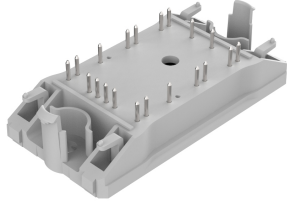
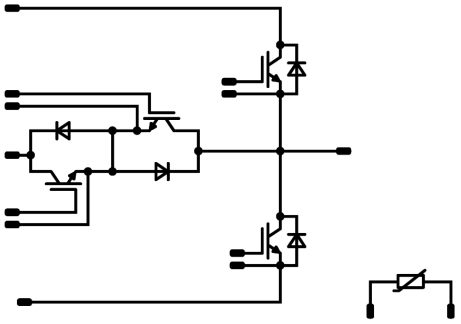




<b>flowMNPC 0</b>		<b>1200 V / 80 A</b>	
<b>Features</b>		<b>flow 0 12 mm housing</b>	
<ul style="list-style-type: none"><li>• mixed voltage component topology</li><li>• neutral point clamped inverter</li><li>• reactive power capability</li><li>• low inductance layout</li></ul>			
<b>Target applications</b>		<b>Schematic</b>	
<ul style="list-style-type: none"><li>• solar inverter</li><li>• UPS</li></ul>			
<b>Types</b>			
<ul style="list-style-type: none"><li>• 10-FZ12NMA080SH01-M260F</li></ul>			



Vincotech

**10-FZ12NMA080SH01-M260F**  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Buck Switch</b>				
Collector-emitter voltage	$V_{CES}$		1200	V
Collector current (DC 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
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	186	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Buck Diode

Peak repetitive reverse voltage	$V_{RRM}$		600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	51	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	69	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Boost Switch

Collector-emitter voltage	$V_{CES}$		600	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	65	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	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$



Vincotech

**10-FZ12NMA080SH01-M260F**  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Boost Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Forward current (DC 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

## 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			9,15	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		

#### Buck Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,003	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		80	25 125	1,78	1,99 2,33	2,42 <sup>(1)</sup>	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		pF
Reverse transfer capacitance	$C_{res}$							260		pF
Gate charge	$Q_g$	$V_{CC} = 960$ V	15		80	25		370		nC

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,51		K/W
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##### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	±15	350	56	25		77,6		ns
						125		78,8		
Rise time	$t_r$					25		13		
						125		15,4		
Turn-off delay time	$t_{d(off)}$					25		170,4		
						125		220,8		
Fall time	$t_f$					25		43,2		ns
						125		68,24		
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 1,01$ µC $Q_{tFWD} = 2,74$ µC				25		0,473		mWs
						125		0,972		
Turn-off energy (per pulse)	$E_{off}$					25		1,28		mWs
						125		2,17		





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### Characteristic Values

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

#### Buck Diode

##### Static

Forward voltage	$V_F$				60	25 125 150		2,27 1,68 1,58	2,8 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_r = 600$ V				25			10	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,38		K/W
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##### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt=4710$ A/μs $di/dt=4651$ A/μs	±15	350	56	25		64,27		A
						125		83,05		
Reverse recovery time	$t_{rr}$					25		28,7		ns
						125		73,13		
Recovered charge	$Q_r$					25		1,01		μC
		125		2,74						
Reverse recovered energy	$E_{rec}$	25		0,172		mWs				
		125		0,521						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		9597		A/μs				
		125		3522						



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### 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		

#### Boost Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0012	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	25 125	1,05	1,44 1,59	1,85 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	600		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		pF
Reverse transfer capacitance	$C_{res}$							137		pF
Gate charge	$Q_g$	$V_{CC} = 480$ V	15		75	25		470		nC

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,94		K/W
----------------------------------------------------	---------------	---------------------------------------	--	--	--	--	--	------	--	-----

##### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	±15	350	56	25		83,6		ns
						125		84,8		
Rise time	$t_r$					25		11		
						125		12,2		
Turn-off delay time	$t_{d(off)}$					25		177		
						125		204,6		
Fall time	$t_f$					25		86,45		
		125		105,19						
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 5,32$ μC				25		0,528		mWs
		$Q_{tFWD} = 8,22$ μC				125		0,747		
Turn-off energy (per pulse)	$E_{off}$					25		1,86		mWs
						125		2,5		



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### Characteristic Values

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

#### Boost Diode

##### Static

Forward voltage	$V_F$				50	25 125 150	1,35	1,73 1,7 1,68	2,05 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_T = 1200$ V				25			10	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,06		K/W
----------------------------------------------------	---------------	------------------------------------	--	--	--	--	--	------	--	-----

##### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt=6090$ A/μs $di/dt=5325$ A/μs	±15	350	56	25		106,49		A
						125		117,83		
Reverse recovery time	$t_{rr}$					25		102,06		ns
						125		148,06		
Recovered charge	$Q_r$					25		5,32		μC
						125		8,22		
Reverse recovered energy	$E_{rec}$	25		1,55		mWs				
		125		2,42						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		6904		A/μs				
		125		4951						



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### Characteristic Values

Parameter	Symbol	Conditions					Values			Unit	
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$V_{CE}$ [V]	$V_F$ [V]	$I_D$ [A]	$I_C$ [A]	$I_F$ [A]		$T_j$ [°C]

### Thermistor

#### Static

Rated resistance	$R$					25		22		kΩ
Deviation of $R_{100}$	$A_{R/R}$	$R_{100} = 1486 \Omega$				100	-12		14	%
Power dissipation	$P$							200		mW
Power dissipation constant	$d$					25		2		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 3 \%$						3950		K
B-value	$B_{(25/100)}$	Tol. $\pm 3 \%$						3998		K
Vincotech Thermistor Reference									B	

<sup>(1)</sup> Value at chip level

<sup>(2)</sup> Only valid with pre-applied Vincotech thermal interface material.

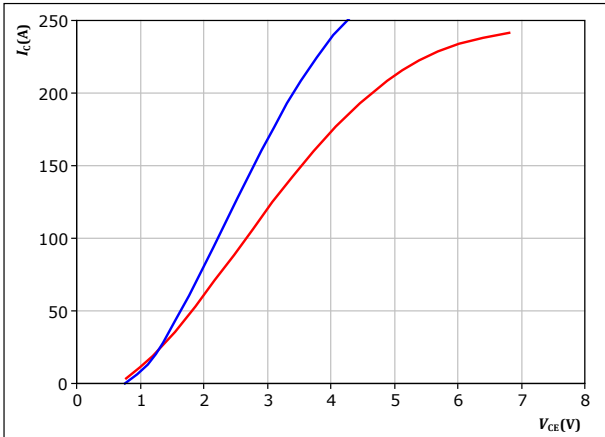


### Buck Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

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

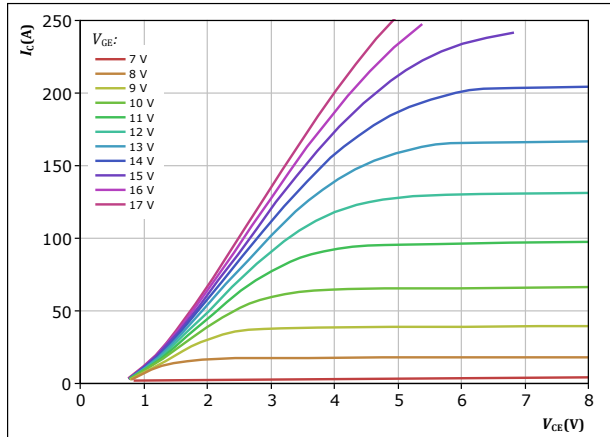


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25^\circ C$  (blue),  $125^\circ C$  (red)

