



<b>flowNPC 0</b>		<b>1200 V / 50 A</b>	
<b>Features</b>		<b>flow 0 12 mm housing</b>	
<ul style="list-style-type: none"><li>• High efficiency three-level half-bridge</li><li>• High efficiency IGBT</li><li>• Neutral point-clamped inverter</li><li>• Clip-In PCB mounting</li><li>• Low inductance layout</li></ul>			
<b>Target applications</b>		<b>Schematic</b>	
<ul style="list-style-type: none"><li>• Solar inverters</li><li>• UPS</li><li>• Power supplies</li></ul>			
<b>Types</b>			
<ul style="list-style-type: none"><li>• 10-FZ07NIA050SM-P925F58</li></ul>			



Vincotech

**10-FZ07NIA050SM-P925F58**  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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### Buck Switch

Collector-emitter voltage	$V_{CES}$		650	V
Collector current	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	41	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	150	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	78	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Maximum junction temperature	$T_{jmax}$		175	°C

### Buck Diode

Peak repetitive reverse voltage	$V_{RRM}$		650	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	47	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	100	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	63	W
Maximum junction temperature	$T_{jmax}$		175	°C

### Boost Switch

Collector-emitter voltage	$V_{CES}$		650	V
Collector current	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	41	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	150	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	78	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Maximum junction temperature	$T_{jmax}$		175	°C

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

Parameter	Symbol	Conditions	Value	Unit
<b>Boost Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		650	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	47	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	100	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	63	W
Maximum junction temperature	$T_{jmax}$		175	°C

**Boost Sw. Inv. Diode**

Peak repetitive reverse voltage	$V_{RRM}$		650	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	47	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	100	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	68	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



### Characteristic Values

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

#### Buck Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0005	25	3,3	4	4,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	25 125		1,83 2,01	2,22	V
Collector-emitter cut-off current	$I_{CES}$		0	650		25			40	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			120	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	25		25		3000		pF
Reverse transfer capacitance	$C_{res}$							11		pF
Gate charge	$Q_g$		15	520	50	25		120		nC

##### Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,22		K/W
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\*Only valid with pre-applied Vincotech thermal interface material.

##### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	-5/15	350	50	25		37,44		ns				
						125		37,44						
						150		37,76						
Rise time	$t_r$									25		12,48		ns
										125		14,08		
										150		14,4		
Turn-off delay time	$t_{d(off)}$									25		87,36		ns
										125		102,4		
										150		105,92		
Fall time	$t_f$									25		5,74		ns
										125		9,28		
										150		10,86		
Turn-on energy (per pulse)	$E_{on}$	$Q_{ifwd} = 1,3 \mu\text{C}$ $Q_{ifwd} = 2,73 \mu\text{C}$ $Q_{ifwd} = 3,09 \mu\text{C}$				25		0,782		mWs				
						125		1,03						
						150		1,1						
Turn-off energy (per pulse)	$E_{off}$					25		0,279		mWs				
						125		0,466						
						150		0,523						





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datasheet

### Characteristic Values

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

### Buck Diode

#### Static

Forward voltage	$V_F$				50	25 125 150		1,5 1,44 1,42	1,92	V
Reverse leakage current	$I_R$	$V_T = 650$ V				25			2,65	μA

#### Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,5		K/W
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\*Only valid with pre-applied Vincotech thermal interface material.

#### Dynamic

Peak recovery current	$I_{RRM}$					25 125 150		22,74 37,47 41,12		A
Reverse recovery time	$t_{rr}$					25 125 150		92,2 122,56 134,22		ns
Recovered charge	$Q_r$	$di/dt=2517$ A/μs $di/dt=2644$ A/μs $di/dt=2539$ A/μs	-5/15	350	50	25 125 150		1,3 2,73 3,09		μC
Reverse recovered energy	$E_{rec}$					25 125 150		0,254 0,563 0,645		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		505,67 306,86 302,23		A/μs



### Characteristic Values

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

#### Boost Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0005	25	3,3	4	4,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	25 125		1,83 2,01	2,22	V
Collector-emitter cut-off current	$I_{CES}$		0	650		25			40	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			120	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	25		25		3000		pF
Reverse transfer capacitance	$C_{res}$							11		pF
Gate charge	$Q_g$		15	520	50	25		120		nC

##### Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,22		K/W
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\*Only valid with pre-applied Vincotech thermal interface material.

##### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	-5/15	350	50	25		37,44		ns				
						125		37,76						
						150		37,44						
Rise time	$t_r$									25		14,08		ns
										125		16		
										150		16,32		
Turn-off delay time	$t_{d(off)}$									25		89,6		ns
										125		105,6		
										150		109,76		
Fall time	$t_f$									25		6,52		ns
										125		15		
										150		17,21		
Turn-on energy (per pulse)	$E_{on}$	$Q_{ifwd} = 1,3 \mu C$ $Q_{ifwd} = 2,66 \mu C$ $Q_{ifwd} = 3,08 \mu C$				25		0,822		mWs				
						125		1,02						
						150		1,06						
Turn-off energy (per pulse)	$E_{off}$					25		0,334		mWs				
						125		0,531						
						150		0,573						



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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 Diode

##### Static

Forward voltage	$V_F$				50	25 125 150		1,5 1,44 1,42	1,92	V
Reverse leakage current	$I_R$	$V_T = 650$ V				25			2,65	μA

##### Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,5		K/W
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\*Only valid with pre-applied Vincotech thermal interface material.

##### Dynamic

Peak recovery current	$I_{RRM}$					25 125 150		21,56 33,23 36,98		A
Reverse recovery time	$t_{rr}$					25 125 150		88,7 117,4 131,38		ns
Recovered charge	$Q_r$	$di/dt=2005$ A/μs $di/dt=2215$ A/μs $di/dt=2195$ A/μs	-5/15	350	50	25 125 150		1,3 2,66 3,08		μC
Reverse recovered energy	$E_{rec}$					25 125 150		0,286 0,631 0,741		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		2007 535,04 338,29		A/μs



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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 Sw. Inv. Diode

##### Static

Forward voltage	$V_F$				50	25 125	1,18	1,63 1,54	1,82	V
Reverse leakage current	$I_R$	$V_i = 650$ V				25			0,6	μA

##### Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,4		K/W
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\*Only valid with pre-applied Vincotech thermal interface material.

