



fastPACK 0 SiC

900 V / 33 mΩ

Features

- 900V SiC MOS
- Switching frequency up to 400kHz
- Suitable for hard switching/soft switching
- Increased power density
- NTC

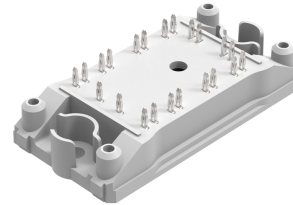
Target applications

- Power Supply
- Special Application
- Welding & Cutting

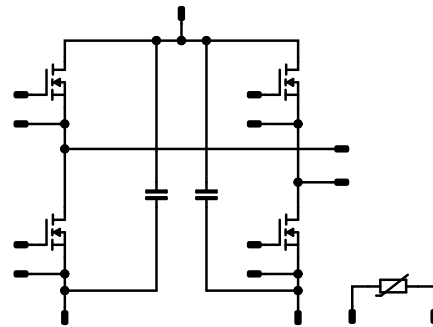
Types

- 10-PC094PB035ME02-L629F36Y

flow 0 12 mm housing



Schematic





Vincotech

Maximum Ratings

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

| Parameter | Symbol | Conditions | Value | Unit |
|----------------------------------|------------|---------------------------------------|---------|------|
| H-Bridge Switch - Lo side | | | | |
| Drain-source voltage | V_{DSS} | | 900 | V |
| Drain current | I_D | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 40 | A |
| Peak drain current | I_{DM} | t_p limited by T_{jmax} | 180 | A |
| Avalanche energy, single pulse | E_{AS} | $V_{DD} = 50\text{ V}$ $I_D = 44$ | 220 | mJ |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 76 | W |
| Gate-source voltage | V_{GSS} | | -4 / 15 | V |
| Maximum Junction Temperature | T_{jmax} | | 175 | °C |

H-Bridge Switch - Hi side

| | | | | |
|--------------------------------|------------|---------------------------------------|---------|----|
| Drain-source voltage | V_{DSS} | | 900 | V |
| Drain current | I_D | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 40 | A |
| Peak drain current | I_{DM} | t_p limited by T_{jmax} | 180 | A |
| Avalanche energy, single pulse | E_{AS} | $V_{DD} = 50\text{ V}$ $I_D = 44$ | 220 | mJ |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 76 | W |
| Gate-source voltage | V_{GSS} | | -4 / 15 | V |
| Maximum Junction Temperature | T_{jmax} | | 175 | °C |

Capacitor (DC)

| | | | | |
|-----------------------|-----------|--|-------------|----|
| Maximum DC voltage | V_{MAX} | | 1000 | V |
| Operation Temperature | T_{op} | | -55 ... 125 | °C |



Vincotech

10-PC094PB035ME02-L629F36Y
datasheet

Maximum Ratings

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

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

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 |
| Isolation voltage | V_{isol} | AC Voltage $t_p = 1\text{ min}$ | 2500 | V |
| Creepage distance | | | min. 12,7 | mm |
| Clearance | | | 9,6 | mm |
| Comparative Tracking Index | CTI | | ≥ 200 | |

*100 % tested in production



Vincotech

Characteristic Values

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

H-Bridge Switch - Lo side

Static

| | | | | | | | | | | |
|----------------------------------|--------------|-------------|-------|-----|-------|------------------|-----|----------------|-----|----|
| Drain-source on-state resistance | $r_{DS(on)}$ | | 15 | | 76 | 25 125 150 | | 34 42 47 | 39 | mΩ |
| Gate-source threshold voltage | $V_{GS(th)}$ | | 0 | | 0,005 | 25 | 1,7 | 2,4 | 3,5 | V |
| Gate to Source Leakage Current | I_{GSS} | | 15 | 0 | | 25 | | 20 | 500 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | | 0 | 0 | 0 | 25 | | 2 | 200 | μA |
| Internal gate resistance | r_g | | | | | | | 2,35 | | Ω |
| Gate charge | Q_g | | | | | | | 60,8 | | nC |
| Gate to source charge | Q_{GS} | | -4/15 | 400 | 40 | 25 | | 15 | | |
| Gate to drain charge | Q_{GD} | | | | | | | 24 | | |
| Short-circuit input capacitance | C_{iss} | | | | | | | 1320 | | pF |
| Short-circuit output capacitance | C_{oss} | $f = 1$ Mhz | 0 | 600 | 0 | 25 | | 120 | | |
| Reverse transfer capacitance | C_{rss} | | | | | | | 8 | | |
| Diode forward voltage | V_{SD} | | 0 | | 0 | 25 | | 4,8 | | V |

Thermal

| | | | | | | | | | | |
|--------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink* | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 1,25 | | K/W |
|--------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

| | | | | | | | | | | |
|-----------------------------|--------------|---|--|--|--|------------------|--|-------------------------|--|-----|
| Turn-on delay time | $t_{d(on)}$ | | | | | 25 125 150 | | 12,8 12,8 13,6 | | ns |
| Rise time | t_r | | | | | 25 125 150 | | 5,4 5 5 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | | | 25 125 150 | | 42,6 42,8 43,4 | | ns |
| Fall time | t_f | | | | | 25 125 150 | | 10,9 11,7 10,8 | | ns |
| Turn-on energy (per pulse) | E_{on} | $Q_{tFWD}=0,455$ μC $Q_{tFWD}=0,875$ μC $Q_{tFWD}=0,825$ μC | | | | 25 125 150 | | 0,459 0,447 0,471 | | mWs |
| Turn-off energy (per pulse) | E_{off} | | | | | 25 125 150 | | 0,082 0,055 0,048 | | mWs |



Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---------------------------------------|----------------------|---|------------------------------|------------------------|------------|------------------|-------|-------------------------|--|------------|
| | | V_{GE} [V] V_{GS} [V] | V_{CE} [V] V_{DS} [V] | I_C [A] I_D [A] | T_j [°C] | Min | Typ | Max | | |
| Dynamic | | | | | | | | | | |
| Peak recovery current | I_{RRM} | | | | | 25 125 150 | | 54 58 63 | | A |
| Reverse recovery time | t_{rr} | | | | | 25 125 150 | | 15 15 15 | | ns |
| Recovered charge | Q_r | $di/dt = 7344$ A/ μ s $di/dt = 7855$ A/ μ s $di/dt = 8439$ A/ μ s | -5/15 | 600 | 40 | 25 125 150 | | 0,455 0,875 0,825 | | μ C |
| Reverse recovered energy | E_{rec} | | | | | 25 125 150 | | 0,028 0,196 0,106 | | mWs |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 25 125 150 | | 11049 13683 15876 | | A/ μ s |



Vincotech

Characteristic Values

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

H-Bridge Switch - Hi side

Static

| | | | | | | | | | | |
|----------------------------------|--------------|-------------|-------|-----|-------|------------------|-----|----------------|-----|----|
| Drain-source on-state resistance | $r_{DS(on)}$ | | 15 | | 76 | 25 125 150 | | 34 42 47 | 39 | mΩ |
| Gate-source threshold voltage | $V_{GS(th)}$ | | 0 | | 0,005 | 25 | 1,7 | 2,4 | 3,5 | V |
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| Zero Gate Voltage Drain Current | I_{DSS} | | 0 | 0 | 0 | 25 | | 2 | 200 | μA |
| Internal gate resistance | r_g | | | | | | | 2,35 | | Ω |
| Gate charge | Q_g | | | | | | | 60,8 | | nC |
| Gate to source charge | Q_{GS} | | -4/15 | 400 | 40 | 25 | | 15 | | |
| Gate to drain charge | Q_{GD} | | | | | | | 24 | | |
| Short-circuit input capacitance | C_{iss} | | | | | | | 1320 | | pF |
| Short-circuit output capacitance | C_{oss} | $f = 1$ Mhz | 0 | 600 | 0 | 25 | | 120 | | |
| Reverse transfer capacitance | C_{rss} | | | | | | | 8 | | |
| Diode forward voltage | V_{SD} | | 0 | | 0 | 25 | | 4,8 | | V |

