td>
<td>$T_{jop}$</td>
<td></td>
<td>-40...+(T_{j\text{max}} - 25)</td>
<td>°C</td>
</tr>
</tbody>
</table>

#### Isolation Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolation voltage</td>
<td>$V_{isol}$</td>
<td>DC Test Voltage*; $t_p = 2, \text{s}$</td>
<td>6000</td>
<td>V</td>
</tr>
<tr>
<td>Isolation voltage</td>
<td>$V_{isol}$</td>
<td>AC Voltage; $t_p = 1, \text{min}$</td>
<td>2500</td>
<td>V</td>
</tr>
<tr>
<td>Creepage distance</td>
<td></td>
<td></td>
<td>min. 12,7</td>
<td>mm</td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
<td></td>
<td>9,34</td>
<td>mm</td>
</tr>
<tr>
<td>Comparative Tracking Index</td>
<td>CTI</td>
<td></td>
<td>≥ 600</td>
<td></td>
</tr>
</tbody>
</table>

*100 % tested in production
# Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain-source on-state resistance</td>
<td>r_{DS(on)}</td>
<td>15</td>
<td>240</td>
<td>25</td>
</tr>
<tr>
<td>Gate-source threshold voltage</td>
<td>V_{GS(th)}</td>
<td>0</td>
<td>0,069</td>
<td>25</td>
</tr>
<tr>
<td>Gate to Source Leakage Current</td>
<td>I_{gs}</td>
<td>15</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>I_{oss}</td>
<td>0</td>
<td>1200</td>
<td>25</td>
</tr>
<tr>
<td>Internal gate resistance</td>
<td>r_{g}</td>
<td>0,283</td>
<td>0</td>
<td>2,2</td>
</tr>
<tr>
<td>Gate charge</td>
<td>Q_{g}</td>
<td>-4/15</td>
<td>800</td>
<td>240</td>
</tr>
<tr>
<td>Short-circuit input capacitance</td>
<td>C_{iss}</td>
<td>/ f = 100 kHz</td>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>Short-circuit output capacitance</td>
<td>C_{oss}</td>
<td>/ f = 100 kHz</td>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>C_{rss}</td>
<td>/ f = 100 kHz</td>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>Diode forward voltage</td>
<td>V_{SD}</td>
<td>0</td>
<td>120</td>
<td>25</td>
</tr>
<tr>
<td>Thermal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance junction to sink (2)</td>
<td>R_{th(j-s)}</td>
<td>λ_{paste} = 3,4 W/mK (PSX)</td>
<td>0,31</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Half-Bridge Switch - Lo side

