



flowNPC 0 IGBT

1200 V / 30 A

Topology features

- Kelvin Emitter for improved switching performance
- Neutral Point Clamped Topology (I-Type)
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current

Housing features

- Base isolation: Al<sub>2</sub>O<sub>3</sub>
- Clip-in, reliable mechanical connection, qualified for wave soldering
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Solder pin

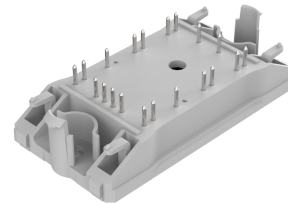
Target applications

- UPS
- Solar Inverters

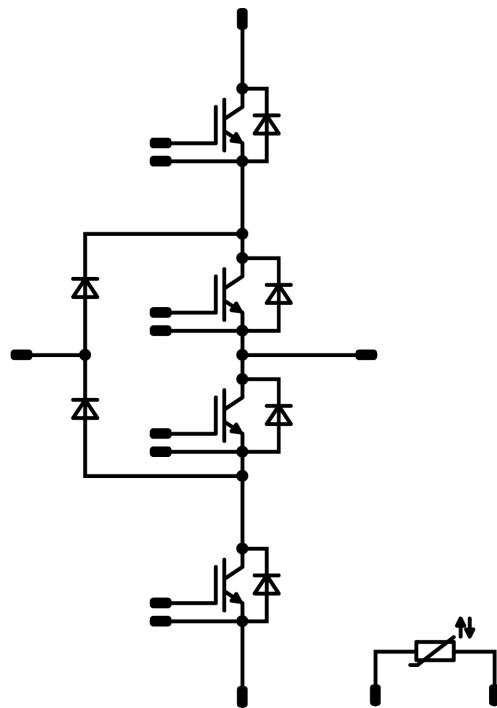
Types

- 10-FZ06NIA030SA-P924F33

flow 0 12 mm housing



Schematic





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10-FZ06NIA030SA-P924F33  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Buck Switch</b>				
Collector-emitter voltage	$V_{CES}$		600	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	90	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	64	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	$^{\circ}\text{C}$

## Buck Diode

Peak repetitive reverse voltage	$V_{RRM}$		600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	60	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	52	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Boost Switch

Collector-emitter voltage	$V_{CES}$		600	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	90	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	64	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	$^{\circ}\text{C}$

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

Parameter	Symbol	Conditions	Value	Unit
<b>Boost Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	60	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	52	W
Maximum junction temperature	$T_{jmax}$		175	°C

**Boost Sw. Inv. Diode**

Peak repetitive reverse voltage	$V_{RRM}$		600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	60	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	52	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



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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		

#### Buck Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00043	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		30	25 150	1,1	1,57 1,8	1,9 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	600		25			1,6	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			300	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$							1630		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25		108		pF
Reverse transfer capacitance	$C_{res}$							50		pF

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,49		K/W
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##### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16$ Ω $R_{goff} = 16$ Ω	±15	350	30	25		98,4		ns
Rise time	$t_r$					125		101,4		
						25		11,4		ns
Turn-off delay time	$t_{d(off)}$					125		16,4		
						25		155,4		ns
Fall time	$t_f$					125		173,6		
		25		93,1		ns				
Turn-on energy (per pulse)	$E_{on}$	$Q_{trFD} = 1,41$ μC				25		0,474		mWs
		$Q_{trFD} = 2,29$ μC				125		0,618		
Turn-off energy (per pulse)	$E_{off}$					25		0,802		mWs
						125		1,01		





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datasheet

### 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 Diode

##### Static

Forward voltage	$V_F$				30	25 150	1,25	1,64 1,55	1,95 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 600$ V				25			27	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,81		K/W
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##### Dynamic

Peak recovery current	$I_{RM}$	$di/dt=3840$ A/μs $di/dt=2458$ A/μs	±15	350	30	25		35,98		A
						125		39,02		
Reverse recovery time	$t_{rr}$					25		126,45		
						125		183,17		
Recovered charge	$Q_r$					25		1,41		
						125		2,29		
Reverse recovered energy	$E_{rec}$	25		0,327						
		125		0,554						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		4073						
		125		2293						



