Vincotech

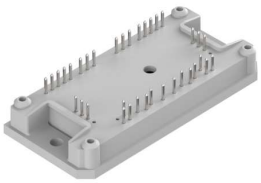
# 10-FY124PA040FV-L588F88
# 10-PY124PA040FV-L588F88Y
datasheet

**flowPACK 1 H** — **1200 V / 40 A**

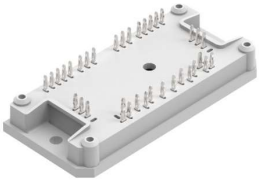
### Features

- High speed IGBT
- Fast, soft reverse Diode
- Open emitter topology
- Integrated thermistor

### flow 1 12 mm housing



solder pins

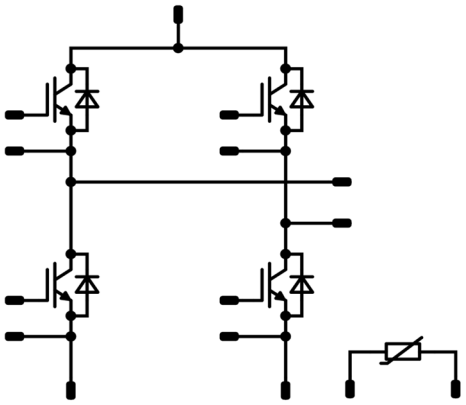


press-fit pins

### Target applications

- Charging Stations
- Power Supply
- Solar Inverters
- Welding & Cutting

### Schematic



### Types

- 10-FY124PA040FV-L588F88
- 10-PY124PA040FV-L588F88Y

## Maximum Ratings

$T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|---|---|---|---|---|
| **H-Bridge Switch** | | | | |
| Collector-emitter voltage | $V_{CES}$ | | 1200 | V |
| Collector current | $I_C$ | | 40 | A |
| Repetitive peak collector current | $I_{CRM}$ | $t_p$ limited by $T_{jmax}$ | 160 | A |
| Total power dissipation | $P_{tot}$ | $T_j$ = $T_{jmax}$ $T_s$ = 80 °C | 117 | W |
| Gate-emitter voltage | $V_{GES}$ | | ±25 | V |
| Maximum junction temperature | $T_{jmax}$ | | 175 | °C |

# Maximum Ratings

$T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|---|---|---|---|---|
| **H-Bridge Diode** | | | | |
| Peak repetitive reverse voltage | $V_{RRM}$ | | 1200 | V |
| Continuous (direct) forward current | $I_F$ | | 25 | A |
| Total power dissipation | $P_{tot}$ | $T_j$ = $T_{jmax}$ $T_s$ = 80 °C | 61 | W |
| 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 s | 6000 | V |
| | | AC Voltage $t_p$ = 1 min | 2500 | V |
| Creepage distance | | | min. 12,7 | mm |
| Clearance | | with solder pins | 8,1 | mm |
| | | with press-fit pins | 7,92 | mm |
| Comparative Tracking Index | CTI | | > 200 | |

*100 % tested in production

# Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | 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 | |
| **H-Bridge Switch** | | | | | | | | | | |
| **Static** | | | | | | | | | | |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | | | | 0,04 | 25 | 5 | | 7,3 | V |
| Collector-emitter saturation voltage | $V_{CEsat}$ | | 15 | | 40 | 25<br>125<br>150 | 1,5 | 1,65<br>1,77<br>1,79 | 2,5 | V |
| Collector-emitter cut-off current | $I_{CES}$ | | 0 | 1200 | | 25 | | | 50 | µA |
| Gate-emitter leakage current | $I_{GES}$ | | 25 | 0 | | 25 | | | 250 | nA |
| Internal gate resistance | $r_g$ | | | | | | | none | | Ω |
| Input capacitance | $C_{ies}$ | $f$= 1 Mhz | 0 | 30 | | 25 | | 4300 | | pF |
| Output capacitance | $C_{oes}$ | | | | | | | 180 | | |
| Reverse transfer capacitance | $C_{res}$ | | | | | | | 100 | | |
| Gate charge | $Q_g$ | | 15 | 600 | 40 | 25 | | 370 | | nC |
| Gate to Emitter Charge | $Q_{ge}$ | | | | | | | 23 | | |
| Gate to Collector Charge | $Q_{gc}$ | | | | | | | 210 | | |
| **Thermal** | | | | | | | | | | |
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste}$ = 3,4 W/mK (PSX) | | | | | | 0,81 | | K/W |
| **Dynamic** | | | | | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $R_{gon}$ = 8 Ω<br>$R_{goff}$ = 8 Ω | ±15 | 600 | 40 | 25<br>125<br>150 | | 128<br>131<br>132 | | ns |
| Rise time | $t_r$ | | | | | 25<br>125<br>150 | | 22<br>27<br>29 | | |
| Turn-off delay time | $t_{d(off)}$ | | | | | 25<br>125<br>150 | | 228<br>274<br>288 | | |
| Fall time | $t_f$ | | | | | 25<br>125<br>150 | | 11<br>27<br>39 | | |
| Turn-on energy (per pulse) | $E_{on}$ | $Q_{rFWD}$ = 2,1 µC<br>$Q_{rFWD}$ = 4,3 µC<br>$Q_{rFWD}$ = 5,2 µC | | | | 25<br>125<br>150 | | 1,97<br>3,02<br>3,35 | | mWs |
| Turn-off energy (per pulse) | $E_{off}$ | | | | | 25<br>125<br>150 | | 1,33<br>2,34<br>2,71 | | |

