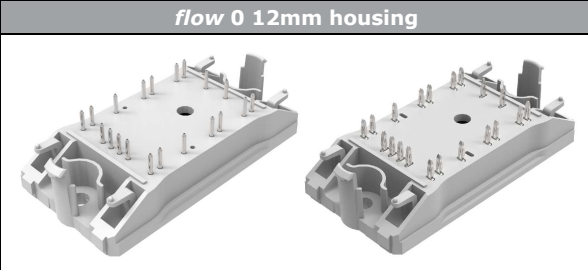
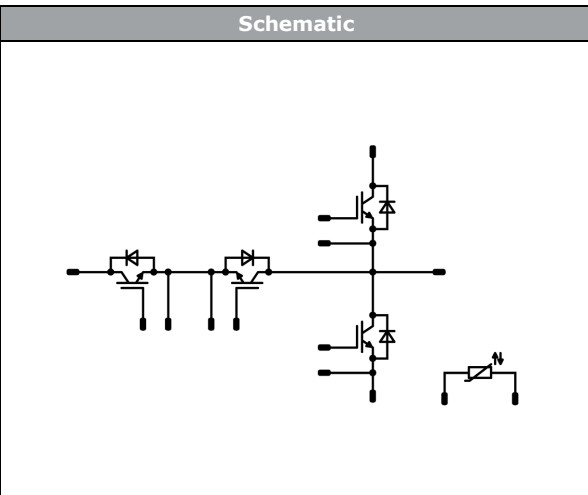




<i>flowMNPC 0</i>	<b>1200 V / 80 A</b>
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Features</b></p> <ul style="list-style-type: none"> <li>Three-level MNPC (T-Type)</li> <li>Reactive power capability</li> <li>Low inductance layout</li> <li>Improved LVRT</li> </ul> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Target applications</b></p> <ul style="list-style-type: none"> <li>Industrial Drives</li> <li>Solar Inverters</li> <li>UPS</li> </ul> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Types</b></p> <ul style="list-style-type: none"> <li>10-FZ12NMA080SH04-M260F13</li> <li>10-PZ12NMA080SH04-M260F13Y</li> </ul> </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><i>flow 0 12mm housing</i></p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Schematic</b></p>  </div>

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Buck Switch</b>				
Collector-emitter voltage	$V_{CES}$		1200	V
Collector current	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	76	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	240	A
Turn off safe operating area		$T_j \leq 175\text{ °C}$ , $V_{CE} \leq 1200\text{ V}$	320	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	186	W
Gate-emitter voltage	$V_{GES}$		±20	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ $V_{ce} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	µs
Maximum junction temperature	$T_{jmax}$		175	°C



Vincotech

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Buck Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		650	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	55	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	150	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	71	W
Maximum junction temperature	$T_{jmax}$		175	°C
<b>Boost Switch</b>				
Collector-emitter voltage	$V_{CES}$		650	V
Collector current	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	58	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	225	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	101	W
Gate-emitter voltage	$V_{GES}$		±20	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ $V_{CE} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	µs
Maximum junction temperature	$T_{jmax}$		175	°C
<b>Boost Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	53	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	100	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	90	W
Maximum junction temperature	$T_{jmax}$		175	°C



Vincotech

**10-FZ12NMA080SH04-M260F13**  
**10-PZ12NMA080SH04-M260F13Y**  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
-----------	--------	-----------	-------	------

### Module Properties

#### Thermal Properties

Storage temperature	$T_{stg}$		-40...+125	°C
Operation temperature under switching condition	$T_{top}$		-40...(T <sub>max</sub> - 25)	°C

#### Isolation Properties

Isolation voltage	$V_{isol}$	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance		Solder pin / Press-fit pin	9,15 / 8,95	mm
Comparative Tracking Index	CTI		> 200	

\*100 % tested in production



## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	

### Buck Switch

#### Static

Parameter	Symbol	Conditions	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$				0,003	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CEsat}$		15			80	25 125 150	1,78	1,99 2,33 2,41	2,42	V
Collector-emitter cut-off current	$I_{CES}$		0	1200			25			10	μA
Gate-emitter leakage current	$I_{GES}$		20	0			25			240	nA
Internal gate resistance	$r_g$								none		Ω
Input capacitance	$C_{ies}$								4660		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25			300		
Reverse transfer capacitance	$C_{res}$								260		
Gate charge	$Q_g$		15	960	80		25		370		nC

#### Thermal

Parameter	Symbol	Conditions	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)							0,51		K/W

#### Dynamic

Parameter	Symbol	Conditions	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	±15	350	50	25 125	25		77		ns
Rise time	$t_r$								11		
Turn-off delay time	$t_{d(off)}$								180		
Fall time	$t_f$								242		
Turn-on energy (per pulse)	$E_{on}$								48		
Turn-off energy (per pulse)	$E_{off}$								76		
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 2,1$ μC $Q_{tFWD} = 3,8$ μC			25 125	25		0,524 0,980		mWs	
Turn-off energy (per pulse)	$E_{off}$				25 125	25		1,31 2,28		mWs	



## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max		

### Buck Diode

#### Static

Parameter	Symbol	$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Forward voltage	$V_F$			75	25 125 150		1,53 1,49 1,47	1,92	V
Reverse leakage current	$I_R$		650		25			3,8	$\mu$ A

#### Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	1,34	K/W

#### Dynamic

Parameter	Symbol	$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Peak recovery current	$I_{RRM}$				25 125		63 73		A
Reverse recovery time	$t_{rr}$				25 125		52 92		ns
Recovered charge	$Q_r$	$di/dt = 5245$ A/ $\mu$ s $di/dt = 3680$ A/ $\mu$ s	$\pm 15$	350	50	25 125	2,06 3,80		$\mu$ C
Reverse recovered energy	$E_{rec}$				25 125		0,473 0,845		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 125		1198 852		A/ $\mu$ s



## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	

### Boost Switch

#### Static

Parameter	Symbol	Conditions	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$				0,0012	25	5,1	5,8	6,4	V
Collector-emitter saturation voltage	$V_{CEsat}$		15			75	25 125 150	0,93	1,46 1,55 1,76	1,77	V
Collector-emitter cut-off current	$I_{CES}$		0	650			25			3,8	µA
Gate-emitter leakage current	$I_{GES}$		20	0			25			600	nA
Internal gate resistance	$r_g$								none		Ω
Input capacitance	$C_{ies}$								4620		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25			288		
Reverse transfer capacitance	$C_{res}$								137		
Gate charge	$Q_g$		15	480	75		25		470		nC

#### Thermal

Parameter	Symbol	Conditions	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)							0,94		K/W

#### Dynamic

Parameter	Symbol	Conditions	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit		
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	±15	350	56		25 125		84		ns		
Rise time	$t_r$								11				
Turn-off delay time	$t_{d(off)}$								177				
Fall time	$t_f$								205				
Turn-on energy (per pulse)	$E_{on}$							$Q_{tFWD} = 5,3$ µC		0,528			mWs
Turn-off energy (per pulse)	$E_{off}$							$Q_{tFWD} = 8,2$ µC		0,747			



Vincotech

**10-FZ12NMA080SH04-M260F13**  
**10-PZ12NMA080SH04-M260F13Y**  
 datasheet

## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max		

### Boost Diode

#### Static

Parameter	Symbol	$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Forward voltage	$V_F$			50	25 125 150		1,73 1,70 1,68	2,05	V
Reverse leakage current	$I_R$		1200		25			10	μA

#### Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	1,06	K/W

#### Dynamic

Parameter	Symbol	$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Peak recovery current	$I_{RRM}$				25 125		106 118		A
Reverse recovery time	$t_{rr}$				25 125		102 148		ns
Recovered charge	$Q_r$	$di/dt = 6090$ A/μs $di/dt = 5325$ A/μs	±15	350	56	25 125	5,32 8,22		μC
Reverse recovered energy	$E_{rec}$				25 125		1,55 2,42		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 125		6904 4951		A/μs

### Thermistor

Parameter	Symbol	Conditions	Value	Unit
Rated resistance	$R$		25	kΩ
Deviation of $R_{100}$	$\Delta_{R/R}$	$R_{100} = 1486$ Ω	100	-12 +14
Power dissipation	$P$		25	200
Power dissipation constant			25	2
B-value	$B_{(25/50)}$	Tol. ±3%	25	3950
B-value	$B_{(25/100)}$	Tol. ±3%	25	3998
Vincotech NTC Reference				B

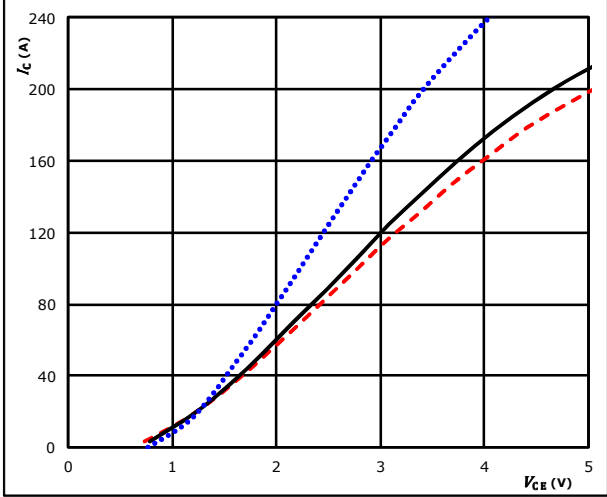


## Buck Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

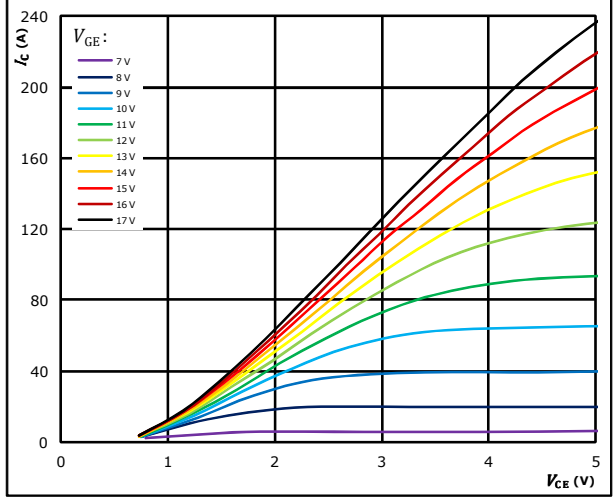


$t_p = 250 \mu s$   $T_j: 25 \text{ }^\circ C$  (blue dotted line)  
 $V_{GE} = 15 \text{ V}$   $T_j: 125 \text{ }^\circ C$  (black solid line)  
 $T_j: 150 \text{ }^\circ C$  (red dashed line)