**figure 2.** IGBT

Typical output characteristics

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

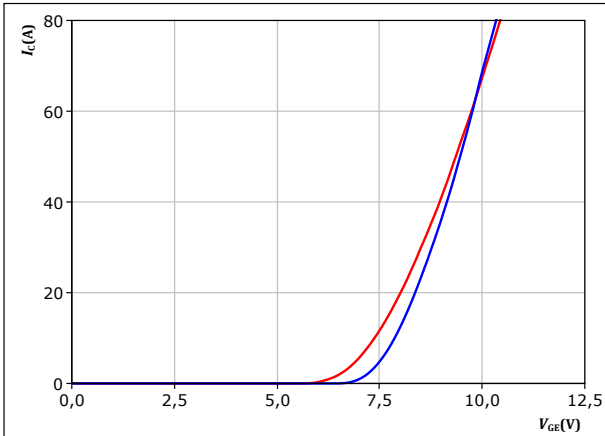


$t_p = 250 \mu s$   
 $T_j = 125^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

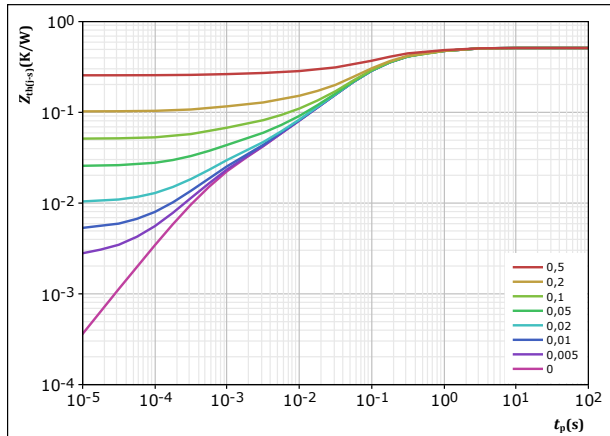


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25^\circ C$  (blue),  $125^\circ C$  (red)

**figure 4.** IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,512 K/W$   
IGBT thermal model values  

R (K/W)	$\tau$ (s)
9,50E-02	1,05E+00
1,84E-01	1,66E-01
1,81E-01	6,37E-02
3,37E-02	7,18E-03
1,79E-02	6,47E-04

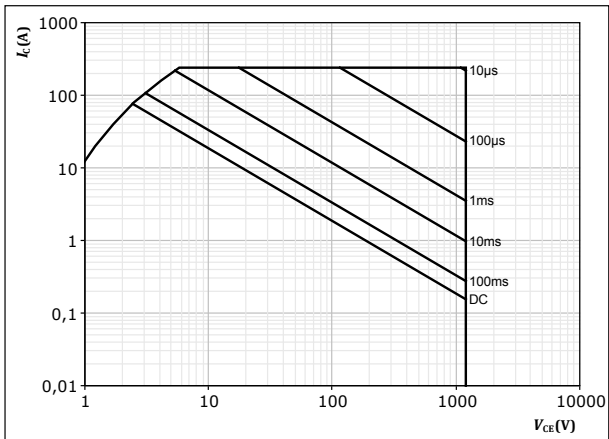


### Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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



$D =$  single pulse  
 $T_s = 80 \text{ } ^\circ\text{C}$   
 $V_{GE} = 15 \text{ V}$   
 $T_j = T_{jmax}$



### Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

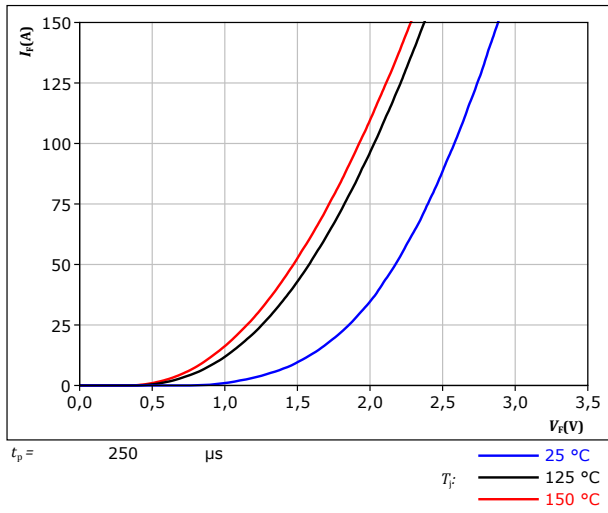
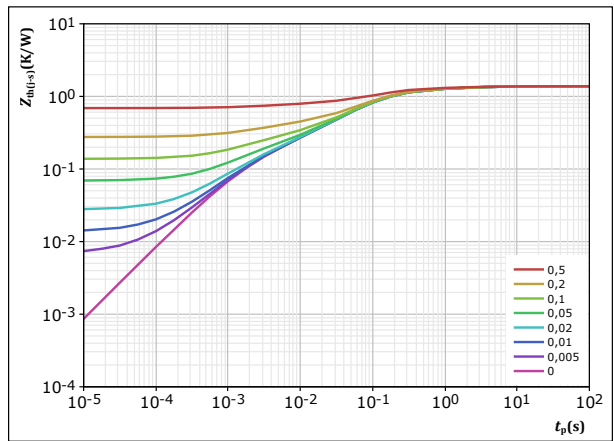


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,379 \text{ K/W}$   
 FWD thermal model values

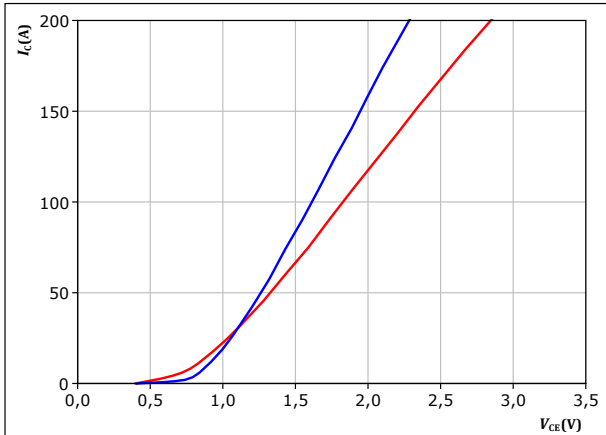
$R$ (K/W)	$\tau$ (s)
8,16E-02	3,99E+00
2,02E-01	6,32E-01
7,09E-01	1,11E-01
2,16E-01	3,68E-02
9,74E-02	5,31E-03
7,28E-02	1,31E-03



### Boost Switch Characteristics

figure 8. IGBT

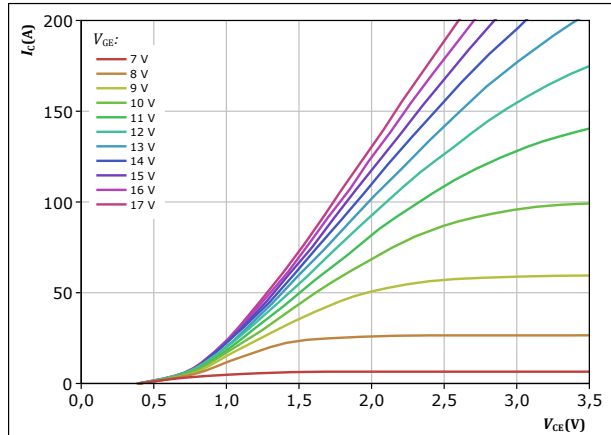
Typical output characteristics  
 $I_C = f(V_{CE})$



$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j:$  — 25 °C  
— 125 °C

figure 9. IGBT

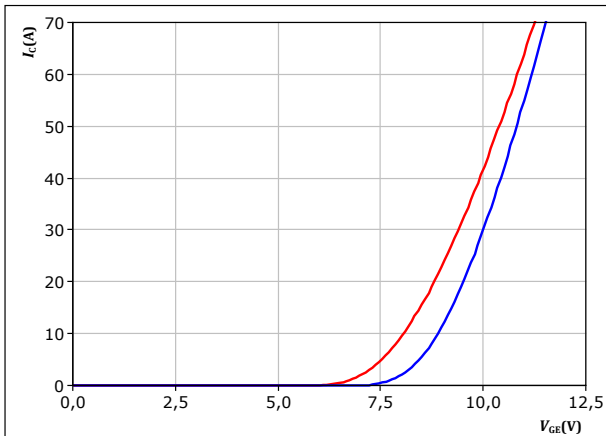
Typical output characteristics  
 $I_C = f(V_{CE})$