(1) R_{th(j-s)} = 3,4 W/mK (PSX)
## Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-on delay time</td>
<td>$t_{\text{on}}$</td>
<td></td>
<td>25</td>
<td>81.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>72.96</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>71.36</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_i$</td>
<td>$R_{\text{on}} = 5.8 , \Omega$</td>
<td>25</td>
<td>44.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>38.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>37.44</td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>$t_{\text{off}}$</td>
<td>$R_{\text{off}} = 5.8 , \Omega$</td>
<td>25</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>192.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>196.8</td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td></td>
<td>25</td>
<td>19.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>19.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>20.12</td>
</tr>
<tr>
<td>Turn-on energy (per pulse)</td>
<td>$E_{\text{on}}$</td>
<td>$Q_{\text{FWD}} = 1.18 , \mu\text{C}$</td>
<td>25</td>
<td>7.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>6.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>7.06</td>
</tr>
<tr>
<td>Turn-off energy (per pulse)</td>
<td>$E_{\text{off}}$</td>
<td>$Q_{\text{FWD}} = 3 , \mu\text{C}$</td>
<td>25</td>
<td>4.96</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>4.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>4.95</td>
</tr>
<tr>
<td>Peak recovery current</td>
<td>$I_{\text{RRM}}$</td>
<td>$</td>
<td>di/dt</td>
<td>= 6563 , \text{A/\mu s}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>121.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>135.34</td>
</tr>
<tr>
<td>Reverse recovery time</td>
<td>$I_o$</td>
<td>$</td>
<td>di/dt</td>
<td>= 7498 , \text{A/\mu s}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>41.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>43.89</td>
</tr>
<tr>
<td>Recovered charge</td>
<td>$Q_r$</td>
<td>$</td>
<td>di/dt</td>
<td>= 7673 , \text{A/\mu s}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>3.46</td>
</tr>
<tr>
<td>Reverse recovered energy</td>
<td>$E_{\text{rec}}$</td>
<td></td>
<td>25</td>
<td>0.315</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>0.821</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>0.972</td>
</tr>
<tr>
<td>Peak rate of fall of recovery current</td>
<td>$</td>
<td>di/dt</td>
<td>_{\text{peak}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>7629</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>7909</td>
</tr>
</tbody>
</table>
## Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-source on-state resistance</td>
<td>$r_{DS(on)}$</td>
<td></td>
<td>15</td>
<td>240</td>
</tr>
<tr>
<td>Gate-source threshold voltage</td>
<td>$V_{GS(th)}$</td>
<td></td>
<td>0</td>
<td>0,069</td>
</tr>
<tr>
<td>Gate to Source Leakage Current</td>
<td>$I_{iss}$</td>
<td></td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>$I_{DSS}$</td>
<td></td>
<td>0</td>
<td>1200</td>
</tr>
<tr>
<td>Internal gate resistance</td>
<td>$r_{g}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate charge</td>
<td>$Q_{g}$</td>
<td></td>
<td>$-4/15$</td>
<td>800</td>
</tr>
<tr>
<td>Short-circuit input capacitance</td>
<td>$C_{iss}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit output capacitance</td>
<td>$C_{oss}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{rss}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode forward voltage</td>
<td>$V_{SD}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Static

**Half-Bridge Switch - Hi side**

### Thermal

**Thermal resistance junction to sink** (2) | $R_{th(j-s)}$ | $P_{max} = 3,4 W/mK \ (PSX)$ | 0,31 | K/W
### Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turn-on delay time</strong></td>
<td>( t_{\text{on}} )</td>
<td>( R_{\text{on}} = 5.8 , \Omega )</td>
<td>25</td>
<td>81.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>72.96</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>71.36</td>
</tr>
<tr>
<td><strong>Rise time</strong></td>
<td>( t_r )</td>
<td>( R_{\text{on}} = 5.8 , \Omega )</td>
<td>25</td>
<td>44.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>38.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>37.44</td>
</tr>
<tr>
<td><strong>Turn-off delay time</strong></td>
<td>( t_{\text{off}} )</td>
<td>( R_{\text{off}} = 5.8 , \Omega )</td>
<td>25</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>192.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>196.8</td>
</tr>
<tr>
<td><strong>Fall time</strong></td>
<td>( t_f )</td>
<td></td>
<td>25</td>
<td>19.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>19.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>20.12</td>
</tr>
<tr>
<td><strong>Turn-on energy (per pulse)</strong></td>
<td>( E_{\text{on}} )</td>
<td>( Q_{\text{FWD}} = 1.18 , \mu \text{C} )</td>
<td>25</td>
<td>7.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( Q_{\text{FWD}} = 3 , \mu \text{C} )</td>
<td>125</td>
<td>6.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( Q_{\text{FWD}} = 3.46 , \mu \text{C} )</td>
<td>150</td>
<td>7.06</td>
</tr>
<tr>
<td><strong>Turn-off energy (per pulse)</strong></td>
<td>( E_{\text{off}} )</td>
<td>( -4/15 )</td>
<td>25</td>
<td>4.96</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600-240</td>
<td>125</td>
<td>4.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>4.95</td>
</tr>
<tr>
<td><strong>Peak recovery current</strong></td>
<td>( I_{\text{rr}} )</td>
<td></td>
<td>25</td>
<td>70.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>121.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>135.34</td>
</tr>
<tr>
<td><strong>Reverse recovery time</strong></td>
<td>( t_{\text{rr}} )</td>
<td></td>
<td>25</td>
<td>24.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>41.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>43.89</td>
</tr>
<tr>
<td><strong>Recovered charge</strong></td>
<td>( Q_{\text{r}} )</td>
<td>( di/dt = 6563 , \text{A/µs} )</td>
<td>25</td>
<td>1.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( di/dt = 7498 , \text{A/µs} )</td>
<td>125</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( di/dt = 7673 , \text{A/µs} )</td>
<td>150</td>
<td>3.46</td>
</tr>
<tr>
<td><strong>Reverse recovered energy</strong></td>
<td>( E_{\text{rec}} )</td>
<td>( di/dt = 6563 , \text{A/µs} )</td>
<td>25</td>
<td>0.315</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( di/dt = 7498 , \text{A/µs} )</td>
<td>125</td>
<td>0.821</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( di/dt = 7673 , \text{A/µs} )</td>
<td>150</td>
<td>0.972</td>
</tr>
<tr>
<td><strong>Peak rate of fall of recovery current</strong></td>
<td>( (di/dt)_{\text{max}} )</td>
<td></td>
<td>25</td>
<td>8511</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
<td>7629</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>7909</td>
</tr>
</tbody>
</table>
### Characteristic Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
</table>