**figure 2.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

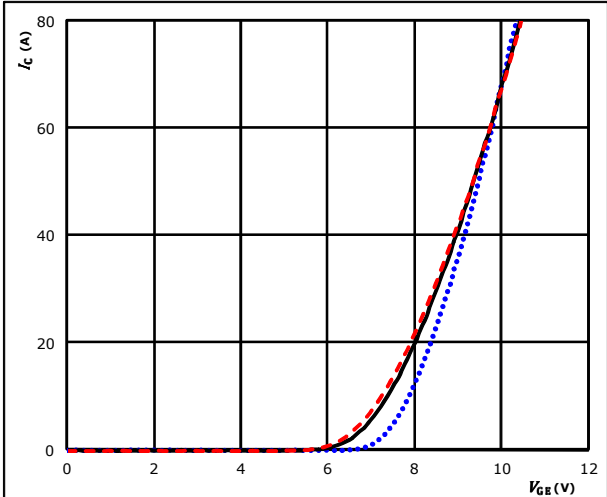


$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

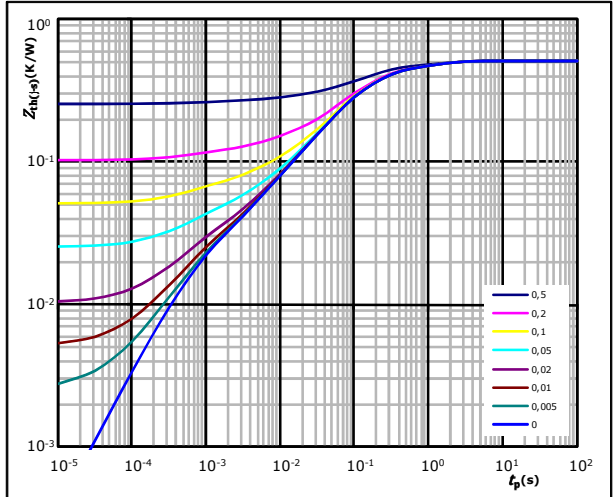


$t_p = 100 \mu s$   $T_j: 25 \text{ }^\circ C$  (blue dotted line)  
 $V_{CE} = 10 \text{ V}$   $T_j: 125 \text{ }^\circ C$  (black solid line)  
 $T_j: 150 \text{ }^\circ C$  (red dashed line)

**figure 4.** IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,51 \text{ K/W}$

IGBT thermal model values

R (K/W)	$\tau$ (s)
9,51E-02	1,03E+00
1,84E-01	1,62E-01
1,81E-01	6,24E-02
3,37E-02	7,02E-03
1,79E-02	6,34E-04

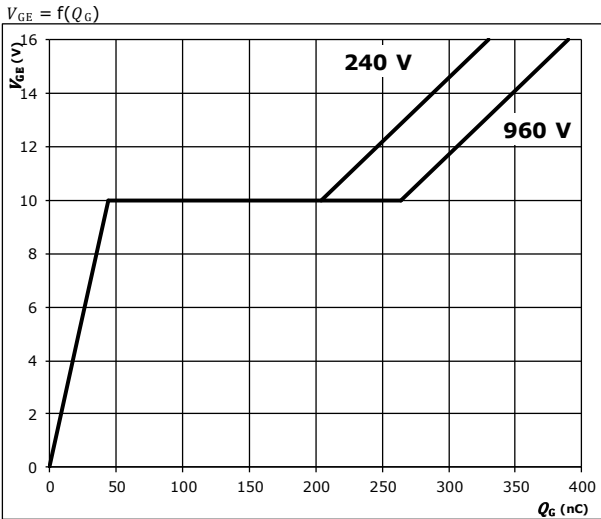




## Buck Switch Characteristics

**figure 5.** IGBT

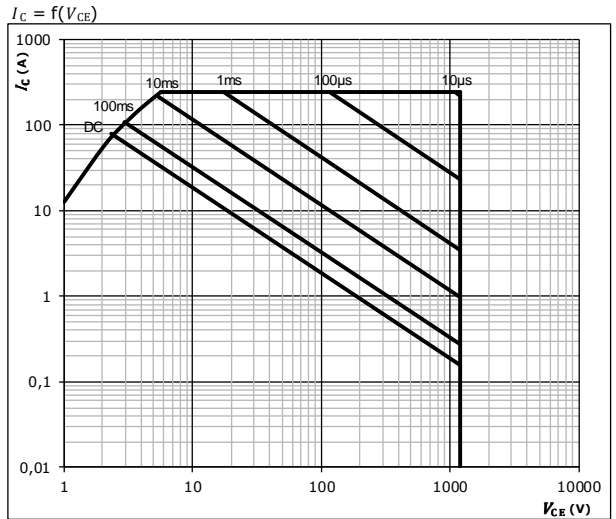
Gate voltage vs gate charge



$I_C = 80$  A

**figure 6.** IGBT

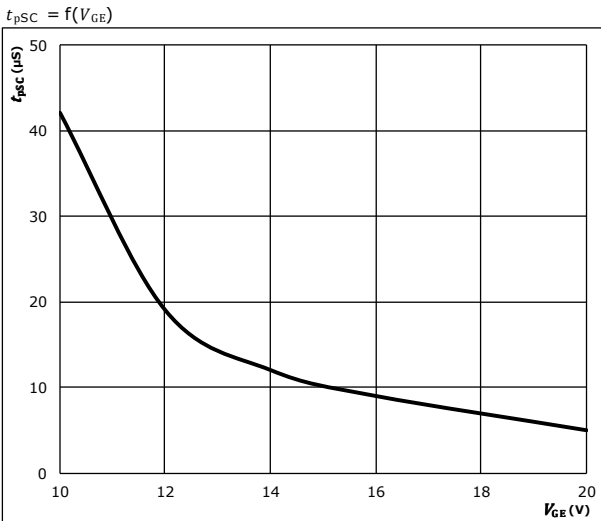
Safe operating area



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

**figure 7.** IGBT

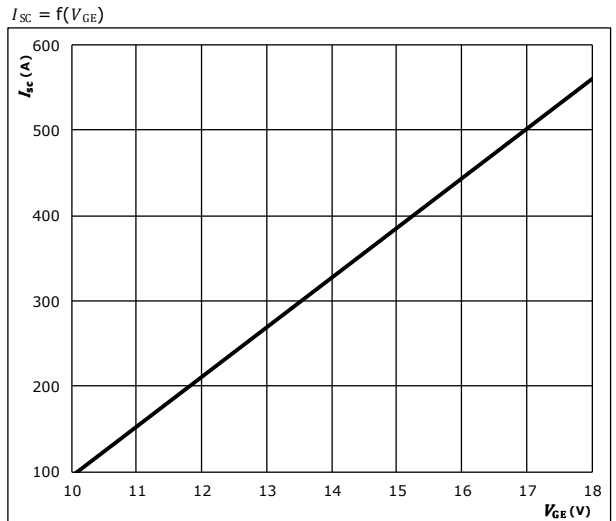
Short circuit duration as a function of  $V_{GE}$



$V_{CE} = 600$  V  
 $T_j \leq 150$  °C

**figure 8.** IGBT

Typical short circuit current as a function of  $V_{GE}$



$V_{CE} \leq 600$  V  
 $T_j \leq 25$  °C

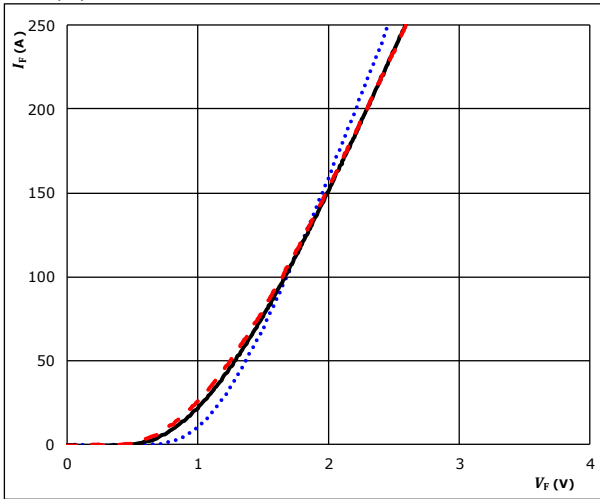


## Buck Diode Characteristics

**figure 1.** FWD

Typical forward characteristics

$$I_F = f(V_F)$$

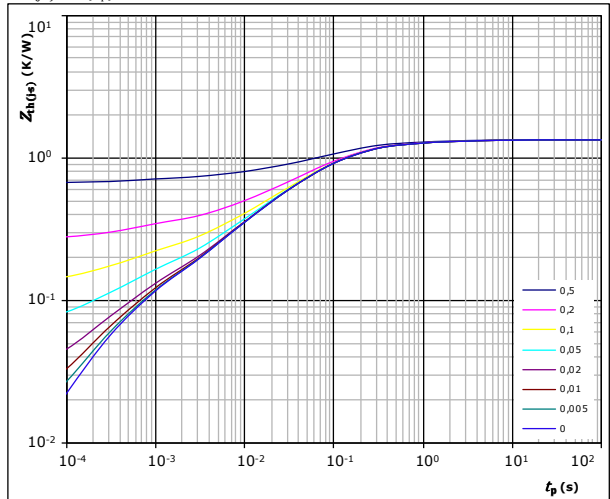


$t_p = 250 \mu s$   
 $T_j$ : 25 °C .....  
 125 °C ———  
 150 °C - - - -

**figure 2.** FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,34 \text{ K/W}$

FWD thermal model values

$R$ (K/W)	$\tau$ (s)
5,84E-02	3,64E+00
1,57E-01	5,25E-01
5,86E-01	1,06E-01
3,27E-01	2,57E-02
1,27E-01	4,84E-03
8,12E-02	4,11E-04

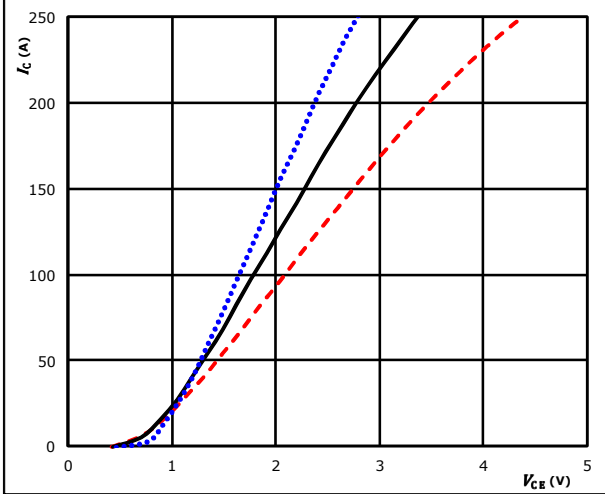


### Boost Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

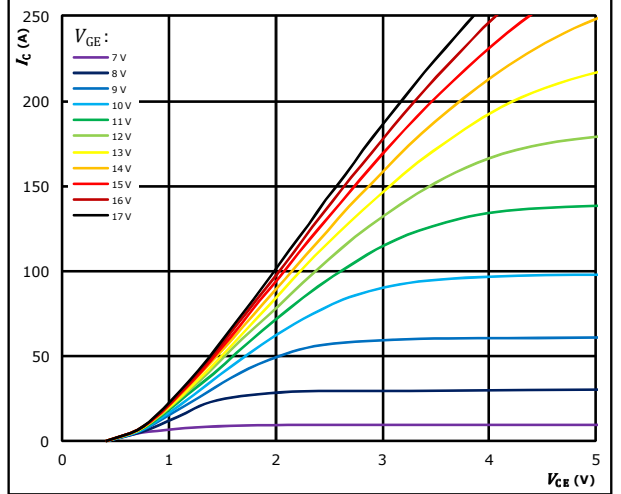


$t_p = 250 \mu s$   $T_j: 25 \text{ }^\circ C$  .....  
 $V_{GE} = 15 \text{ V}$   $T_j: 125 \text{ }^\circ C$  ———  
 $T_j: 150 \text{ }^\circ C$  - - - - -

