

LEGM35TD120E1H

IGBT Power Module

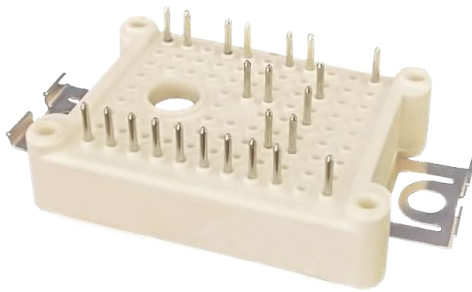
Features:

- $V_{CE}=1200V$ $I_C=35A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 175°C
- Isolation Type Package

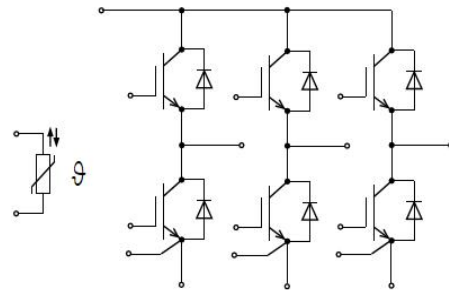
Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit



E1



Internal Circuit

Maximum Rated Values (IGBT, Inverter)

| Symbol | Parameter | Conditions | Ratings | Unit |
|-----------|------------------------------|---|----------|------|
| V_{CES} | Collector-emitter voltage | $V_{EC}=0V, I_C=1mA, T_{vj}=25^\circ C$ | 1200 | V |
| I_C | Continuous Collector Current | $T_C=100^\circ C$ | 35 | A |
| I_{CRM} | Peak Collector Current | $I_{CRM}=2I_C$ | 70 | A |
| V_{GES} | Gate-Emitter Voltage | $T_{vj}=25^\circ C$ | ± 30 | V |
| P_{tot} | Total Power Dissipation | $T_C=25^\circ C, T_{vjmax}=175^\circ C$ | 200 | W |

Characteristics Values (IGBT Inverter)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------|--|--|--|------|------|------------------|-----|
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^\circ\text{C}$ | | 2.00 | | V | |
| | | $I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=150\text{ }^\circ\text{C}$ | | 2.50 | | V | |
| $V_{GE(th)}$ | Gate Threshold Voltage | $I_C=5.0\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25\text{ }^\circ\text{C}$ | | 5.8 | | V | |
| I_{CES} | Collector-Emitter Cut-off Current | $V_{CE}=1200\text{ V}, V_{GE}=0\text{ V}, T_{vj}=25\text{ }^\circ\text{C}$ | | | 1.2 | mA | |
| I_{GES} | Gate-Emitter Leakage Current | $V_{CE}=0\text{ V}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^\circ\text{C}$ | | | 410 | nA | |
| $t_{d(on)}$ | Turn-on Delay Time, Inductive Load | $I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_{Gon}=15\Omega$ $T_{vj}=25\text{ }^\circ\text{C}$ | | 170 | | ns | |
| t_r | Rise Time, Inductive Load | | | 160 | | ns | |
| $t_{d(off)}$ | Turn-on Delay Time, Inductive Load | | | 310 | | ns | |
| t_f | Fall Time, Inductive Load | | | 100 | | ns | |
| E_{on} | Turn-on Energy Loss per Pulse | | | 4.6 | | mJ | |
| E_{off} | Energy Loss per Pulse | | | 2.2 | | mJ | |
| $t_{d(on)}$ | Turn-on Delay Time, Inductive Load | | $I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_{Gon}=15\Omega$ $T_{vj}=150\text{ }^\circ\text{C}$ | | 210 | | ns |
| t_r | Rise Time, Inductive Load | | | | 180 | | ns |
| $t_{d(off)}$ | Turn-on Delay Time, Inductive Load | | | | 350 | | ns |
| t_f | Fall Time, Inductive Load | | | | 180 | | ns |
| E_{on} | Turn-on Energy Loss per Pulse | | | 4.9 | | mJ | |
| E_{off} | Energy Loss per Pulse | | | 3.0 | | mJ | |
| R_{thJC} | Thermal resistance, junction to case | per IGBT | | | | 0.75 | K/W |
| $T_{vj\ op}$ | Temperature under switching conditions | | -40 | | 150 | $^\circ\text{C}$ | |
| I_{sc} | SC | $V_{GE}\leq 15\text{ V}, V_{CE}=600\text{ V},$ $t_p\leq 10\mu\text{s}, T_{vj}=150\text{ }^\circ\text{C},$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ | | 170 | | A | |