# Characteristic Values

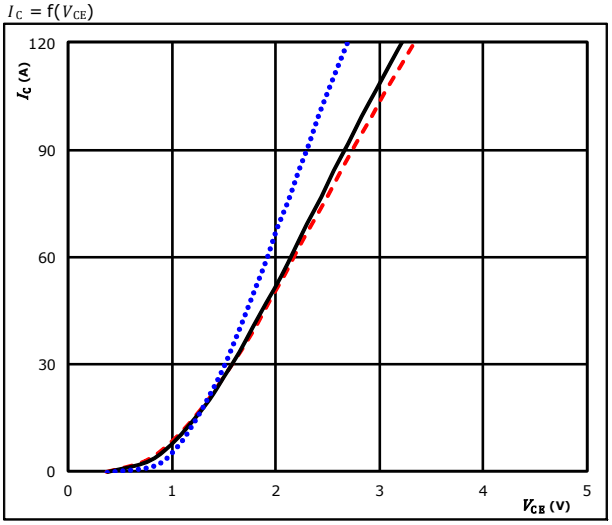
| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{GE}$ [V]<br>$V_{GS}$ [V] | $V_{CE}$ [V]<br>$V_{DS}$ [V]<br>$V_F$ [V] | $I_C$ [A]<br>$I_D$ [A]<br>$I_F$ [A] | $T_j$ [°C] | Min | Typ | Max | |
| **H-Bridge Diode** | | | | | | | | | | |
| **Static** | | | | | | | | | | |
| Forward voltage | $V_F$ | | | | 25 | 25<br>125<br>150 | | 2,27<br>2,44<br>2,36 | 2,74 | V |
| Reverse leakage current | $I_R$ | | | 1200 | | 25<br>150 | | | 60<br>3300 | µA |
| **Thermal** | | | | | | | | | | |
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste}$ = 3,4 W/mK (PSX) | | | | | | 1,56 | | K/W |
| **Dynamic** | | | | | | | | | | |
| Peak recovery current | $I_{RRM}$ | $di/dt$ = 1643 A/µs<br>$di/dt$ = 2321 A/µs<br>$di/dt$ = 2030 A/µs | ±15 | 600 | 40 | 25<br>125<br>150 | | 33<br>31<br>32 | | A |
| Reverse recovery time | $t_{rr}$ | | | | | 25<br>125<br>150 | | 144<br>417<br>482 | | ns |
| Recovered charge | $Q_r$ | | | | | 25<br>125<br>150 | | 2,08<br>4,29<br>5,16 | | µC |
| Reverse recovered energy | $E_{rec}$ | | | | | 25<br>125<br>150 | | 0,73<br>1,74<br>2,12 | | mWs |
| Peak rate of fall of recovery current | $(di_{rf}/dt)_{max}$ | | | | | 25<br>125<br>150 | | 788<br>329<br>303 | | A/µs |
| **Thermistor** | | | | | | | | | | |
| Rated resistance | $R$ | | | | | 25 | | 22 | | kΩ |
| Deviation of $R_{100}$ | $\Delta_{R/R}$ | $R_{100}$ = 1484 Ω | | | | 100 | -5 | | 5 | % |
| Power dissipation | $P$ | | | | | 25 | | 5 | | mW |
| Power dissipation constant | | | | | | 25 | | 1,5 | | mW/K |
| B-value | $B_{(25/50)}$ | Tol. ±1 % | | | | 25 | | 3962 | | K |
| B-value | $B_{(25/100)}$ | Tol. ±1 % | | | | 25 | | 4000 | | K |
| Vincotech NTC Reference | | | | | | | | | I | |

# H-Bridge Switch Characteristics

**figure 1.** **IGBT**

**Typical output characteristics**

$I_C = f(V_{CE})$

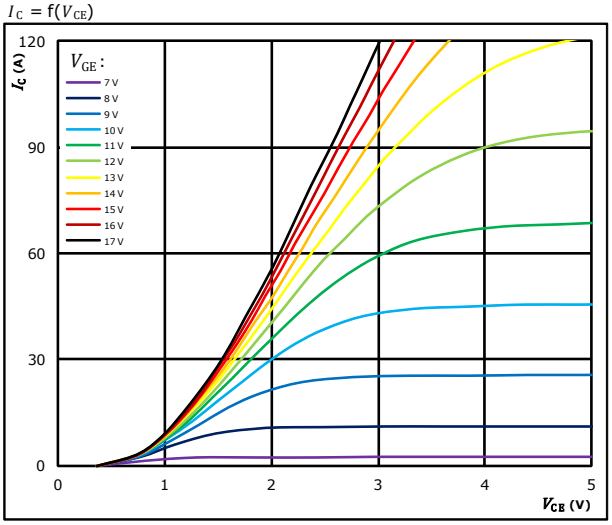



| | | | | | |
|---|---|---|---|---|---|
| $t_p$ = | 250 | µs | | 25 °C | |
| $V_{GE}$ = | 15 | V | $T_j$: | 125 °C | |
| | | | | 150 °C | |

**figure 2.** **IGBT**

**Typical output characteristics**

$I_C = f(V_{CE})$

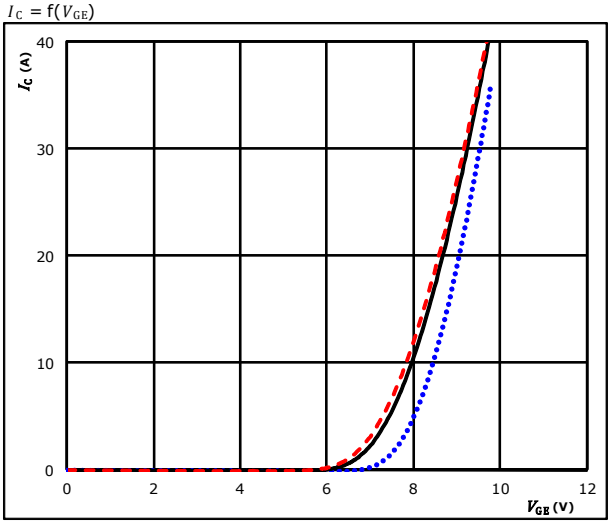



| | | |
|---|---|---|
| $t_p$ = | 250 | µs |
| $T_j$ = | 150 | °C |
| $V_{GE}$ from | 7 V to 17 V in steps of 1 V | |

**figure 3.** **IGBT**

**Typical transfer characteristics**

$I_C = f(V_{GE})$

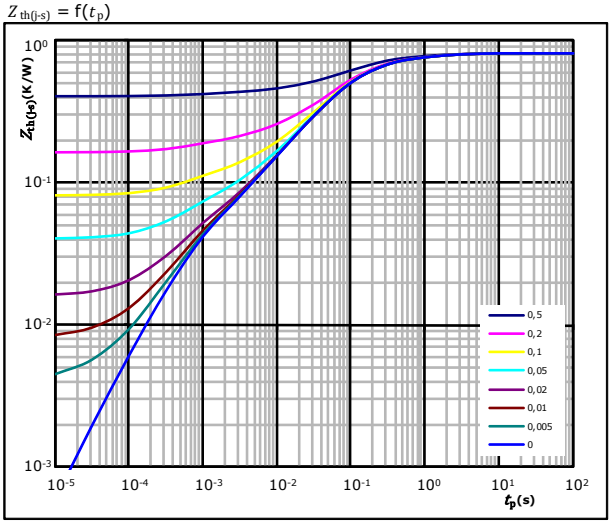



| | | | | | |
|---|---|---|---|---|---|
| $t_p$ = | 100 | µs | | 25 °C | |
| $V_{CE}$ = | 10 | V | $T_j$: | 125 °C | |
| | | | | 150 °C | |

**figure 4.** **IGBT**

**Transient thermal impedance as function of pulse duration**

$Z_{th(j-s)} = f(t_p)$




| | | |
|---|---|---|
| $D$ = | $t_p / T$ | |
| $R_{th(j-s)}$ = | 0,81 | K/W |

IGBT thermal model values

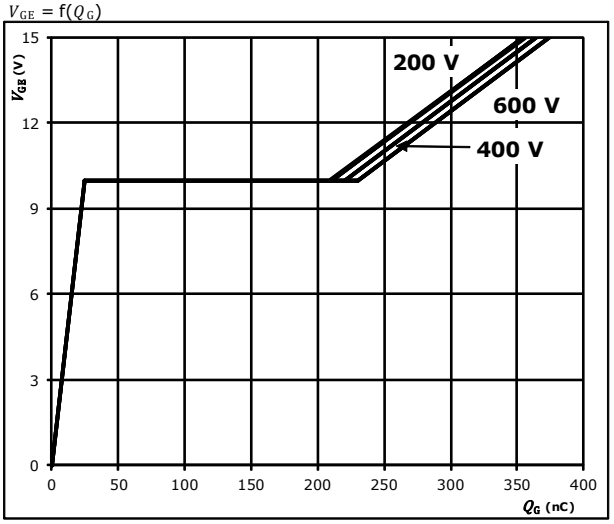
| $R$ (K/W) | $\tau$ (s) |
|---|---|
| 9,05E-02 | 1,57E+00 |
| 2,50E-01 | 2,08E-01 |
| 3,60E-01 | 5,82E-02 |
| 7,42E-02 | 9,04E-03 |
| 3,66E-02 | 7,39E-04 |

