# LGM40HF120S2F2A

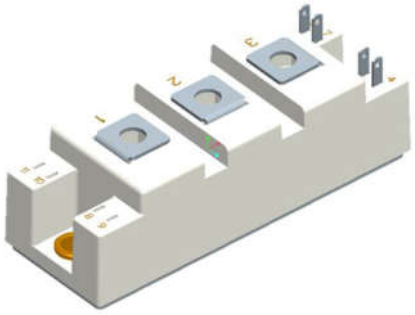
**1200V/40A Half Bridge in one-package**

## FEATURES

- Low switching losses
- Low $V_{CEsat}$
- $V_{CEsat}$ with positive temperature coefficient
- 10μs short circuit capability
- Isolated copper baseplate using DBC technology

## IGBT

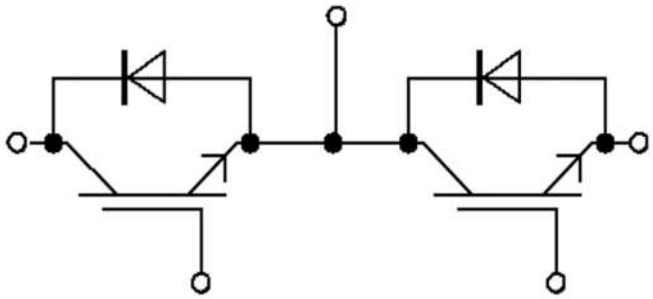
**VCES = 1200V**
**IC nom = 40A / ICRM = 80A**



## APPLICATION

- Welding Machine
- Switching Mode Power Supplies

## Equivalent Circuit Schematic



## IGBT, Inverter

## Maximum Rated Values

| Parameter | Conditions | Symbol | Values | Units |
|---|---|---|---|---|
| Collector-emitter voltage | Tvj = 25°C | $V_{CES}$ | 1200 | V |
| Continuous DC collector current | $T_C$ = 100°C, Tvj max = 150°C | $I_{C\ nom}$ | 40 | A |
| Repetitive peak collector current | $t_P$ = 1 ms | $I_{CRM}$ | 80 | A |
| Total power dissipation | TC = 25°C, Tvj max = 150°C | $P_{tot}$ | 240 | W |
| Gate-emitter peak voltage | | $V_{GE}$ | ±20 | V |

## Characteristic Values

| Parameter | Conditions | Symbol | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Collector-emitter saturation voltage | $I_C$ = 40 A, $V_{GE}$ = 15 V<br>$T_{vj}$ = 25°C<br>$T_{vj}$ = 150°C | $V_{CE\ sat}$ | | 1.8<br>2.3 | | V |
| Gate threshold voltage | $I_C$ = 0.25 mA, $V_{CE}$ = $V_{GE}$,<br>$T_{vj}$ = 25°C | $V_{GEth}$ | | 5.9 | | V |
| Gate charge | $V_{GE}$ = -15V…+15V | $Q_G$ | | 0.25 | | µC |
| Input capacitance | $V_{CE}$ = 25V, $V_{GE}$ = 0V,<br>f = 1MHz | Cies | | 6400 | | pF |
| Output capacitance | | Coes | | 180 | | pF |
| Reverse transfer capacitance | | Cres | | 90 | | pF |
| Collector-emitter cut-off current | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V,<br>Tvj = 25°C | $I_{CES}$ | | | 1.0 | mA |
| Gate-emitter leakage current | $V_{CE}$ = 0 V, $V_{GE}$ = 20 V,<br>Tvj = 25°C | $I_{GES}$ | | | 400 | nA |
| SC data | $V_{GE}$ ⩽ 15 V, $V_{CC}$ = 800 V<br>$V_{CEmax}$ = $V_{CES}$ -$L_{sCE}$ ·di/dt<br>$t_P$ ⩽ 10 µs, Tvj = 150°C | $I_{SC}$ | | 350 | | A |
| Thermal resistance, junction to case | per IGBT | $R_{thJC}$ | | | 0.52 | K/W |
| Thermal resistance, case to heatsink | per IGBT<br>$\lambda_{Paste}$=1 W/(m·K) /$\lambda_{grease}$=1 W/(m·K) | $R_{thCH}$ | | 0.081 | | K/W |
| Temperature under switching conditions | | $T_{vj\ op}$ | -40 | | 150 | °C |
| Turn-on delay time, inductive load | $I_C$ = 40 A, $V_{CE}$ = 600 V<br>$V_{GE}$ = -15 / 15 V ,<br>RG = 10Ω<br>Tvj = 25°C | $t_{d\ on}$ | | 85 | | ns |
| Rise time, inductive load | | $t_r$ | | 50 | | ns |
| Turn-off delay time, inductive load | | $t_{d\ off}$ | | 200 | | ns |
| Fall time, inductive load | | $t_f$ | | 70 | | ns |
| Turn-on energy loss per pulse | | $E_{on}$ | | 4.3 | | mJ |
| Turn-off energy loss per pulse | | $E_{off}$ | | 1.2 | | mJ |