**Thermistor**

#### Static

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated resistance</td>
<td>R</td>
<td>25</td>
<td>5</td>
<td>kΩ</td>
</tr>
<tr>
<td>Deviation of R&lt;sub&gt;th&lt;/sub&gt;</td>
<td>ΔR&lt;sub&gt;th&lt;/sub&gt;</td>
<td>100</td>
<td>-5</td>
<td>5 %</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>P</td>
<td>245</td>
<td>mW</td>
<td></td>
</tr>
<tr>
<td>Power dissipation constant</td>
<td>d</td>
<td>25</td>
<td>1,4</td>
<td>mW/K</td>
</tr>
<tr>
<td>B-value (25/50)</td>
<td>B&lt;sub&gt;25/50&lt;/sub&gt;</td>
<td>±2 %</td>
<td>3375</td>
<td>K</td>
</tr>
<tr>
<td>B-value (25/100)</td>
<td>B&lt;sub&gt;25/100&lt;/sub&gt;</td>
<td>±2 %</td>
<td>3437</td>
<td>K</td>
</tr>
</tbody>
</table>

Vincotech Thermistor Reference

(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.
Half-Bridge Switch - Lo side Characteristics

Figure 1. MOSFET
Typical output characteristics

\[ I_D = f(V_{DS}) \]

\[ t_p = 250 \mu s \]

\[ V_{GS} = 14 \text{ V} \]

V$_{DS}$ from -4 V to 20 V in steps of 2 V

Figure 2. MOSFET
Typical output characteristics

\[ I_D = f(V_{GS}) \]

\[ V_{DS} = 10 \text{ V} \]

T$_j$: 25 °C, 125 °C, 150 °C

Figure 3. MOSFET
Typical transfer characteristics

\[ I_D = f(V_{GS}) \]

\[ V_{DS} = 10 \text{ V} \]

Figure 4. MOSFET
Transient thermal impedance as a function of pulse width

\[ Z_{th}(j\omega) = f(t_p) \]

\[ D = \frac{t_p}{T} \]

\[ R_{th} = 0.313 \text{ K/W} \]

MOSFET thermal model values

<table>
<thead>
<tr>
<th>R (K/W)</th>
<th>( r ) (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.18E-02</td>
<td>4.91E+00</td>
</tr>
<tr>
<td>5.79E-02</td>
<td>1.39E+00</td>
</tr>
<tr>
<td>1.25E-01</td>
<td>1.28E-01</td>
</tr>
<tr>
<td>7.04E-02</td>
<td>3.88E-02</td>
</tr>
<tr>
<td>3.80E-02</td>
<td>4.91E-03</td>
</tr>
</tbody>
</table>
Half-Bridge Switch - Lo side Characteristics

Figure 5. MOSFET

Safe operating area

\[ I_D = f(V_{DS}) \]

- \( D \) = single pulse
- \( T_s = 80 \)°C
- \( V_{GS} = 14 \) V
- \( T_j = T_{j\text{max}} \)