Thermal

| | | | | | | | | | | |
|--------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink* | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 1,25 | | K/W |
|--------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

| | | | | | | | | | | |
|-----------------------------|--------------|---|--|--|--|------------------|--|-------------------------|--|-----|
| Turn-on delay time | $t_{d(on)}$ | | | | | 25 125 150 | | 12,8 12,8 13,6 | | ns |
| Rise time | t_r | | | | | 25 125 150 | | 5,4 5 5 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | | | 25 125 150 | | 42,6 42,8 43,4 | | ns |
| Fall time | t_f | | | | | 25 125 150 | | 10,9 11,7 10,8 | | ns |
| Turn-on energy (per pulse) | E_{on} | $Q_{tFWD}=0,455$ μC $Q_{tFWD}=0,875$ μC $Q_{tFWD}=0,825$ μC | | | | 25 125 150 | | 0,459 0,447 0,471 | | mWs |
| Turn-off energy (per pulse) | E_{off} | | | | | 25 125 150 | | 0,082 0,055 0,048 | | mWs |



Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---------------------------------------|----------------------|---|------------------------------|------------------------|------------|------------------|-------|-------------------------|--|------------|
| | | V_{GE} [V] V_{GS} [V] | V_{CE} [V] V_{DS} [V] | I_C [A] I_D [A] | T_j [°C] | Min | Typ | Max | | |
| Dynamic | | | | | | | | | | |
| Peak recovery current | I_{RRM} | | | | | 25 125 150 | | 54 58 63 | | A |
| Reverse recovery time | t_{rr} | | | | | 25 125 150 | | 15 15 15 | | ns |
| Recovered charge | Q_r | $di/dt = 7344$ A/ μ s $di/dt = 7855$ A/ μ s $di/dt = 8439$ A/ μ s | -5/15 | 600 | 40 | 25 125 150 | | 0,455 0,875 0,825 | | μ C |
| Reverse recovered energy | E_{rec} | | | | | 25 125 150 | | 0,028 0,196 0,106 | | mWs |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 25 125 150 | | 11049 13683 15876 | | A/ μ s |



Vincotech

Characteristic Values

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

Capacitor (DC)

Static

| | | | | | | | | | | |
|--------------------|-----|-------------|--|--|--|----|-----|----|----|----|
| Capacitance | C | | | | | | | 94 | | nF |
| Tolerance | | | | | | | -20 | | 20 | % |
| Dissipation factor | | $f = 1$ kHz | | | | 25 | | 25 | | % |

Thermistor

Static

| | | | | | | | | | | |
|--------------------------------|----------------|-------------------------|--|--|--|-----|----|------|---|------|
| Rated resistance | R | | | | | 25 | | 22 | | kΩ |
| Deviation of R_{100} | $A_{R/R}$ | $R_{100} = 1484 \Omega$ | | | | 100 | -5 | | 5 | % |
| Power dissipation | P | | | | | | | 5 | | mW |
| Power dissipation constant | d | | | | | 25 | | 1,5 | | mW/K |
| B-value | $B_{(25/50)}$ | Tol. ± 1 % | | | | | | 3962 | | K |
| B-value | $B_{(25/100)}$ | Tol. ± 1 % | | | | | | 4000 | | K |
| Vincotech Thermistor Reference | | | | | | | | | I | |

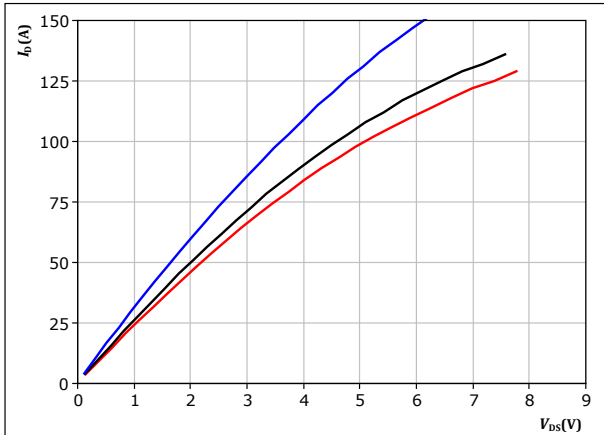


H-Bridge Switch - Lo side Characteristics

figure 1. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

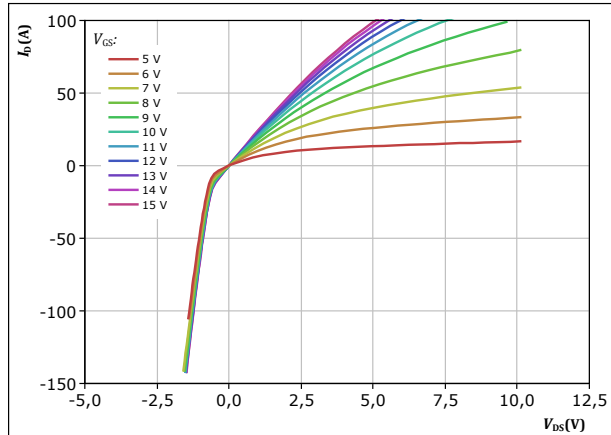


$t_p = 250 \mu s$
 $V_{GS} = 15 V$
 $T_F:$ 25 °C, 125 °C, 150 °C

figure 2. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

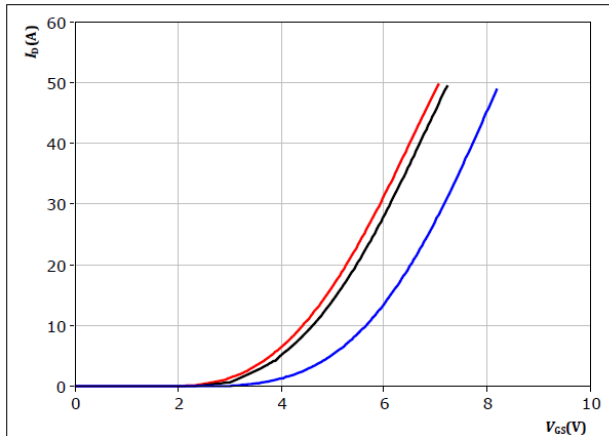


$t_p = 250 \mu s$
 $T_F = 150 \text{ °C}$
 V_{GS} from 5 V to 15 V in steps of 1 V

figure 3. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

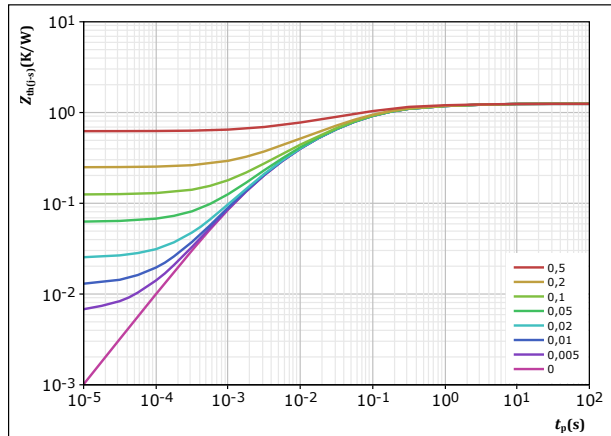


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_F:$ 25 °C, 125 °C, 150 °C

figure 4. MOSFET

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,247 \text{ K/W}$
MOSFET thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 6,45E-02 | 3,56E+00 |
| 1,36E-01 | 5,08E-01 |
| 4,22E-01 | 9,62E-02 |
| 3,45E-01 | 2,46E-02 |
| 2,11E-01 | 5,94E-03 |
| 6,79E-02 | 1,44E-03 |