**figure 2.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

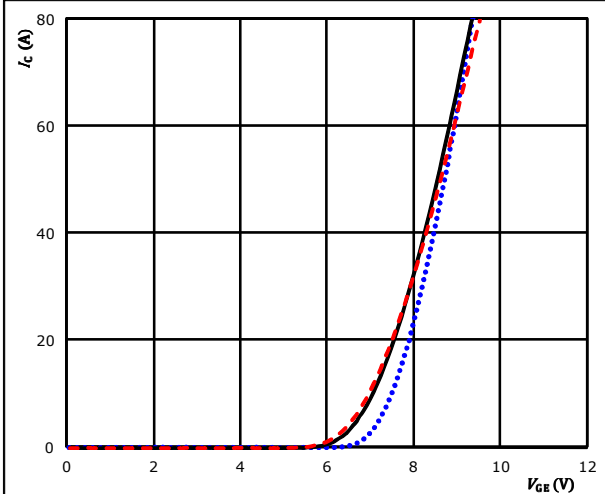


$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

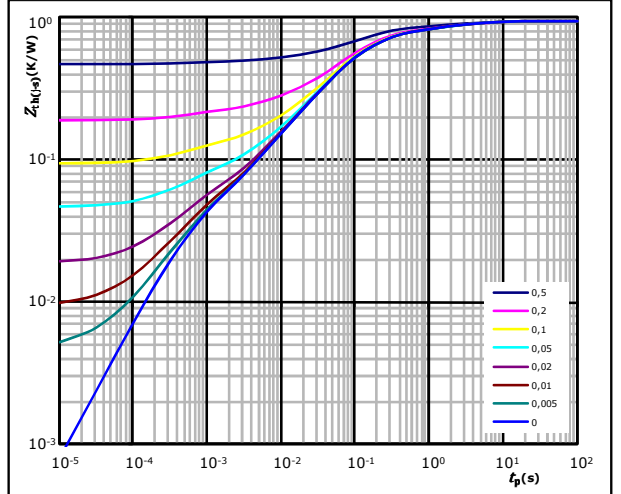


$t_p = 100 \mu s$   $T_j: 25 \text{ }^\circ C$  .....  
 $V_{CE} = 10 \text{ V}$   $T_j: 125 \text{ }^\circ C$  ———  
 $T_j: 150 \text{ }^\circ C$  - - - - -

**figure 4.** IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,94 \text{ K/W}$

IGBT thermal model values

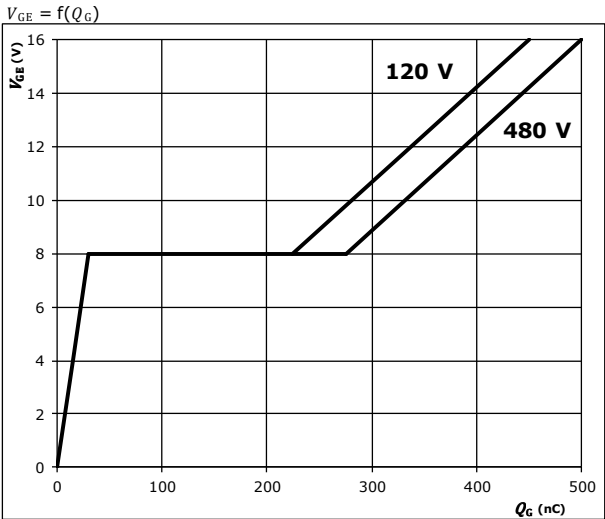
R (K/W)	$\tau$ (s)
8,02E-02	4,50E+00
1,26E-01	1,07E+00
3,43E-01	1,53E-01
2,97E-01	5,33E-02
6,50E-02	7,48E-03
3,26E-02	5,38E-04



### Boost Switch Characteristics

**figure 5.** IGBT

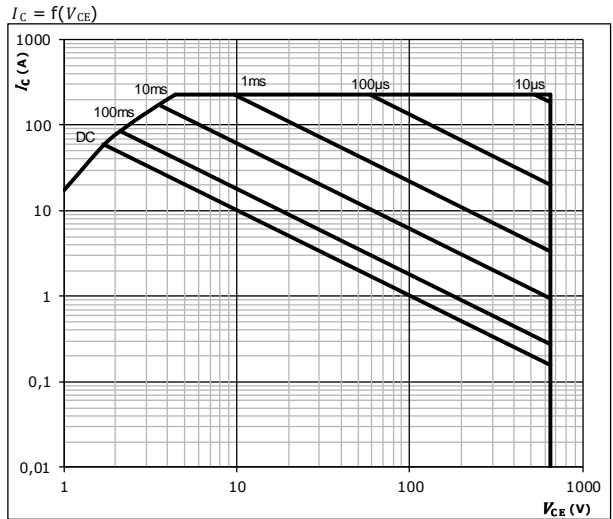
Gate voltage vs gate charge



$I_C = 75$  A

**figure 6.** IGBT

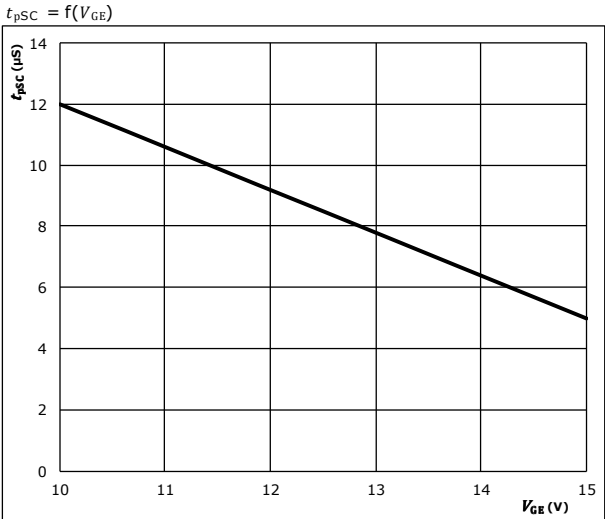
Safe operating area



$I_C = f(V_{CE})$   
 $D =$  single pulse  
 $T_s = 80$  °C  
 $V_{GE} = \pm 15$  V  
 $T_j = T_{jmax}$  °C

**figure 7.** IGBT

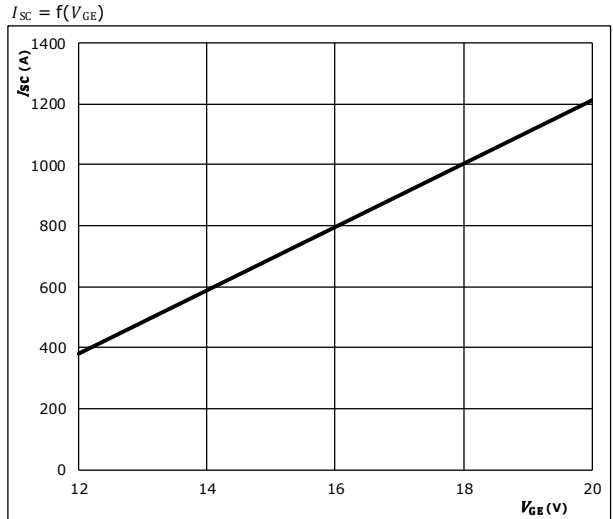
Short circuit duration as a function of  $V_{GE}$



$V_{CE} = 400$  V  
 $T_j \leq 150$  °C

**figure 8.** IGBT

Typical short circuit current as a function of  $V_{CE}$



$V_{CE} \leq 400$  V  
 $T_j \leq 150$  °C

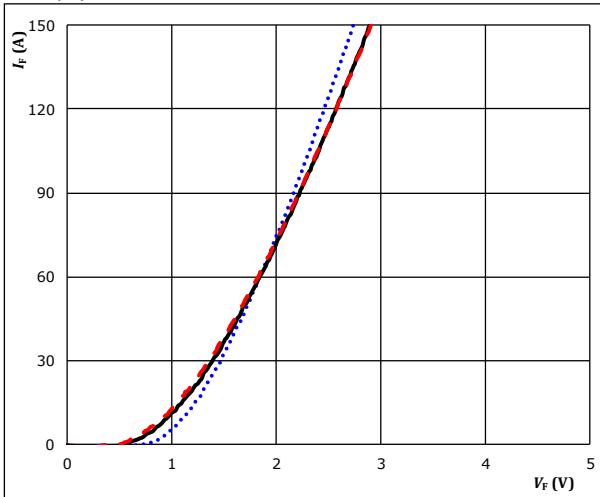


## Boost Diode Characteristics

**figure 1.** FWD

Typical forward characteristics

$$I_F = f(V_F)$$

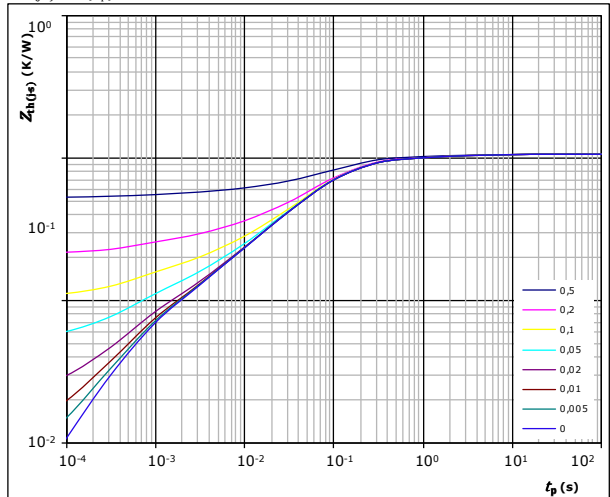


$t_p = 250 \mu s$   
 $T_j$ : 25 °C .....  
 125 °C ———  
 150 °C - - - -

**figure 2.** FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(\theta-s)} = 1,06 \text{ K/W}$   
 FWD thermal model values