Maximum Rated Values (Diode Inverter)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------|---------------------------------|--|------|------|------|----------------------|
| V_{RRM} | Repetitive Peak Reverse Voltage | $T_{vj}=25\text{ }^{\circ}\text{C}$ | | 1200 | | V |
| I_F | Continuous DC Forward Current | $T_C=100\text{ }^{\circ}\text{C}$ | | 25 | | A |
| I_{FRM} | Repetitive Peak Forward Current | $t_p=1\text{ ms}$ | | 52 | | A |
| I^2t | I^2t Value | $V_R=0\text{ V}, t_p=10\text{ ms}, T_{vj}=150\text{ }^{\circ}\text{C}$ | | 230 | | A^2s |

Characteristic Values (Diode Inverter)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------------|--|--|--------------------------------------|------|------|--------------------|
| V_F | Forward Voltage | $I_F=35\text{ A}, V_{CE}=0\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$ | | 2.38 | | V |
| | | $I_F=35\text{ A}, V_{CE}=0\text{ V}, T_{vj}=150\text{ }^{\circ}\text{C}$ | | 2.7 | | V |
| t_{rr} | Reverse Recovery time | $I_F=35\text{ A}, V_R=600\text{ V}$ $-di/dt=100\text{ A/us}$ | | 140 | | ns |
| Q_r | Recovered Charge | | | 1.1 | | μC |
| E_{rec} | Reverse Recovery Energy | | $T_{vj}=25\text{ }^{\circ}\text{C}$ | | 6.7 | |
| t_{rr} | Reverse Recovery time | $I_F=35\text{ A}, V_R=600\text{ V}$ $-di/dt=100\text{ A/us}$ | | 290 | | ns |
| Q_r | Recovered Charge | | | 2.5 | | μC |
| E_{rec} | Reverse Recovery Energy | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | | 0.5 | |
| R_{thJC} | Thermal resistance, junction to case | per Diode | | | 1.03 | K/W |
| $T_{vj\text{ op}}$ | Temperature under switching conditions | | -40 | | 150 | $^{\circ}\text{C}$ |

NTC-Thermistor (Characteristic Values)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-------------------|---|------|------|------|------|
| R ₂₅ | Rated resistance | T _c =25 °C | | 5 | | KΩ |
| ΔR/R | Deviation of R100 | T _c =100 °C | -5 | | 5 | % |
| P ₂₅ | Power dissipation | T _c =25 °C | | 20 | | mW |
| B _{25/50} | B-value | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$ | | 3380 | | K |
| B _{25/100} | B-value | $R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298,15K))]$ | | 3450 | | K |

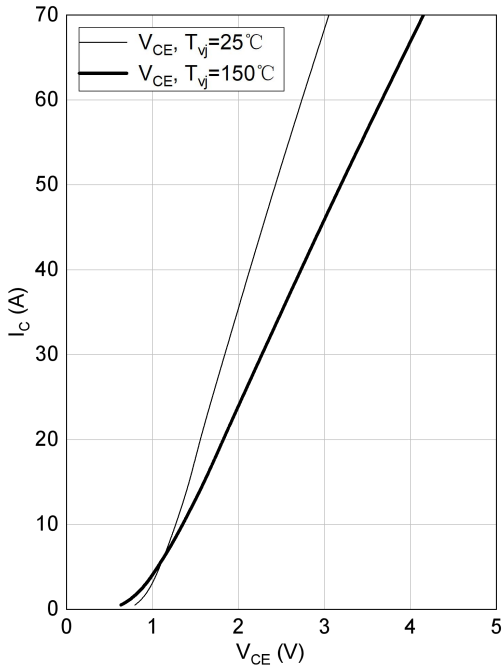
Module Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------|--------------------------|---------------|------|------|------|------|
| V _{isol} | Isolation voltage | t=1min,f=50Hz | 2500 | | | V |
| T _{stg} | Storage Temperature | | -40 | | 150 | °C |
| F | Mounting Force per Clamp | | 20 | | 50 | N |
| G | Weight of Module | | | 25 | | g |

Output characteristic of IGBT, Inverter (typical)