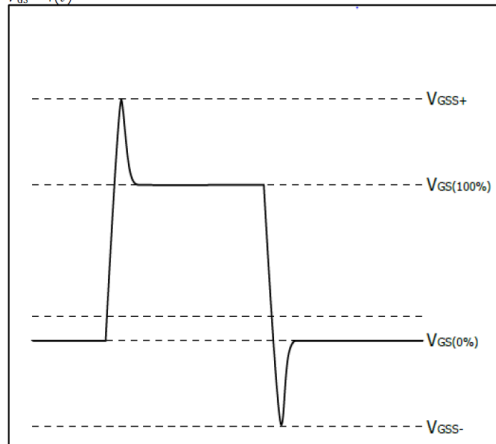


H-Bridge Switch - Lo side Characteristics

figure 5. MOSFET

Gate maximum operating boundaries

$$V_{GS} = f(t)$$



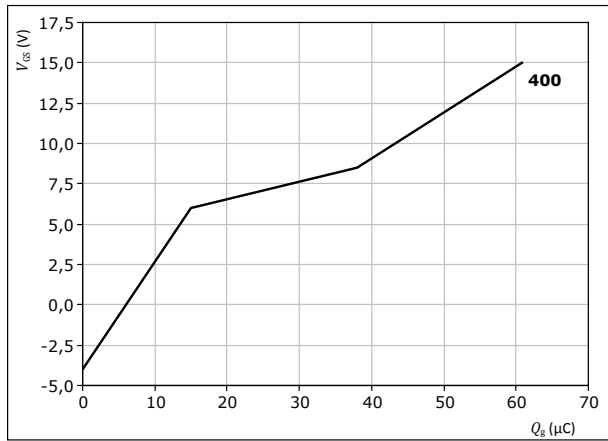
At

| | |
|-------------------|------|
| $V_{GS+} =$ | 19 V |
| $V_{GS(100\%)} =$ | 15 V |
| $V_{GS(0\%)} =$ | -4 V |
| $V_{GS-} =$ | -8 V |

figure 6. MOSFET

Gate voltage vs gate charge

$$V_{GS} = f(Q_g)$$



At

| | | |
|---------|----|---|
| $I_D =$ | 40 | A |
|---------|----|---|

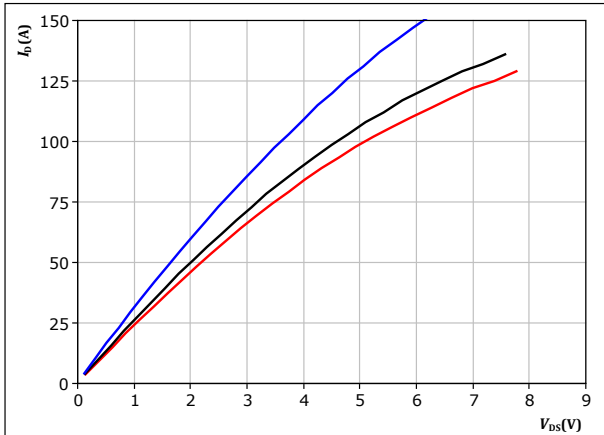


H-Bridge Switch - Hi side Characteristics

figure 7. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

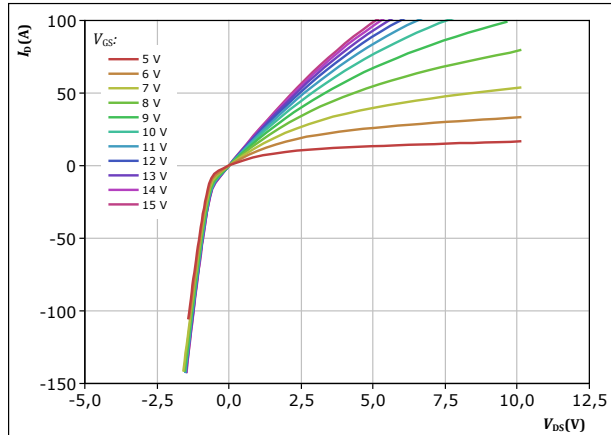


$t_p = 250 \mu s$
 $V_{GS} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 8. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

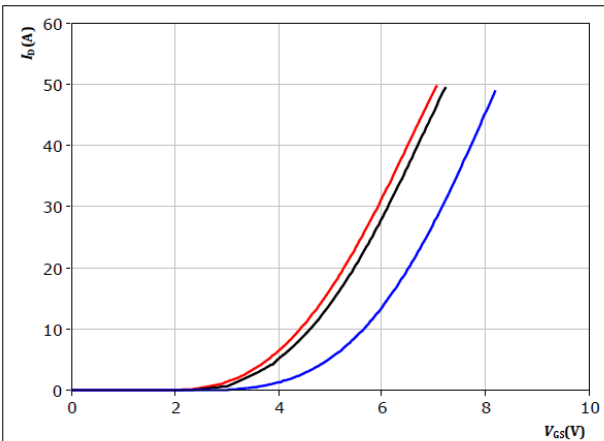


$t_p = 250 \mu s$
 $T_j = 150 \text{ }^\circ\text{C}$
 V_{GS} from 5 V to 15 V in steps of 1 V

figure 9. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

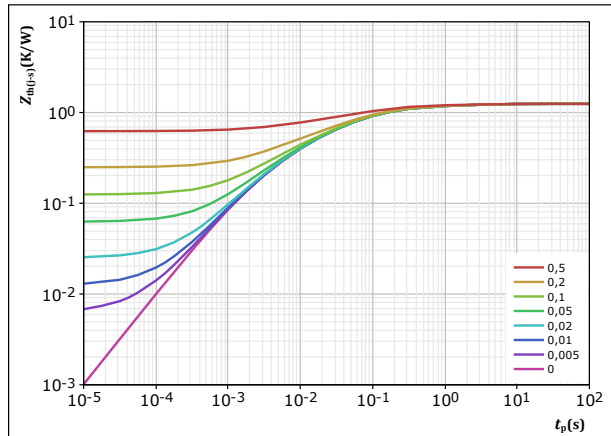


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 10. MOSFET

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,247 \text{ K/W}$
MOSFET thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 6,45E-02 | 3,56E+00 |
| 1,36E-01 | 5,08E-01 |
| 4,22E-01 | 9,62E-02 |
| 3,45E-01 | 2,46E-02 |
| 2,11E-01 | 5,94E-03 |
| 6,79E-02 | 1,44E-03 |

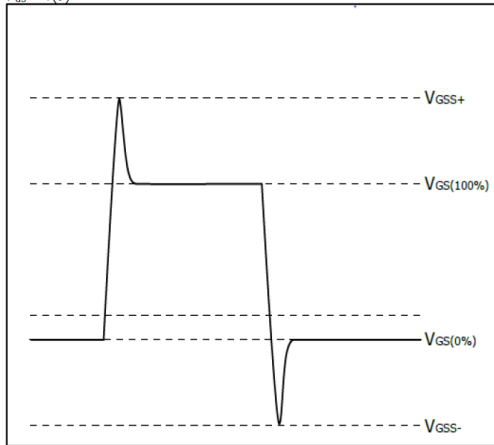


H-Bridge Switch - Hi side Characteristics

figure 11. MOSFET

Gate maximum operating boundaries

$$V_{GS} = f(t)$$



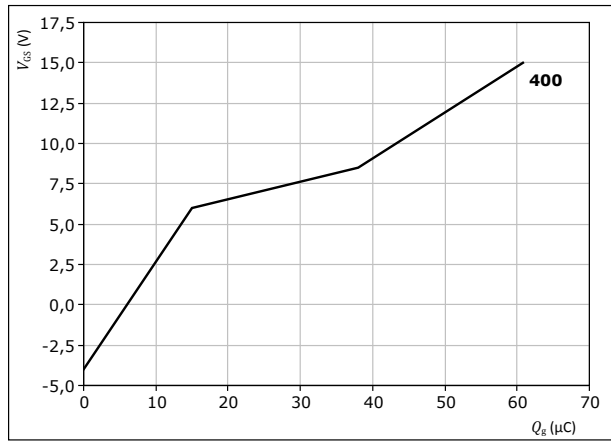
At

| | |
|-------------------|------|
| $V_{GS+} =$ | 19 V |
| $V_{GS(100\%)} =$ | 15 V |
| $V_{GS(0\%)} =$ | -4 V |
| $V_{GS-} =$ | -8 V |