$t_p = 250 \mu s$   
 $T_j = 125 \text{ °C}$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 10. IGBT

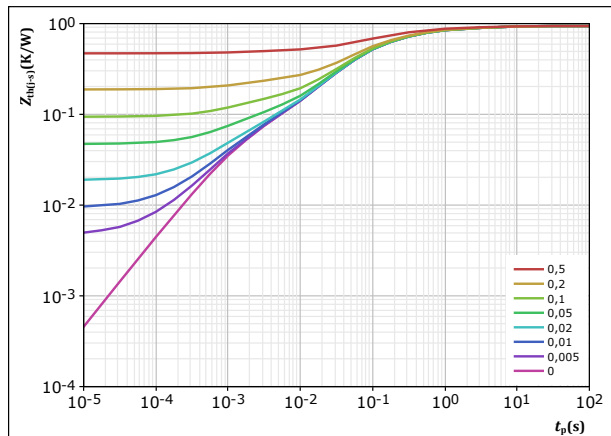
Typical transfer characteristics  
 $I_C = f(V_{GE})$



$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j:$  — 25 °C  
— 125 °C

figure 11. IGBT

Transient thermal impedance as a function of pulse width  
 $Z_{th(j-s)} = f(t_p)$



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

R (K/W)	$\tau$ (s)
8,42E-02	4,56E+00
2,89E-01	4,19E-01
4,35E-01	7,20E-02
8,50E-02	2,19E-02
4,67E-02	1,33E-03



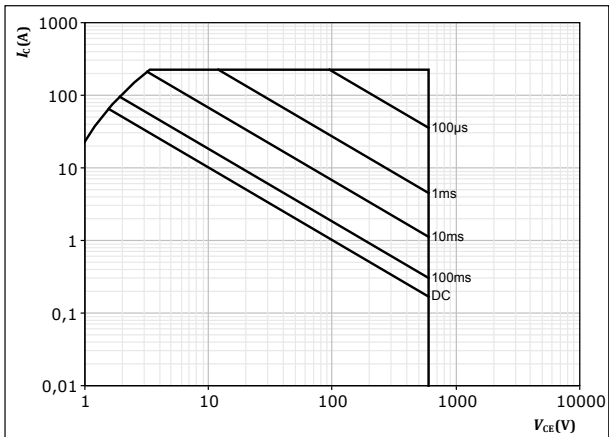


### Boost Switch Characteristics

figure 12. IGBT

Safe operating area

$I_C = f(V_{CE})$



$D =$  single pulse  
 $T_s = 80 \text{ } ^\circ\text{C}$   
 $V_{GE} = 15 \text{ V}$   
 $T_j = T_{jmax}$



### Boost Diode Characteristics

figure 13. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

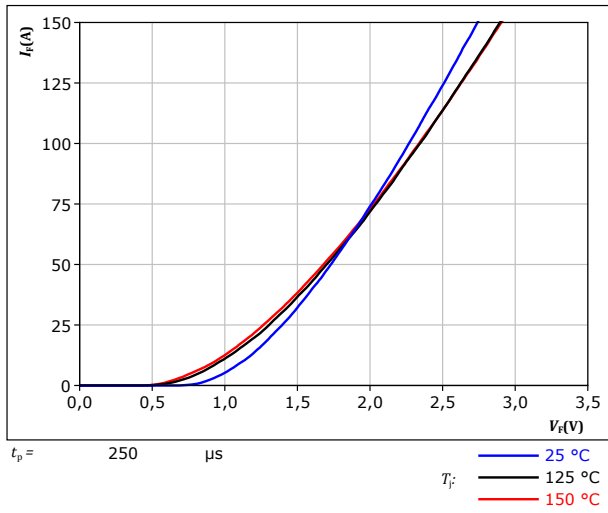
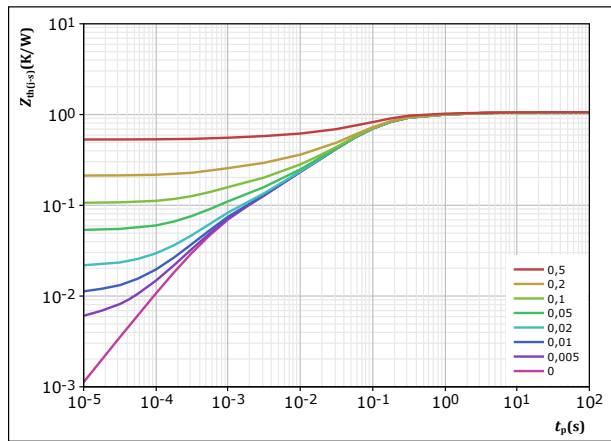


figure 14. FWD

Transient thermal impedance as a function of pulse width

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



$D = \frac{t_p}{T}$   
 $R_{th(j-s)} = 1,061 \text{ K/W}$   
 FWD thermal model values

R (K/W)	$\tau$ (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

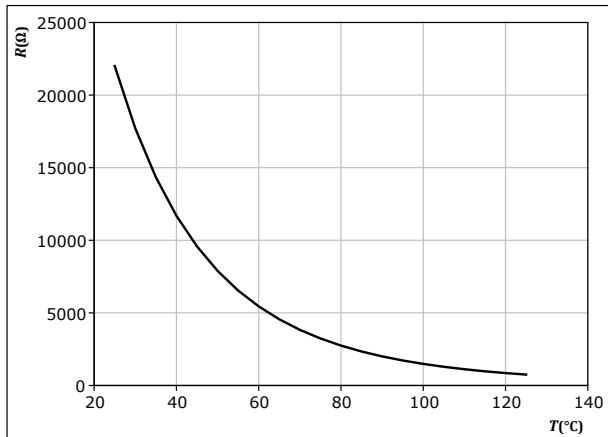


### Thermistor Characteristics

figure 15. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

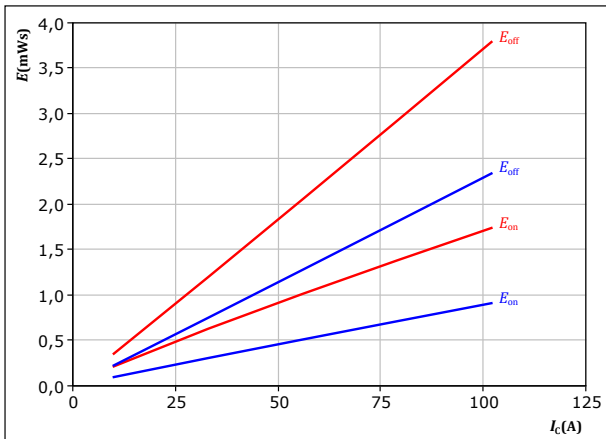




## Buck Switching Characteristics

**figure 16.** IGBT

Typical switching energy losses as a function of collector current  
 $E = f(I_c)$



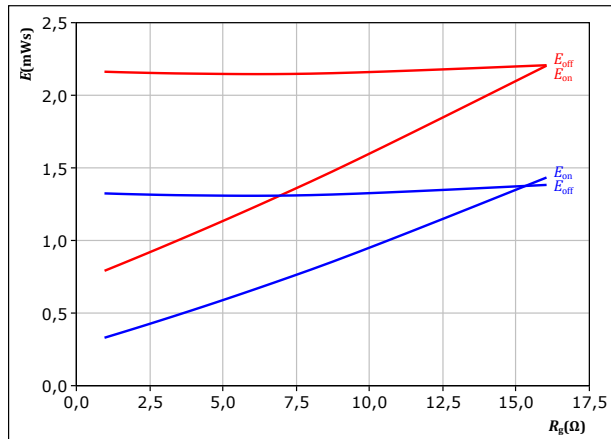
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 17.** IGBT