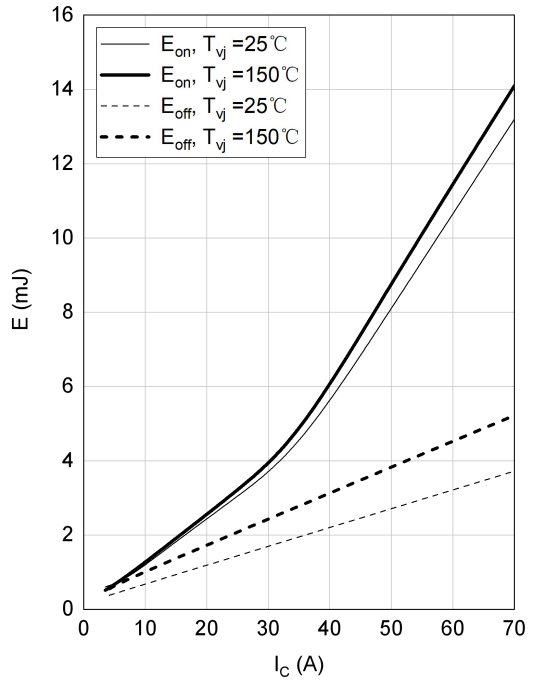
$$I_c = f(V_{CE})$$

$$V_{GE} = 15V$$


Switching time of IGBT, Inverter (typical)

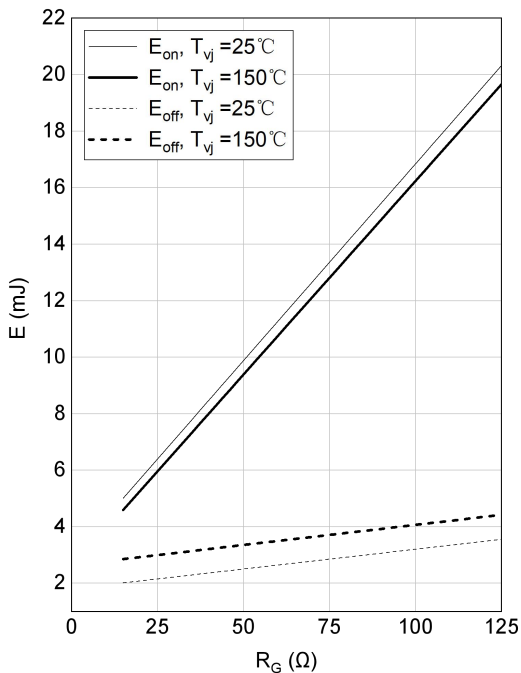
$$E_{on} = f(I_c), E_{off} = f(I_c)$$

$$V_{GE} = \pm 15V, R_G = 15\Omega, V_{CE} = 600V$$


Switching losses of IGBT, Inverter (typical)

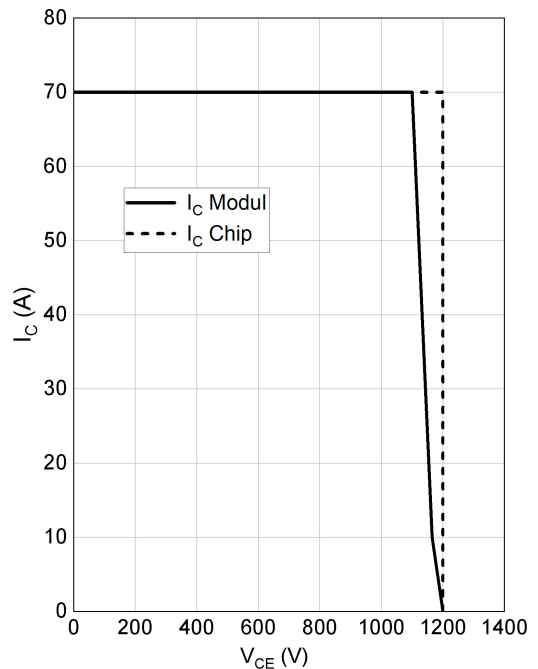
$$E_{on} = f(R_G), E_{off} = f(R_G)$$

$$V_{GE} = \pm 15V, I_c = 35A, V_{CE} = 600V$$


RBSOA IGBT, Inverter (typical)

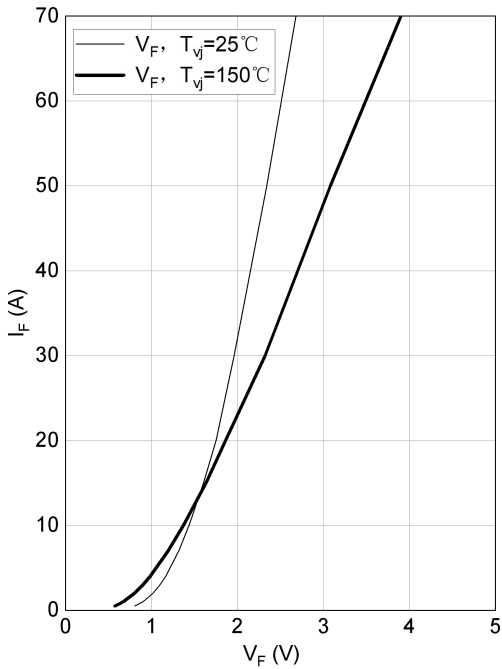
$$I_c = f(V_{CE})$$

$$V_{GE} = \pm 15V, R_{Goff} = 15\Omega, T_{vj} = 150^\circ\text{C}$$



Forward characteristic of Diode, Inverter (typical)