figure 12. MOSFET

Gate voltage vs gate charge

$$V_{GS} = f(Q_g)$$



At

| | | |
|---------|----|---|
| $I_D =$ | 40 | A |
|---------|----|---|

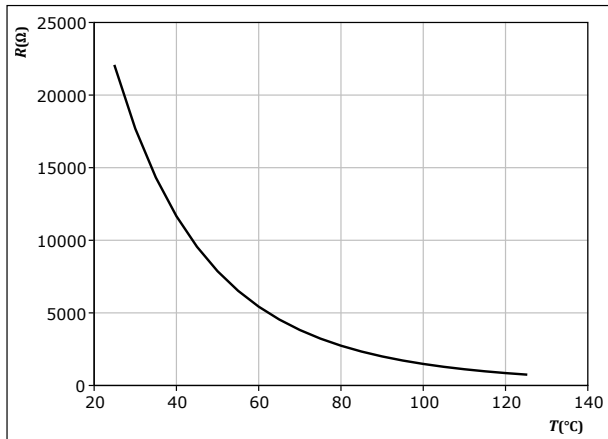


Thermistor Characteristics

figure 13. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

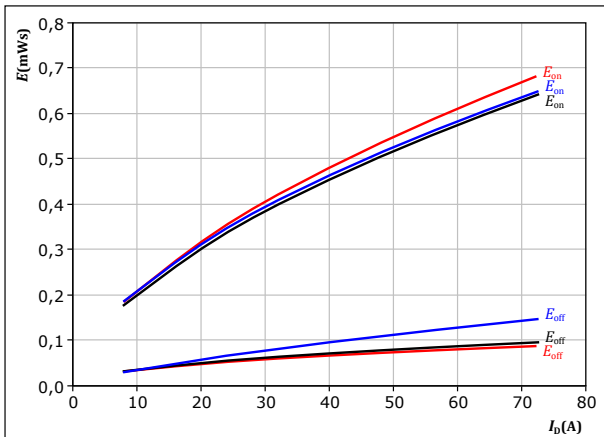




H-Bridge Switching Characteristics - Lo side

figure 14. MOSFET

Typical switching energy losses as a function of drain current
 $E = f(I_D)$

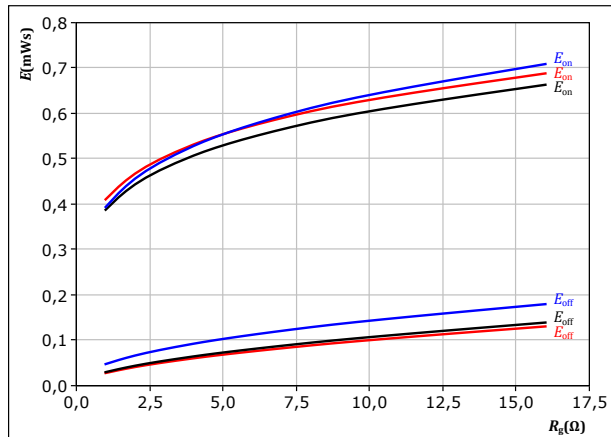


With an inductive load at

| | | | | |
|--------------|-------|----------|--------|--------|
| $V_{DS} =$ | 600 | V | $T_j:$ | 25 °C |
| $V_{GS} =$ | -5/15 | V | | 125 °C |
| $R_{gon} =$ | 4 | Ω | | 150 °C |
| $R_{goff} =$ | 4 | Ω | | |

figure 15. MOSFET

Typical switching energy losses as a function of gate resistor
 $E = f(R_g)$

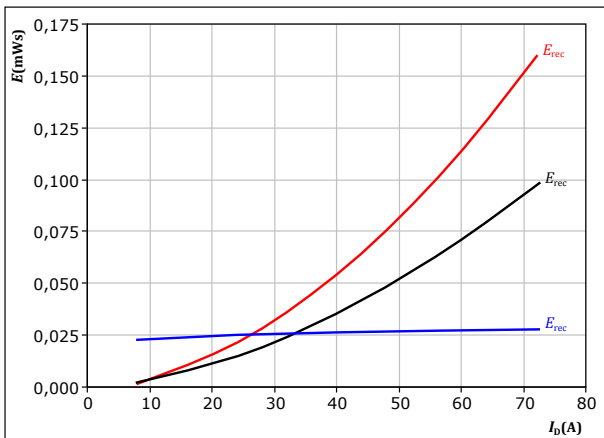


With an inductive load at

| | | | | |
|------------|-------|---|--------|--------|
| $V_{DS} =$ | 600 | V | $T_j:$ | 25 °C |
| $V_{GS} =$ | -5/15 | V | | 125 °C |
| $I_D =$ | 40 | A | | 150 °C |

figure 16. MOSFET

Typical reverse recovered energy loss as a function of drain current
 $E_{rec} = f(I_D)$

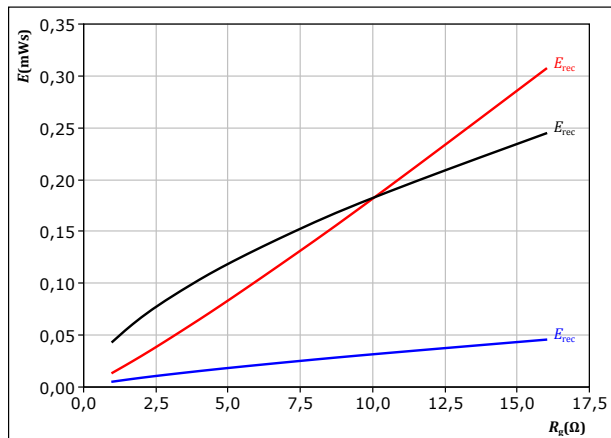


With an inductive load at

| | | | | |
|-------------|-------|----------|--------|--------|
| $V_{DS} =$ | 600 | V | $T_j:$ | 25 °C |
| $V_{GS} =$ | -5/15 | V | | 125 °C |
| $R_{gon} =$ | 4 | Ω | | 150 °C |

figure 17. MOSFET

Typical reverse recovered energy loss as a function of gate resistor
 $E_{rec} = f(R_g)$



With an inductive load at

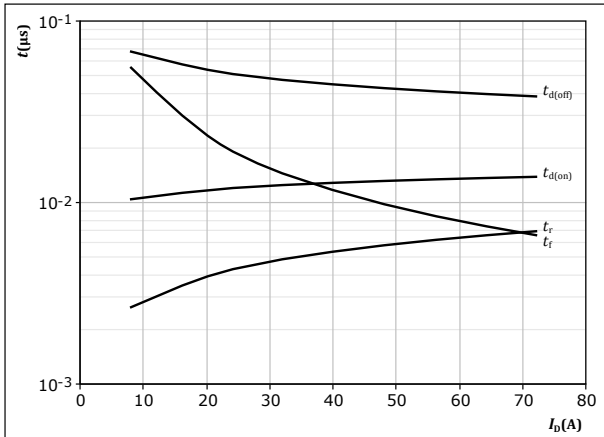
| | | | | |
|------------|-------|---|--------|--------|
| $V_{DS} =$ | 600 | V | $T_j:$ | 25 °C |
| $V_{GS} =$ | -5/15 | V | | 125 °C |
| $I_D =$ | 40 | A | | 150 °C |



H-Bridge Switching Characteristics - Lo side

figure 18. MOSFET

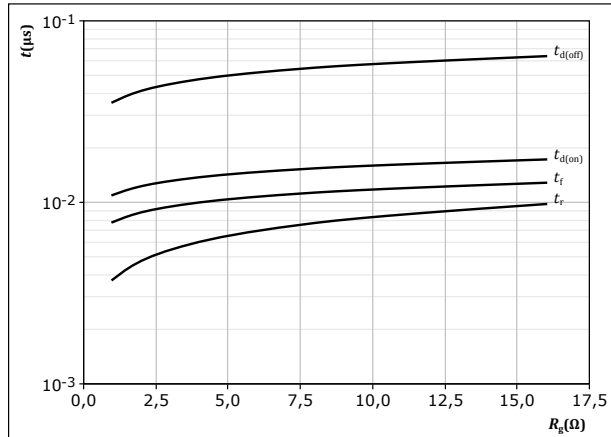
Typical switching times as a function of drain current
 $t = f(I_D)$



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

figure 19. MOSFET

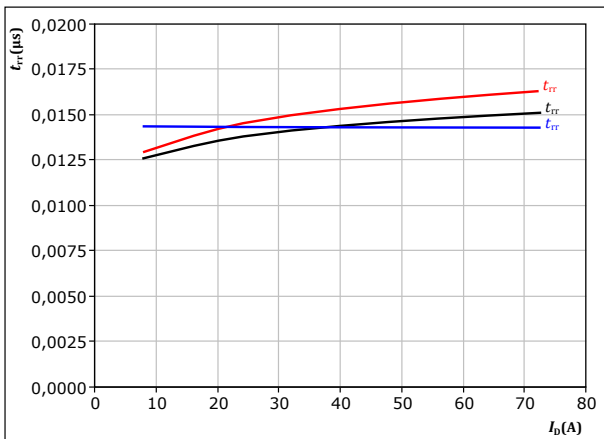
Typical switching times as a function of gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 40 \text{ A}$

figure 20. MOSFET

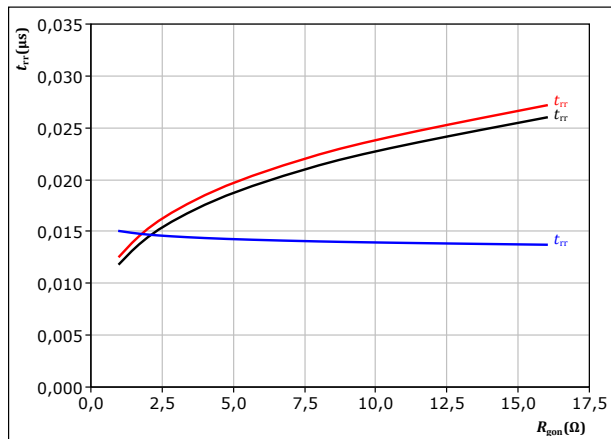
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

figure 21. MOSFET

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



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 40 \text{ A}$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