\( I_D \) (A) | \( V_{DS} \) (V)
---|---
1 | 1000
0.1 | 100
0.01 | 10
0.001 | 1
0.0001 | 1

Copyright Vincotech
Half-Bridge Switch - Hi side Characteristics

Figure 6. MOSFET
Typical output characteristics
\[ I_D = f(V_{DS}) \]
\[ t_p = 250 \, \mu s \]
\[ V_{GS} = 14 \, V \]
\[ T_j \] from 25 °C to 150 °C

Figure 7. MOSFET
Typical output characteristics
\[ I_D = f(V_{GS}) \]
\[ V_{DS} \] from -4 V to 20 V in steps of 2 V

Figure 8. MOSFET
Typical transfer characteristics
\[ I_D = f(V_{GS}) \]
\[ V_{DS} = 10 \, V \]
\[ T_j \] from 25 °C to 150 °C

Figure 9. MOSFET
Transient thermal impedance as a function of pulse width
\[ Z_{th(j-s)} = f(t_p) \]
\[ R_{th} = 0.313 \, K/W \]

MOSFET thermal model values
\[
\begin{array}{ccc}
R (K/W) & \tau (s) \\
2.18E-02 & 4.91E+00 \\
5.79E-02 & 1.09E+00 \\
1.25E-01 & 1.28E-01 \\
7.04E-02 & 3.88E-02 \\
3.80E-02 & 4.91E-03 \\
\end{array}
\]
Half-Bridge Switch - Hi side Characteristics

Figure 10. MOSFET Safe operating area

\[ I_D = f(V_{DS}) \]

D = single pulse

\( T_J = 80 \, ^\circ C \)

\( V_{GS} = 14 \, V \)

\( T_J = T_{J\text{max}} \)
Half-Bridge Switching Characteristics - Lo side

**Figure 11.** MOSFET

Typical switching energy losses as a function of drain current

\[ E = f(I_D) \]

With an inductive load at

\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -\frac{4}{15} \text{ V} \]
\[ R_{gon} = 5.8 \text{ Ω} \]
\[ R_{goff} = 5.8 \text{ Ω} \]

\( T_j: \)

0,0
2,5
5,0
7,5
10,0
12,5
15,0

\( E(\text{mWs}) \)

0,0
100
200
300
400
500

\( I_D(\text{A}) \)

25 °C
125 °C
150 °C

**Figure 12.** MOSFET

Typical switching energy losses as a function of gate resistor

\[ E = f(R_g) \]

With an inductive load at

\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -\frac{4}{15} \text{ V} \]
\[ I_D = 240 \text{ A} \]

\( T_j: \)

0,0
0,5
1,0
1,5
2,0
2,5
3,0

\( R_g(\text{Ω}) \)

25 °C
125 °C
150 °C

**Figure 13.** MOSFET

Typical reverse recovered energy loss as a function of drain current

\[ E_{rec} = f(I_D) \]

With an inductive load at

\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -\frac{4}{15} \text{ V} \]
\[ R_{gon} = 5.8 \text{ Ω} \]

\( T_j: \)

0,0
0,25
0,50
0,75
1,00
1,25
1,50

\( E(\text{mWs}) \)

0,0
2,5
5,0
7,5
10,0
12,5

\( I_D(\text{A}) \)

25 °C
125 °C
150 °C

**Figure 14.** MOSFET

Typical reverse recovered energy loss as a function of gate resistor

\[ E_{rec} = f(R_g) \]

With an inductive load at

\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -\frac{4}{15} \text{ V} \]
\[ I_D = 240 \text{ A} \]

\( T_j: \)

0,0
0,5
1,0
1,5
2,0
2,5
3,0

\( R_g(\text{Ω}) \)

25 °C
125 °C
150 °C
Half-Bridge Switching Characteristics - Lo side

Figure 15. MOSFET
Typical switching times as a function of drain current
$t = f(I_D)$

With an inductive load at:
- $V_{DS} = 600$ V
- $V_{GS} = -4/15$ V
- $R_{gon} = 5.8 \, \Omega$
- $R_{goff} = 5.8 \, \Omega$
- $T_j = 150 \, ^\circ$C