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### 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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00043	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		30	25 150	1,1	1,57 1,8	1,9 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	600		25			1,6	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			300	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$							1630		pF
Output capacitance	$C_{oes}$	$f = 1 \text{ Mhz}$	0	25		25		108		pF
Reverse transfer capacitance	$C_{res}$							50		pF

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,49		K/W
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##### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \Omega$ $R_{goff} = 16 \Omega$	±15	350	30	25		101,6		ns
Rise time	$t_r$					125		102,4		ns
Turn-off delay time	$t_{d(off)}$					25		158,2		ns
Fall time	$t_f$					125		177,2		ns
Turn-on energy (per pulse)	$E_{on}$					25		87,95		mWs
Turn-off energy (per pulse)	$E_{off}$					125		105,11		mWs



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datasheet

### 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	$V_F$				30	25 150	1,25	1,64 1,55	1,95 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_r = 600$ V				25			27	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,81		K/W
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##### Dynamic

Peak recovery current	$I_{RM}$	$di/dt=2467$ A/μs $di/dt=1930$ A/μs	±15	350	30	25		27,63		A
Reverse recovery time	$t_{rr}$					125		30,48		
						25		138,03		
Recovered charge	$Q_r$					125		264,77		
						25		1,36		
Reverse recovered energy	$E_{rec}$					125		2,52		
		25		0,336						
Peak rate of fall of recovery current	$(di_r/dt)_{max}$	125		0,667	mWs					
		25		1297						
						125		449,65		A/μs

#### Boost Sw. Inv. Diode

##### Static

Forward voltage	$V_F$				30	25 150	1,25	1,64 1,55	1,95 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_r = 600$ V				25			27	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,81		K/W
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### Characteristic Values

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

### 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.

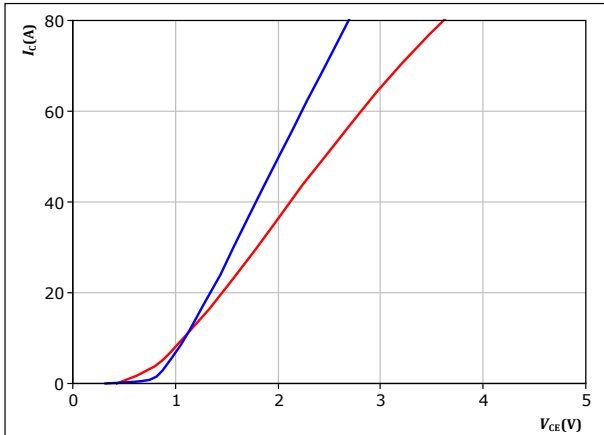


### Buck Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

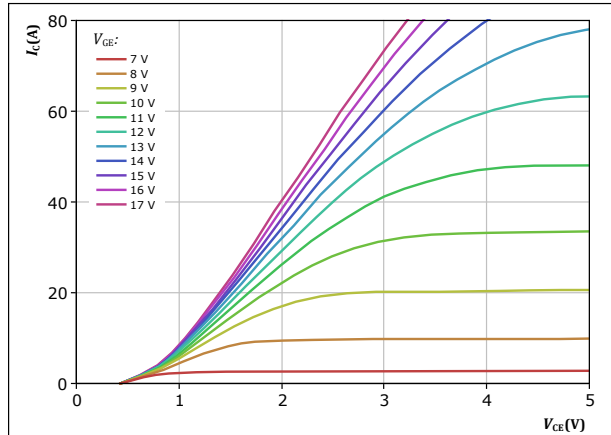


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25 \text{ } ^\circ C$  (blue),  $150 \text{ } ^\circ C$  (red)

**figure 2.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

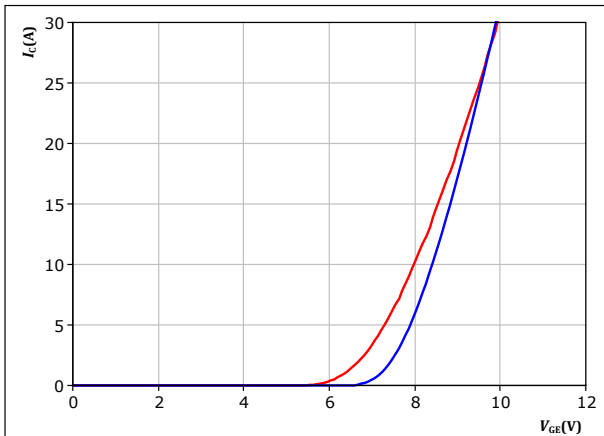


$t_p = 250 \mu s$   
 $T_j = 150 \text{ } ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