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



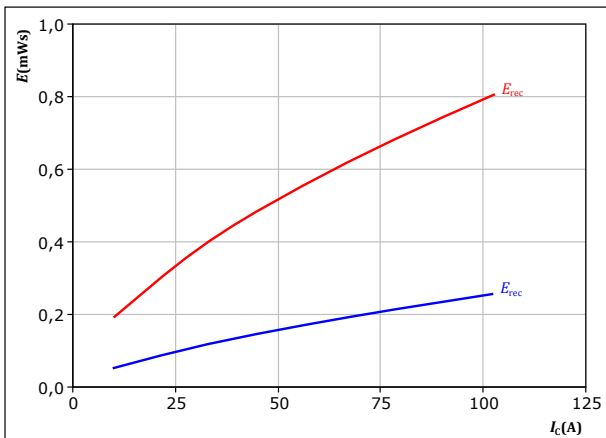
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 18.** FWD

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



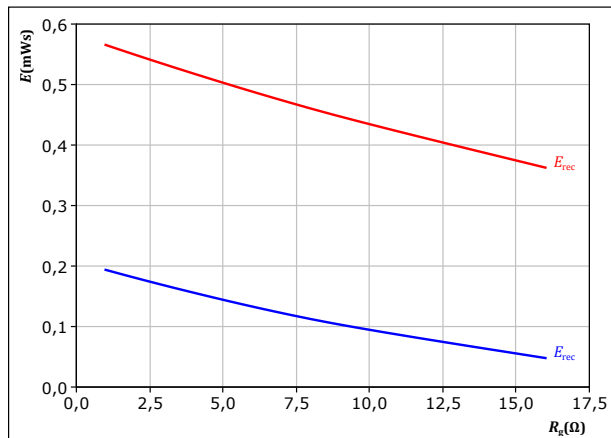
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 19.** FWD

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



With an inductive load at

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

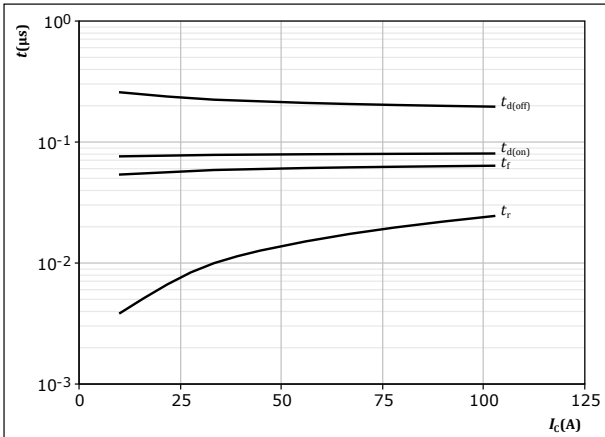
$T_j$ : — 25 °C  
 — 125 °C



## Buck Switching Characteristics

**figure 20.** IGBT

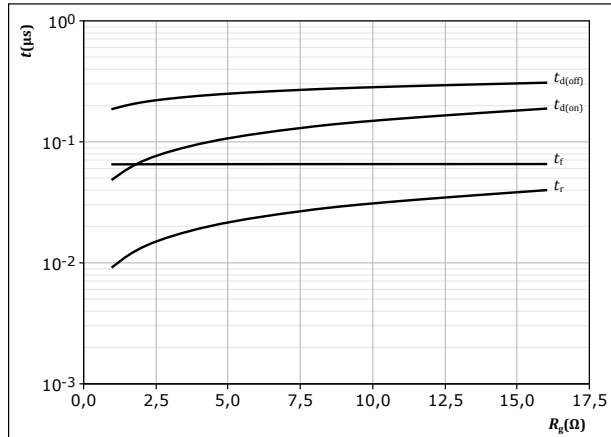
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 125 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{g(on)} = 4 \text{ } \Omega$   
 $R_{g(off)} = 4 \text{ } \Omega$

**figure 21.** IGBT

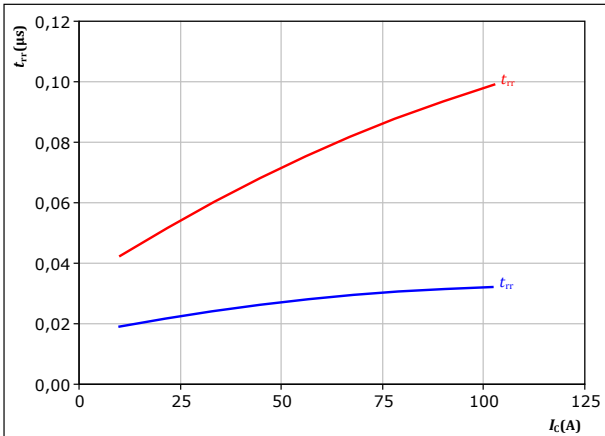
Typical switching times as a function of gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 125 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 56 \text{ A}$

**figure 22.** FWD

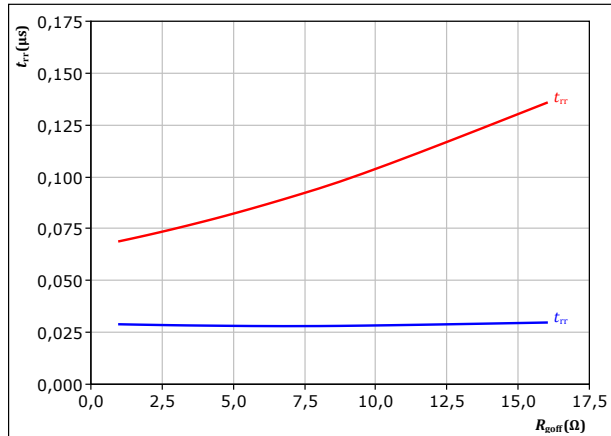
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



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

**figure 23.** FWD

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



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 56 \text{ A}$   
 $T_j: \text{ — } 25 \text{ }^\circ\text{C}$   
 $\text{ — } 125 \text{ }^\circ\text{C}$

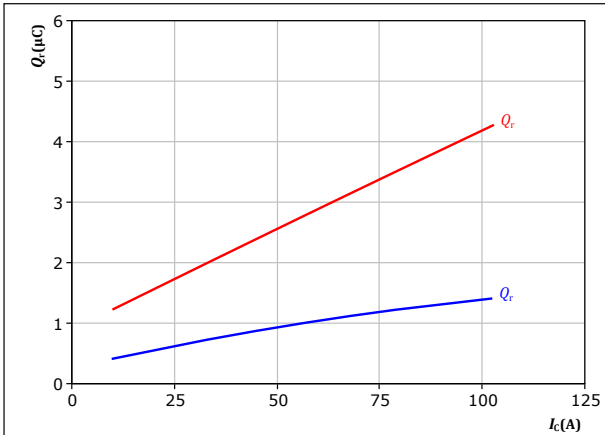


## Buck Switching Characteristics

figure 24. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

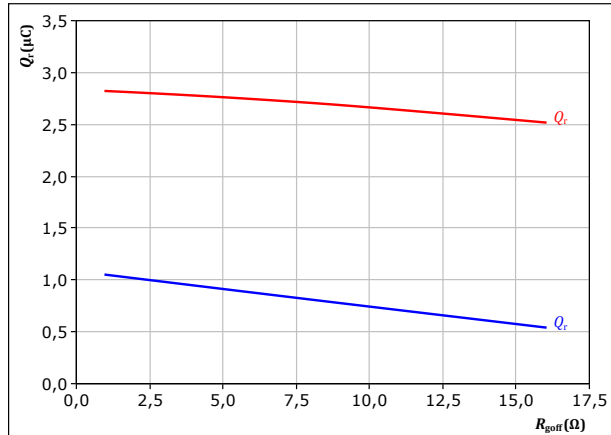
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{goff} = 4$  Ω

$T_j$ : — 25 °C  
— 125 °C

figure 25. FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

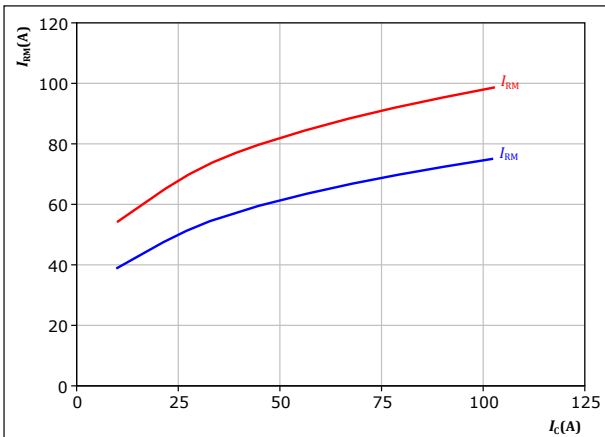
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 56$  A