Figure 16. MOSFET
Typical switching times as a function of gate resistor
$t = f(R_g)$

With an inductive load at:
- $V_{DS} = 600$ V
- $V_{GS} = -4/15$ V
- $I_D = 240$ A
- $T_j = 150 \, ^\circ$C

Figure 17. MOSFET
Typical reverse recovery time as a function of drain current
$t_{rr} = f(I_D)$

At:
- $V_{DS} = 600$ V
- $V_{GS} = -4/15$ V
- $R_{gon} = 5.8 \, \Omega$
- $T_j = 25 \, ^\circ, 125 \, ^\circ, 150 \, ^\circ$C

Figure 18. MOSFET
Typical reverse recovery time as a function of turn on gate resistor
$t_{rr} = f(R_{gon})$

At:
- $V_{DS} = 600$ V
- $V_{GS} = -4/15$ V
- $I_D = 240$ A
- $T_j = 25 \, ^\circ, 125 \, ^\circ, 150 \, ^\circ$C
Half-Bridge Switching Characteristics - Lo side

Figure 19. MOSFET
Typical recovered charge as a function of drain current
\( Q_r = f(I_D) \)

\[ Q_r(\mu C) \]

\[ Q_r(\mu C) \]

\[ Q_r(\mu C) \]

\[ Q_r(\mu C) \]

\[ Q_r(\mu C) \]

\[ Q_r(\mu C) \]

At
\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -4/15 \text{ V} \]
\[ R_{gon} = 5.8 \Omega \]

25 °C
125 °C
150 °C

Figure 20. MOSFET
Typical recovered charge as a function of turn on gate resistor
\( Q_r = f(R_{gon}) \)

\[ R_{gon}(\Omega) \]

\[ R_{gon}(\Omega) \]

\[ R_{gon}(\Omega) \]

\[ R_{gon}(\Omega) \]

\[ R_{gon}(\Omega) \]

At
\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -4/15 \text{ V} \]
\[ I_D = 240 \text{ A} \]

25 °C
125 °C
150 °C

Figure 21. MOSFET
Typical peak reverse recovery current as a function of drain current
\( I_{RM} = f(I_D) \)

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

At
\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -4/15 \text{ V} \]
\[ R_{gon} = 5.8 \Omega \]

25 °C
125 °C
150 °C

Figure 22. MOSFET
Typical peak reverse recovery current as a function of turn on gate resistor
\( I_{RM} = f(R_{gon}) \)

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

\[ I_{RM}(\text{A}) \]

At
\[ V_{DS} = 600 \text{ V} \]
\[ V_{GS} = -4/15 \text{ V} \]
\[ I_D = 240 \text{ A} \]

25 °C
125 °C
150 °C
Half-Bridge Switching Characteristics - Lo side

Figure 23.

Typical rate of fall of forward and reverse recovery current as a function of drain current.

diF/dt, dirr/dt = f(ID)

At VDS = 600 V
VGS = -4/15 V
Rgon = 5.8 Ω

Tj:

0
25 °C
125 °C
150 °C

At

2500
5000
7500
10000
12500
15000
di/dt(A/μs)

0 100 200 300 400 500
ID(A)

25 °C
125 °C
150 °C

Figure 24.

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor.

diF/dt, dirr/dt = f(Rgon)

At

2,5
5,0
7,5
10,0
12,5
R gon(Ω)

0
10000
20000
30000
40000
50000
di/dt(A/μs)

0,0 2,5 5,0 7,5 10,0 12,5

Rgon = 5.8 Ω

Tj:

0
25 °C
125 °C
150 °C

Figure 25.