# H-Bridge Switch Characteristics

**figure 5.** **IGBT**

**Gate voltage vs gate charge**

$V_{GE} = f(Q_G)$

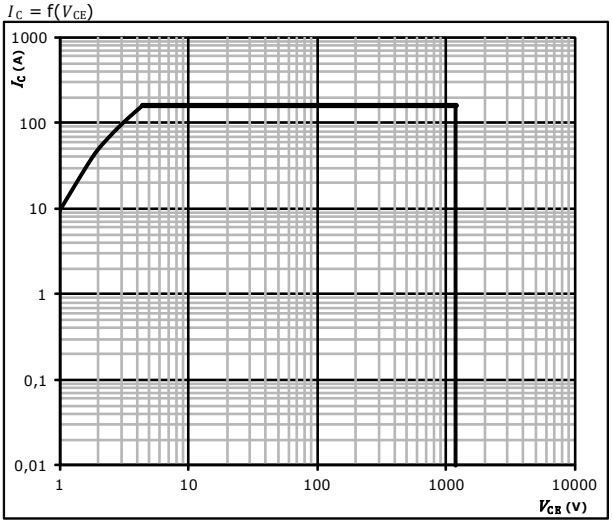



$I_C$ = 40 A

**figure 6.** **IGBT**

**Safe operating area**

$I_C = f(V_{CE})$



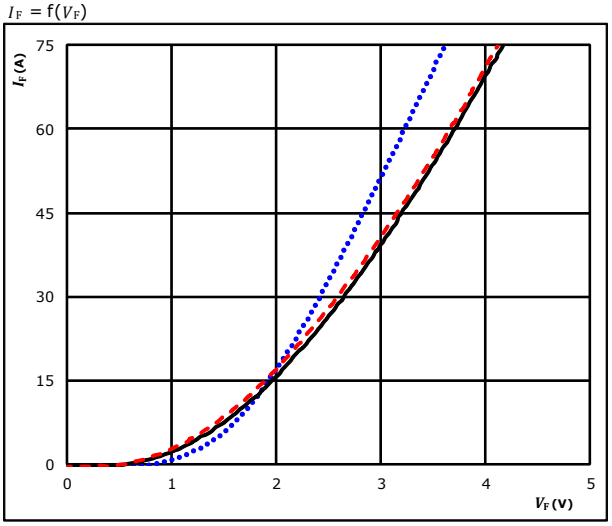

$D$ = single pulse
$T_s$ = 80 °C
$V_{GE}$ = ±15 V
$T_j$ = $T_{jmax}$

# H-Bridge Diode Characteristics

**figure 1.** **FWD**

**Typical forward characteristics**

$I_F = f(V_F)$




$t_p$ = 250 µs

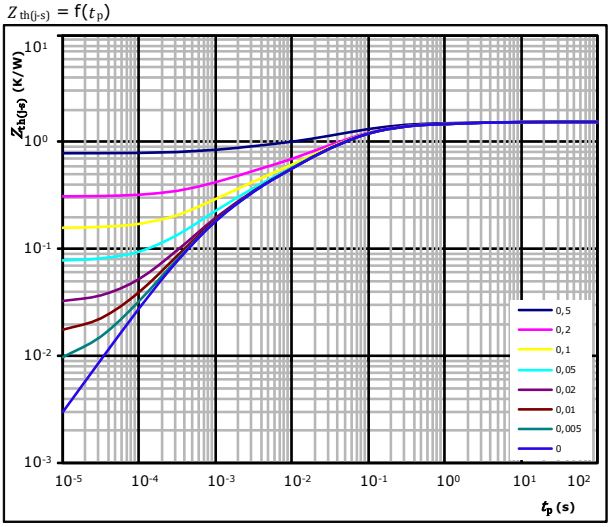
$T_j$: 25 °C

150 °C

**figure 2.** **FWD**

**Transient thermal impedance as a function of pulse width**

$Z_{th(j-s)} = f(t_p)$




$D$ = $t_p / T$

$R_{th(j-s)}$ = 1,56 K/W

FWD thermal model values

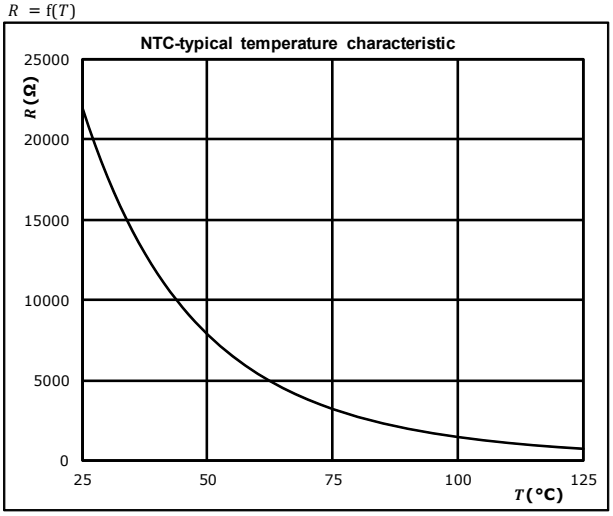
| $R$ (K/W) | $\tau$ (s) |
|---|---|
| 4,65E-02 | 4,86E+00 |
| 1,06E-01 | 8,11E-01 |
| 4,71E-01 | 1,09E-01 |
| 4,83E-01 | 3,07E-02 |
| 2,34E-01 | 7,03E-03 |
| 1,81E-01 | 1,25E-03 |
| 3,38E-02 | 3,28E-04 |