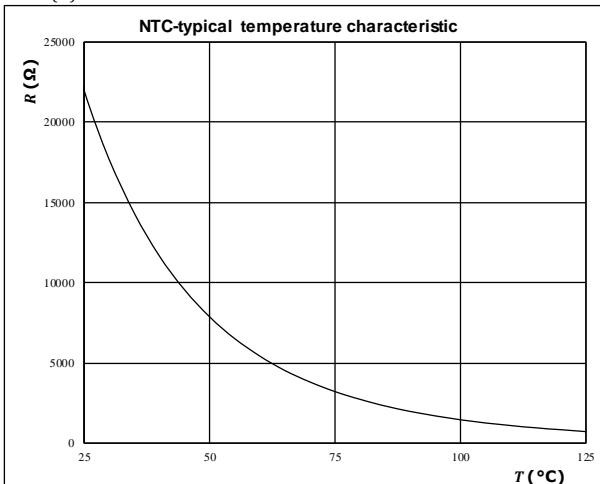
$R \text{ (K/W)}$	$\tau \text{ (s)}$
4,19E-02	4,68E+00
8,50E-02	8,80E-01
4,99E-01	1,21E-01
2,83E-01	4,12E-02
9,28E-02	6,53E-03
5,92E-02	6,76E-04

## Thermistor Characteristics

**figure 1.** Thermistor

Typical NTC characteristic as a function of temperature

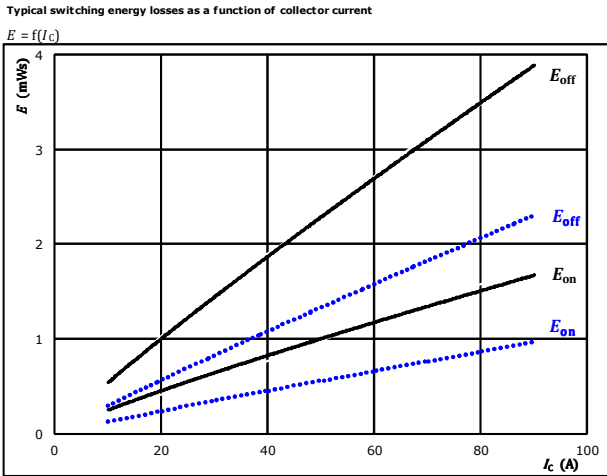
$$R = f(T)$$





## Buck Switching Characteristics

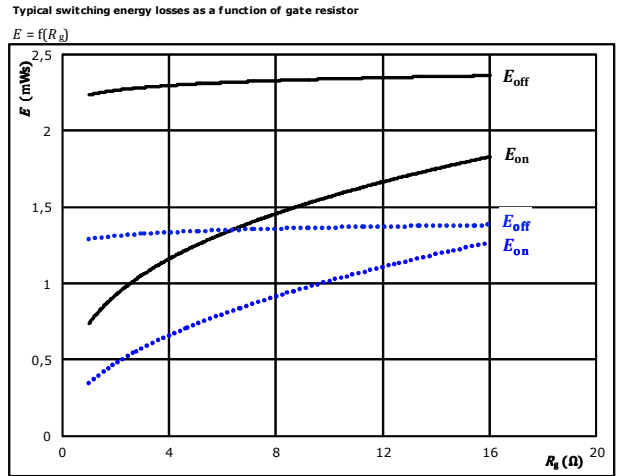
**figure 1.** IGBT



With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$

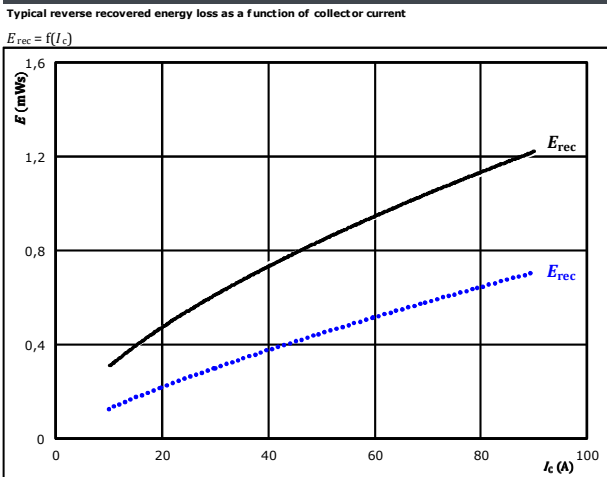
**figure 2.** IGBT



With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 50$  A

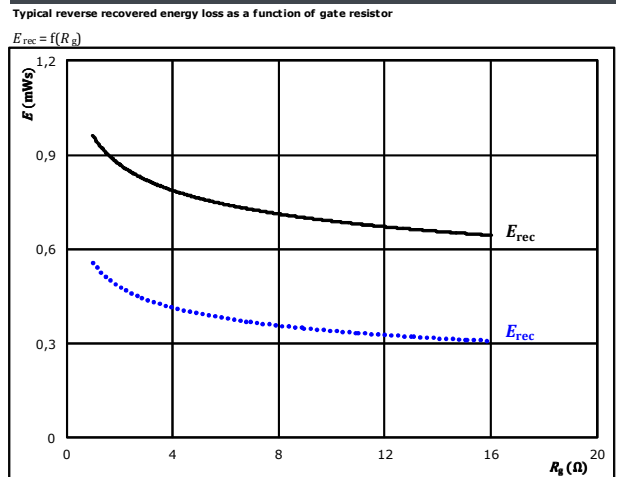
**figure 3.** FWD



With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

**figure 4.** FWD



With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 50$  A



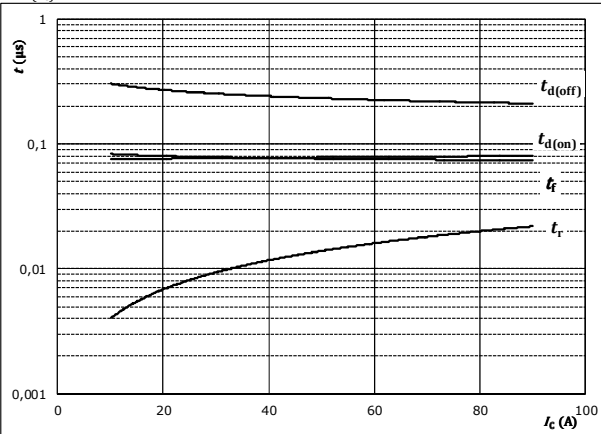
Vincotech

## Buck Switching Characteristics

**figure 5.** IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



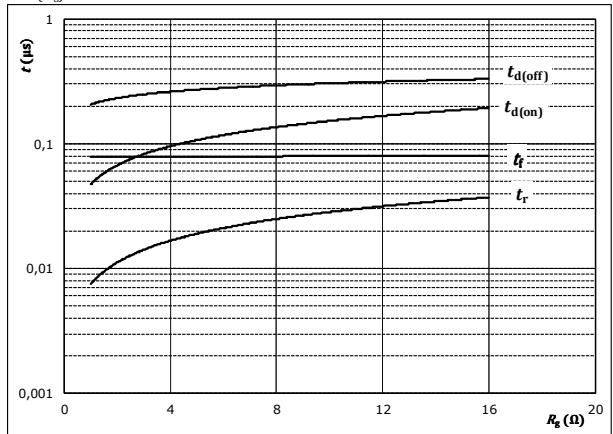
With an inductive load at

$T_j = 0$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$

**figure 6.** IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



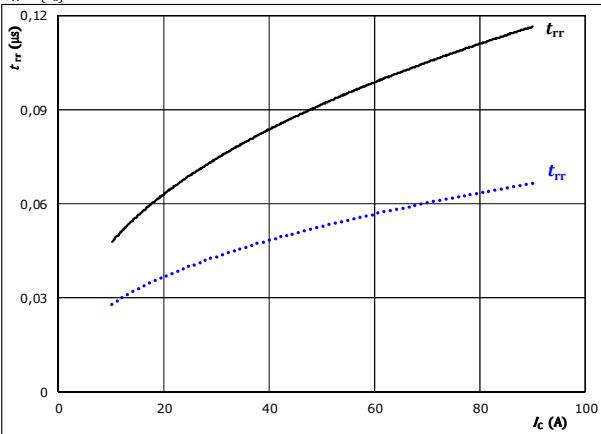
With an inductive load at

$T_j = 0$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 50$  A

**figure 7.** FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$



With an inductive load at

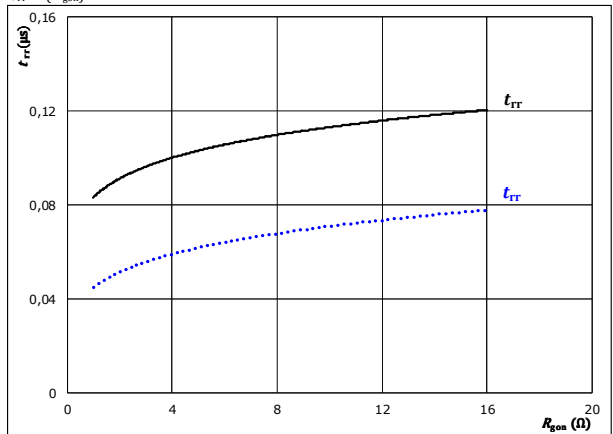
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : 25 °C (dotted)  
 125 °C (solid)

**figure 8.** FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 50$  A

$T_j$ : 25 °C (dotted)  
 125 °C (solid)

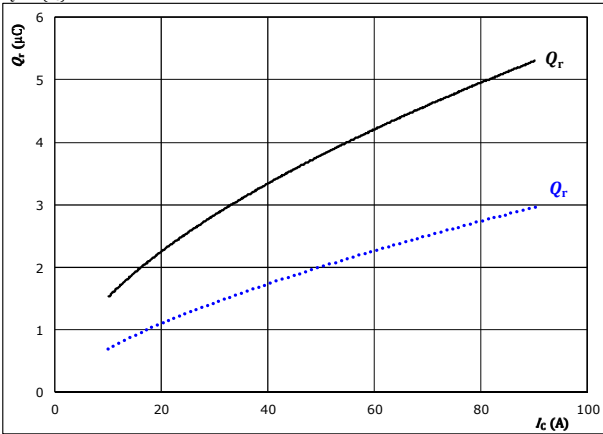


## Buck Switching Characteristics

**figure 9.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

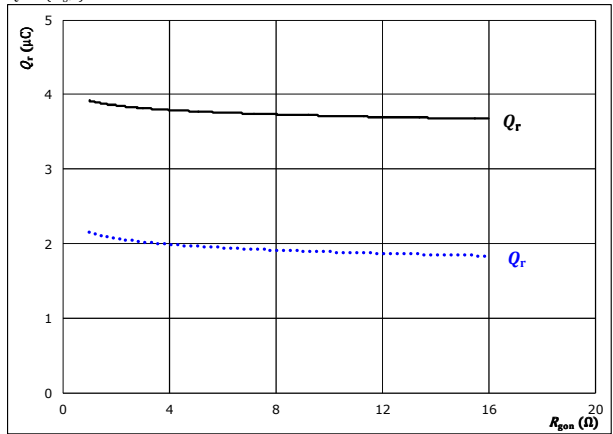
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gpn} = 4$  Ω

$T_j$ : 25 °C (dotted blue line)  
 125 °C (solid black line)