#### Thermistor

##### Static

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

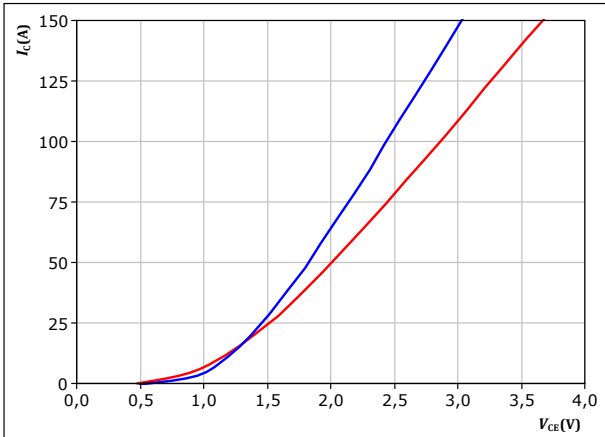


## Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

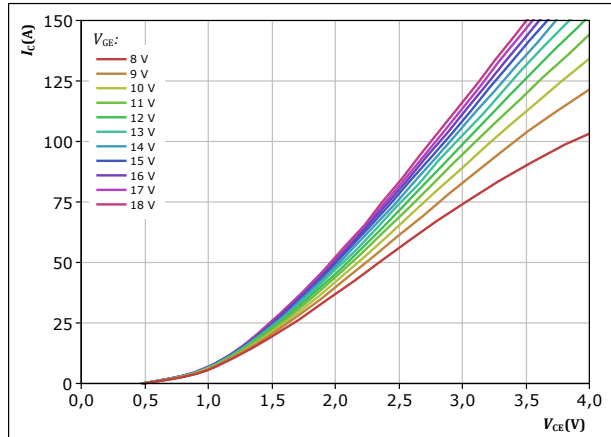


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j$ : — 25 °C  
— 125 °C

figure 2. IGBT

Typical output characteristics

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

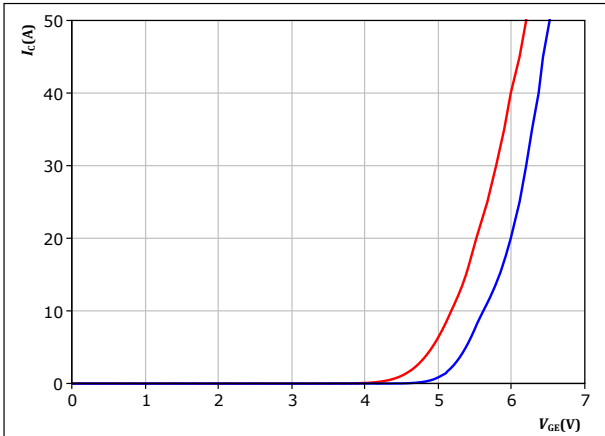


$t_p = 250 \mu s$   
 $T_j = 125 \text{ } ^\circ C$   
 $V_{GE}$  from 8 V to 18 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

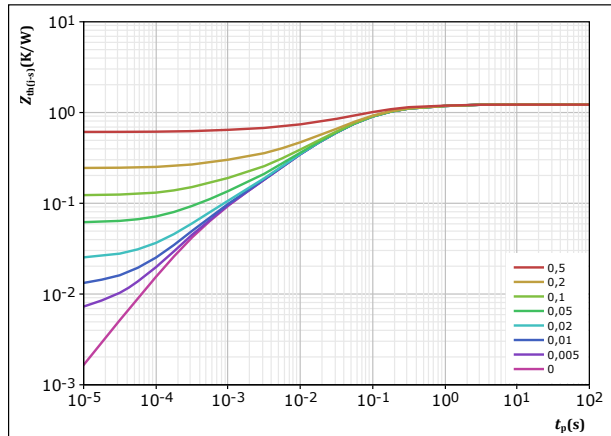


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j$ : — 25 °C  
— 125 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,222 \text{ K/W}$   
IGBT thermal model values

$R$ (K/W)	$\tau$ (s)
1,28E-01	8,75E-01
4,40E-01	1,12E-01
3,96E-01	3,56E-02
1,75E-01	7,55E-03
3,44E-02	1,97E-03
4,80E-02	4,33E-04

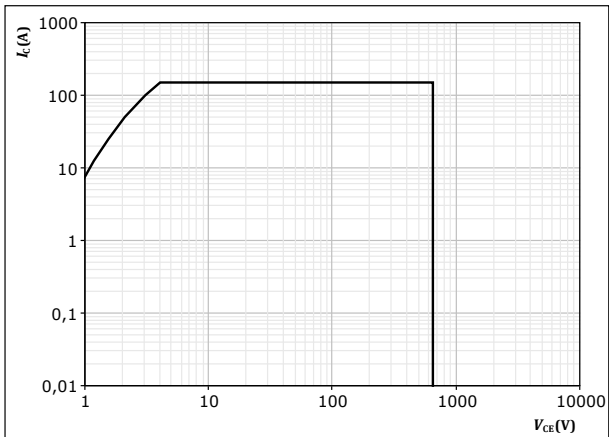


### Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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



D = single pulse  
T<sub>s</sub> = 80 °C  
V<sub>CE</sub> = 15 V  
T<sub>j</sub> = T<sub>jmax</sub>



### Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

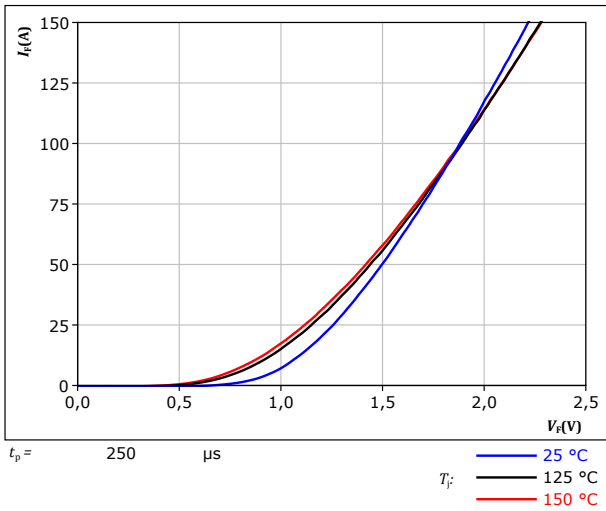
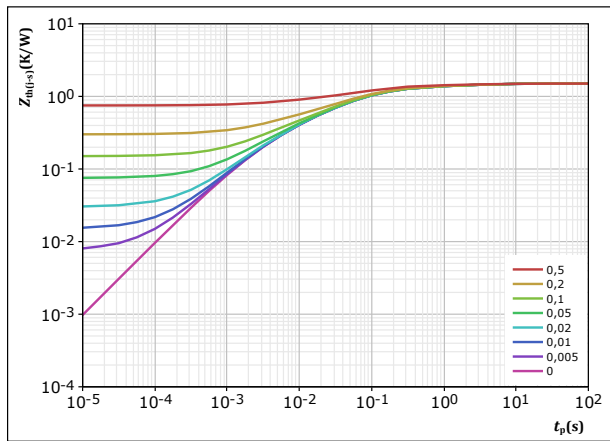


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,501 \text{ K/W}$   
 IGBT thermal model values

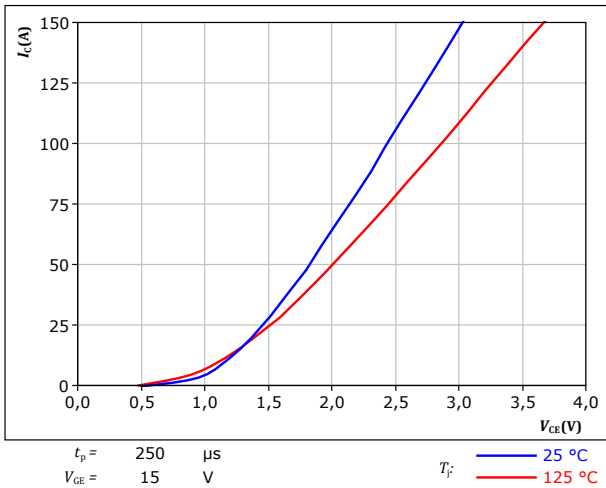
R (K/W)	$\tau$ (s)
1,03E-01	4,73E+00
2,05E-01	5,53E-01
6,39E-01	8,31E-02
3,39E-01	2,02E-02
1,71E-01	4,42E-03
4,45E-02	1,30E-03