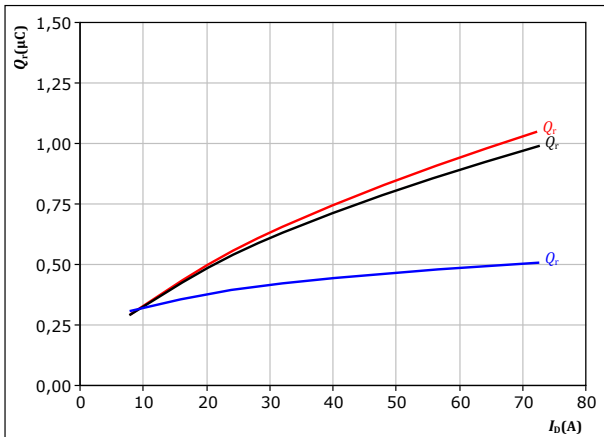


H-Bridge Switching Characteristics - Lo side

figure 22. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



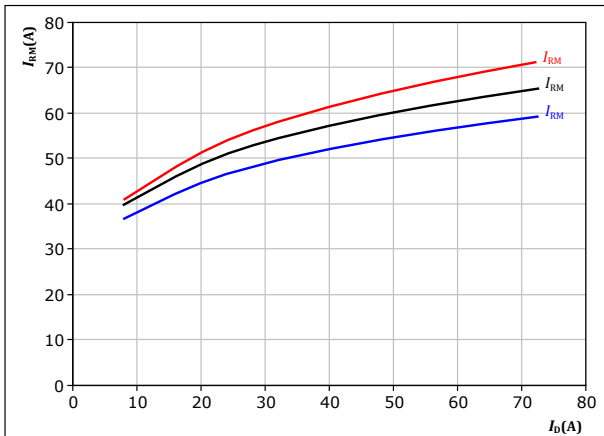
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gon} = 4$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 24. MOSFET

Typical peak reverse recovery current as a function of drain current

$$I_{RM} = f(I_D)$$



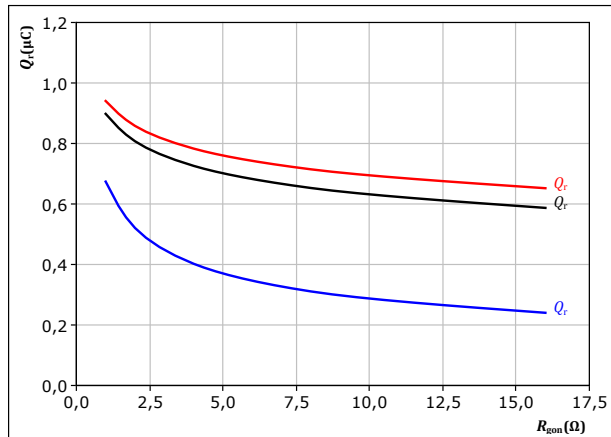
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gon} = 4$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 23. MOSFET

Typical recovered charge as a function of turn on gate resistor

$$Q_r = f(R_{gon})$$



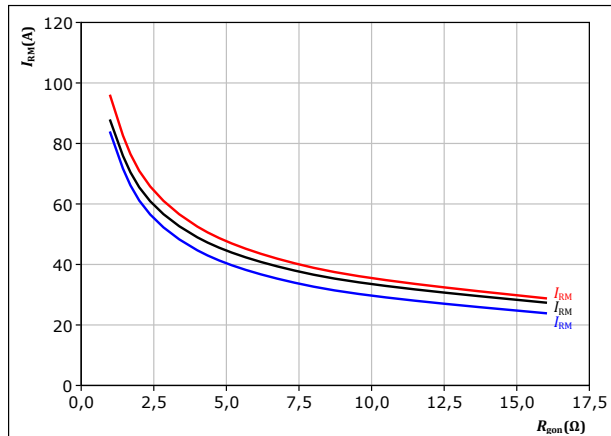
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 25. MOSFET

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

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



At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

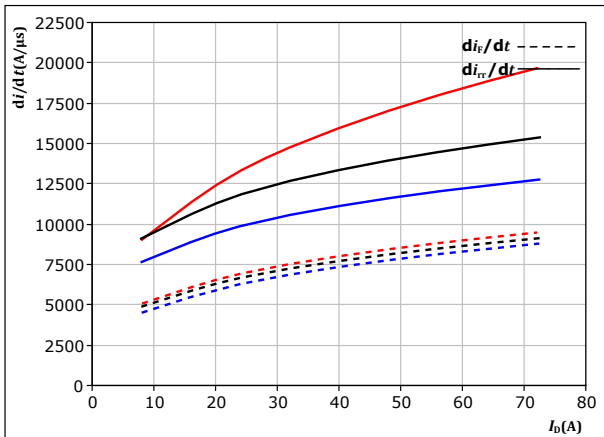
T_j : — 25 °C
 — 125 °C
 — 150 °C



H-Bridge Switching Characteristics - Lo side

figure 26. MOSFET

Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_r/dt = f(I_D)$

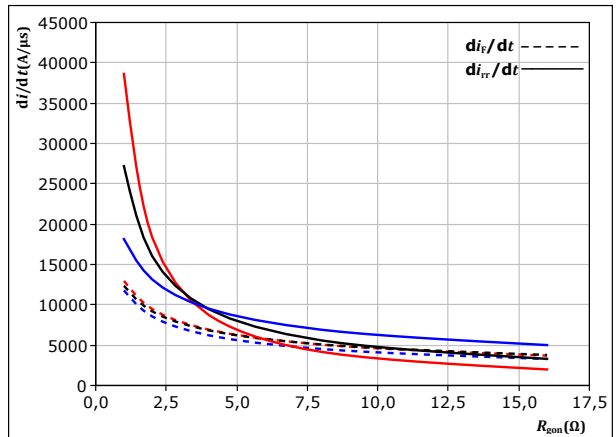


At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{g(on)} = 4$ Ω

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 27. MOSFET

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{g(on)})$



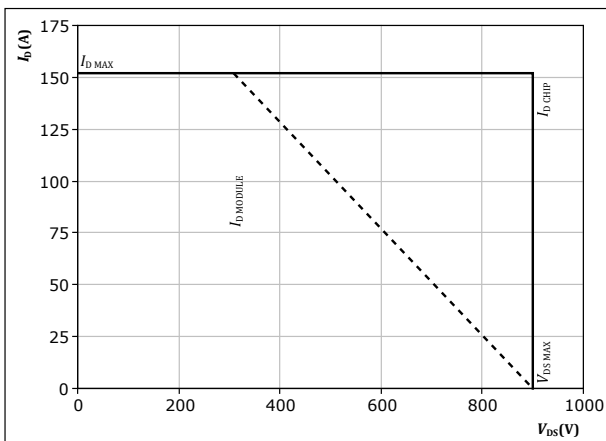
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 28. MOSFET