## Diode, Inverter
## Maximum Rated Values

| Parameter | Conditions | Symbol | Values | Units |
|---|---|---|---|---|
| Repetitive peak reverse voltage | Tvj = 25°C | VRRM | 1200 | V |
| Continuous DC forward current | | IF | 40 | A |
| Repetitive peak forward current | $t_P$ = 1 ms | IFRM | 80 | A |

## Characteristic Values

| Parameter | Conditions | Symbol | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Forward voltage | $I_F$ = 40 A, $V_{GE}$ = 0 V<br>Tvj = 25°C<br>Tvj = 150°C | $V_F$ | | 2.3<br>2.5 | | V |
| Peak reverse recovery current | $I_F$ = 40 A, - $d_{iF}/d_t$ = 600 A/µs<br>$V_R$ = 600 V, VGE = -15 V<br>Tvj = 25°C<br>Tvj = 150°C | $I_{RM}$ | | 160<br>291 | | A |
| Recovered charge | | Qrr | | 1.9<br>3.9 | | µC |
| Reverse recovery energy | | $E_{rec}$ | | 2.1<br>3.4 | | mJ |
| Thermal resistance, junction to case | per diode | $R_{thJC}$ | | | 1.18 | K/W |
| Thermal resistance, case to heatsink | per diode<br>$l_{Paste}$ = 1 W/(m·K) / $l_{grease}$ = 1 W/(m·K) | $R_{thCH}$ | | 0.12 | | K/W |
| Temperature under switching conditions | | $T_{vj\ op}$ | -40 | | 150 | °C |

## Module
## Characteristic Values

| Parameter | Conditions | Symbol | Values | Units |
|---|---|---|---|---|
| Isolation test voltage | RMS, f = 50 Hz, t = 1 min. | VISOL | 2.5 | kV |
| Internal isolation | basic insulation (class 1, IEC 61140) | | $AI_2O_3$ | |
| Storage temperature | | | -40-125 | °C |
| Torque | To heatsink(M6)<br>To terminal(M5) | M | 3-5<br>2.5-5 | Nm |
| Comperative tracking index | | CTI | ＞200 | |