### Boost Switch Characteristics

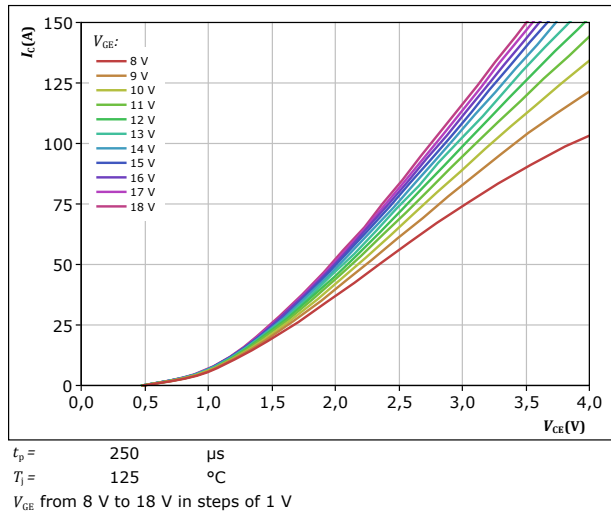
**figure 8.** IGBT

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



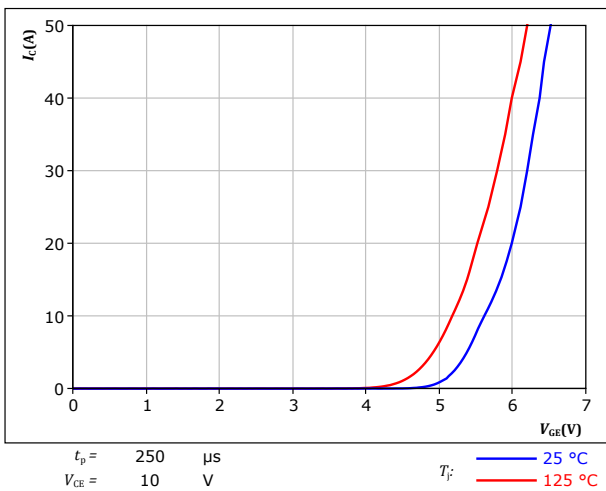
**figure 9.** IGBT

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



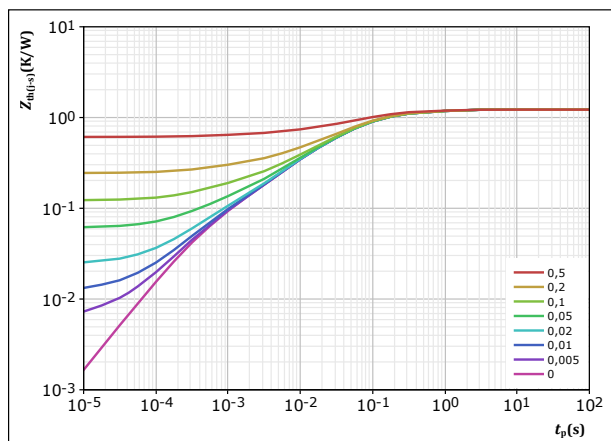
**figure 10.** IGBT

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



**figure 11.** IGBT

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,222 \text{ K/W}$

IGBT thermal model values

R (K/W)	$\tau$ (s)
1,28E-01	8,75E-01
4,40E-01	1,12E-01
3,96E-01	3,56E-02
1,75E-01	7,55E-03
3,44E-02	1,97E-03
4,80E-02	4,33E-04



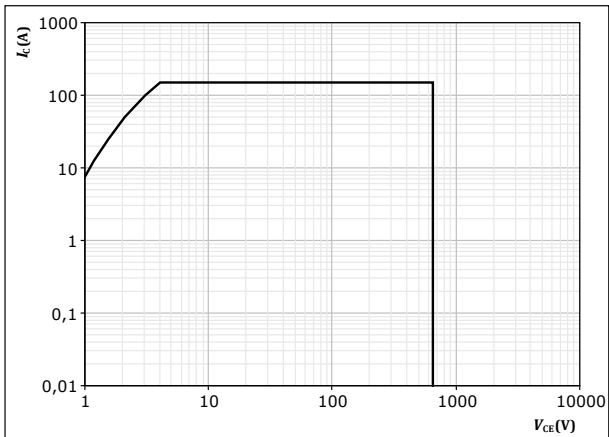


### Boost Switch Characteristics

figure 12. IGBT

Safe operating area

$I_C = f(V_{CE})$



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



### Boost Diode Characteristics

figure 13. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

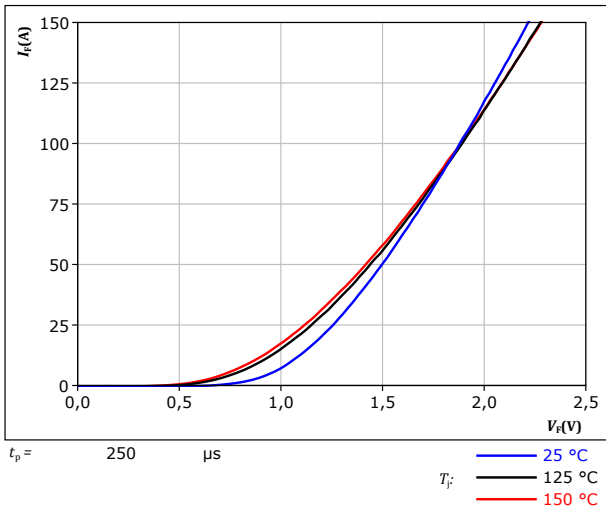
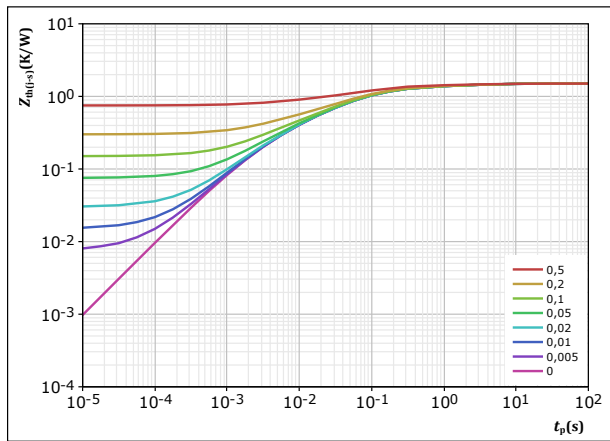


figure 14. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,501 \text{ K/W}$   
 IGBT thermal model values

R (K/W)	$\tau$ (s)
1,03E-01	4,73E+00
2,05E-01	5,53E-01
6,39E-01	8,31E-02
3,39E-01	2,02E-02
1,71E-01	4,42E-03
4,45E-02	1,30E-03



### Boost Sw. Inv. Diode Characteristics

figure 15. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

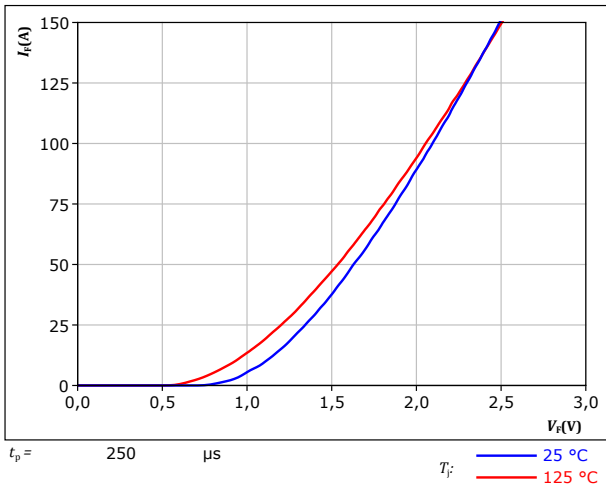
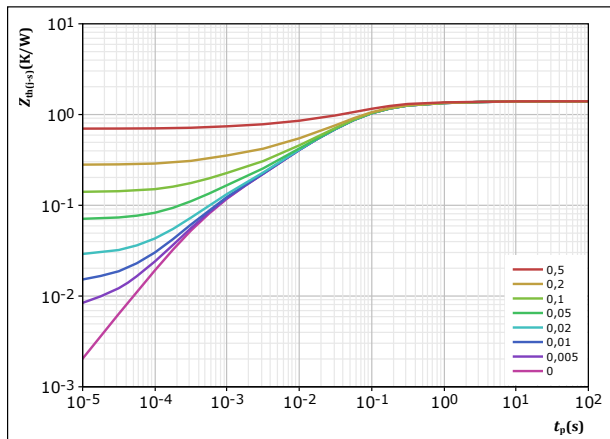


figure 16. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 1,399 \text{ K/W}$

IGBT thermal model values

R (K/W)	$\tau$ (s)
6,76E-02	3,05E+00
1,79E-01	3,50E-01
6,70E-01	7,08E-02
2,72E-01	1,81E-02
1,35E-01	4,13E-03
7,56E-02	5,11E-04