Reverse bias safe operating area

$I_D = f(V_{DS})$



At $T_j = 150$ °C
 $R_{g(on)} = 4$ Ω
 $R_{g(off)} = 4$ Ω

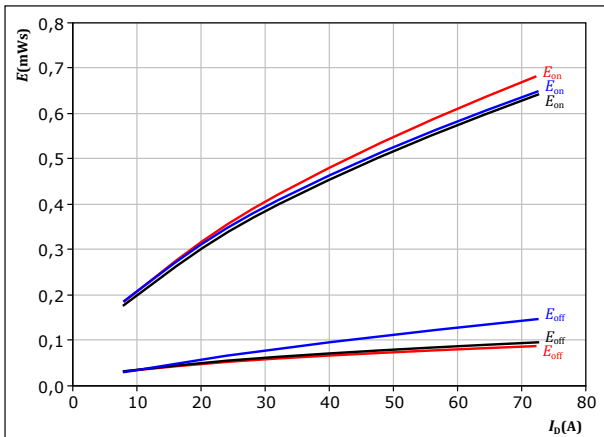


H-Bridge Switching Characteristics - Hi side

figure 29. MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



With an inductive load at

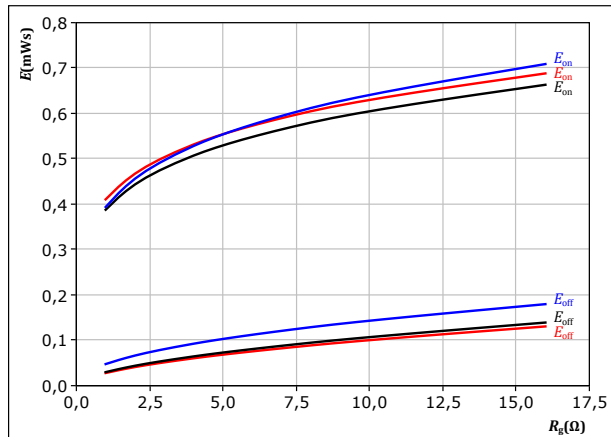
$V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

figure 30. MOSFET

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

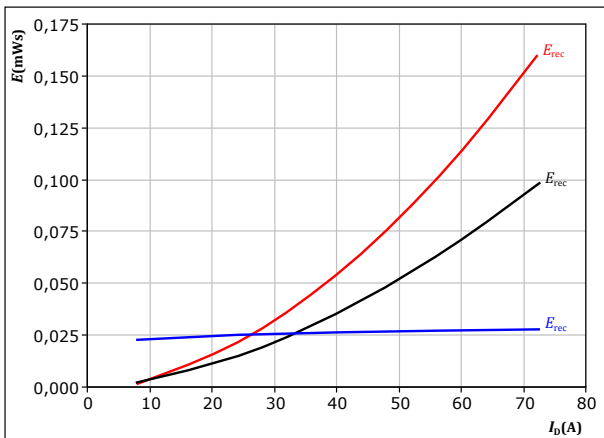
$V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

T_j : — 25 °C
— 125 °C
— 150 °C

figure 31. MOSFET

Typical reverse recovered energy loss as a function of drain current

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



With an inductive load at

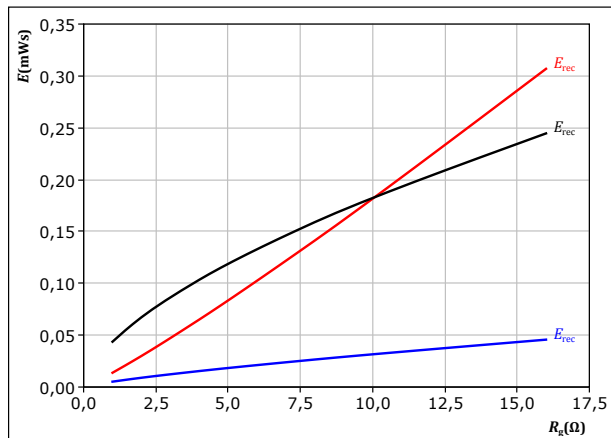
$V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gon} = 4$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

figure 32. MOSFET

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

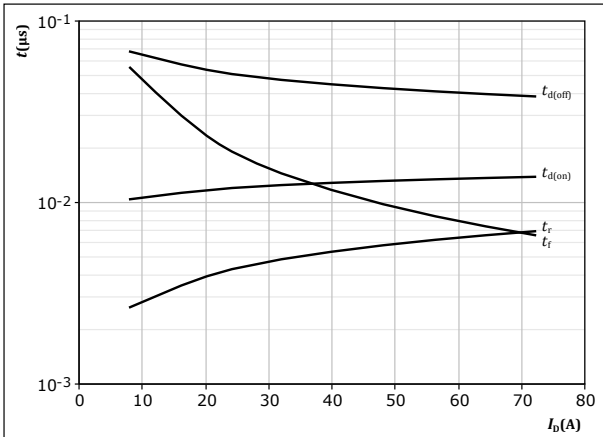
T_j : — 25 °C
— 125 °C
— 150 °C



H-Bridge Switching Characteristics - Hi side

figure 33. MOSFET

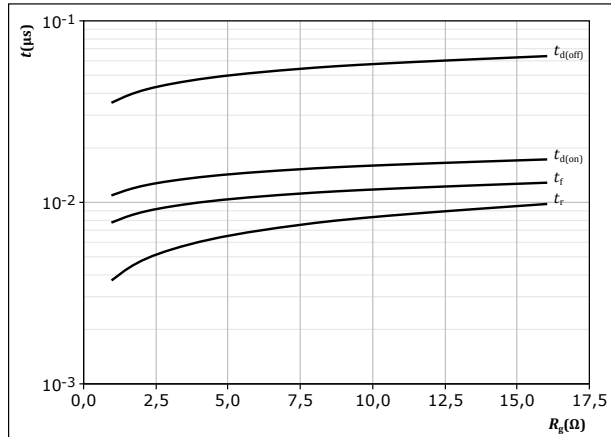
Typical switching times as a function of drain current
 $t = f(I_D)$



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

figure 34. MOSFET

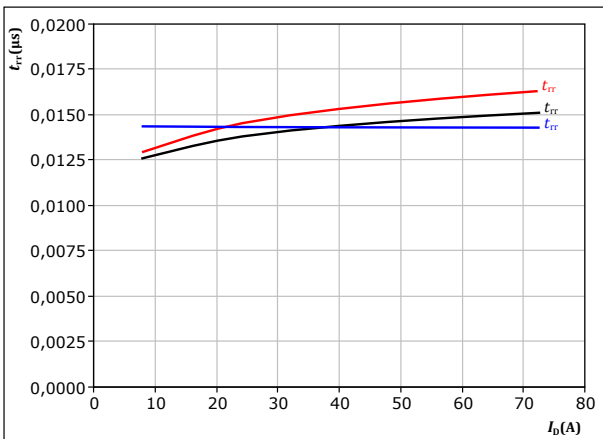
Typical switching times as a function of gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 40 \text{ A}$

figure 35. MOSFET

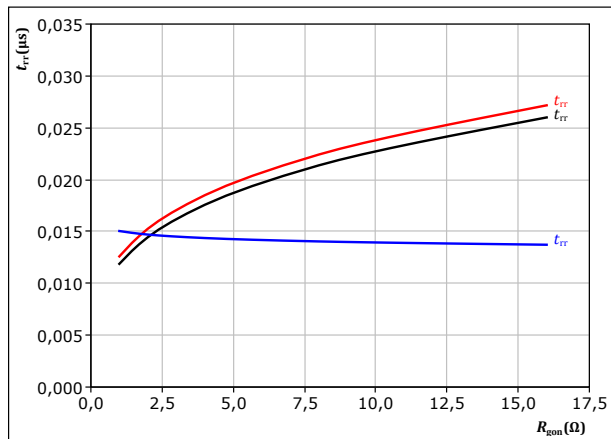
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



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

figure 36. MOSFET

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



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 40 \text{ A}$
 $T_j: 25 \text{ }^\circ\text{C}$
 $125 \text{ }^\circ\text{C}$
 $150 \text{ }^\circ\text{C}$

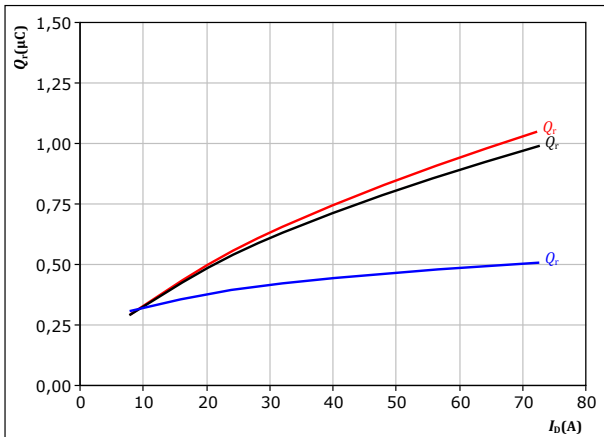


H-Bridge Switching Characteristics - Hi side

figure 37. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



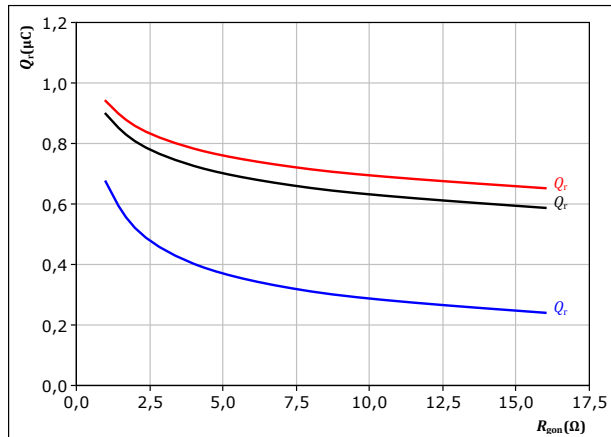
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gon} = 4$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 38. MOSFET