# Thermistor Characteristics

**figure 1.** **Thermistor**

**Typical NTC characteristic as a function of temperature**

$R = f(T)$

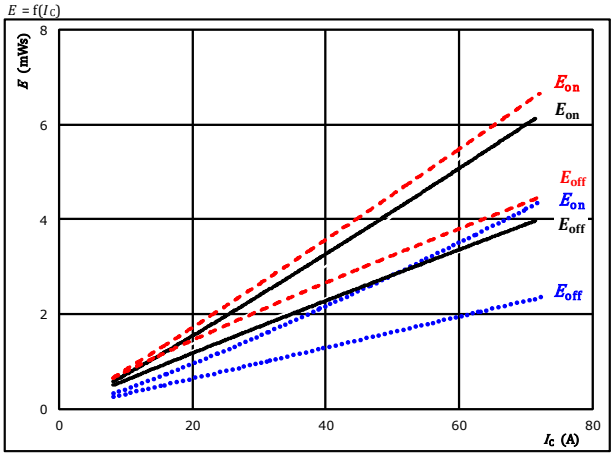


# H-Bridge Switching Characteristics

**figure 1.** **IGBT**

**Typical switching energy losses as a function of collector current**

$E = f(I_C)$



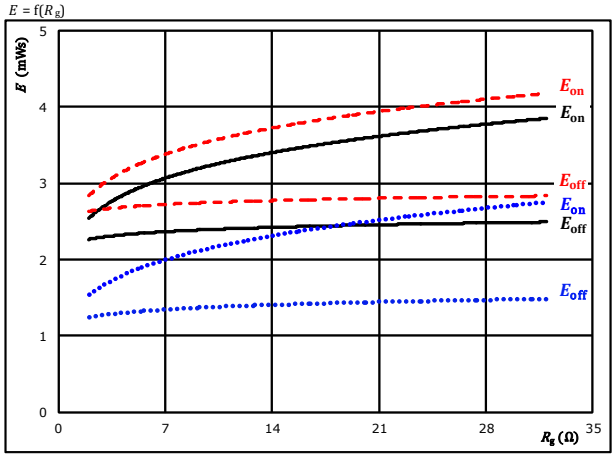

With an inductive load at

| | | | | |
|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | $T_j$: | 25 °C |
| $V_{GE}$ = | ±15 | V | | 125 °C |
| $R_{gon}$ = | 8 | Ω | | 150 °C |
| $R_{goff}$ = | 8 | Ω | | |

**figure 2.** **IGBT**

**Typical switching energy losses as a function of gate resistor**

$E = f(R_g)$



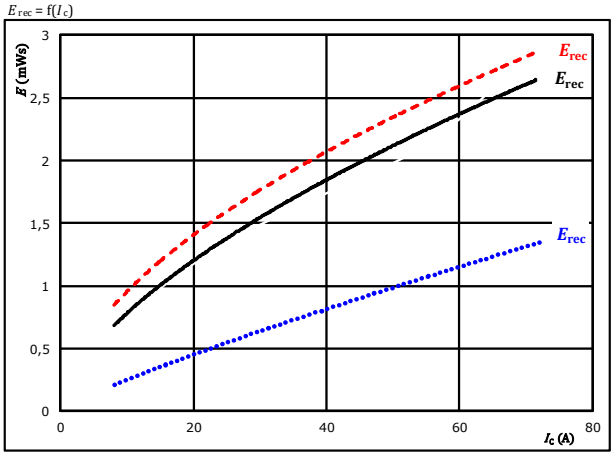

With an inductive load at

| | | | | |
|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | $T_j$: | 25 °C |
| $V_{GE}$ = | ±15 | V | | 125 °C |
| $I_C$ = | 40 | A | | 150 °C |

**figure 3.** **FWD**

**Typical reverse recovered energy loss as a function of collector current**

$E_{rec} = f(I_C)$



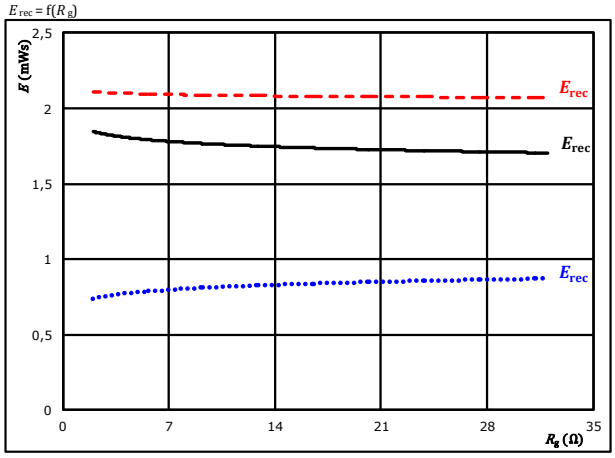

With an inductive load at

| | | | | |
|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | $T_j$: | 25 °C |
| $V_{GE}$ = | ±15 | V | | 125 °C |
| $R_{gon}$ = | 8 | Ω | | 150 °C |

**figure 4.** **FWD**

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

$E_{rec} = f(R_g)$




With an inductive load at

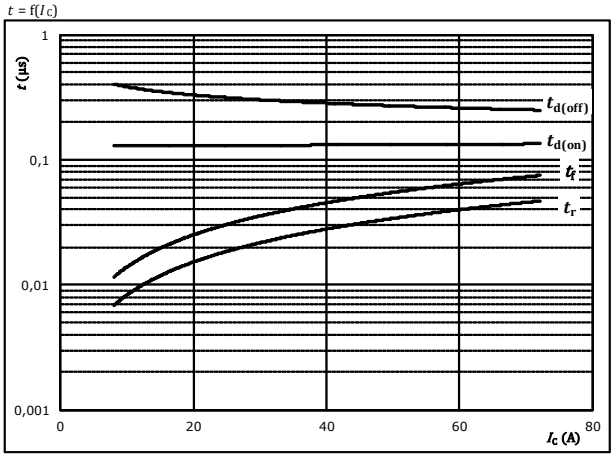
| | | | | |
|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | $T_j$: | 25 °C |
| $V_{GE}$ = | ±15 | V | | 125 °C |
| $I_C$ = | 40 | A | | 150 °C |

# H-Bridge Switching Characteristics

**figure 5.** **IGBT**

**Typical switching times as a function of collector current**

$t = f(I_C)$



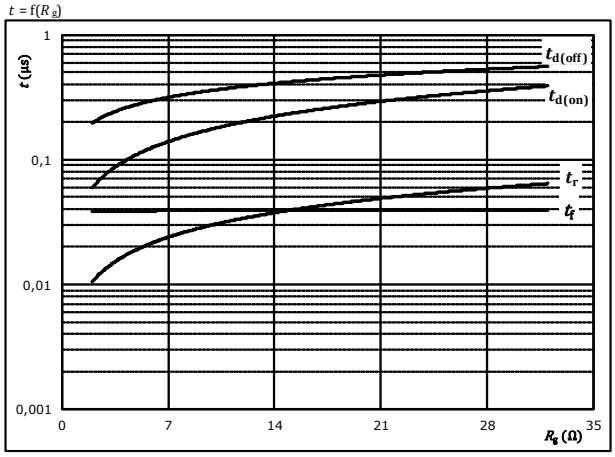

With an inductive load at

| | | |
|---|---|---|
| $T_j$ = | 150 | °C |
| $V_{CE}$ = | 600 | V |
| $V_{GE}$ = | ±15 | V |
| $R_{gon}$ = | 8 | Ω |
| $R_{goff}$ = | 8 | Ω |