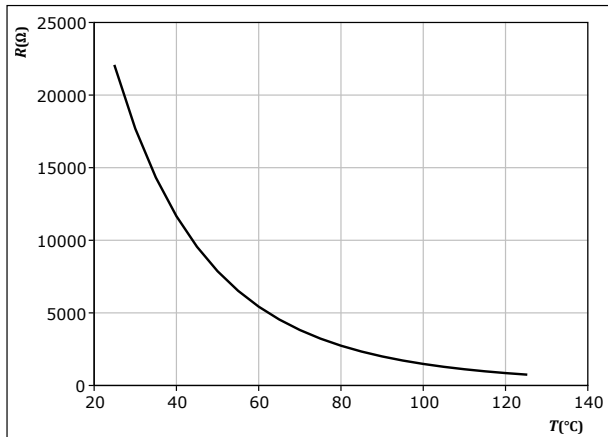


## Thermistor Characteristics

figure 17. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

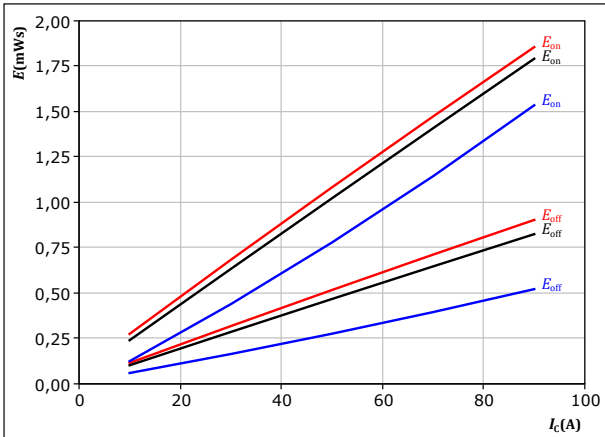




## Buck Switching Characteristics

**figure 18.** IGBT

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

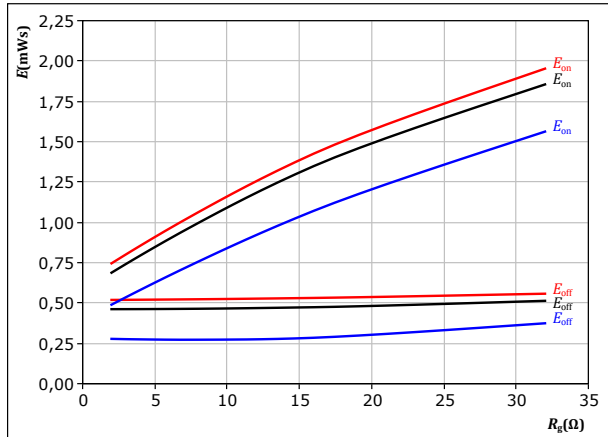


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{g(on)} = 8 \ \Omega$   
 $R_{g(off)} = 8 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 19.** IGBT

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

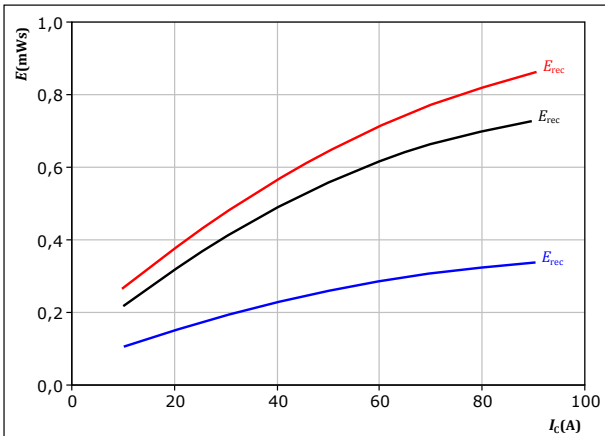


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 20.** FWD

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

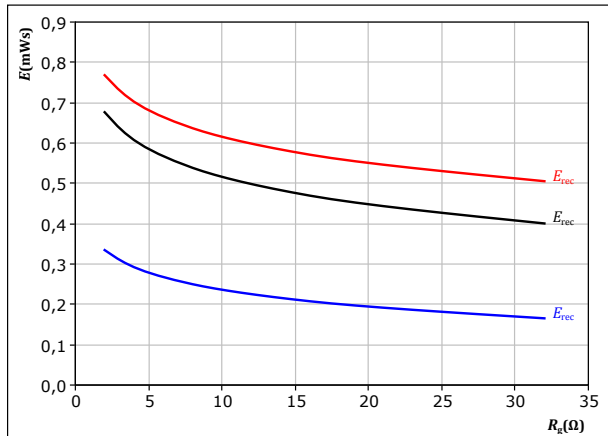


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{g(on)} = 8 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 21.** FWD

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



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

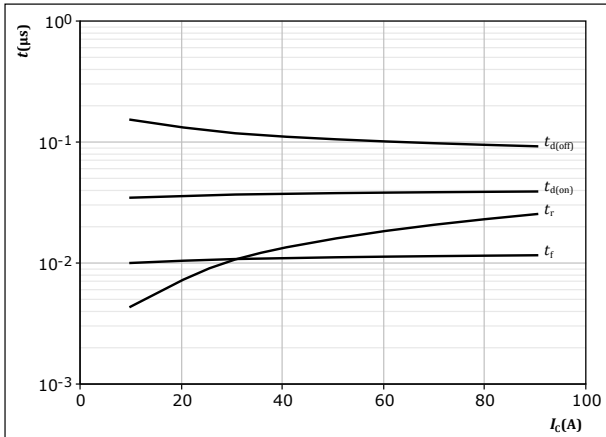
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C



## Buck Switching Characteristics

**figure 22.** IGBT

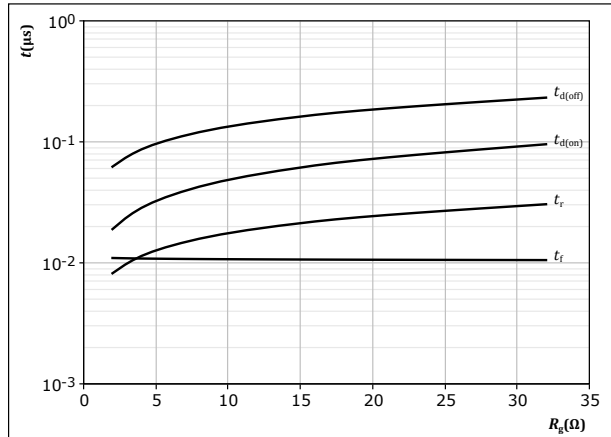
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $R_{gon} = 8$  Ω  
 $R_{goff} = 8$  Ω

**figure 23.** IGBT

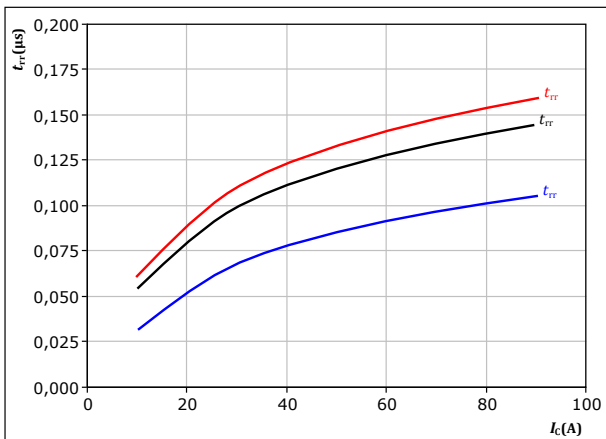
Typical switching times as a function of gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $I_c = 50$  A