**figure 10.** FWD

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

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



With an inductive load at

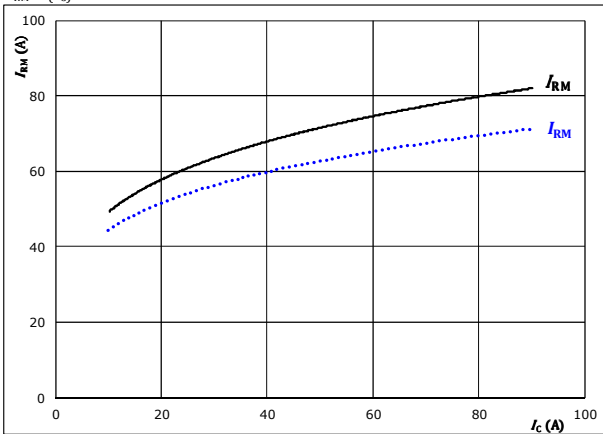
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 50$  A

$T_j$ : 25 °C (dotted blue line)  
 125 °C (solid black line)

**figure 11.** FWD

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

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



With an inductive load at

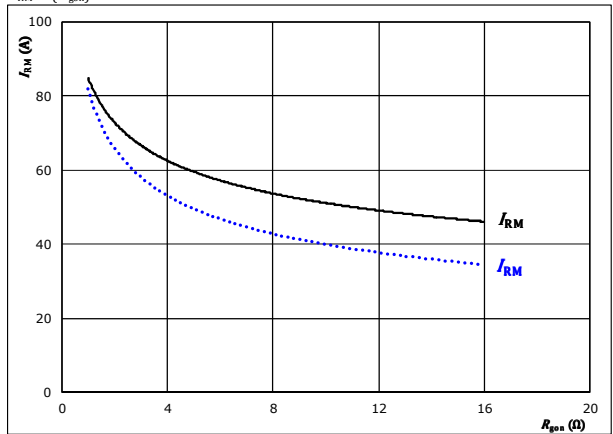
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gpn} = 4$  Ω

$T_j$ : 25 °C (dotted blue line)  
 125 °C (solid black line)

**figure 12.** FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 50$  A

$T_j$ : 25 °C (dotted blue line)  
 125 °C (solid black line)



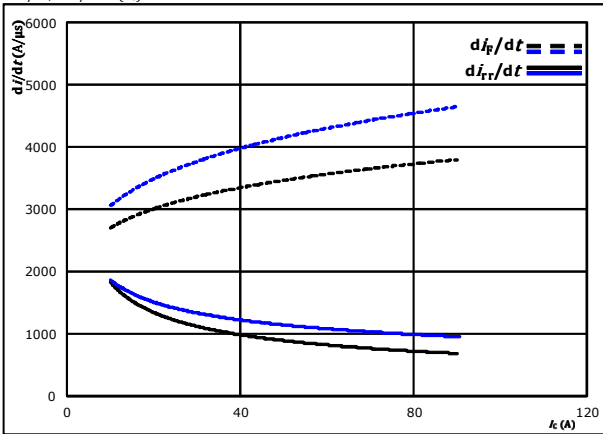


Vincotech

## Buck Switching Characteristics

**figure 13.** FWD

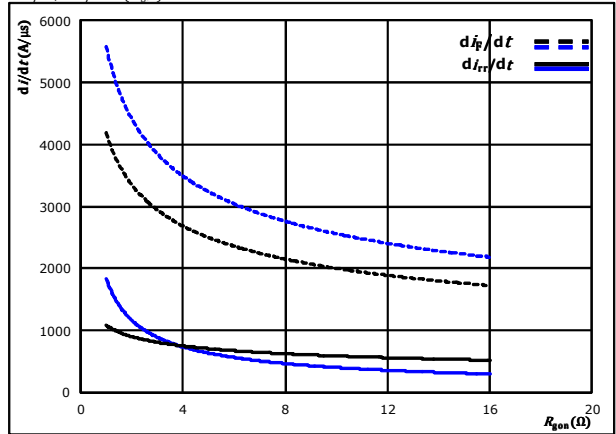
Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_{rr}/dt = f(I_c)$



With an inductive load at  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{g(on)} = 4$   $\Omega$   
 $T_j = 25$  °C  
 $T_c = 125$  °C

**figure 14.** FWD

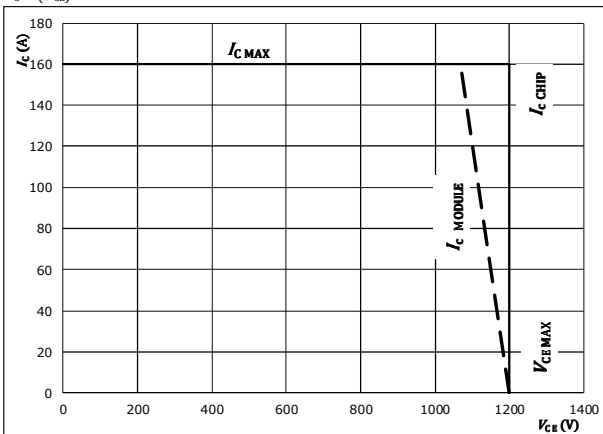
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor  
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



With an inductive load at  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 50$  A  
 $T_j = 25$  °C  
 $T_c = 125$  °C

**figure 15.** IGBT

Reverse bias safe operating area  
 $I_c = f(V_{CB})$



At  
 $T_j = 125$  °C  
 $R_{g(on)} = 4$   $\Omega$   
 $R_{g(off)} = 4$   $\Omega$



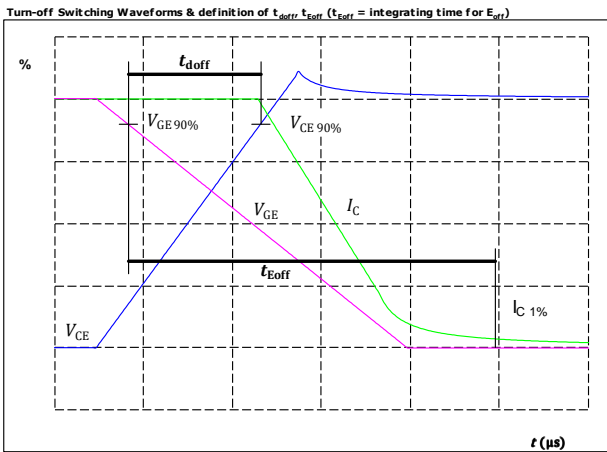
Vincotech

## Buck Switching Definitions

**General conditions**

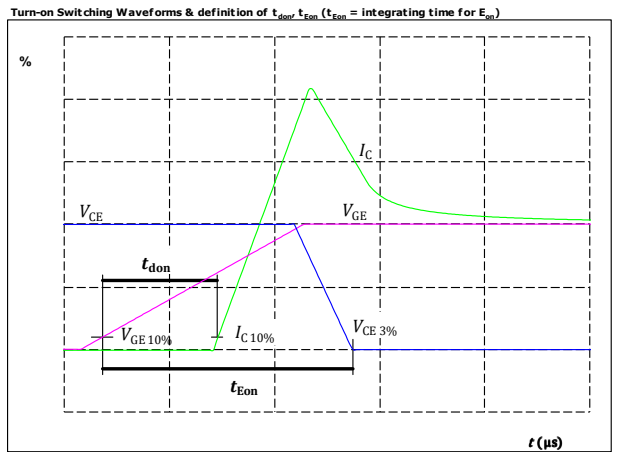
$T_j$	=	125 °C
$R_{\text{gon}}$	=	4 $\Omega$
$R_{\text{goff}}$	=	4 $\Omega$

**figure 1.** IGBT



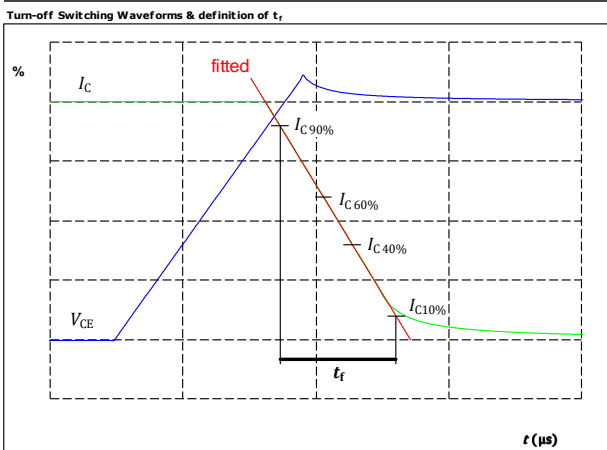
$V_{\text{CE}}(0\%) =$	-15	V
$V_{\text{GE}}(100\%) =$	15	V
$V_{\text{C}}(100\%) =$	350	V
$I_{\text{C}}(100\%) =$	50	A
$t_{\text{doff}} =$	242	ns

**figure 2.** IGBT



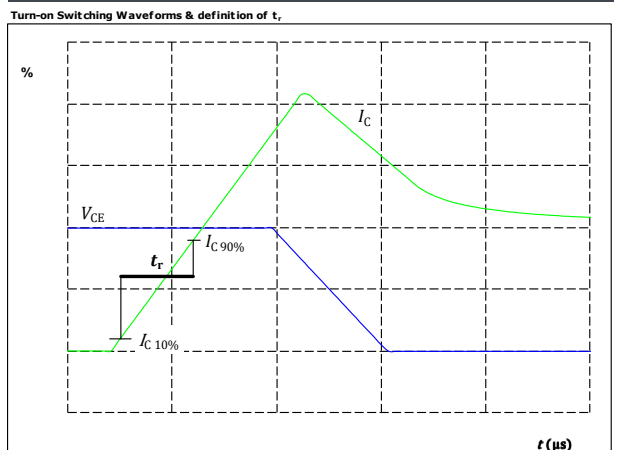
$V_{\text{CE}}(0\%) =$	-15	V
$V_{\text{GE}}(100\%) =$	15	V
$V_{\text{C}}(100\%) =$	350	V
$I_{\text{C}}(100\%) =$	50	A
$t_{\text{don}} =$	79	ns

**figure 3.** IGBT



$V_{\text{C}}(100\%) =$	350	V
$I_{\text{C}}(100\%) =$	50	A
$t_f =$	76	ns

**figure 4.** IGBT



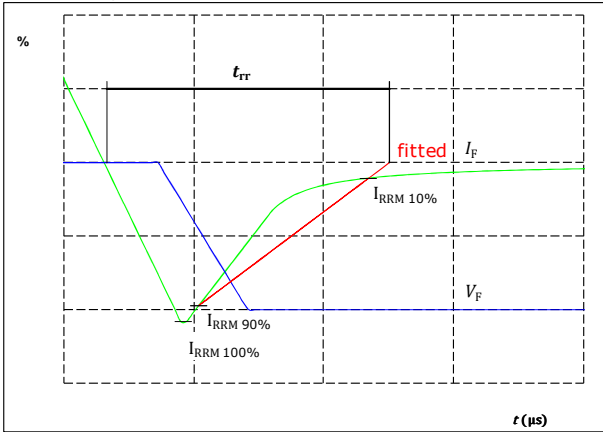
$V_{\text{C}}(100\%) =$	350	V
$I_{\text{C}}(100\%) =$	50	A
$t_r =$	14	ns