**figure 6.** **IGBT**

**Typical switching times as a function of gate resistor**

$t = f(R_g)$



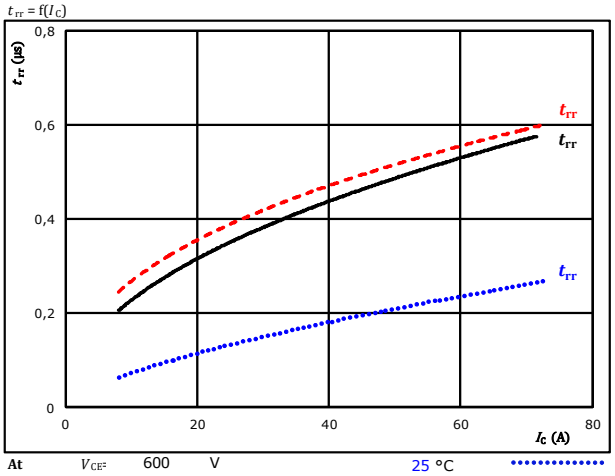

With an inductive load at

| | | |
|---|---|---|
| $T_j$ = | 150 | °C |
| $V_{CE}$ = | 600 | V |
| $V_{GE}$ = | ±15 | V |
| $I_C$ = | 40 | A |

**figure 7.** **FWD**

**Typical reverse recovery time as a function of collector current**

$t_{rr} = f(I_C)$

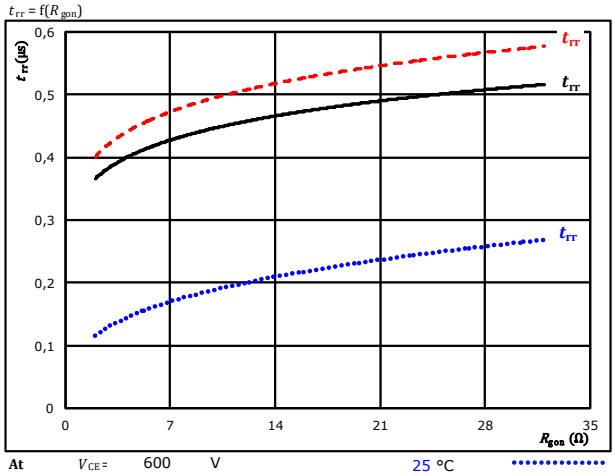



| | | | | | |
|---|---|---|---|---|---|
| At | $V_{CE}$ = | 600 | V | | 25 °C |
| | $V_{GE}$ = | ±15 | V | $T_j$: | 125 °C |
| | $R_{gon}$ = | 8 | Ω | | 150 °C |

**figure 8.** **FWD**

**Typical reverse recovery time as a function of IGBT turn on gate resistor**

$t_{rr} = f(R_{gon})$



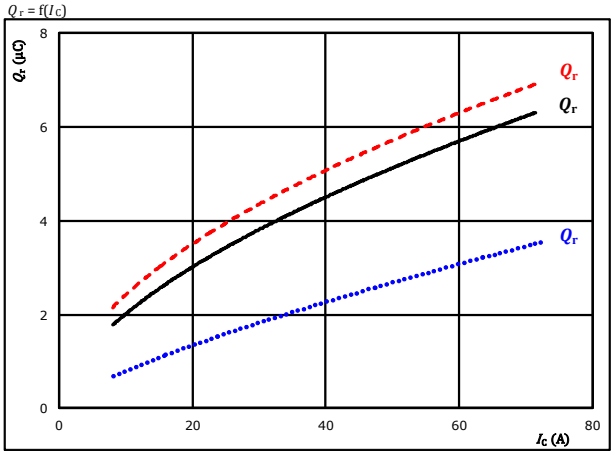

| | | | | | |
|---|---|---|---|---|---|
| At | $V_{CE}$ = | 600 | V | | 25 °C |
| | $V_{GE}$ = | ±15 | V | $T_j$: | 125 °C |
| | $I_C$ = | 40 | A | | 150 °C |

# H-Bridge Switching Characteristics

**figure 9.** FWD

**Typical recovered charge as a function of collector current**

$Q_r = f(I_C)$

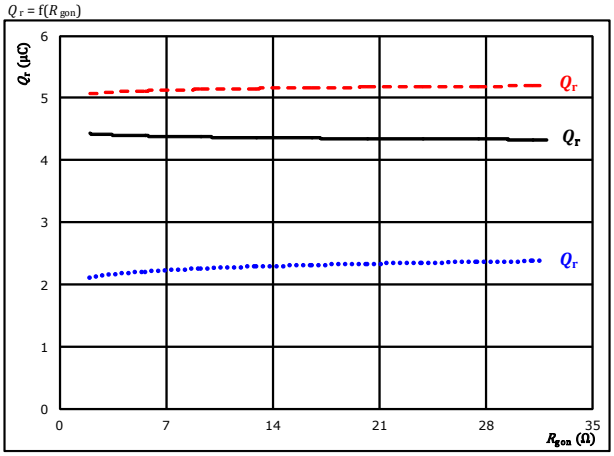



| At | | | | | |
|---|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | | 25 °C | |
| $V_{GE}$ = | ±15 | V | $T_j$: | 125 °C | |
| $R_{gon}$ = | 8 | Ω | | 150 °C | |

**figure 10.** FWD

**Typical recovered charge as a function of IGBT turn on gate resistor**

$Q_r = f(R_{gon})$

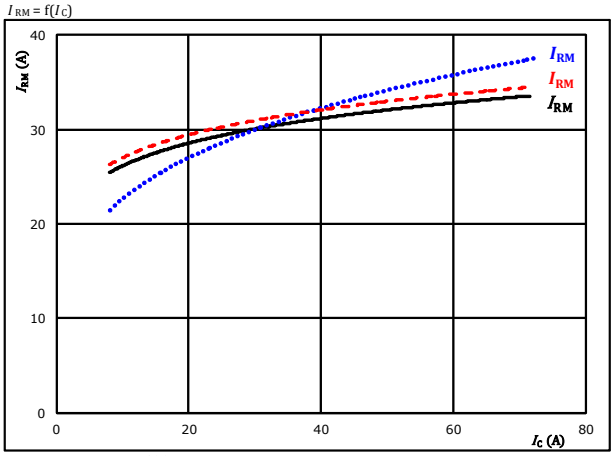



| At | | | | | |
|---|---|---|---|---|---|
| $V_{CE}$= | 600 | V | | 25 °C | |
| $V_{GE}$ = | ±15 | V | $T_j$: | 125 °C | |
| $I_C$= | 40 | A | | 150 °C | |

**figure 11.** FWD

**Typical peak reverse recovery current current as a function of collector current**

$I_{RM} = f(I_C)$

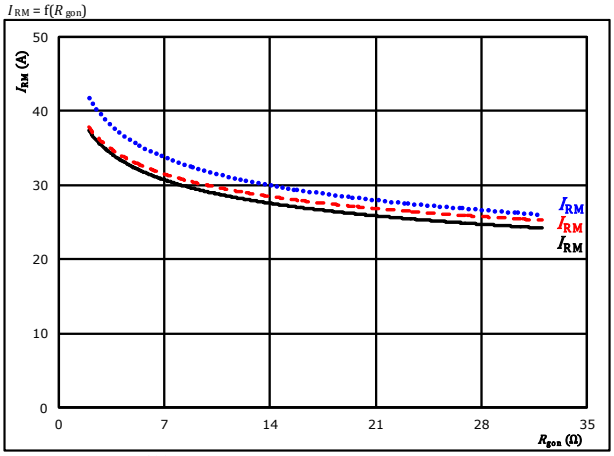



| At | | | | | |
|---|---|---|---|---|---|
| $V_{CE}$: | 600 | V | | 25 °C | |
| $V_{GE}$ = | ±15 | V | $T_j$: | 125 °C | |
| $R_{gon}$ = | 8 | Ω | | 150 °C | |