Reverse bias safe operating area

ID  = f(VDS)

At

Rgon  = 5.8 Ω
Rgoff  = 5.8 Ω
Tj = 150 °C

At

250
500
750
1000
1250
1500
ID (A)

0 250 500 750 1000 1250 1500

VDS (V)
**Half-Bridge Switching Characteristics - Hi side**

**Figure 26.**
Typical switching energy losses as a function of drain current

\[ E = f(I_D) \]

With an inductive load at

- \( V_{DS} = 600 \) V
- \( V_{GS} = -4/15 \) V
- \( R_{gon} = 5.8 \) Ω
- \( R_{goff} = 5.8 \) Ω

\( T_j: 25 °C, 125 °C, 150 °C \)

**Figure 27.**
Typical switching energy losses as a function of gate resistor

\[ E = f(R_g) \]

With an inductive load at

- \( V_{DS} = 600 \) V
- \( V_{GS} = -4/15 \) V
- \( I_D = 240 \) A

\( T_j: 25 °C, 125 °C, 150 °C \)

**Figure 28.**
Typical reverse recovered energy loss as a function of drain current

\[ E_{rec} = f(I_D) \]

With an inductive load at

- \( V_{DS} = 600 \) V
- \( V_{GS} = -4/15 \) V
- \( R_{gon} = 5.8 \) Ω

\( T_j: 25 °C, 125 °C, 150 °C \)

**Figure 29.**
Typical reverse recovered energy loss as a function of gate resistor

\[ E_{rec} = f(R_g) \]

With an inductive load at

- \( V_{DS} = 600 \) V
- \( V_{GS} = -4/15 \) V
- \( I_D = 240 \) A

\( T_j: 25 °C, 125 °C, 150 °C \)
Half-Bridge Switching Characteristics - Hi side

**Figure 30.** MOSFET
Typical switching times as a function of drain current
\[ t = f(I_D) \]

With an inductive load at
- \( V_{DS} = 600 \text{ V} \)
- \( V_{GS} = -4/15 \text{ V} \)
- \( R_{gon} = 5,8 \Omega \)
- \( R_{goff} = 5,8 \Omega \)
- \( T_j = 150 ^\circ \text{C} \)

**Figure 31.** MOSFET
Typical switching times as a function of gate resistor
\[ t = f(R_g) \]

At
- \( V_{DS} = 600 \text{ V} \)
- \( V_{GS} = -4/15 \text{ V} \)
- \( I_D = 240 \text{ A} \)
- \( T_j = 150 ^\circ \text{C} \)

**Figure 32.** MOSFET
Typical reverse recovery time as a function of drain current
\[ t_{rr} = f(I_D) \]

At
- \( V_{DS} = 600 \text{ V} \)
- \( V_{GS} = -4/15 \text{ V} \)
- \( R_{gon} = 5,8 \Omega \)
- \( T_j = 25, 125, 150 ^\circ \text{C} \)

**Figure 33.** MOSFET
Typical reverse recovery time as a function of turn on gate resistor
\[ t_{rr} = f(R_{gon}) \]

At
- \( V_{DS} = 600 \text{ V} \)
- \( V_{GS} = -4/15 \text{ V} \)
- \( I_D = 240 \text{ A} \)
- \( T_j = 25, 125, 150 ^\circ \text{C} \)
Half-Bridge Switching Characteristics - Hi side

**Figure 34.**
MOSFET
Typical recovered charge as a function of drain current

\[ Q_r = f(I_D) \]

At:
- \( V_{ds} = 600 \, \text{V} \)
- \( V_{gs} = -4/15 \, \text{V} \)
- \( R_{gon} = 5.8 \, \Omega \)

**Figure 35.**
MOSFET
Typical recovered charge as a function of turn on gate resistor

\[ Q_r = f(R_{gon}) \]

At:
- \( V_{ds} = 600 \, \text{V} \)
- \( V_{gs} = -4/15 \, \text{V} \)
- \( I_D = 240 \, \text{A} \)

**Figure 36.**
MOSFET
Typical peak reverse recovery current as a function of drain current

\[ I_{RM} = f(I_D) \]

At:
- \( V_{ds} = 600 \, \text{V} \)
- \( V_{gs} = -4/15 \, \text{V} \)
- \( R_{gon} = 5.8 \, \Omega \)

**Figure 37.**
MOSFET
Typical peak reverse recovery current as a function of turn on gate resistor

\[ I_{RM} = f(R_{gon}) \]