Vincotech

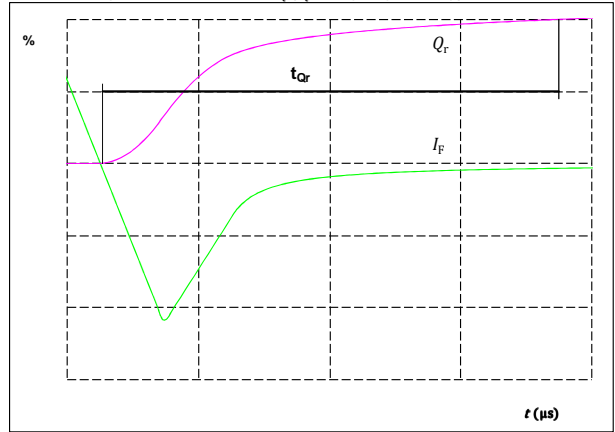
## Buck Switching Characteristics

**figure 5.** FWD  
 Turn-off Switching Waveforms & definition of  $t_{rr}$



$V_F(100\%) =$	350	V
$I_F(100\%) =$	50	A
$I_{RRM}(100\%) =$	73	A
$t_{rr} =$	92	ns

**figure 6.** FWD  
 Turn-on Switching Waveforms & definition of  $t_{Qr}$  ( $t_{Qr}$  = integrating time for  $Q_r$ )



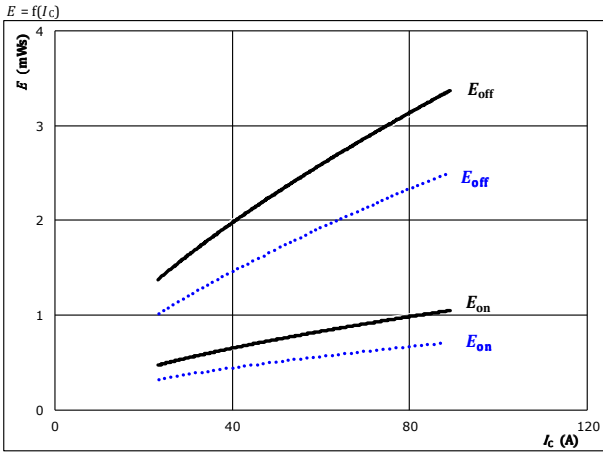
$I_F(100\%) =$	50	A
$Q_r(100\%) =$	3,80	$\mu\text{C}$



## Boost Switching Characteristics

**figure 1.** IGBT

Typical switching energy losses as a function of collector current

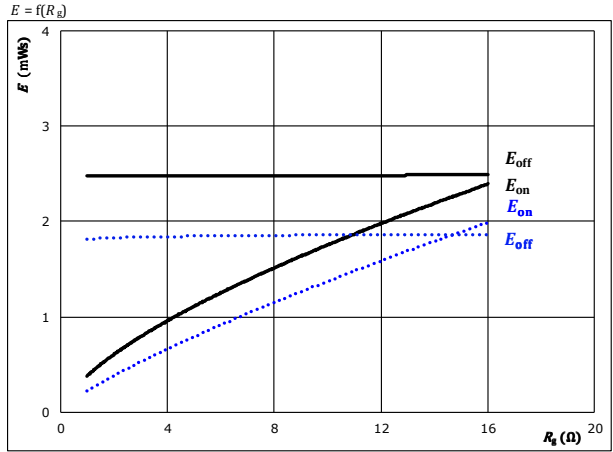


With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$

**figure 2.** IGBT

Typical switching energy losses as a function of gate resistor

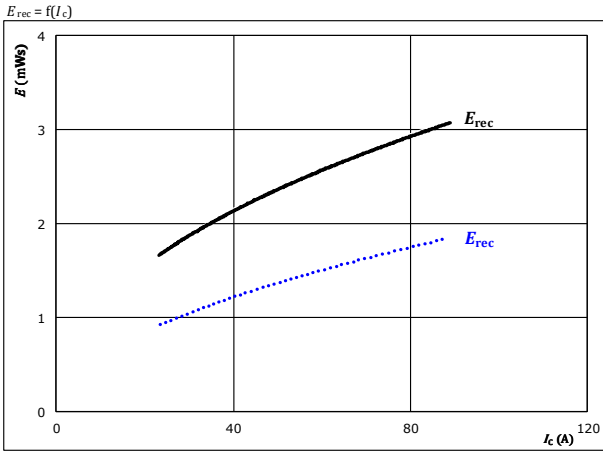


With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 56$  A

**figure 3.** FWD

Typical reverse recovered energy loss as a function of collector current

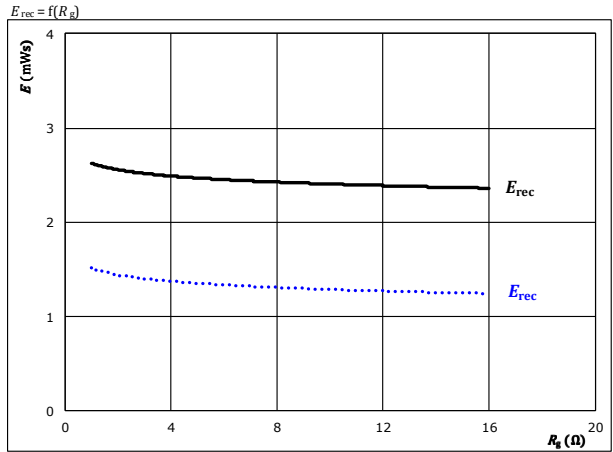


With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

**figure 4.** FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 56$  A

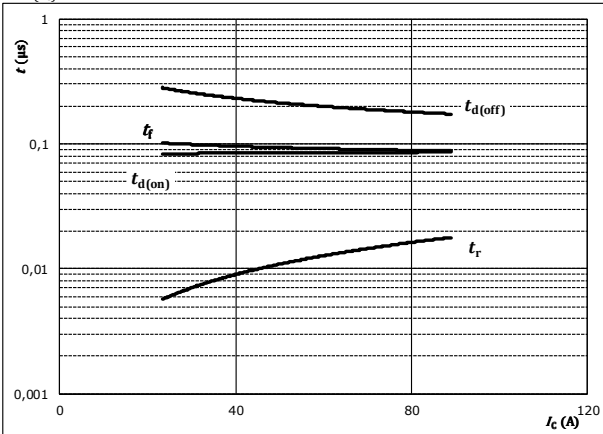


## Boost Switching Characteristics

**figure 5.** IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



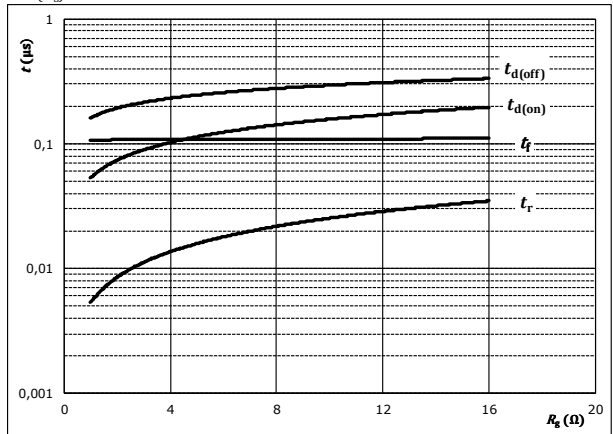
With an inductive load at

$T_j =$	0	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

**figure 6.** IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



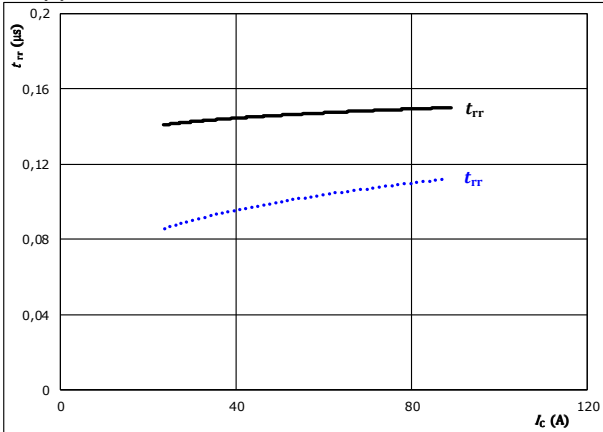
With an inductive load at

$T_j =$	0	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$I_C =$	56	A

**figure 7.** FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$



With an inductive load at

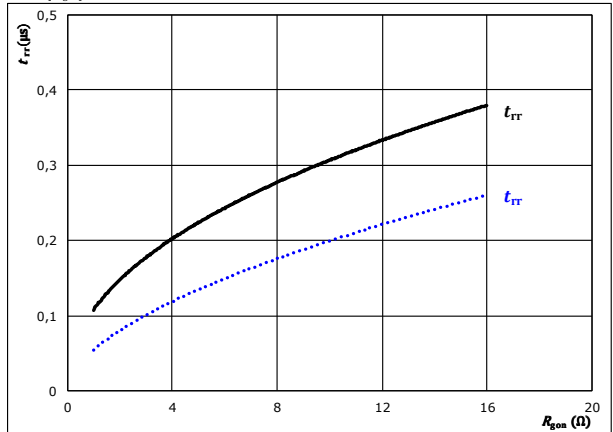
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω

$T_j:$  25 °C (dotted line)  
 125 °C (solid line)

**figure 8.** FWD

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

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



With an inductive load at

$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$I_C =$	56	A

$T_j:$  25 °C (dotted line)  
 125 °C (solid line)



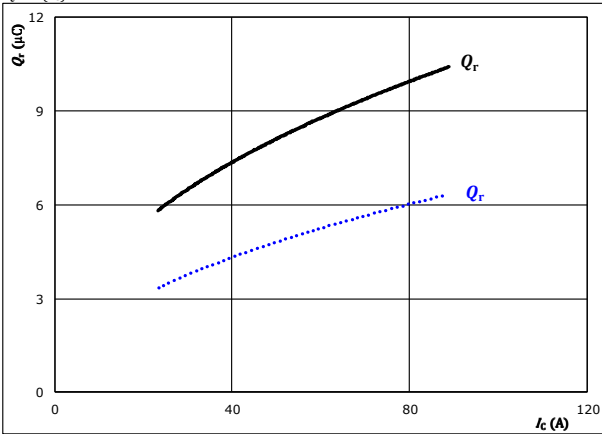
Vincotech

## Boost Switching Characteristics

**figure 9.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

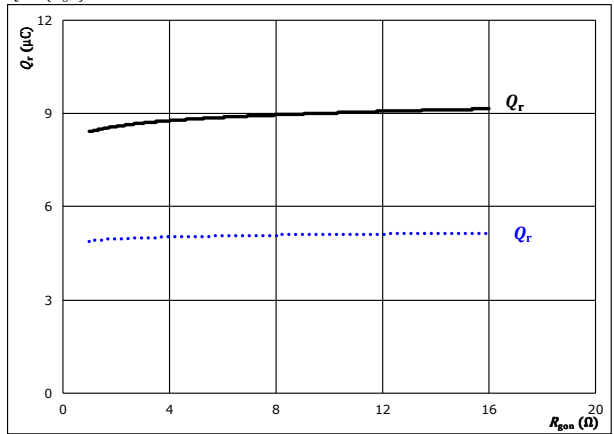
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gpn} = 4$  Ω