**figure 12.** FWD

**Typical peak reverse recovery current as a function of IGBT turn on gate resistor**

$I_{RM} = f(R_{gon})$



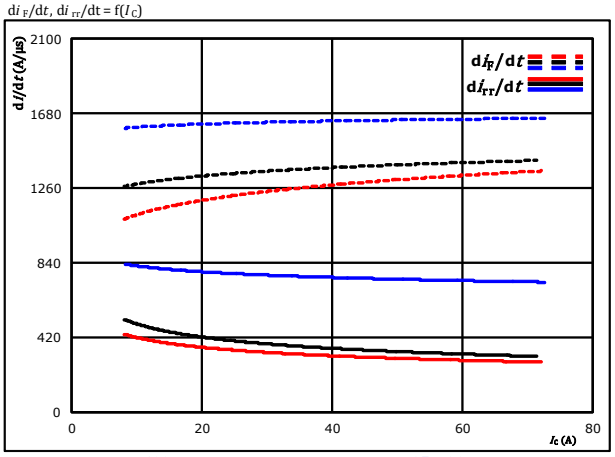

| At | | | | | |
|---|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | | 25 °C | |
| $V_{GE}$ = | ±15 | V | $T_j$: | 125 °C | |
| $I_C$ = | 40 | A | | 150 °C | |

# H-Bridge Switching Characteristics

**figure 13.** **FWD**

**Typical rate of fall of forward and reverse recovery current as a function of collector current**

$di_F/dt, di_{rr}/dt = f(I_C)$

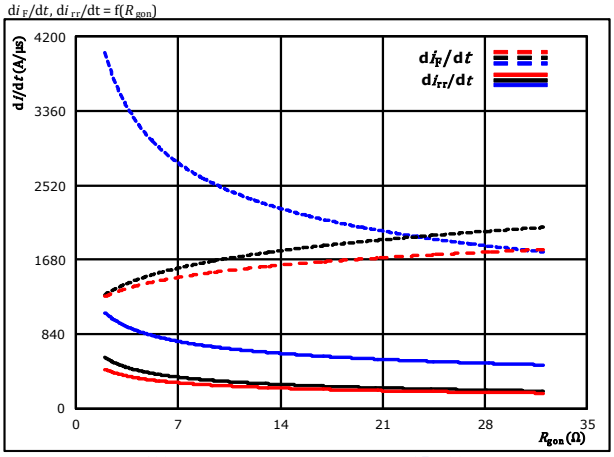



| At | | | | | |
|---|---|---|---|---|---|
| $V_{CE}$: | 600 | V | | 25 | °C |
| $V_{GE}$ = | ±15 | V | $T_j$: | 125 | °C |
| $R_{gon}$ = | 8 | Ω | | 150 | °C |

**figure 14.** **FWD**

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

$di_F/dt, di_{rr}/dt = f(R_{gon})$



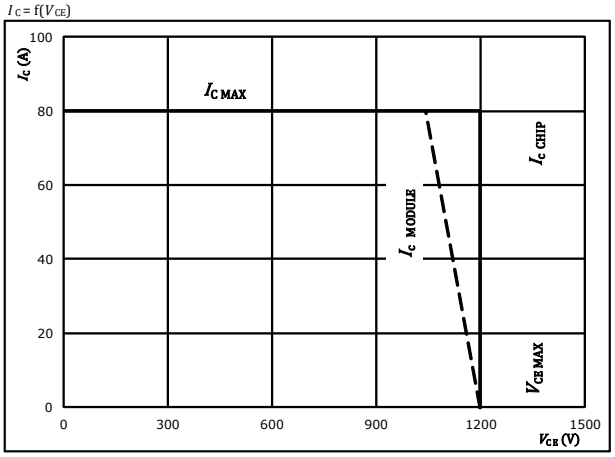

| At | | | | | |
|---|---|---|---|---|---|
| $V_{CE}$ = | 600 | V | | 25 | °C |
| $V_{GE}$ = | ±15 | V | $T_j$: | 125 | °C |
| $I_C$= | 40 | A | | 150 | °C |

# H-Bridge Switching Characteristics

**figure 15.** **IGBT**

**Reverse bias safe operating area**

$I_C = f(V_{CE})$




**At**

| | | |
|---|---|---|
| $T_j$ = | 175 | °C |
| $R_{gon}$ = | 8 | Ω |
| $R_{goff}$ = | 8 | Ω |

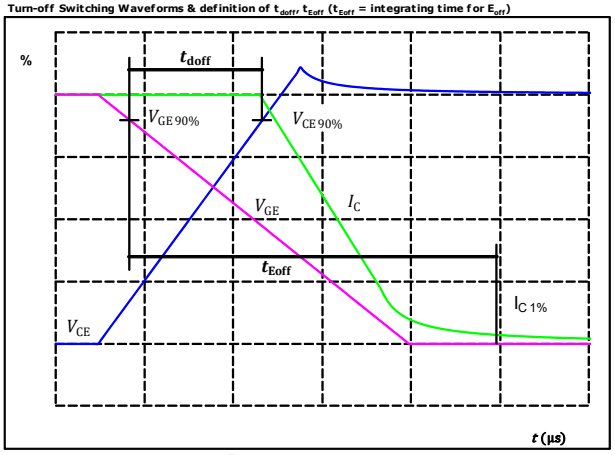
# H-Bridge Switching Definitions

**General conditions**

| | | |
|---|---|---|
| $T_j$ | = | 125 °C |
| $R_{gon}$ | = | 8 Ω |
| $R_{goff}$ | = | 8 Ω |

**figure 1.** IGBT

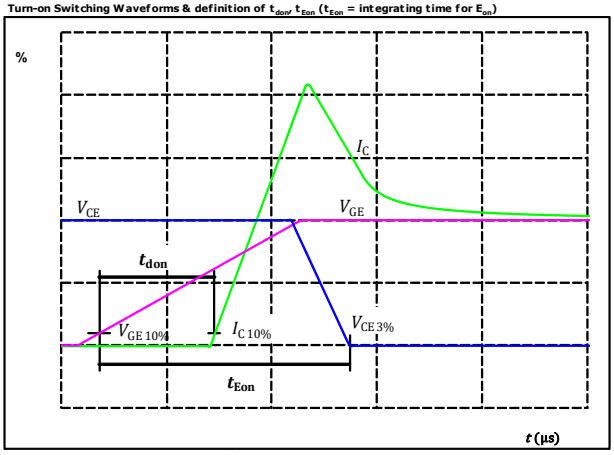
Turn-off Switching Waveforms & definition of $t_{doff}$, $t_{Eoff}$ ($t_{Eoff}$ = integrating time for $E_{off}$)




| | | |
|---|---|---|
| $V_{GE}(0\%)$ = | -15 | V |
| $V_{GE}(100\%)$ = | 15 | V |
| $V_C(100\%)$ = | 600 | V |
| $I_C(100\%)$ = | 40 | A |
| $t_{doff}$ = | 274 | ns |