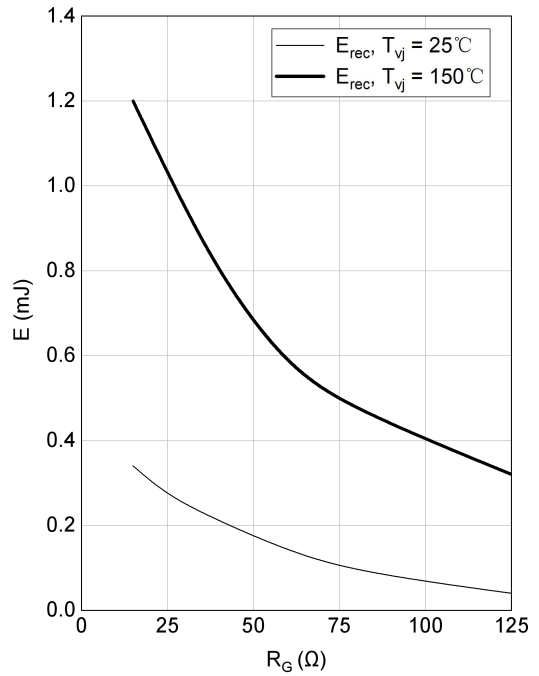
$$I_F = f(V_F)$$



Switching losses of Diode, Inverter (typical)

$$E_{rec} = f(R_G)$$

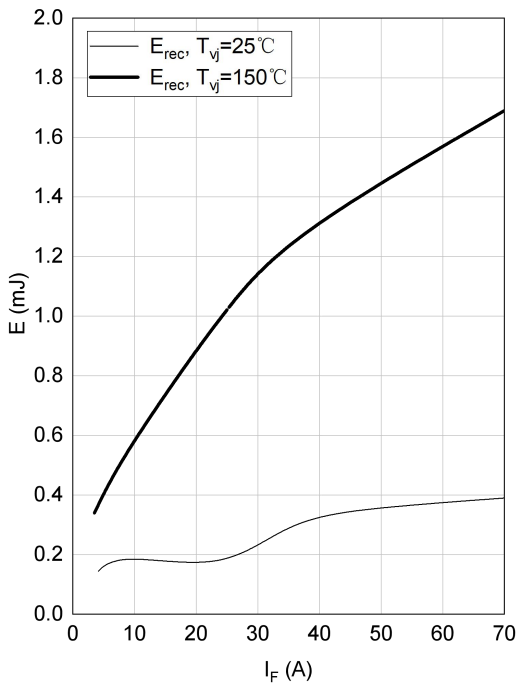
$$I_F = 35A, V_{CE} = 600V$$



Switching losses of Diode, Inverter (typical)