$T_j$ : — 25 °C  
— 125 °C

figure 26. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

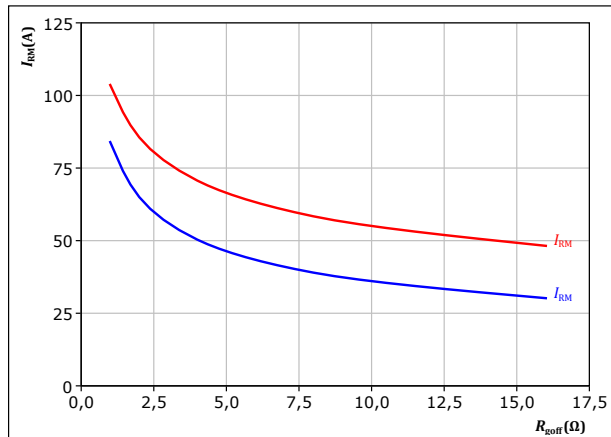
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{goff} = 4$  Ω

$T_j$ : — 25 °C  
— 125 °C

figure 27. FWD

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

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



With an inductive load at

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

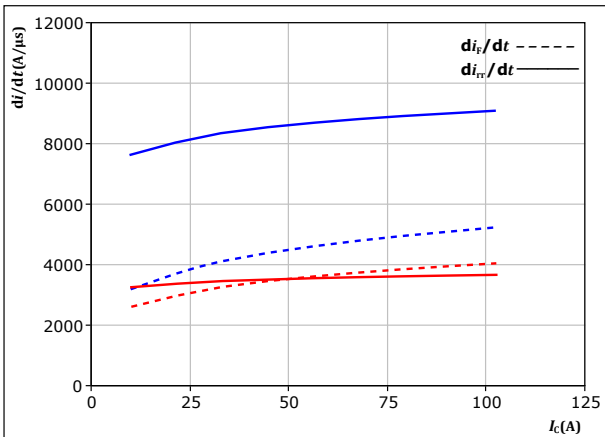
$T_j$ : — 25 °C  
— 125 °C



### Buck Switching Characteristics

**figure 28.** FWD

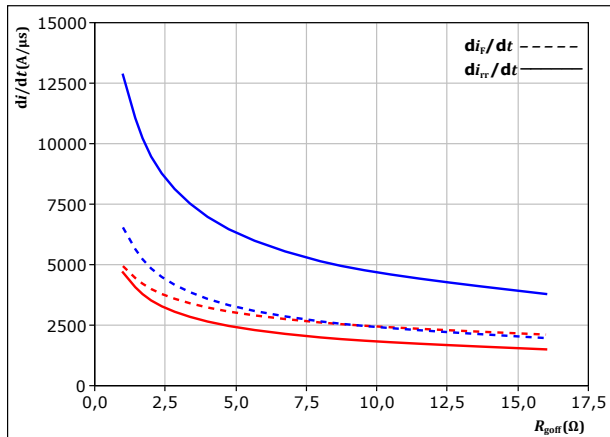
Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_{rr}/dt = f(I_C)$



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{goff} = 4 \text{ } \Omega$   
 $T_j: \text{ — } 25 \text{ } ^\circ\text{C}$   
 $\text{ — } 125 \text{ } ^\circ\text{C}$

**figure 29.** FWD

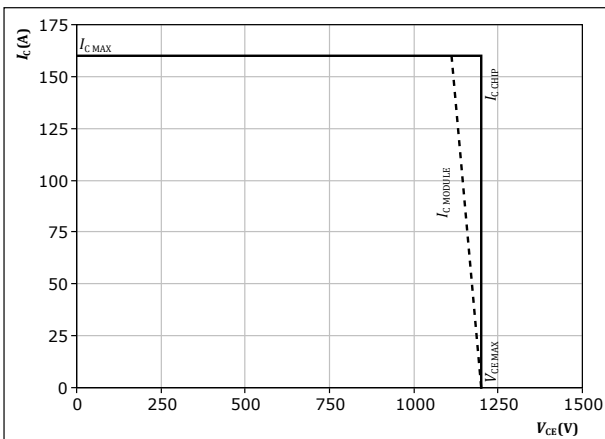
Typical rate of fall of forward and reverse recovery current as a function of turn off gate resistor  
 $di_f/dt, di_{rr}/dt = f(R_{goff})$



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 56 \text{ A}$   
 $T_j: \text{ — } 25 \text{ } ^\circ\text{C}$   
 $\text{ — } 125 \text{ } ^\circ\text{C}$

**figure 30.** IGBT

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



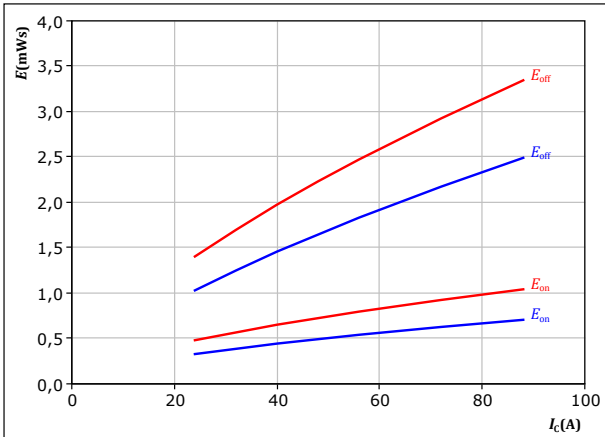
At  $T_j = 125 \text{ } ^\circ\text{C}$   
 $R_{goff} = 4 \text{ } \Omega$   
 $R_{gson} = 4 \text{ } \Omega$



## Boost Switching Characteristics

**figure 31.** IGBT

Typical switching energy losses as a function of collector current  
 $E = f(I_c)$



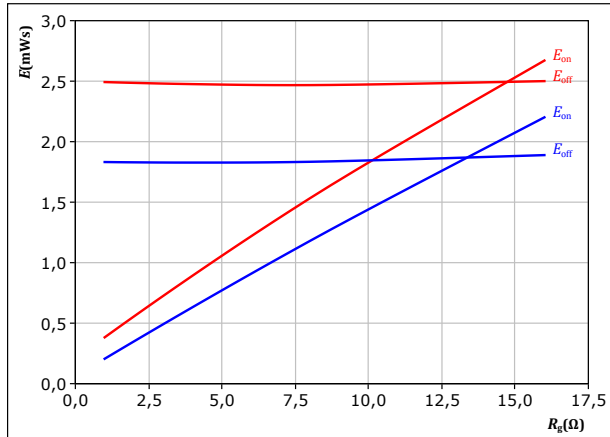
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 32.** IGBT

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



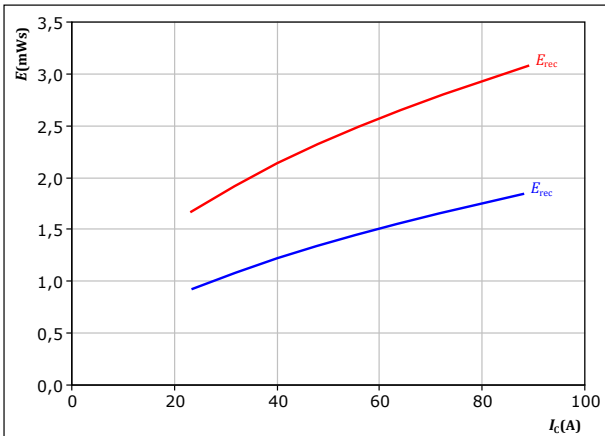
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 33.** FWD