Typical recovered charge as a function of turn on gate resistor

$$Q_r = f(R_{gon})$$



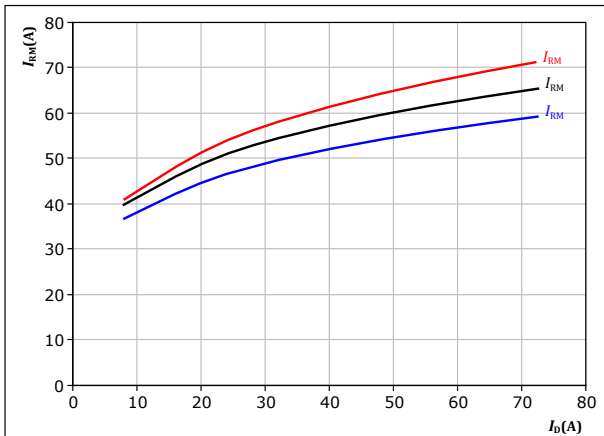
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 39. MOSFET

Typical peak reverse recovery current as a function of drain current

$$I_{RM} = f(I_D)$$



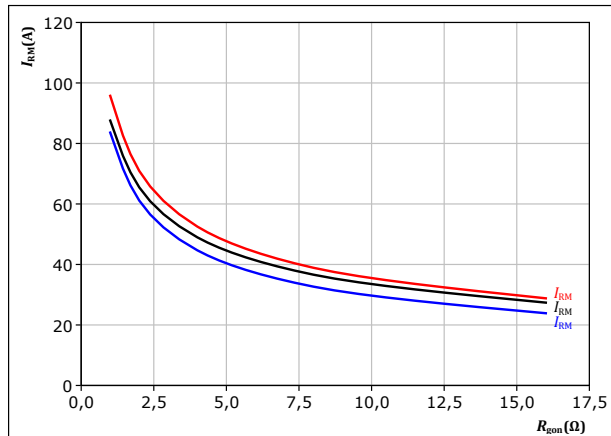
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gon} = 4$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 40. MOSFET

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

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



At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

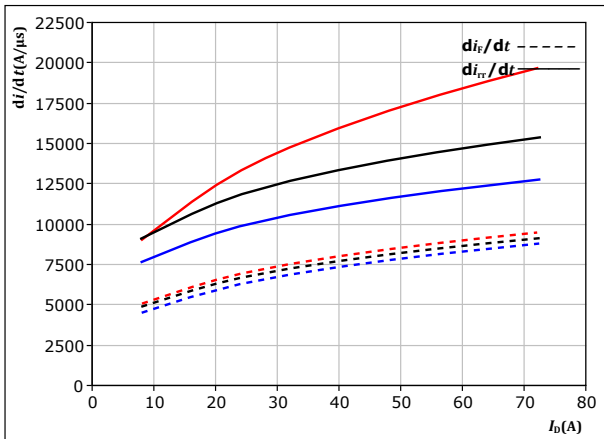
T_j : — 25 °C
 — 125 °C
 — 150 °C



H-Bridge Switching Characteristics - Hi side

figure 41. MOSFET

Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_r/dt = f(I_D)$

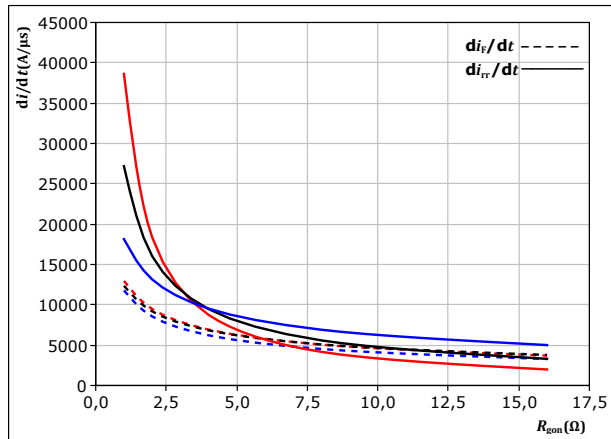


At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{g(on)} = 4$ Ω

T_j : 25 °C
 125 °C
 150 °C

figure 42. MOSFET

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{g(on)})$



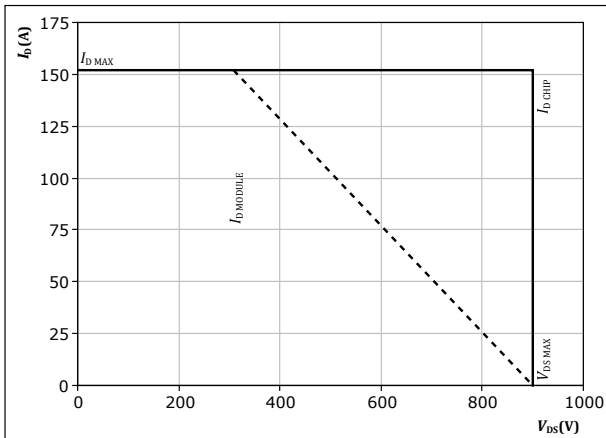
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 40$ A

T_j : 25 °C
 125 °C
 150 °C

figure 43. MOSFET

Reverse bias safe operating area

$I_D = f(V_{DS})$



At $T_j = 150$ °C
 $R_{g(on)} = 4$ Ω
 $R_{g(off)} = 4$ Ω



Switching Definitions

figure 44. MOSFET

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

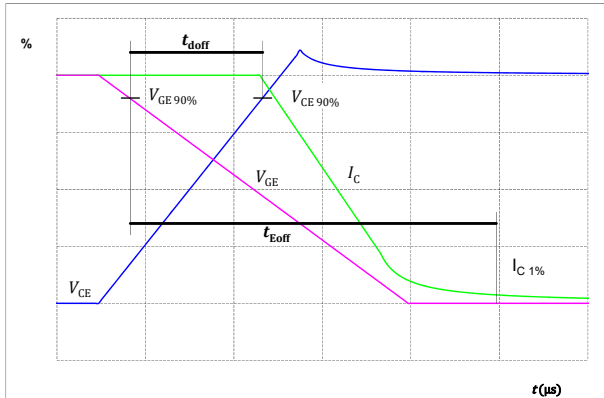


figure 45. MOSFET

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

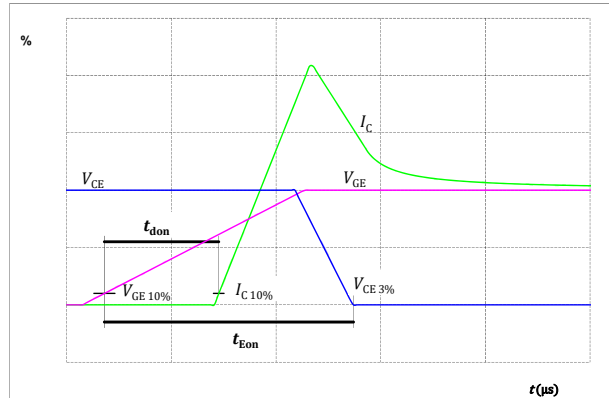


figure 46. MOSFET

Turn-off Switching Waveforms & definition of t_f

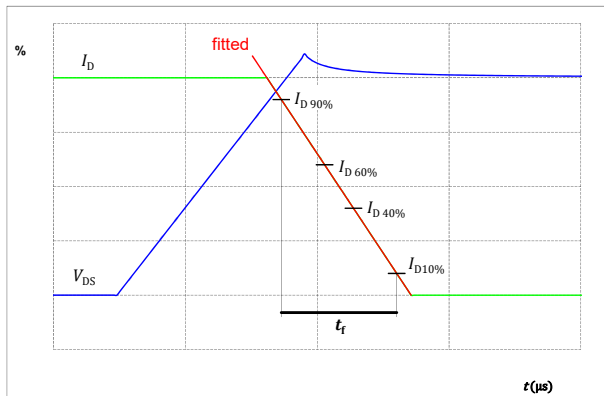
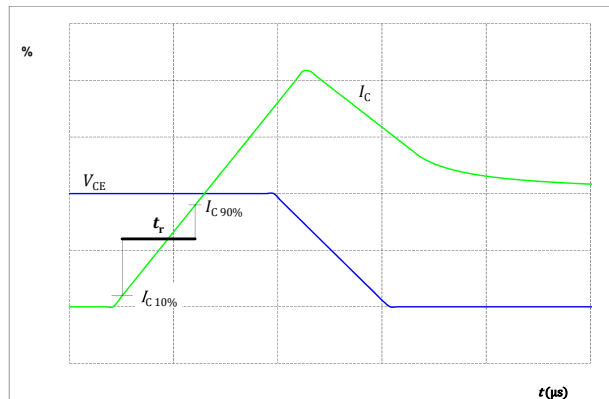