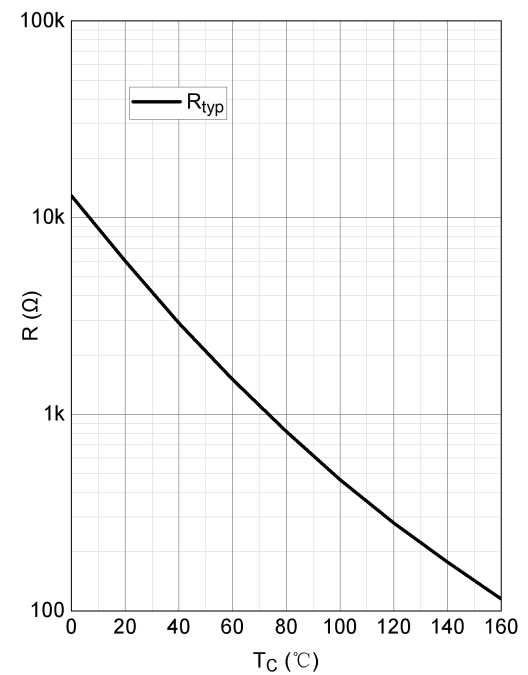
$$E_{rec} = f(I_F)$$

$$R_{Gon} = 15\Omega, V_{CE} = 600V$$

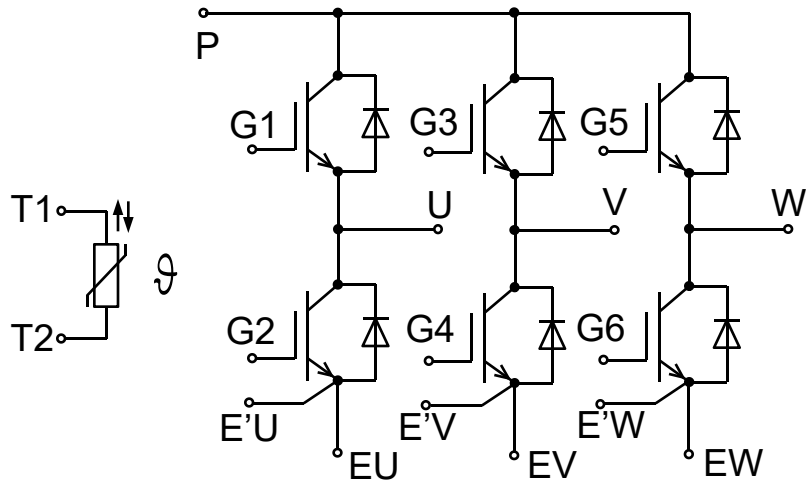


NTC-Thermistor-temperature characteristic (typical)

$$R = f(T)$$

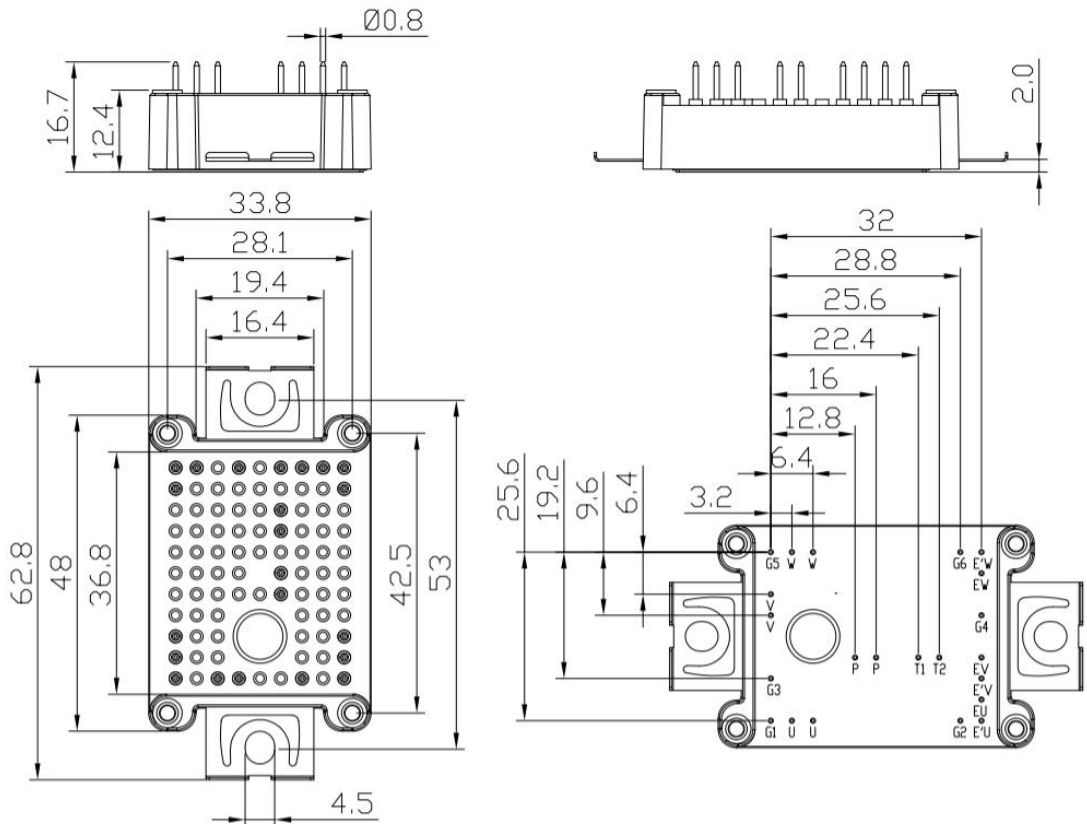


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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