**figure 24.** FWD

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

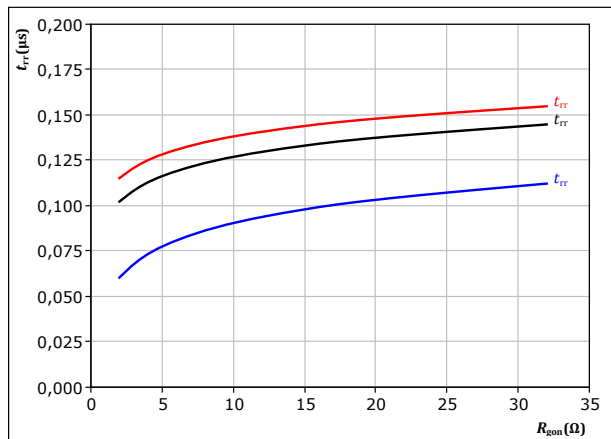


With an inductive load at  
 $V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $R_{gon} = 8$  Ω

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 25.** 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  
 $V_{GE} = -5/15$  V  
 $I_c = 50$  A

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

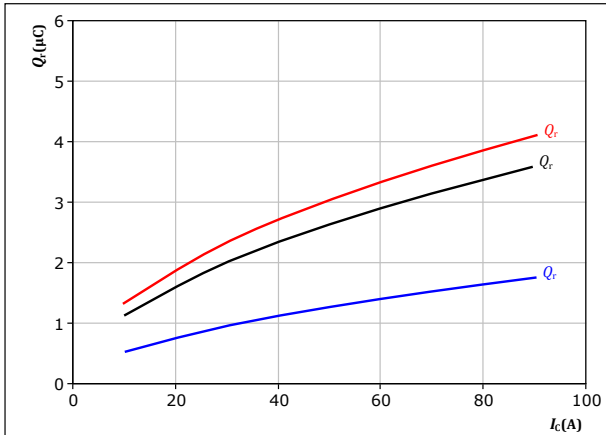


## Buck Switching Characteristics

figure 26. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

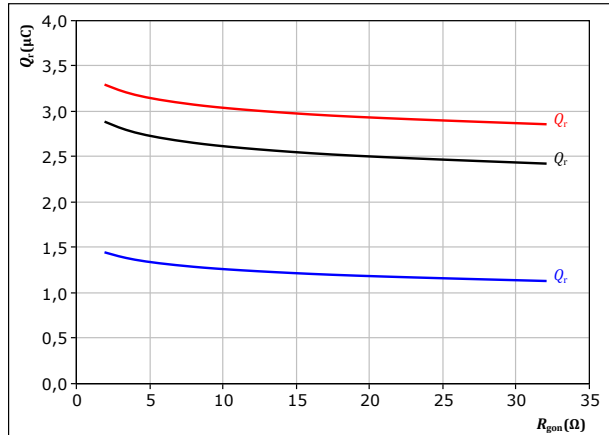
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{gon} = 8 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 27. FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

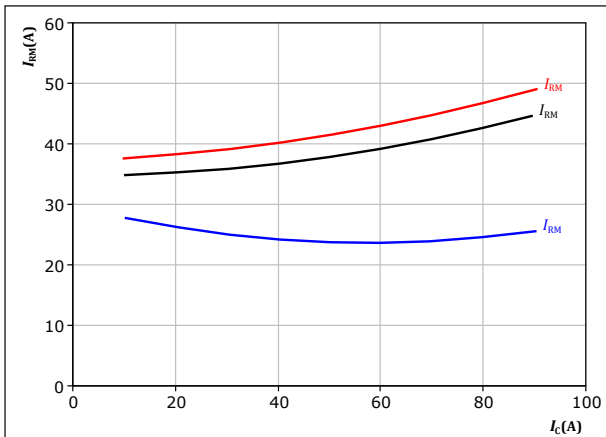
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 28. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

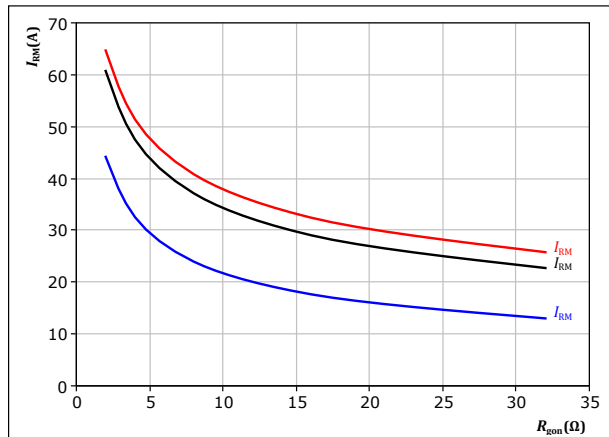
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{gon} = 8 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 29. FWD

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

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

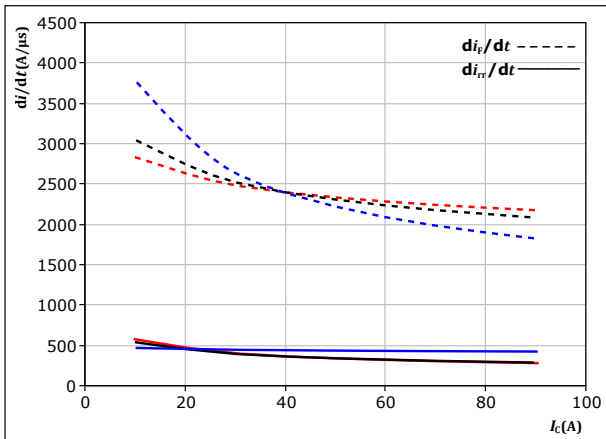
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C



## Buck Switching Characteristics

**figure 30.** FWD

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



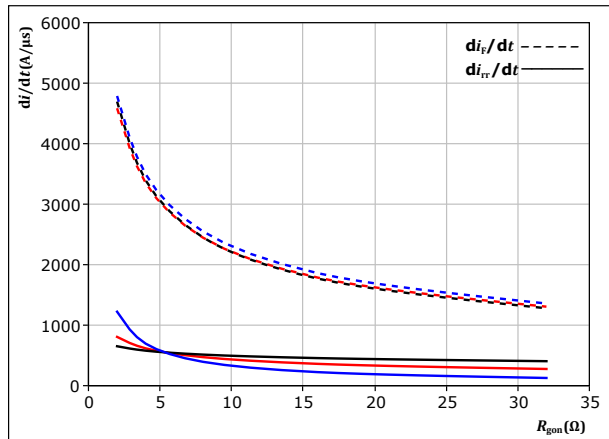
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $R_{gon} = 8$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 31.** FWD

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



With an inductive load at

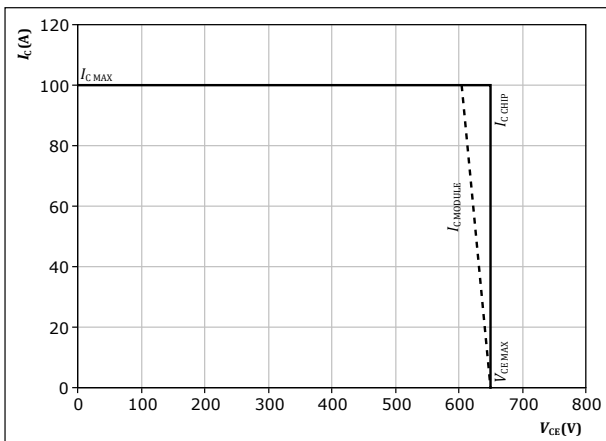
$V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $I_c = 50$  A

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 32.** IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At  $T_j = 150$  °C  
 $R_{gon} = 8$   $\Omega$   
 $R_{goff} = 8$   $\Omega$