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



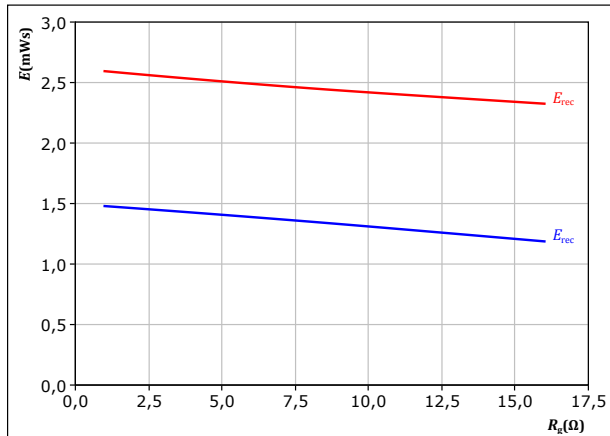
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 34.** FWD

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



With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

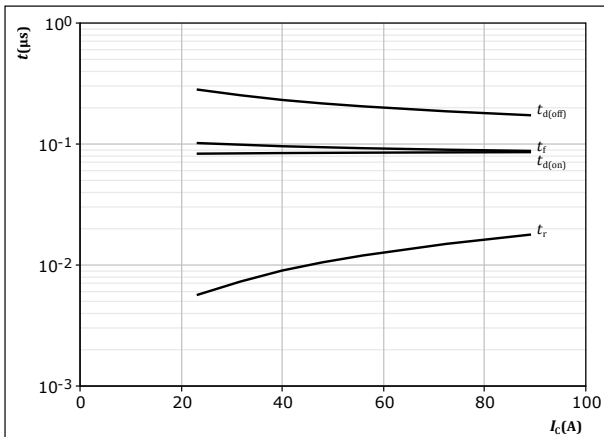




## Boost Switching Characteristics

**figure 35.** IGBT

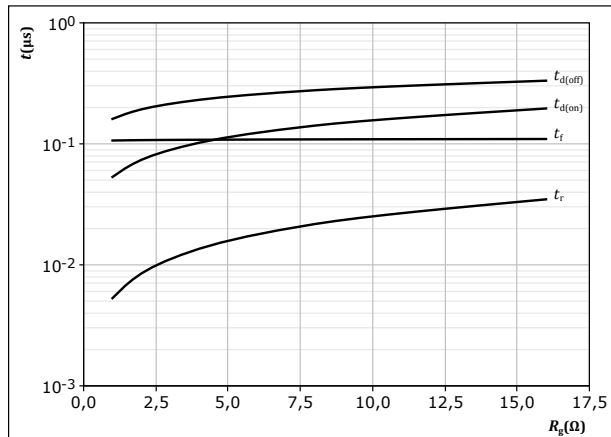
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 125 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{g(on)} = 4 \text{ } \Omega$   
 $R_{g(off)} = 4 \text{ } \Omega$

**figure 36.** IGBT

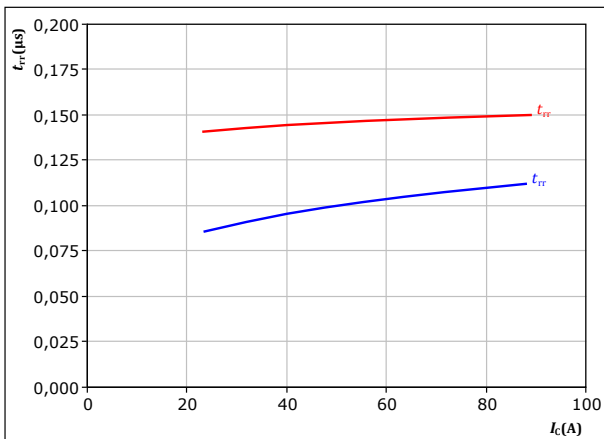
Typical switching times as a function of gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 125 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 56 \text{ A}$

**figure 37.** FWD

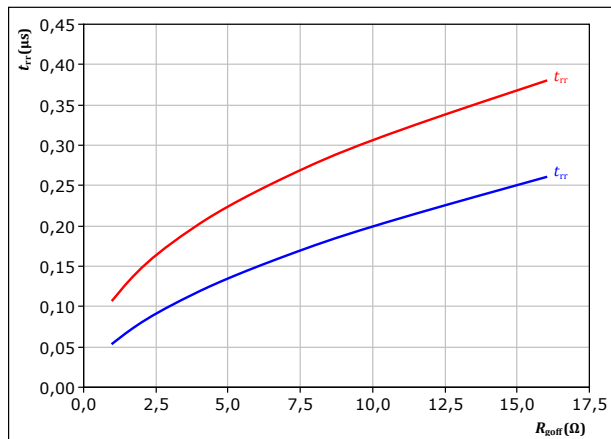
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



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

**figure 38.** FWD

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



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

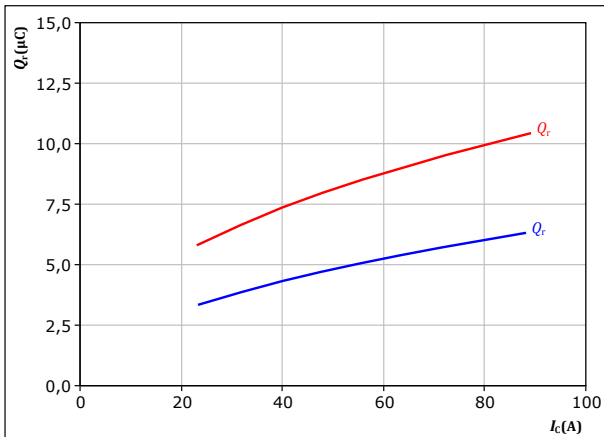


## Boost Switching Characteristics

figure 39. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

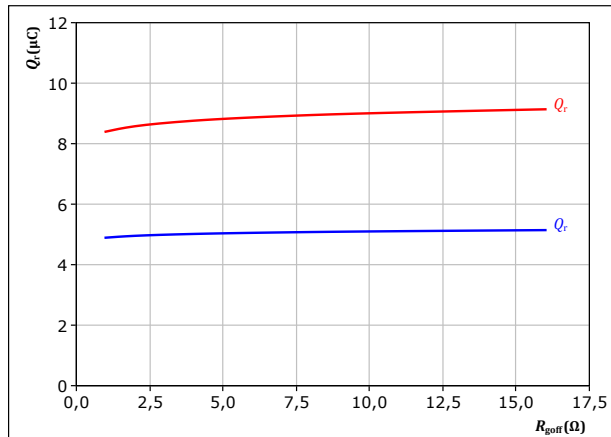
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{goff} = 4$  Ω

$T_j$ : — 25 °C  
— 125 °C

figure 40. FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

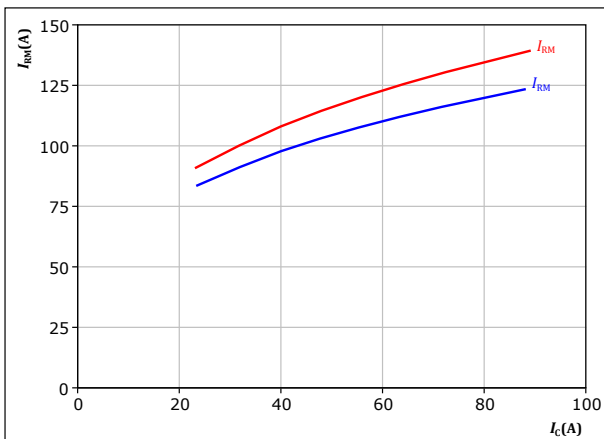
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 56$  A