figure 47. MOSFET

Turn-on Switching Waveforms & definition of t_r





Switching Definitions

figure 48. FWD

Turn-off Switching Waveforms & definition of t_{tr}

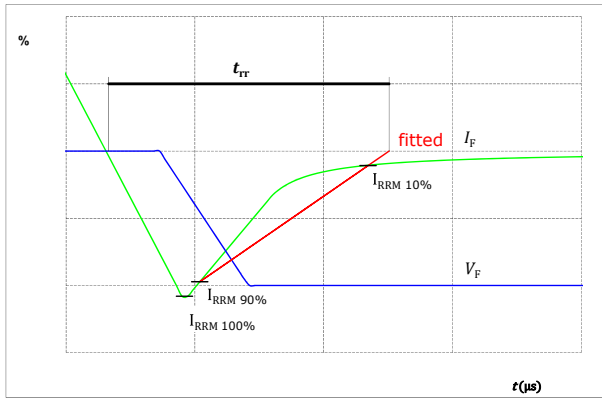


figure 49. FWD

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

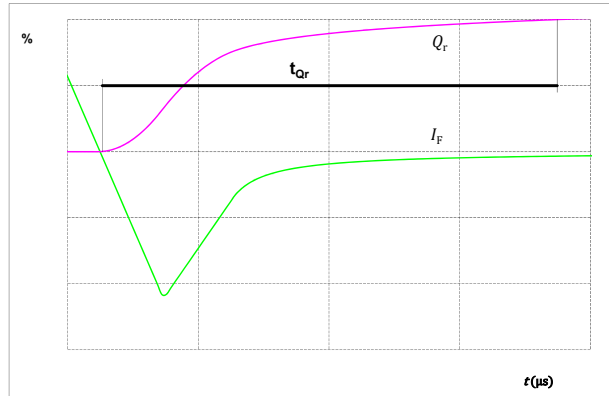
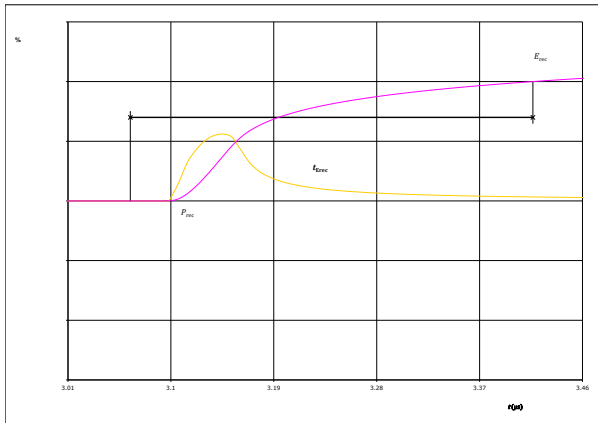


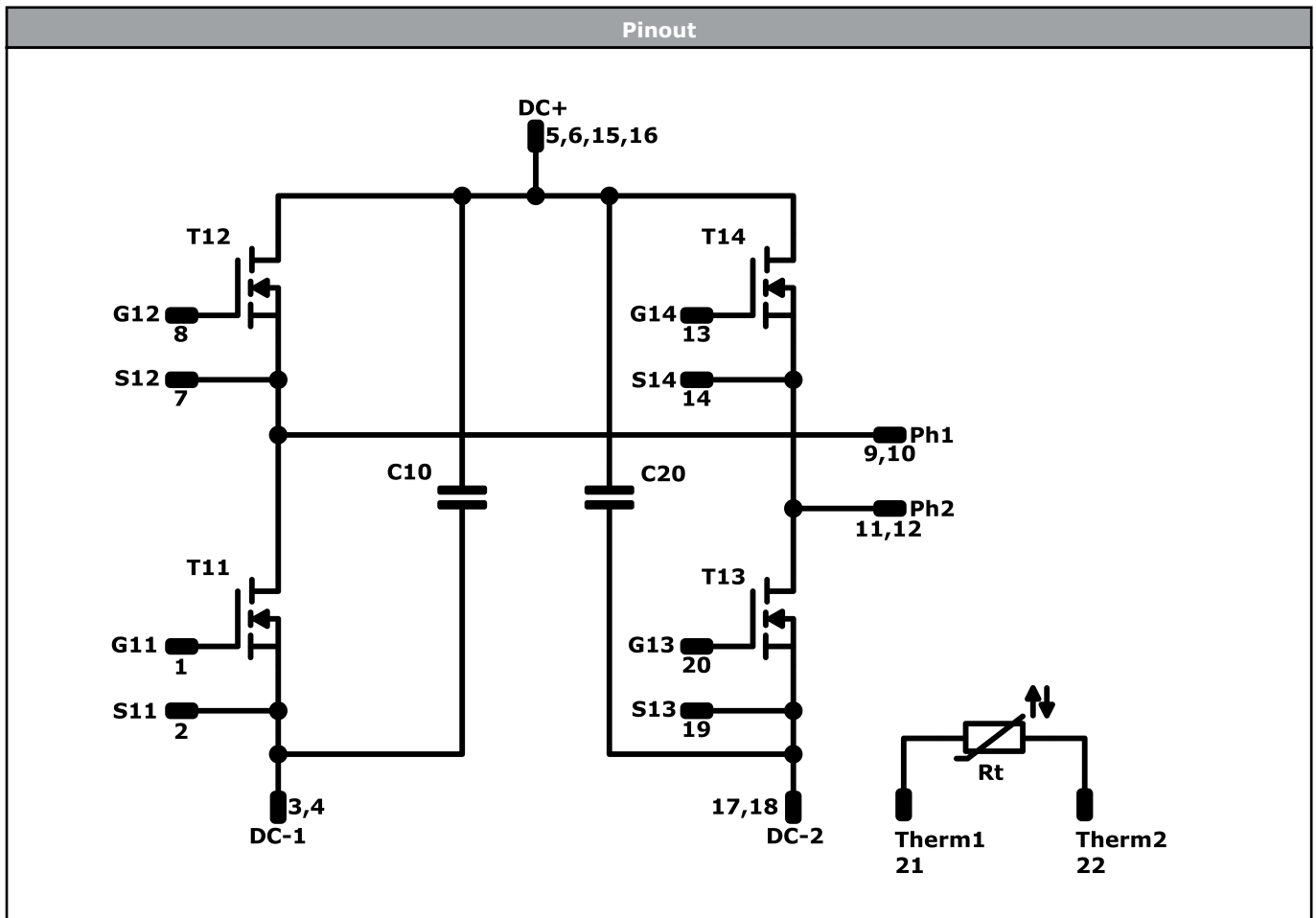
figure 50. FWD

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





Vincotech




| Identification | | | | | |
|----------------|-----------|---------|---------|---------------------------|---------|
| ID | Component | Voltage | Current | Function | Comment |
| T11, T13 | MOSFET | 900 V | 32,5 mΩ | H-Bridge Switch - Lo side | |
| T12, T14 | MOSFET | 900 V | 32,5 mΩ | H-Bridge Switch - Hi side | |
| C10, C20 | Capacitor | 1000 V | | Capacitor (DC) | |
| Rt | NTC | | | Thermistor | |



| Packaging instruction | | | | |
|---------------------------------------|------|----------|------|--------|
| Standard packaging quantity (SPQ) 135 | >SPQ | Standard | <SPQ | Sample |

| Handling instruction |
|---|
| Handling instructions for <i>flow 0</i> packages see vincotech.com website. |

| Package data |
|--|
| Package data for <i>flow 0</i> 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-PC094PB035ME02-L629F36Y-D2-14 | 11 Feb. 2020 | Correct output characteristic of H-bridge switch | |

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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.