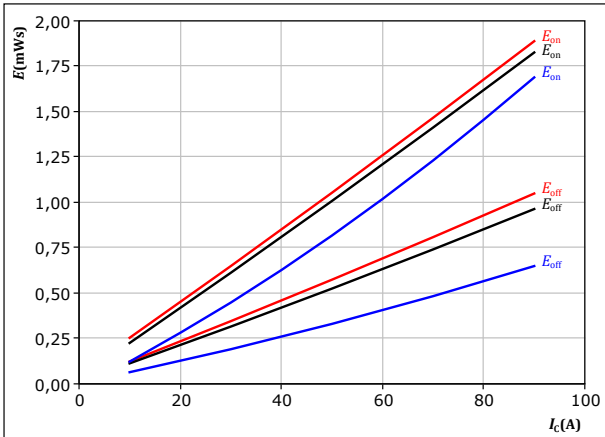




## Boost Switching Characteristics

**figure 33.** IGBT

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

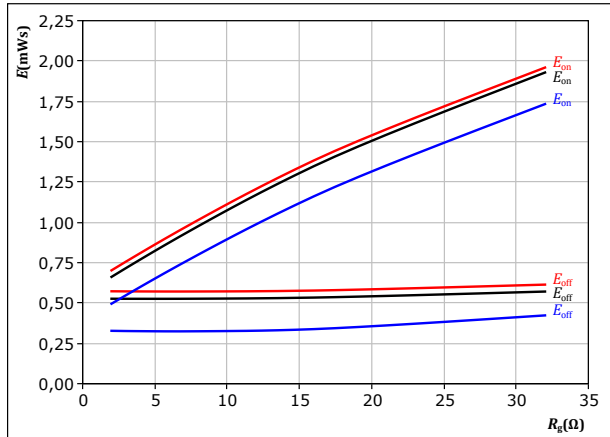


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{g(on)} = 8 \ \Omega$   
 $R_{g(off)} = 8 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 34.** IGBT

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

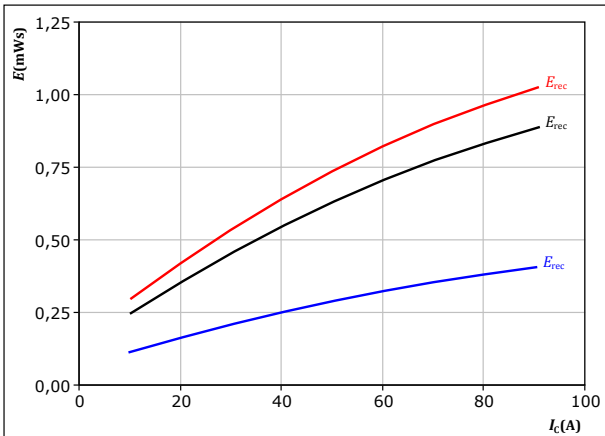


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 35.** FWD

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

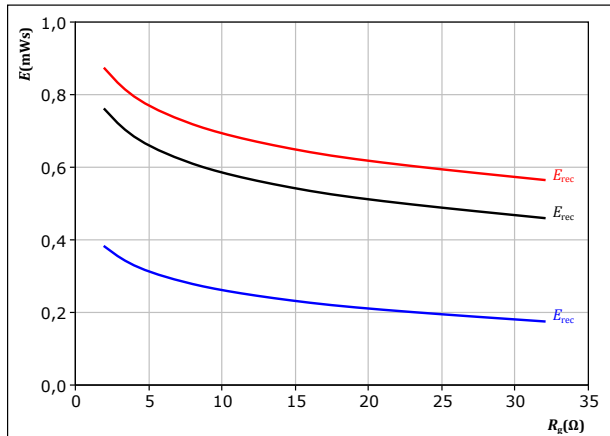


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{g(on)} = 8 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 36.** FWD

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



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

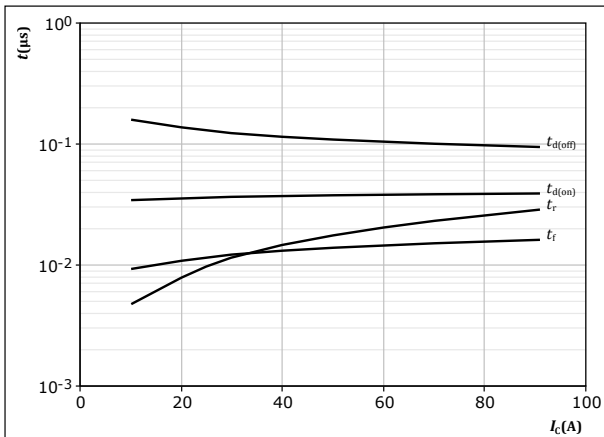
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C



## Boost Switching Characteristics

**figure 37.** IGBT

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

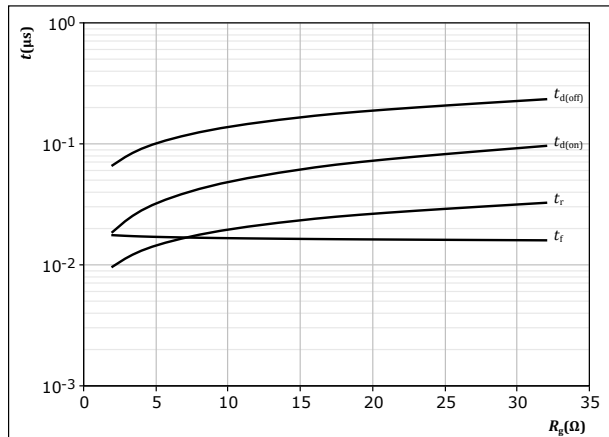


With an inductive load at

$T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{g(on)} = 8 \text{ } \Omega$   
 $R_{g(off)} = 8 \text{ } \Omega$

**figure 38.** IGBT

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

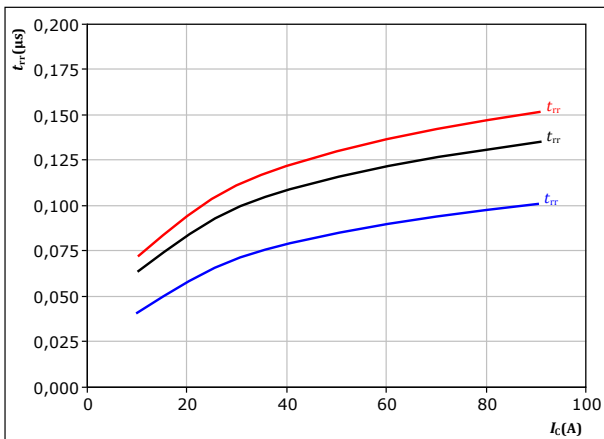


With an inductive load at

$T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

**figure 39.** FWD

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



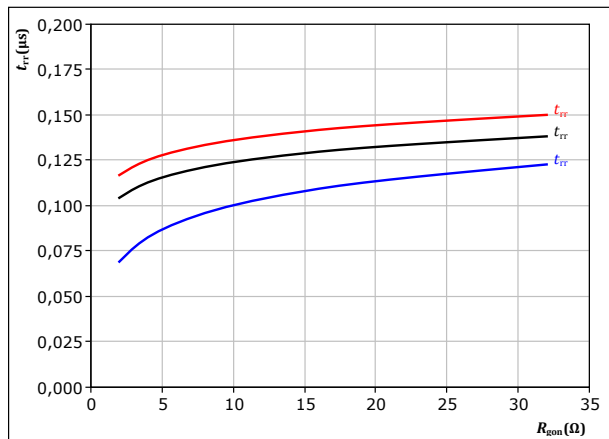
With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{g(on)} = 8 \text{ } \Omega$