$T_j$ : — 25 °C  
— 125 °C

figure 41. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

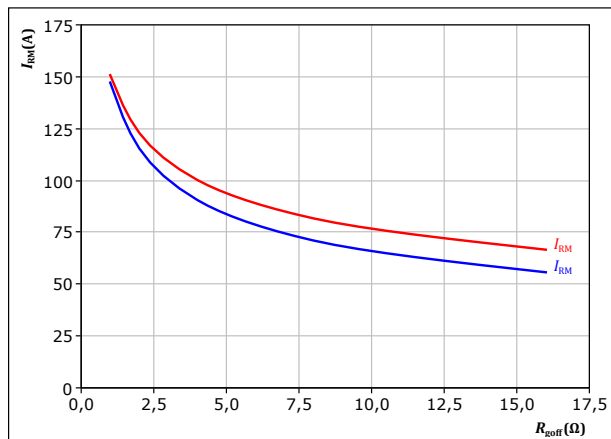
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{goff} = 4$  Ω

$T_j$ : — 25 °C  
— 125 °C

figure 42. FWD

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

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



With an inductive load at

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

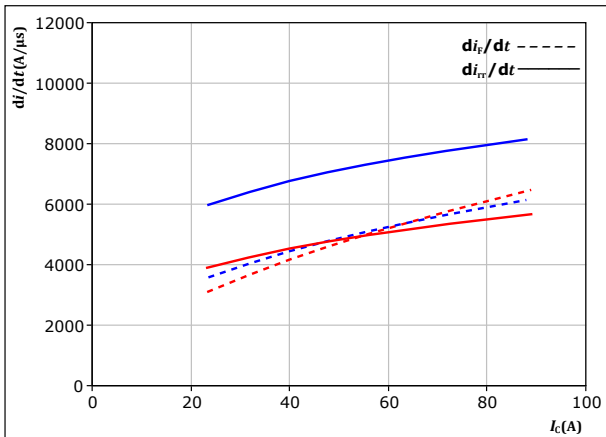
$T_j$ : — 25 °C  
— 125 °C



### Boost Switching Characteristics

**figure 43.** FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_i/dt, di_r/dt = f(I_c)$



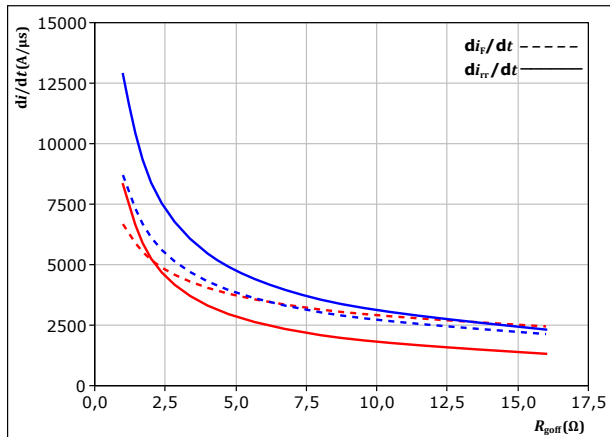
With an inductive load at

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

$T_j$ : — 25 °C  
 — 125 °C

**figure 44.** FWD

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



With an inductive load at

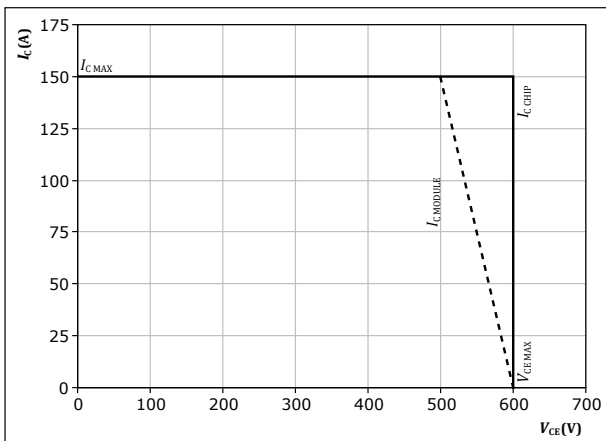
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 56 \text{ A}$

$T_j$ : — 25 °C  
 — 125 °C

**figure 45.** IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At  $T_j = 125 \text{ } ^\circ\text{C}$   
 $R_{goff} = 4 \text{ } \Omega$   
 $R_{goff} = 4 \text{ } \Omega$



## Switching Definitions

figure 46. IGBT

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

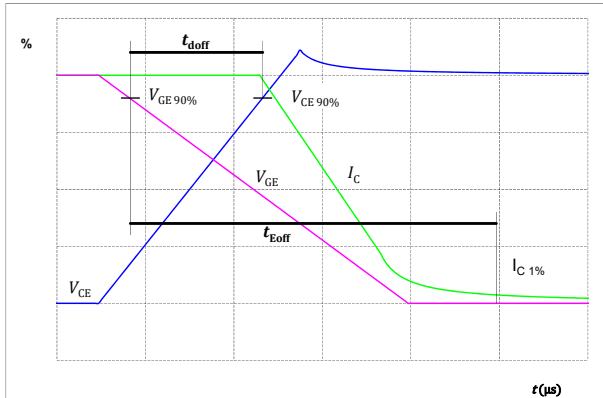


figure 47. IGBT

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

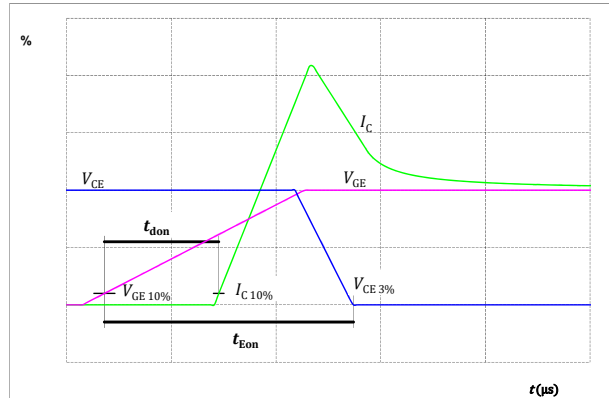


figure 48. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

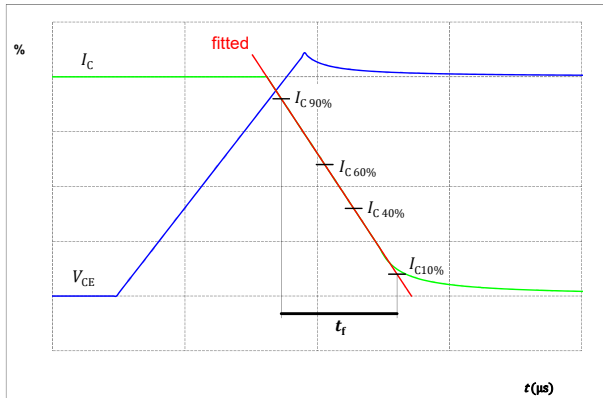
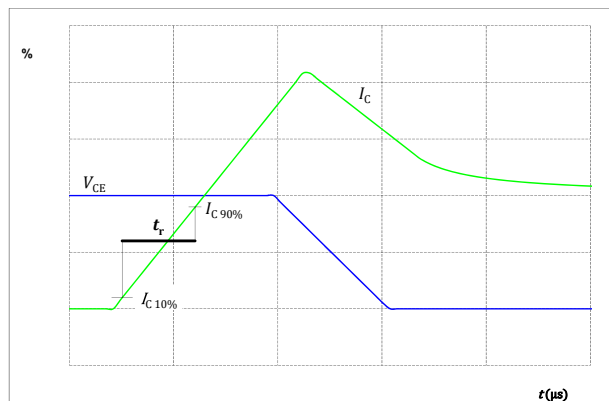