Fig. 1 Output characteristics

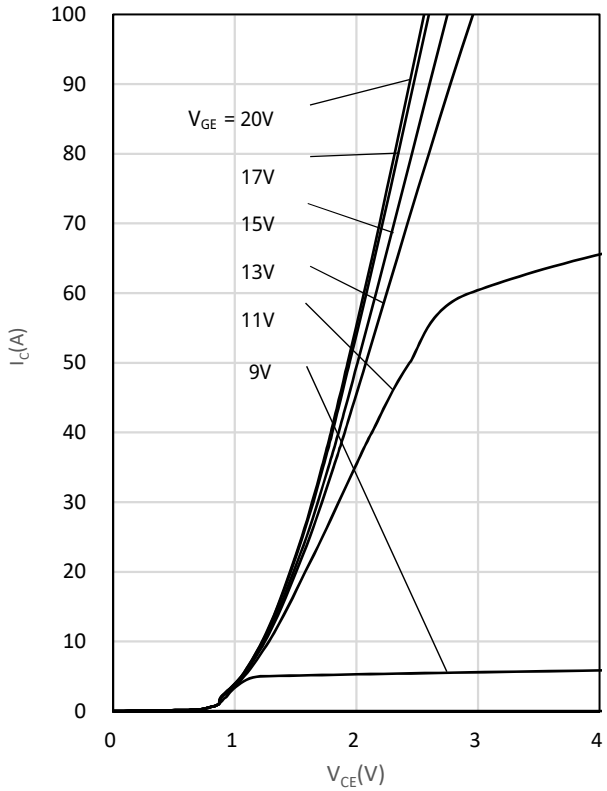



Fig. 2 Saturation voltage characteristics

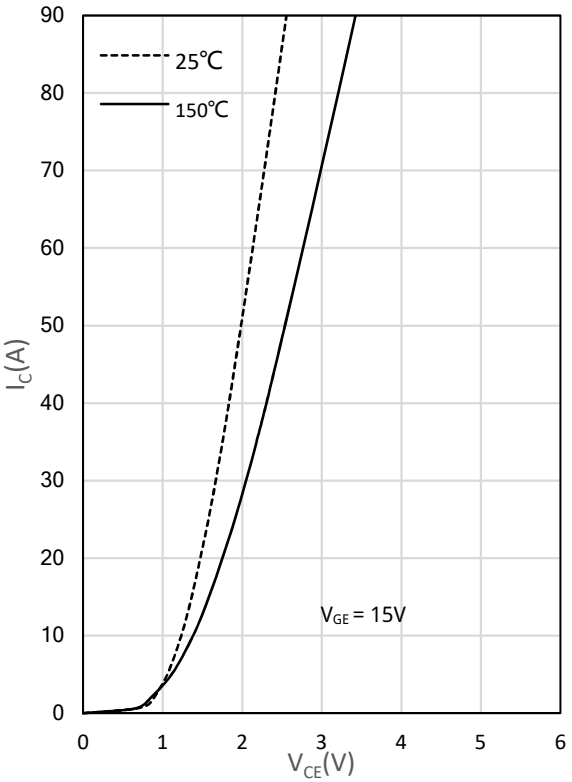



Fig. 3 Gate charge characteristics

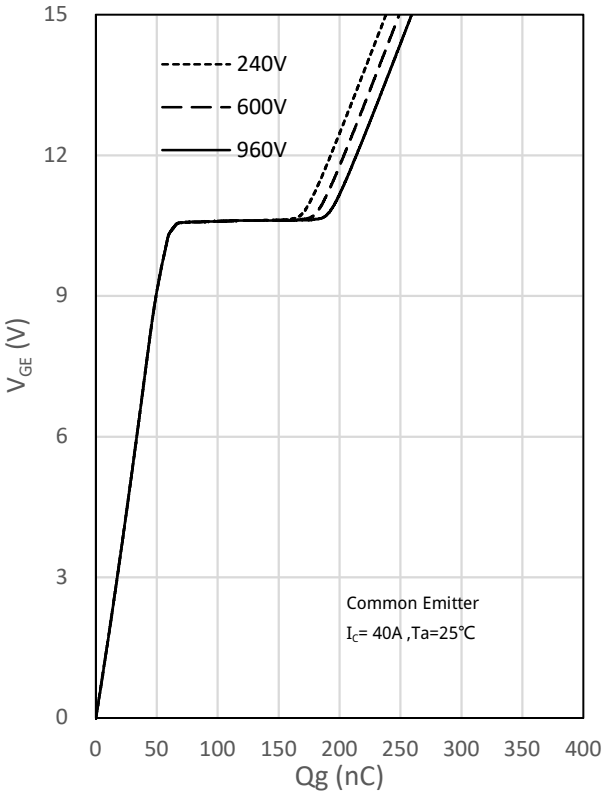