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 40.** FWD

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

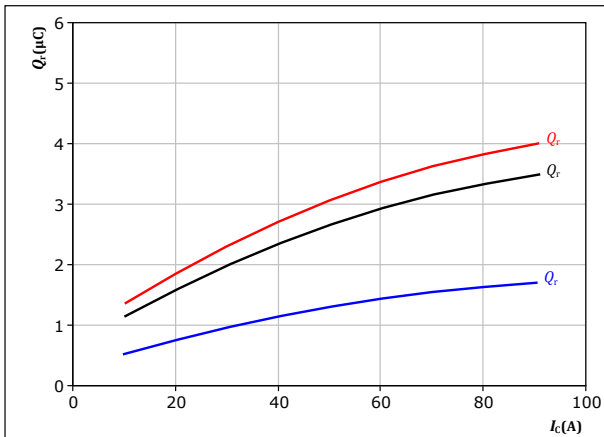


## Boost Switching Characteristics

figure 41. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

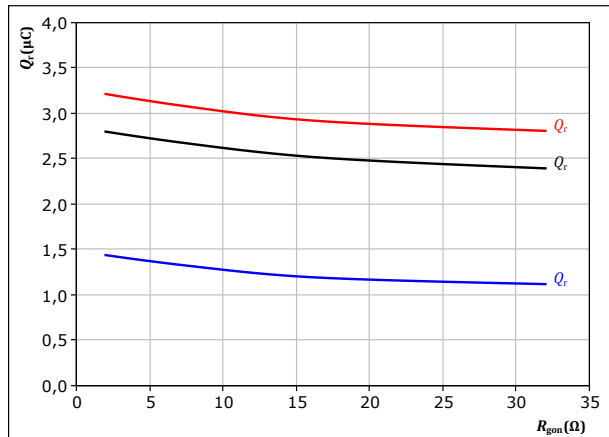
$V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $R_{gon} = 8$  Ω

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 42. FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

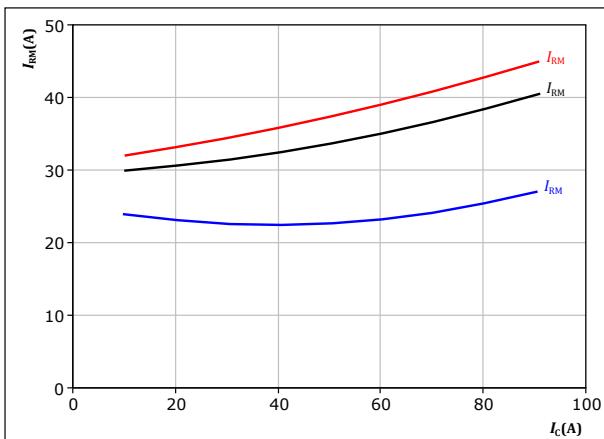
$V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $I_c = 50$  A

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 43. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

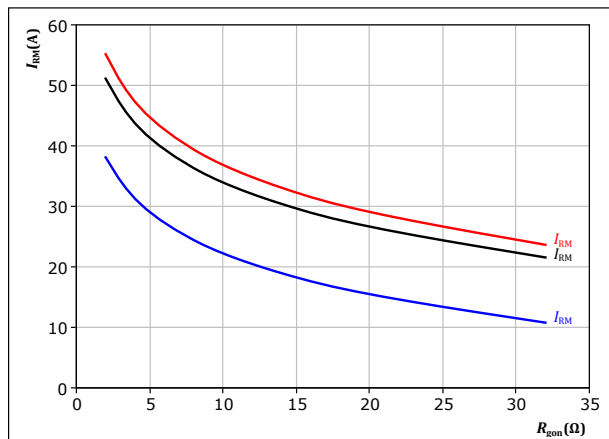
$V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $R_{gon} = 8$  Ω

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 44. FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = -5/15$  V  
 $I_c = 50$  A

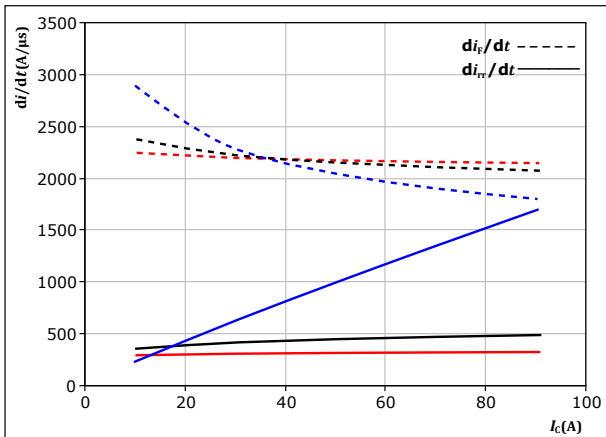
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C



### Boost Switching Characteristics

**figure 45.** FWD

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

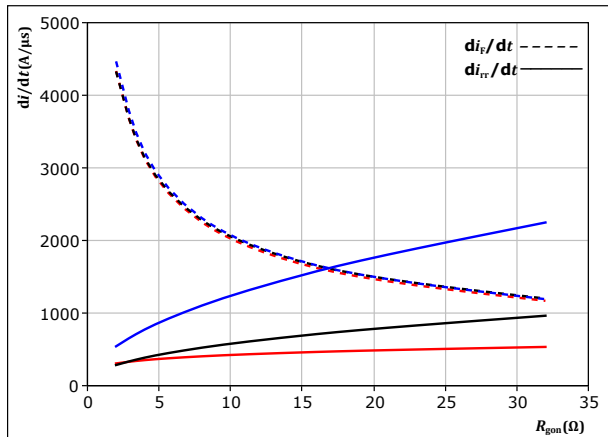


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $R_{gon} = 8 \ \Omega$

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

**figure 46.** FWD

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

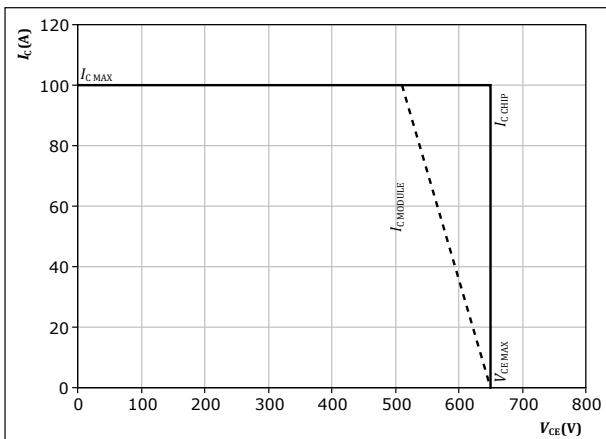


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = -5/15 \text{ V}$   
 $I_c = 50 \text{ A}$

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

**figure 47.** IGBT

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



At  $T_j = 150 \text{ °C}$   
 $R_{gon} = 8 \ \Omega$   
 $R_{goff} = 8 \ \Omega$