$T_j:$  25 °C (dotted blue line)  
 125 °C (solid black line)

**figure 10.** FWD

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

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



With an inductive load at

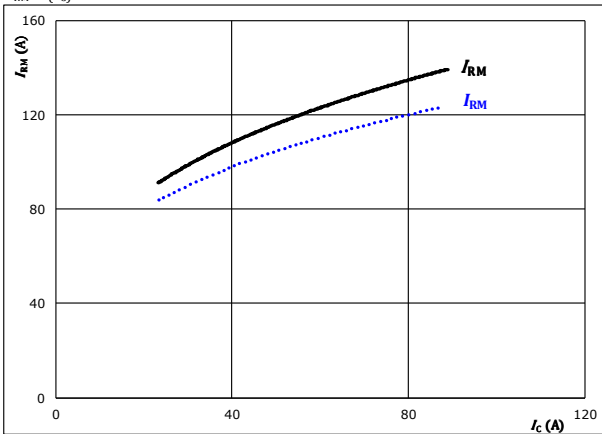
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 56$  A

$T_j:$  25 °C (dotted blue line)  
 125 °C (solid black line)

**figure 11.** FWD

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

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



With an inductive load at

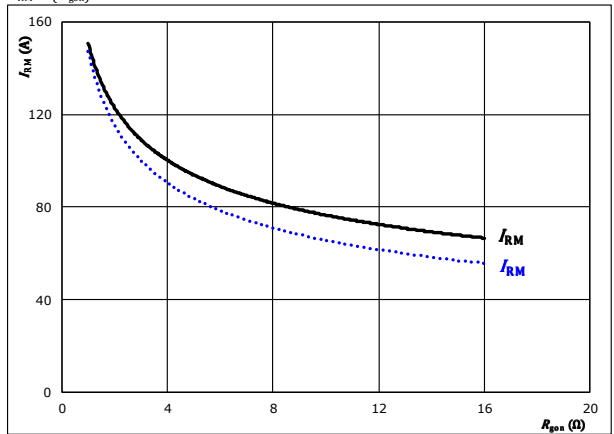
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gpn} = 4$  Ω

$T_j:$  25 °C (dotted blue line)  
 125 °C (solid black line)

**figure 12.** FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 56$  A

$T_j:$  25 °C (dotted blue line)  
 125 °C (solid black line)

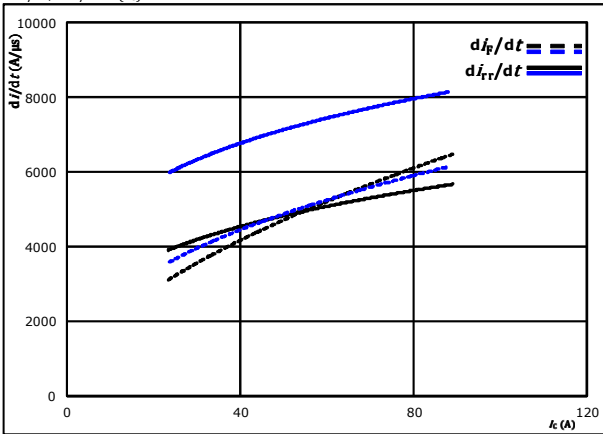


Vincotech

## Boost Switching Characteristics

**figure 13.** FWD

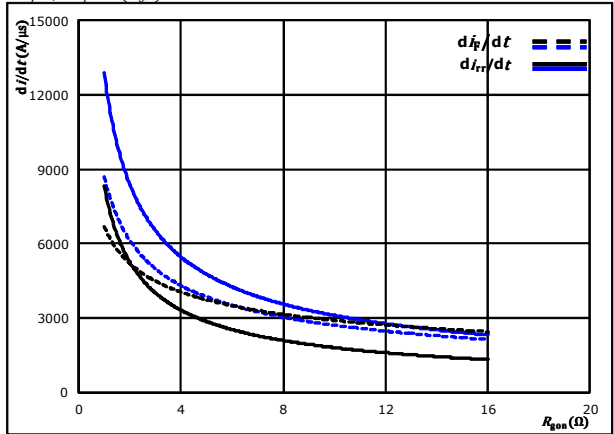
Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_{rr}/dt = f(I_c)$



With an inductive load at  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{g(on)} = 4$   $\Omega$   
 $T_j = 25$  °C  
 $T_c = 125$  °C

**figure 14.** FWD

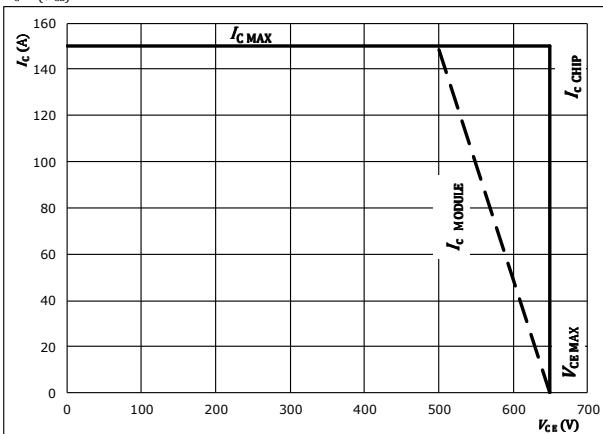
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor  
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



With an inductive load at  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 56$  A  
 $T_j = 25$  °C  
 $T_c = 125$  °C

**figure 15.** IGBT

Reverse bias safe operating area  
 $I_C = f(V_{CE})$



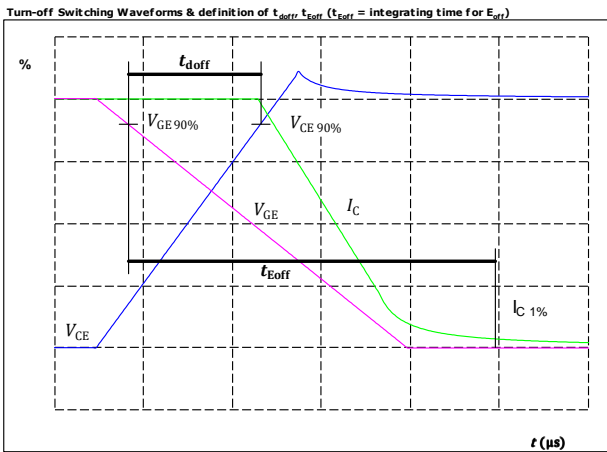
At  
 $T_j = 125$  °C  
 $R_{g(on)} = 4$   $\Omega$   
 $R_{g(off)} = 4$   $\Omega$



## Boost Switching Definitions

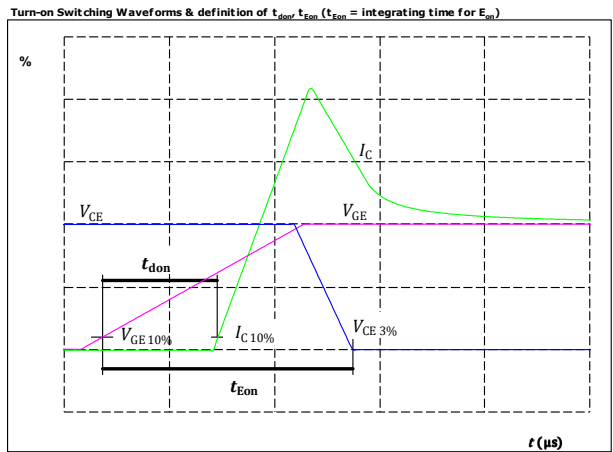
General conditions		
$T_j$	=	125 °C
$R_{gon}$	=	4 $\Omega$
$R_{goff}$	=	4 $\Omega$

**figure 1.** IGBT



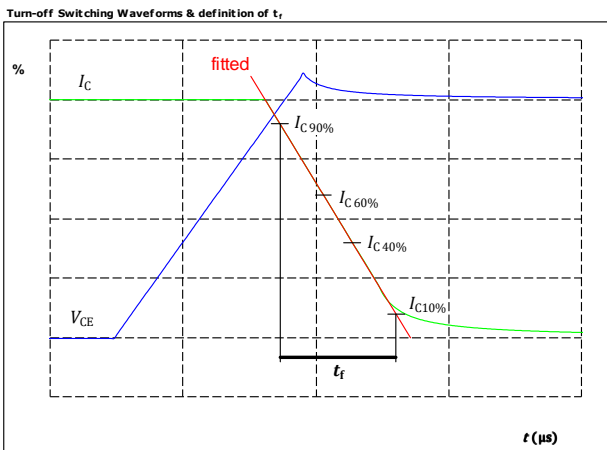
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	56	A
$t_{doff} =$	205	ns

**figure 2.** IGBT



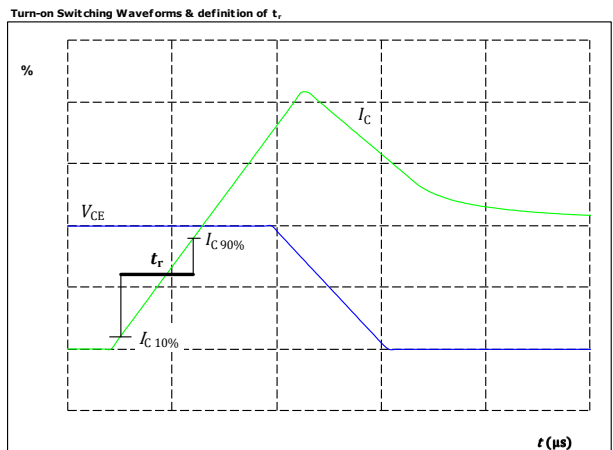
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	56	A
$t_{don} =$	85	ns