At:
- \( V_{ds} = 600 \, \text{V} \)
- \( V_{gs} = -4/15 \, \text{V} \)
- \( I_D = 240 \, \text{A} \)
Half-Bridge Switching Characteristics - Hi side

**Figure 38.** Typical rate of fall of forward and reverse recovery current as a function of drain current $\frac{di}{dt}$, $\frac{d_{irr}}{dt} = f(I_D)$

- At $V_{DS} = 600$ V, $V_{GS} = -4/15$ V, $R_{gon} = 5.8$ Ω
- $T_j: 25^\circ C, 125^\circ C, 150^\circ C$

**Figure 39.** Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor $\frac{di}{dt}$, $\frac{d_{irr}}{dt} = f(R_{gon})$

- At $V_{DS} = 600$ V, $V_{GS} = -4/15$ V, $I_D = 240$ A
- $T_j: 25^\circ C, 125^\circ C, 150^\circ C$

**Figure 40.** MOSFET Reverse bias safe operating area $I_D = f(V_{DS})$

- At $T_j = 150^\circ C$
- $R_{fus} = 5.8$ Ω
- $R_{goff} = 5.8$ Ω
Switching Definitions

Figure 41. MOSFET
Turn-off Switching Waveforms & definition of $t_{doff}$, $t_{Eoff}$ ($t_{Eoff}$ = integrating time for $E_{off}$)

Figure 42. MOSFET
Turn-on Switching Waveforms & definition of $t_{don}$, $t_{Eon}$ ($t_{Eon}$ = integrating time for $E_{on}$)

Figure 43. MOSFET
Turn-off Switching Waveforms & definition of $t_f$

Figure 44. MOSFET
Turn-on Switching Waveforms & definition of $t_r$
Switching Definitions

Figure 45. Turn-off Switching Waveforms & definition of $t_{tr}$

Figure 46. Turn-on Switching Waveforms & definition of $t_{Qrr}$ ($t_{Qrr}$ = integrating time for $Q_{rr}$)

Figure 47. Turn-on Switching Waveforms & definition of $t_{Erec}$ ($t_{Erec}$ = integrating time for $E_{rec}$)

$t_{tr}$

$fitted$

$I(f)$

$V_f$

$t_{Qrr}$

$I_Q$

$E_{rec}$

$P_{rec}$

$t_{Erec}$

$E_{rec}$

$P_{rec}$
# Ordering Code

<table>
<thead>
<tr>
<th>Version</th>
<th>Ordering Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without thermal paste</td>
<td>10-EY122PA005ME-LU39F08T</td>
</tr>
<tr>
<td>With thermal paste</td>
<td>10-EY122PA005ME-LU39F08T-/3/</td>
</tr>
</tbody>
</table>

## Marking

<table>
<thead>
<tr>
<th>Text</th>
<th>Name</th>
<th>Date code</th>
<th>UL &amp; VIN</th>
<th>Lot</th>
<th>Serial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Datamatrix</th>
<th>Type &amp; Version</th>
<th>Lot number</th>
<th>Serial</th>
<th>Date code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TTTTTTVV</td>
<td>LLLLLL</td>
<td>SSSS</td>
<td>WWYY</td>
</tr>
</tbody>
</table>