## Switching Definitions

figure 48. IGBT

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

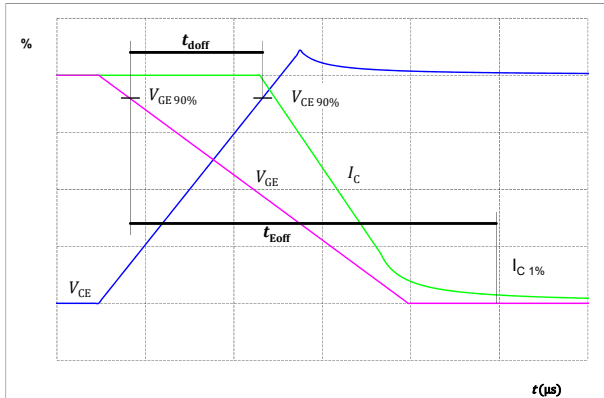


figure 49. IGBT

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

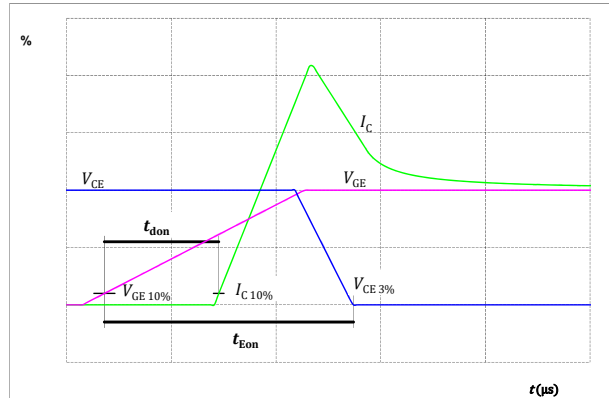


figure 50. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

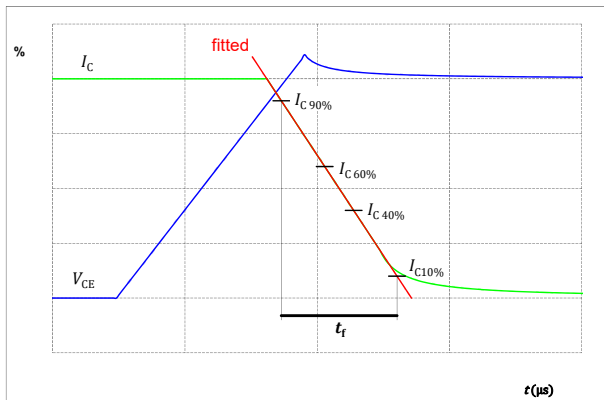
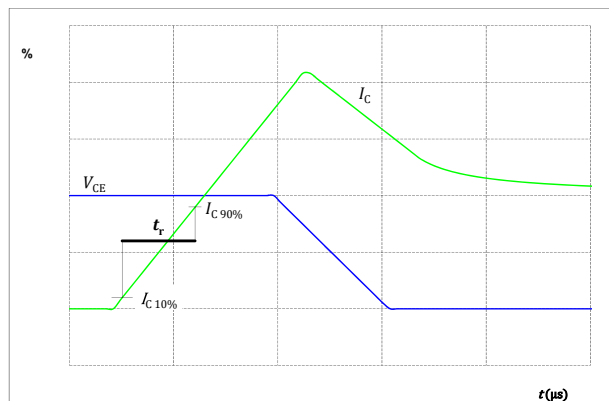


figure 51. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





### Switching Definitions

figure 52. FWD

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

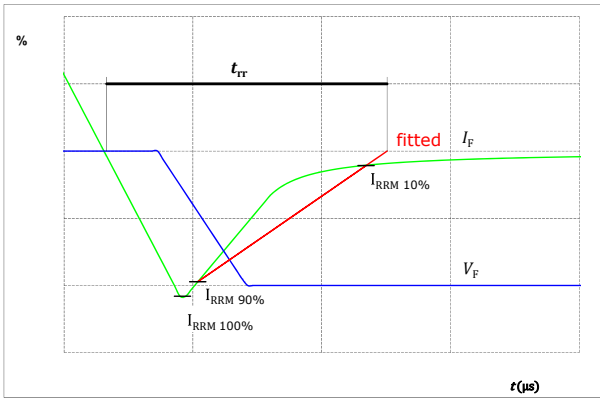
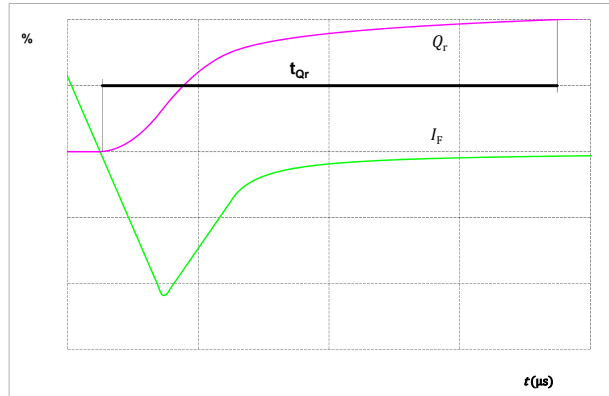


figure 53. FWD

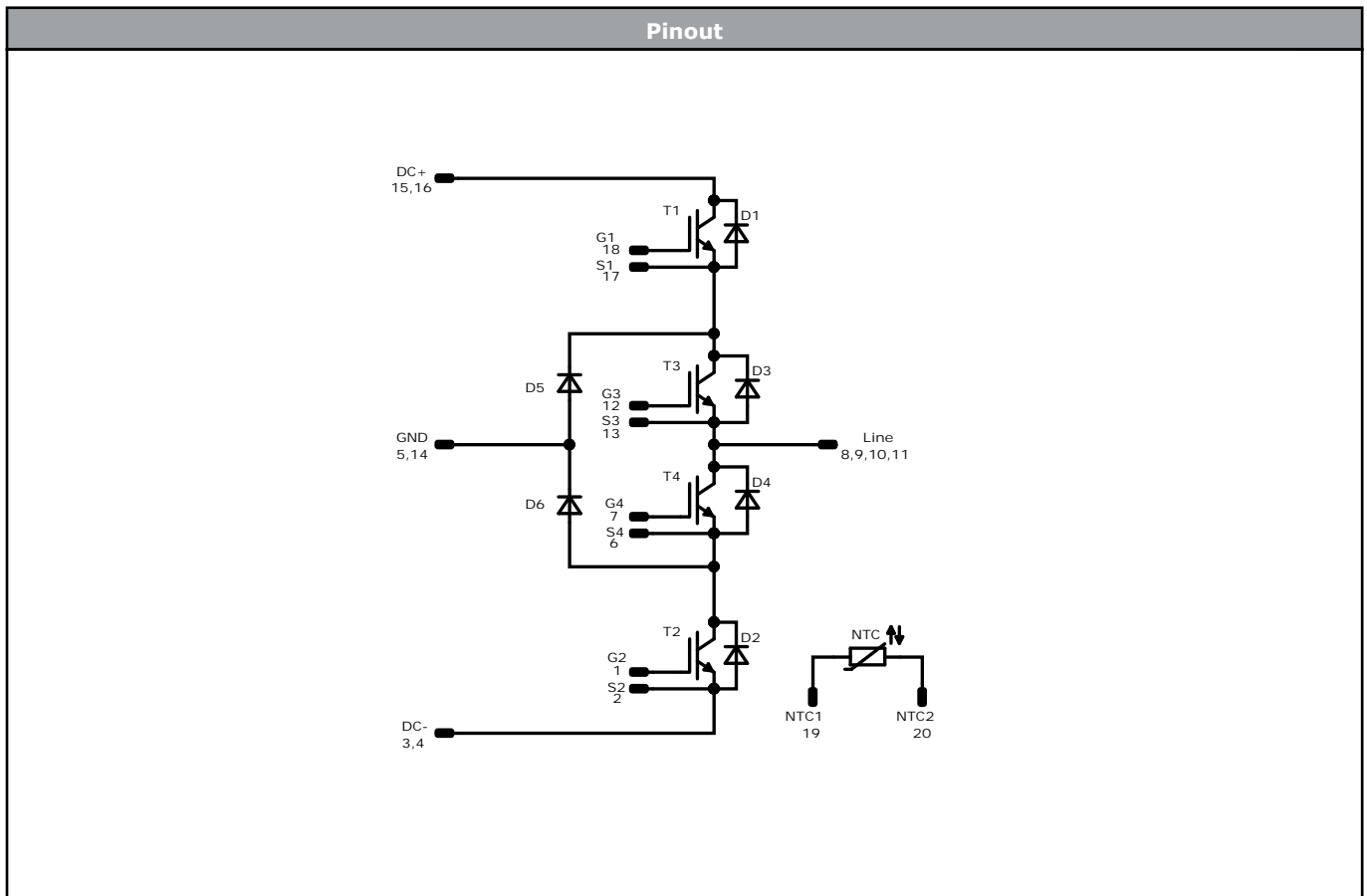
Turn-on Switching Waveforms & definition of  $t_{Qr}$  ( $t_{Qr}$  = integrating time for  $Q_r$ )







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	650 V	50 A	Buck Switch	
D5, D6	FWD	650 V	50 A	Buck Diode	
T3, T4	IGBT	650 V	50 A	Boost Switch	
D2, D1	FWD	650 V	50 A	Boost Diode	
D4, D3	FWD	650 V	50 A	Boost Sw. Inv. 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.

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-FZ07NIA050SM-P925F58-D1-14	21 May, 2020		

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