figure 49. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





### Switching Definitions

figure 50. FWD

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

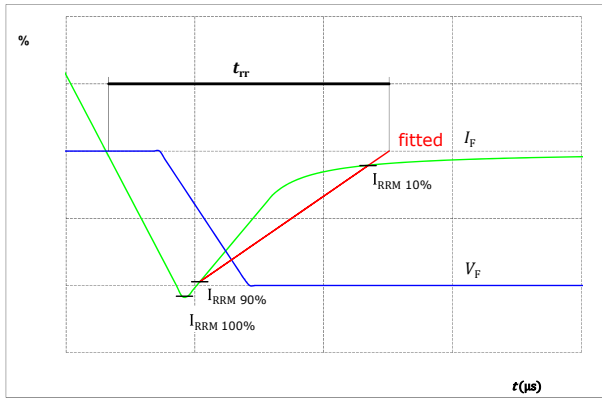
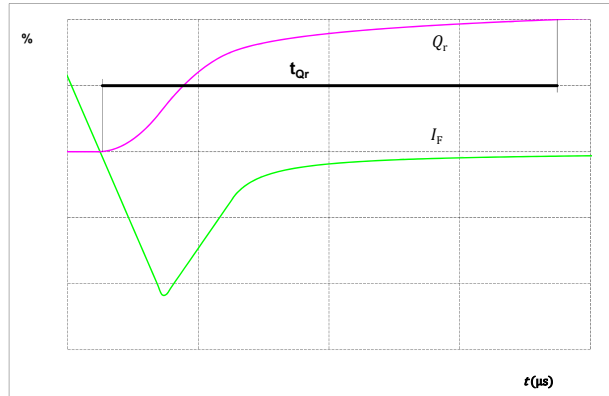


figure 51. FWD

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





Vincotech

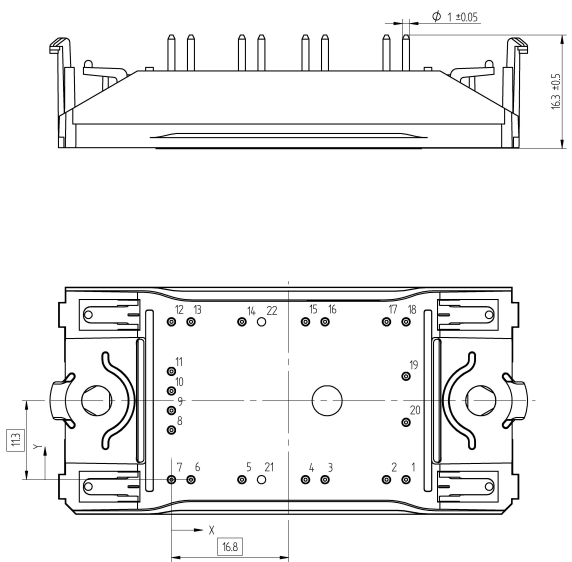
**10-FZ12NMA080SH01-M260F**  
datasheet

Ordering Code	
<b>Version</b>	<b>Ordering Code</b>
Without thermal paste	10-FZ12NMA080SH01-M260F
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ12NMA080SH01-M260F-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ12NMA080SH01-M260F-/3/

Marking						
	<b>Text</b>	<b>Name</b> NN-NNNNNNNNNNNNNN- TTTTIV	<b>Date code</b> WWYY	<b>UL &amp; VIN</b> UL VIN	<b>Lot</b> LLLLL	<b>Serial</b> SSSS
	<b>Datamatrix</b>	<b>Type&amp;Ver</b> TTTTIV	<b>Lot number</b> LLLLL	<b>Serial</b> SSSS	<b>Date code</b> WWYY	

**Outline**

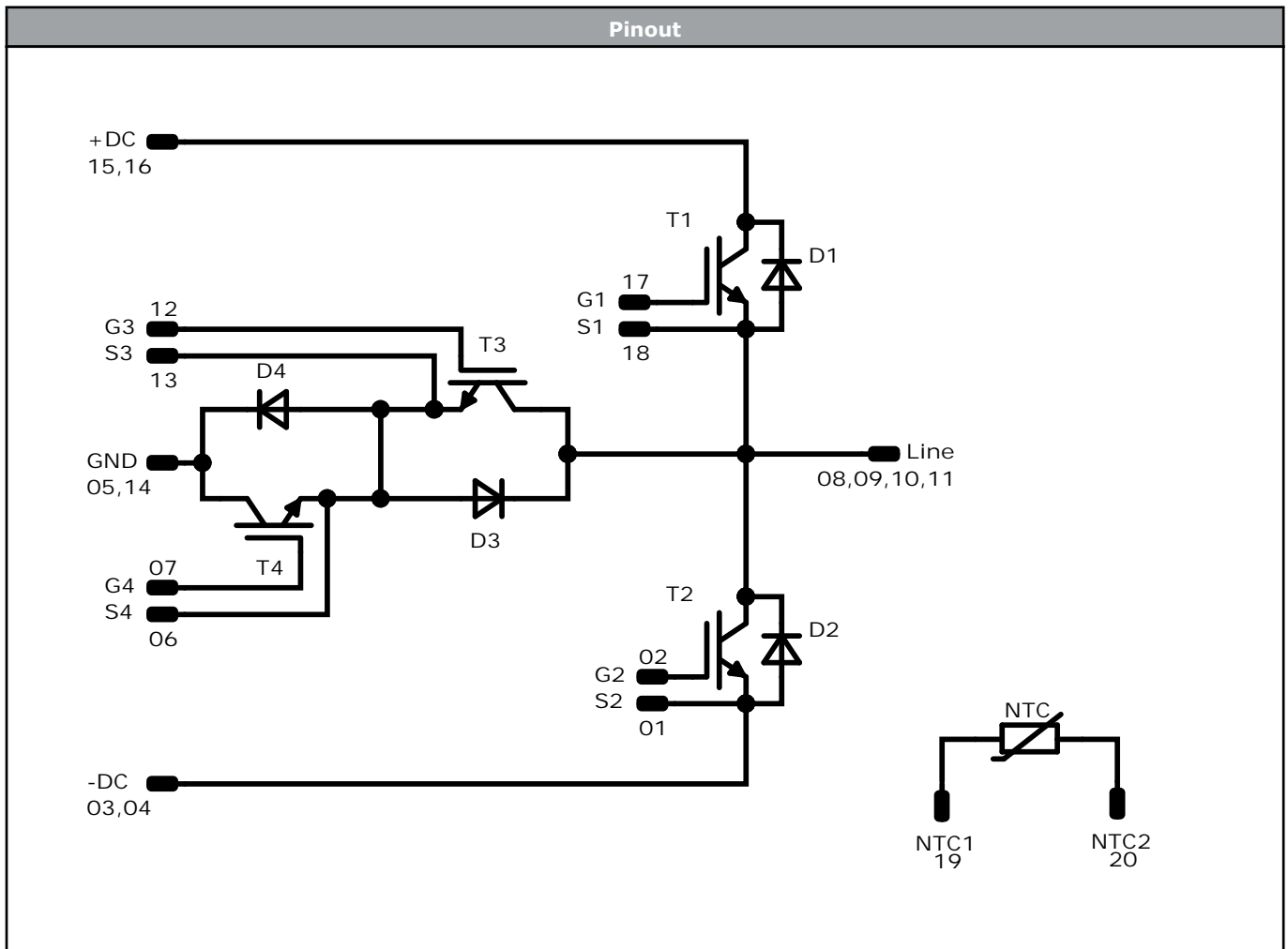
Pin table [mm]			
Pin	X	Y	Function
1	33,6	0	S2
2	30,8	0	G2
3	22	0	-DC
4	19,2	0	-DC
5	10,1	0	GND
6	2,8	0	S4
7	0	0	G4
8	0	7,1	Line
9	0	9,9	Line
10	0	12,7	Line
11	0	15,5	Line
12	0	22,6	G3
13	2,8	22,6	S3
14	10,1	22,6	GND
15	19,2	22,6	+DC
16	22	22,6	+DC
17	30,8	22,6	G1
18	33,6	22,6	S1
19	33,6	14,8	NTC1
20	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



Identification					
ID	Component	Voltage	Current	Function	Comment
T1, T2	IGBT	1200 V	80 A	Buck Switch	
D3, D4	FWD	600 V	60 A	Buck Diode	
T3, T4	IGBT	600 V	75 A	Boost Switch	
D1, D2	FWD	1200 V	50 A	Boost Diode	
NTC	Thermistor			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.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-FZ12NMA080SH01-M260F-D11-14	11 Sep. 2021	New Datasheet format, module is unchanged Introduce Rth values with PSX-P7 TIM Separate datasheet for pressfit pin version	

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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.