**figure 2.** IGBT

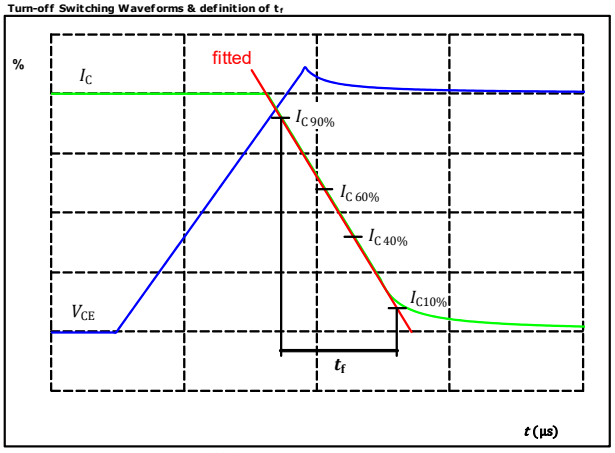
Turn-on Switching Waveforms & definition of $t_{don}$, $t_{Eon}$ ($t_{Eon}$ = integrating time for $E_{on}$)




| | | |
|---|---|---|
| $V_{GE}(0\%)$ = | -15 | V |
| $V_{GE}(100\%)$ = | 15 | V |
| $V_C(100\%)$ = | 600 | V |
| $I_C(100\%)$ = | 40 | A |
| $t_{don}$ = | 131 | ns |

**figure 3.** IGBT

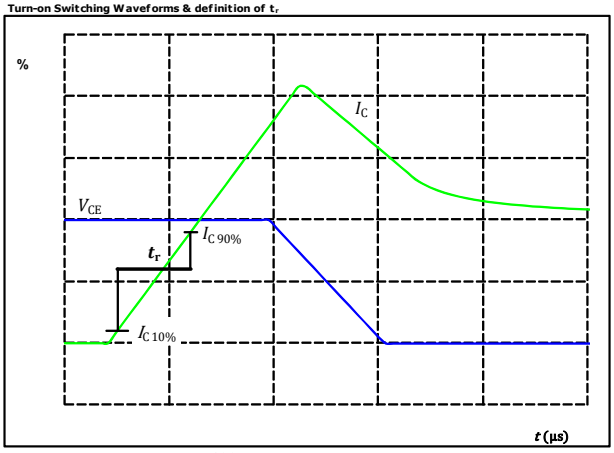
Turn-off Switching Waveforms & definition of $t_f$




| | | |
|---|---|---|
| $V_C(100\%)$ = | 600 | V |
| $I_C(100\%)$ = | 40 | A |
| $t_f$ = | 27 | ns |

**figure 4.** IGBT

Turn-on Switching Waveforms & definition of $t_r$

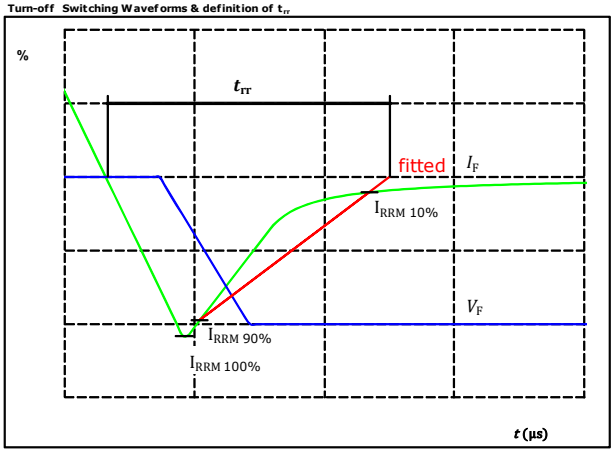



| | | |
|---|---|---|
| $V_C(100\%)$ = | 600 | V |
| $I_C(100\%)$ = | 40 | A |
| $t_r$ = | 27 | ns |

# H-Bridge Switching Characteristics

**figure 5.** **FWD**

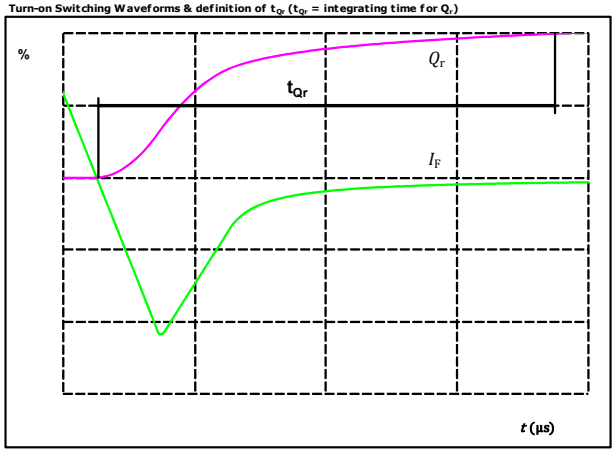
Turn-off Switching Waveforms & definition of $t_{rr}$




| | | |
|---|---|---|
| $V_F(100\%)$ = | 600 | V |
| $I_F(100\%)$ = | 40 | A |
| $I_{RRM}(100\%)$ = | 31 | A |
| $t_{rr}$ = | 417 | ns |

**figure 6.** **FWD**

Turn-on Switching Waveforms & definition of $t_{Qr}$ ($t_{Qr}$ = integrating time for $Q_r$)




| | | |
|---|---|---|
| $I_F(100\%)$ = | 40 | A |
| $Q_r(100\%)$ = | 4,29 | µC |

## Ordering Code & Marking

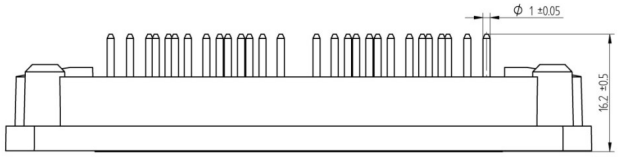
| Version | Ordering Code |
|---|---|
| without thermal paste 12 mm housing with solder pins | 10-FY124PA040FV-L588F88 |
| with thermal paste 12 mm housing with solder pins | 10-FY124PA040FV-L588F88-/3/ |
| without thermal paste 12 mm housing with press-fit pins | 10-PY124PA040FV-L588F88Y |
| with thermal paste 12 mm housing with press-fit pins | 10-PY124PA040FV-L588F88Y-/3/ |


| | | | | | | |
|---|---|---|---|---|---|---|
| **Text** | **Name** | | **Date code** | **UL & VIN** | **Lot** | **Serial** |
| | NN-NNNNNNNNNNNNN-TTTTTTVV | | WWYY | UL VIN | LLLLL | SSSS |
| **Datamatrix** | **Type&Ver** | **Lot number** | **Serial** | **Date code** | | |
| | TTTTTTVV | LLLLL | SSSS | WWYY | | |