**figure 3.** IGBT



$V_C(100\%) =$	350	V
$I_C(100\%) =$	56	A
$t_f =$	105	ns

**figure 4.** IGBT



$V_C(100\%) =$	350	V
$I_C(100\%) =$	56	A
$t_r =$	12	ns

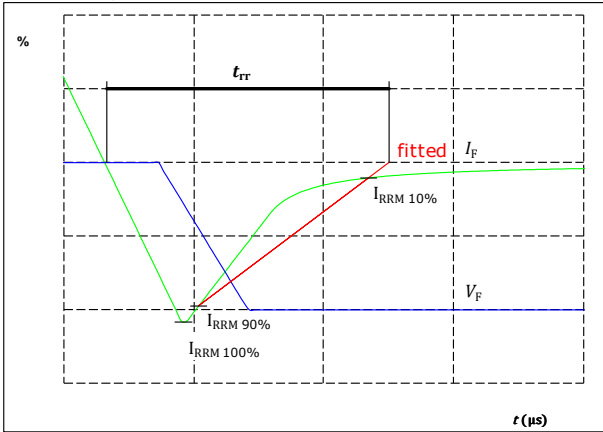




Vincotech

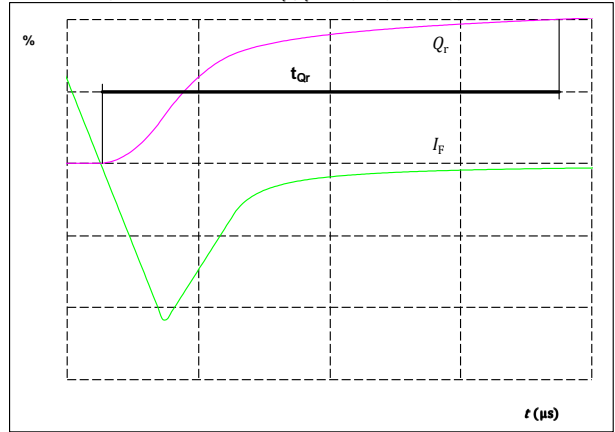
### Boost Switching Characteristics

**figure 5.** FWD  
 Turn-off Switching Waveforms & definition of  $t_{rr}$



$V_F(100\%) =$	350	V
$I_F(100\%) =$	56	A
$I_{RRM}(100\%) =$	118	A
$t_{rr} =$	148	ns

**figure 6.** FWD  
 Turn-on Switching Waveforms & definition of  $t_{Qr}$  ( $t_{Qr}$  = integrating time for  $Q_r$ )



$I_F(100\%) =$	56	A
$Q_r(100\%) =$	8,22	$\mu\text{C}$



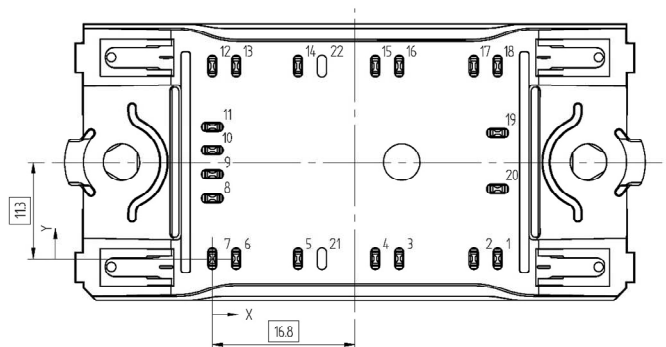
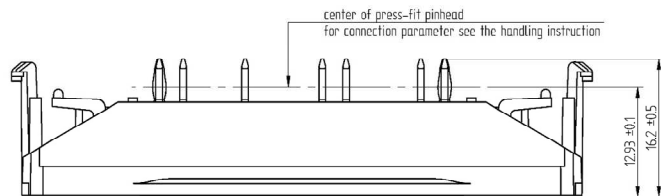
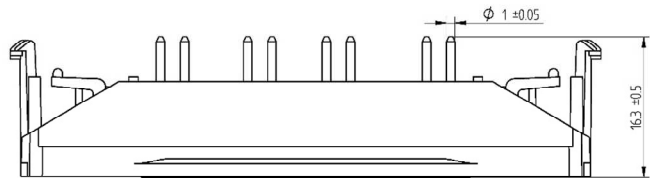
**10-FZ12NMA080SH04-M260F13**  
**10-PZ12NMA080SH04-M260F13Y**  
 datasheet

Vincotech

Ordering Code & Marking																																
<b>Version</b>			<b>Ordering Code</b>																													
without thermal paste 12mm housing with solder pins			10-FZ12NMA080SH04-M260F13																													
without thermal paste 12mm housing with Press-fit pins			10-PZ12NMA080SH04-M260F13Y																													
<table border="1"> <thead> <tr> <th rowspan="2">Text</th> <th colspan="2">Name</th> <th>Date code</th> <th>UL &amp; VIN</th> <th>Lot</th> <th>Serial</th> </tr> <tr> <th>Type&amp;Ver</th> <th>Lot number</th> <th>Serial</th> <th>Date code</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">           NN-NNNNNNNNNNNN            TTTTWW WWYY UL            VIN LLLL SSSS         </td> <td colspan="2">NN-NNNNNNNNNNNN-TTTTWW</td> <td>WWYY</td> <td>UL VIN</td> <td>LLLL</td> <td>SSSS</td> </tr> <tr> <td>TTTTTWW</td> <td>LLLL</td> <td>SSSS</td> <td>WWYY</td> <td></td> <td></td> </tr> </tbody> </table>							Text	Name		Date code	UL & VIN	Lot	Serial	Type&Ver	Lot number	Serial	Date code			NN-NNNNNNNNNNNN TTTTWW WWYY UL VIN LLLL SSSS	NN-NNNNNNNNNNNN-TTTTWW		WWYY	UL VIN	LLLL	SSSS	TTTTTWW	LLLL	SSSS	WWYY		
Text	Name		Date code	UL & VIN	Lot	Serial																										
	Type&Ver	Lot number	Serial	Date code																												
NN-NNNNNNNNNNNN TTTTWW WWYY UL VIN LLLL SSSS	NN-NNNNNNNNNNNN-TTTTWW		WWYY	UL VIN	LLLL	SSSS																										
	TTTTTWW	LLLL	SSSS	WWYY																												

**Outline**

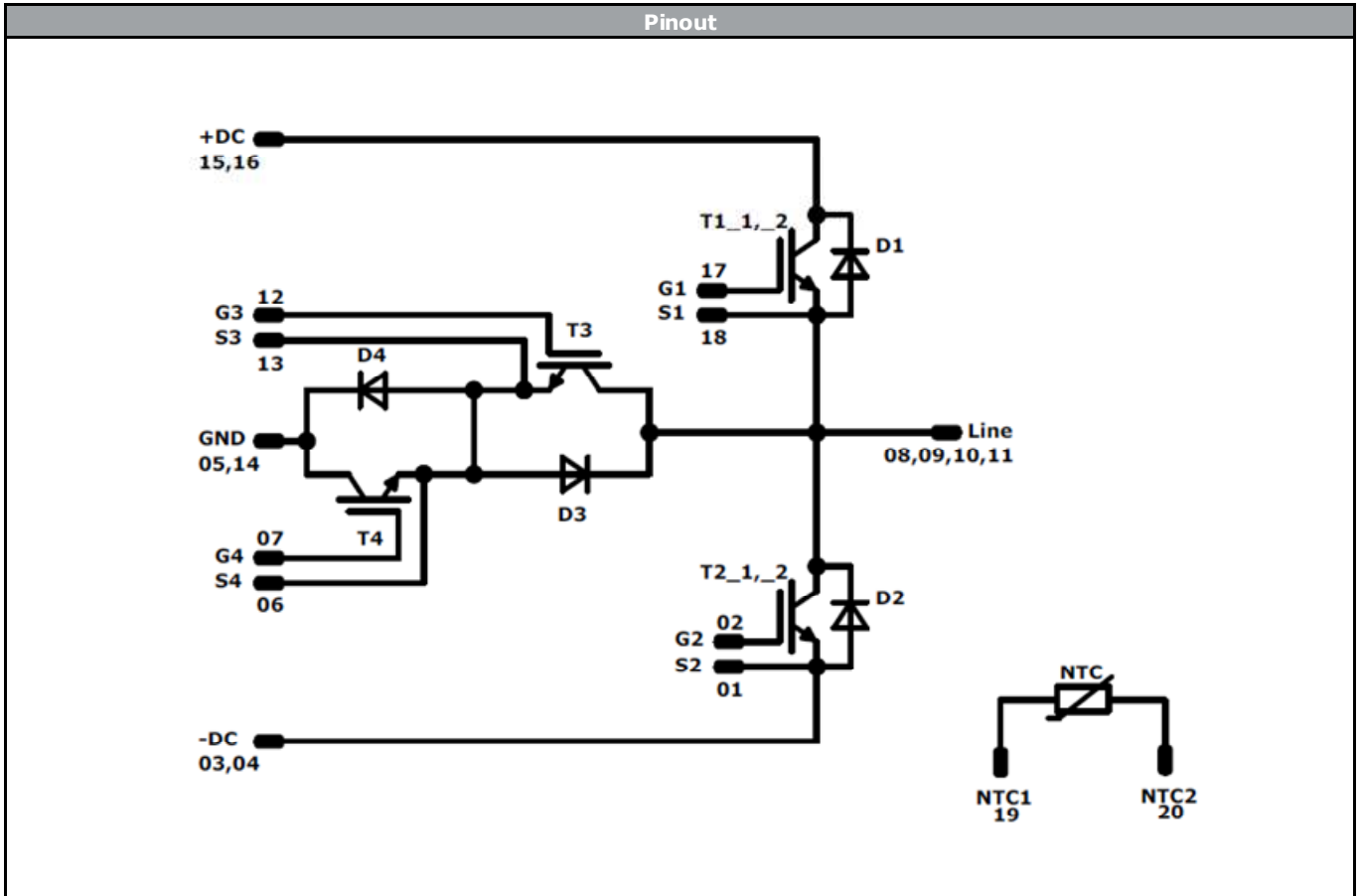
Pin table			
Pin	X	Y	Function
1	33,6	0	S2
2	30,8	0	G2
3	22	0	-DC
4	19,2	0	-DC
5	10,1	0	GND
6	2,8	0	S4
7	0	0	G4
8	0	7,1	Line
9	0	9,9	Line
10	0	12,7	Line
11	0	15,5	Line
12	0	22,6	G3
13	2,8	22,6	S3
14	10,1	22,6	GND
15	19,2	22,6	+DC
16	22	22,6	+DC
17	30,8	22,6	G1
18	33,6	22,6	S1
19	33,6	14,8	NTC1
20	33,6	8,2	NTC2
21	Not assembled		
22	Not assembled		



Tolerance of pinpositions: ±0.5mm at the end of pins  
 Dimension of coordinate axis is only offset without tolerance



Vincotech



<b>Identification</b>					
<b>ID</b>	<b>Component</b>	<b>Voltage</b>	<b>Current</b>	<b>Function</b>	<b>Comment</b>
T1, T2	IGBT	1200 V	80 A	Buck Switch	
D3, D4	FWD	650 V	75 A	Buck Diode	
T3, T4	IGBT	650 V	75 A	Boost Switch	
D1, D2	FWD	1200 V	50 A	Boost Diode	
NTC	NTC			Thermistor	




Vincotech

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-xZ12NMA080SH04-M260F13x-D1-14	12 Jun. 2018		

**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.

单击下面可查看定价，库存，交付和生命周期等信息

[>>Vincotech\(威科\)](#)