## Outline

<table>
<thead>
<tr>
<th>Pin</th>
<th>X</th>
<th>Y</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25.6</td>
<td>48</td>
<td>Ph1</td>
</tr>
<tr>
<td>2</td>
<td>28.8</td>
<td>48</td>
<td>Ph1</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td></td>
<td>Ph1</td>
</tr>
<tr>
<td>4</td>
<td>28.8</td>
<td>44.8</td>
<td>Ph1</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>44.8</td>
<td>Ph1</td>
</tr>
<tr>
<td>6</td>
<td>28.8</td>
<td>35.2</td>
<td>S11</td>
</tr>
<tr>
<td>7</td>
<td>32</td>
<td>35.2</td>
<td>G11</td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>28.8</td>
<td>Therm1</td>
</tr>
<tr>
<td>9</td>
<td>32</td>
<td>25.6</td>
<td>Therm2</td>
</tr>
<tr>
<td>10</td>
<td>28.8</td>
<td>12.8</td>
<td>S11</td>
</tr>
<tr>
<td>11</td>
<td>32</td>
<td>12.8</td>
<td>G11</td>
</tr>
<tr>
<td>12</td>
<td>28.8</td>
<td>3.2</td>
<td>Ph1</td>
</tr>
<tr>
<td>13</td>
<td>32</td>
<td>3.2</td>
<td>Ph1</td>
</tr>
<tr>
<td>14</td>
<td>32</td>
<td>0</td>
<td>Ph1</td>
</tr>
<tr>
<td>15</td>
<td>28.8</td>
<td>0</td>
<td>Ph1</td>
</tr>
<tr>
<td>16</td>
<td>25.6</td>
<td>0</td>
<td>Ph1</td>
</tr>
<tr>
<td>17</td>
<td>19.2</td>
<td>6.4</td>
<td>DC-</td>
</tr>
<tr>
<td>18</td>
<td>16</td>
<td>9.6</td>
<td>DC-</td>
</tr>
<tr>
<td>19</td>
<td>16</td>
<td>16</td>
<td>DC-</td>
</tr>
<tr>
<td>20</td>
<td>16</td>
<td>19.2</td>
<td>DC-</td>
</tr>
<tr>
<td>21</td>
<td>19.2</td>
<td>19.2</td>
<td>DC-</td>
</tr>
<tr>
<td>22</td>
<td>16</td>
<td>28.8</td>
<td>DC-</td>
</tr>
<tr>
<td>23</td>
<td>19.2</td>
<td>28.8</td>
<td>DC-</td>
</tr>
<tr>
<td>24</td>
<td>19.2</td>
<td>41.6</td>
<td>DC-</td>
</tr>
<tr>
<td>25</td>
<td>12.8</td>
<td>48</td>
<td>DC+</td>
</tr>
<tr>
<td>26</td>
<td>9.6</td>
<td>48</td>
<td>DC+</td>
</tr>
<tr>
<td>27</td>
<td>6.4</td>
<td>35.2</td>
<td>DC+</td>
</tr>
<tr>
<td>28</td>
<td>3.2</td>
<td>35.2</td>
<td>DC+</td>
</tr>
<tr>
<td>29</td>
<td>6.4</td>
<td>12.8</td>
<td>DC+</td>
</tr>
<tr>
<td>30</td>
<td>3.2</td>
<td>12.8</td>
<td>DC+</td>
</tr>
<tr>
<td>31</td>
<td>12.8</td>
<td>0</td>
<td>DC+</td>
</tr>
<tr>
<td>32</td>
<td>9.6</td>
<td>0</td>
<td>DC+</td>
</tr>
<tr>
<td>33</td>
<td>0</td>
<td>0</td>
<td>S12</td>
</tr>
<tr>
<td>34</td>
<td>0</td>
<td>3.2</td>
<td>G12</td>
</tr>
<tr>
<td>35</td>
<td>0</td>
<td>44.8</td>
<td>G12</td>
</tr>
<tr>
<td>36</td>
<td>0</td>
<td>48</td>
<td>S12</td>
</tr>
</tbody>
</table>
Pinout

<table>
<thead>
<tr>
<th>ID</th>
<th>Component</th>
<th>Voltage</th>
<th>Current</th>
<th>Function</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>T11</td>
<td>MOSFET</td>
<td>1200 V</td>
<td>5.33 mΩ</td>
<td>Half-Bridge Switch - Lo side</td>
<td></td>
</tr>
<tr>
<td>T12</td>
<td>MOSFET</td>
<td>1200 V</td>
<td>5.33 mΩ</td>
<td>Half-Bridge Switch - Hi side</td>
<td></td>
</tr>
<tr>
<td>Rt</td>
<td>Thermistor</td>
<td></td>
<td></td>
<td>Thermistor</td>
<td></td>
</tr>
</tbody>
</table>
DISCLAIMER
The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

LIFE SUPPORT POLICY
Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.
As used herein:
1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.