Fig. 4 Capacitance characteristics

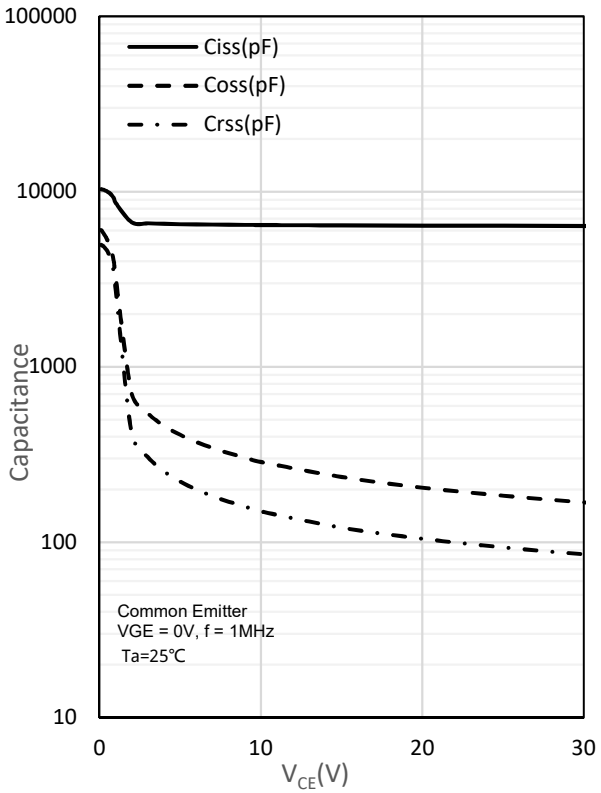


Fig. 5 Switching times vs. gate resistor

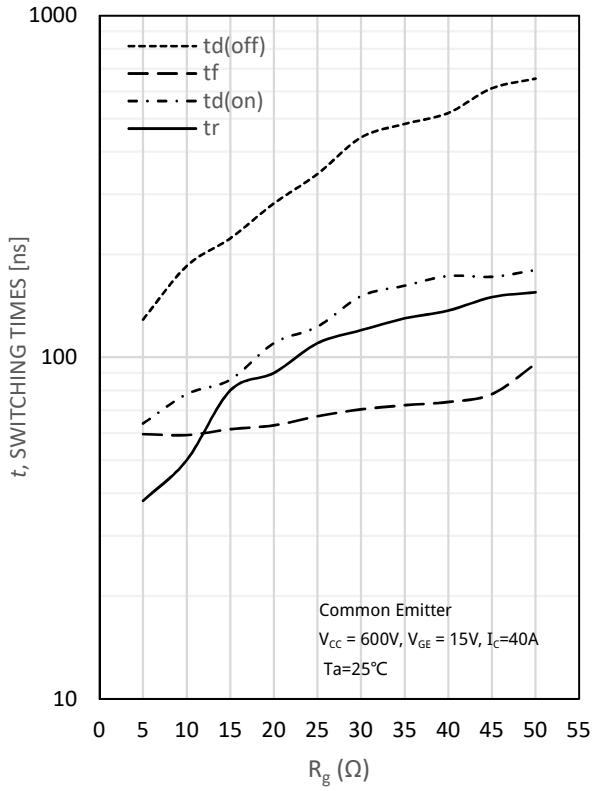



Fig. 6 Switching times vs. collector current

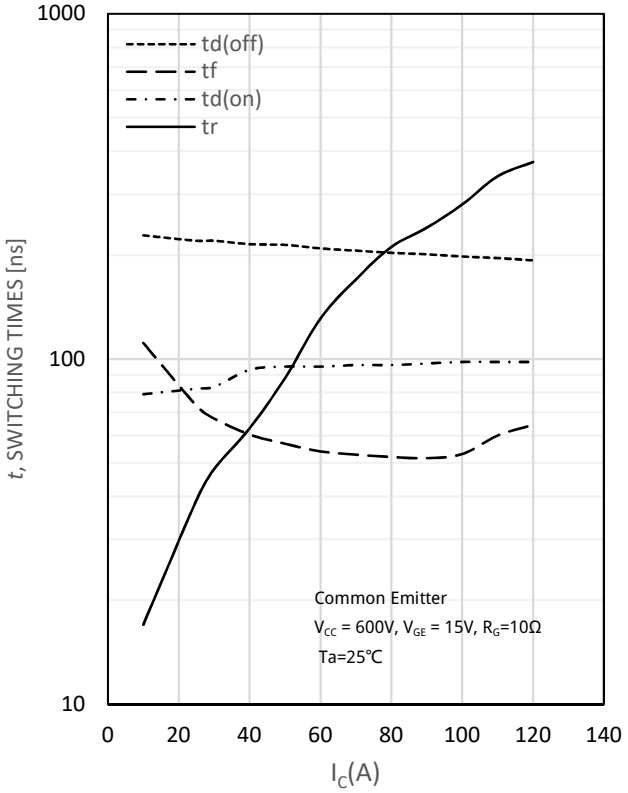