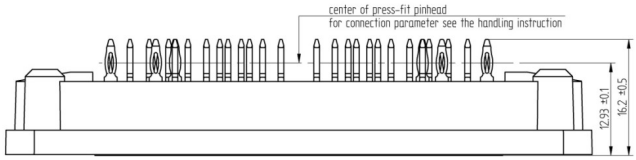
## Outline

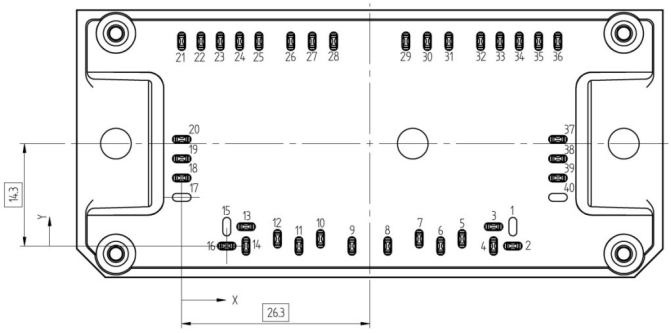
| Pin table | | | |
|---|---|---|---|
| Pin | X | Y | Function |
| 1 | Not assembled | | |
| 2 | 46,3 | 0 | DC-2 |
| 3 | 43,6 | 2,7 | DC-2 |
| 4 | 43,6 | 0 | DC-2 |
| 5 | 39,2 | 1 | G13 |
| 6 | 36,2 | 0 | S13 |
| 7 | 33,2 | 1 | NC |
| 8 | 28,8 | 0 | Therm2 |
| 9 | 23,8 | 0 | Therm1 |
| 10 | 19,4 | 1 | NC |
| 11 | 16,4 | 0 | S11 |
| 12 | 13,4 | 1 | G11 |
| 13 | 9 | 2,7 | DC-1 |
| 14 | 9 | 0 | DC-1 |
| 15 | Not assembled | | |
| 16 | 6,3 | 0 | DC-1 |
| 17 | Not assembled | | |
| 18 | 0 | 9,5 | DC+ |
| 19 | 0 | 12,2 | DC+ |
| 20 | 0 | 14,9 | DC+ |
| 21 | 0 | 28,6 | Ph1 |
| 22 | 2,7 | 28,6 | Ph1 |
| 23 | 5,4 | 28,6 | Ph1 |
| 24 | 8,1 | 28,6 | Ph1 |
| 25 | 10,8 | 28,6 | Ph1 |
| 26 | 15,25 | 28,6 | G12 |
| 27 | 18,25 | 28,6 | S12 |
| 28 | 21,25 | 28,6 | NC |
| 29 | 31,35 | 28,6 | NC |
| 30 | 34,35 | 28,6 | S14 |
| 31 | 37,35 | 28,6 | G14 |
| 32 | 41,8 | 28,6 | Ph2 |
| 33 | 44,5 | 28,6 | Ph2 |
| 34 | 47,2 | 28,6 | Ph2 |
| 35 | 49,9 | 28,6 | Ph2 |
| 36 | 52,6 | 28,6 | Ph2 |
| 37 | 52,6 | 14,9 | DC+ |
| 38 | 52,6 | 12,2 | DC+ |
| 39 | 52,6 | 9,5 | DC+ |
| 40 | Not assembled | | |

solder pins



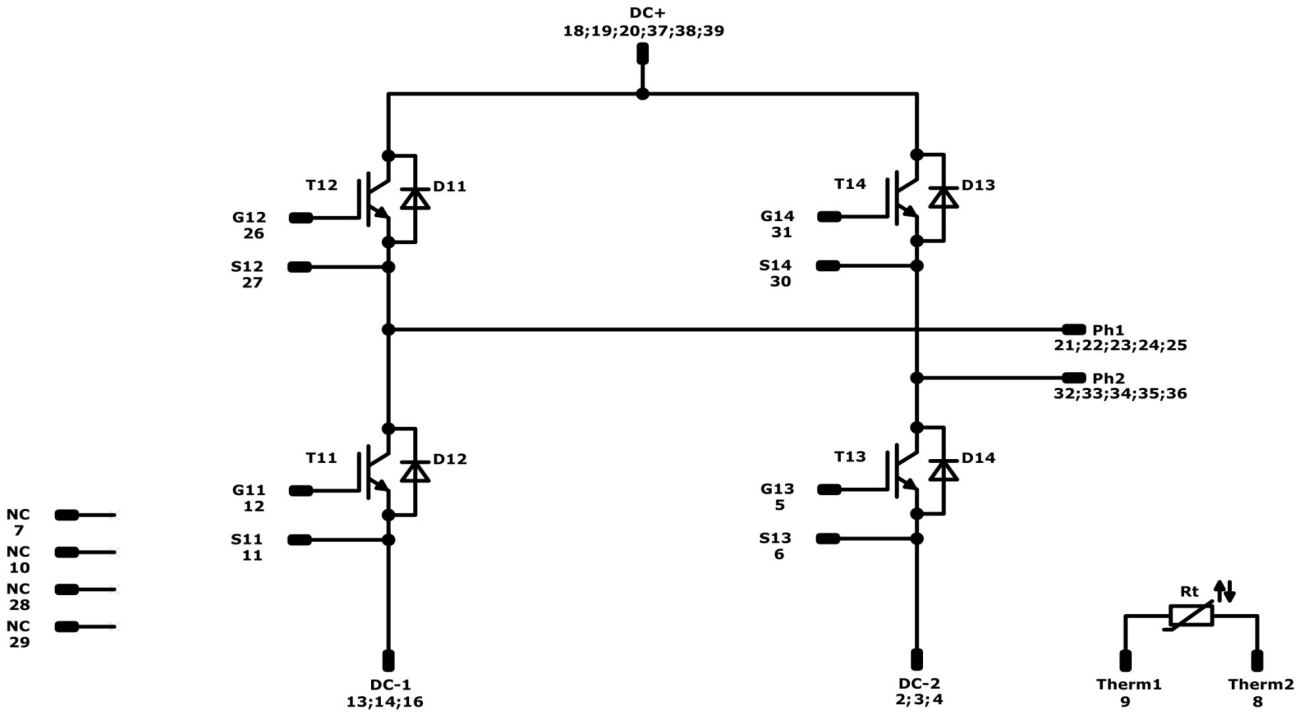

press-fit pins




Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

## Pinout




## Identification

| ID | Component | Voltage | Current | Function | Comment |
|---|---|---|---|---|---|
| T11-T14 | IGBT | 1200 V | 40 A | H-Bridge Switch | |
| D11-D14 | FWD | 1200 V | 25 A | H-Bridge Diode | |
| Rt | NTC | | | Thermistor | |

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

| Handling instruction |
|---|
| Handling instructions for *flow* 1 packages see vincotech.com website. |

| Package data |
|---|
| Package data for *flow* 1 packages see vincotech.com website. |

| UL recognition and file number |
|---|
| This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website. |

| Document No.: | Date: | Modification: | Pages |
|---|---|---|---|
| 10-xY124PA040FV-L588F88x-D1-14 | 28 Feb. 2018 | | |

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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.