Fig. 7 Switching loss vs. gate resistor

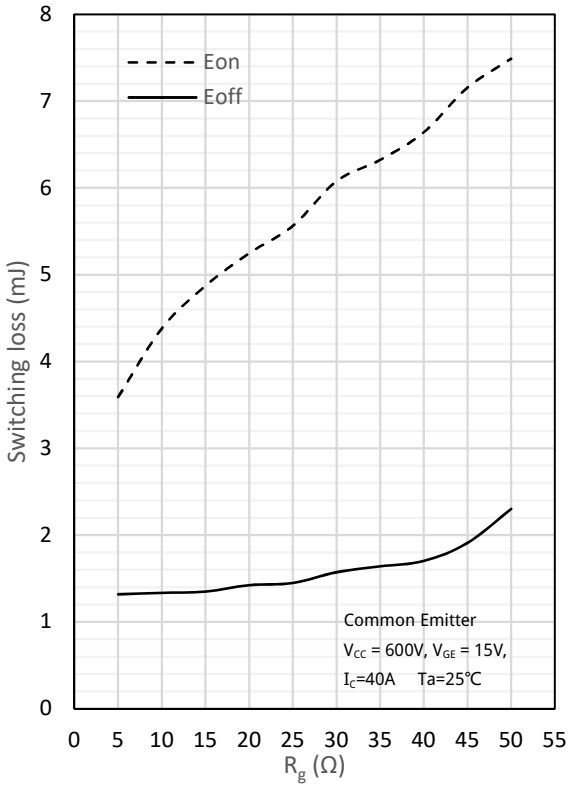
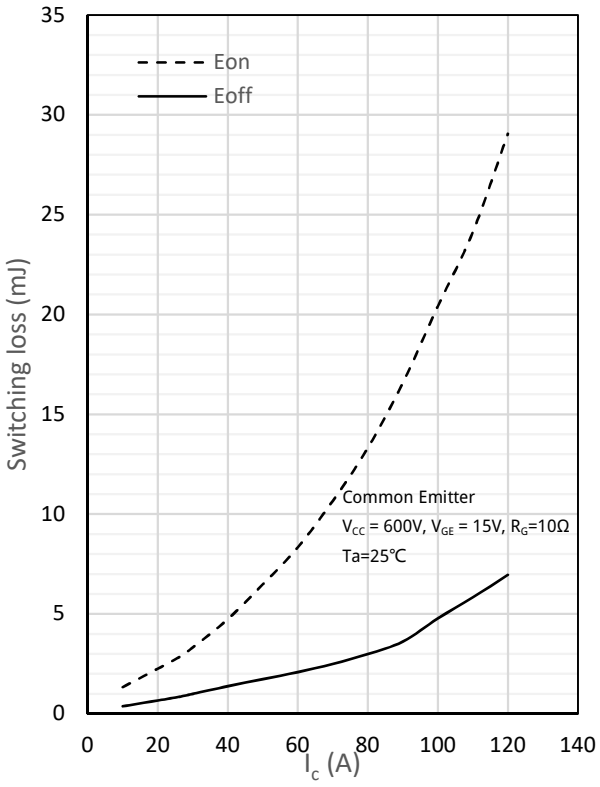
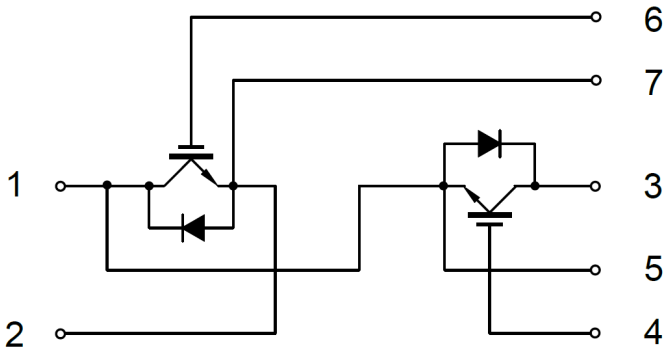



Fig. 8 Switching loss vs. collector current



## Circuit diagram




## Package outlines (mm)