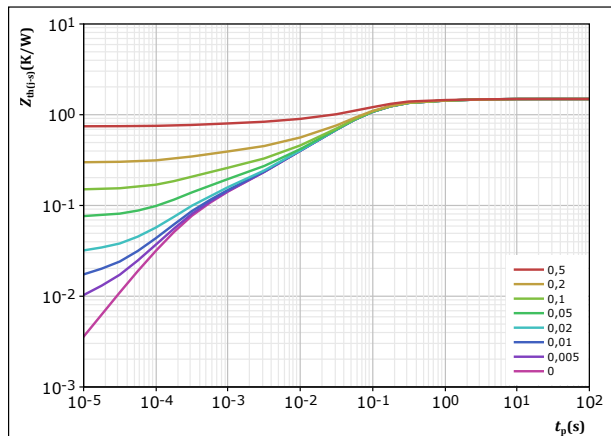


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25 \text{ } ^\circ C$  (blue),  $150 \text{ } ^\circ C$  (red)

**figure 4.** IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,49 \text{ K/W}$   
IGBT thermal model values  

R (K/W)	$\tau$ (s)
7,25E-02	2,15E+00
1,02E-01	4,82E-01
6,96E-01	9,49E-02
3,56E-01	3,40E-02
1,42E-01	5,95E-03
4,77E-02	1,04E-03
7,51E-02	2,72E-04

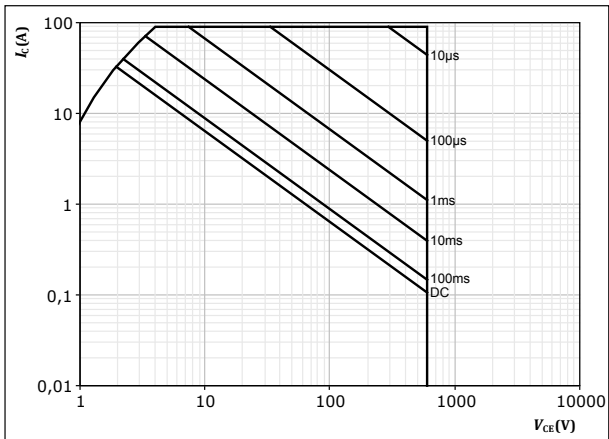


### Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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



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

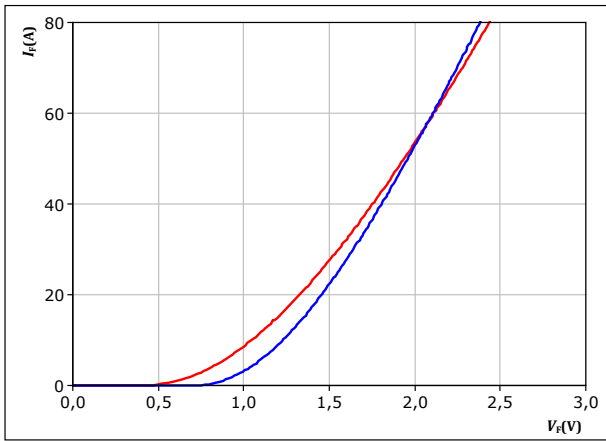


### Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

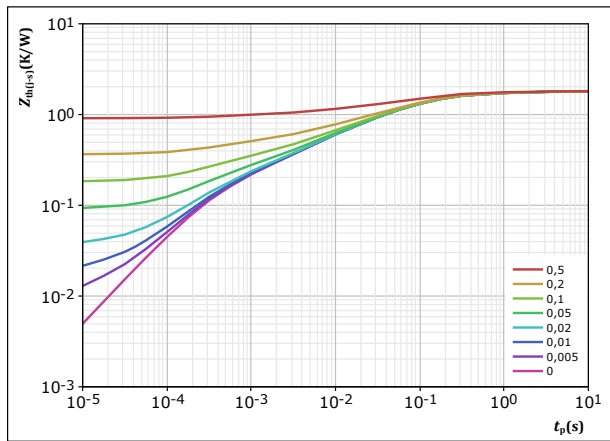


$t_p = 250 \mu s$   
 $T_j: 25 \text{ }^\circ\text{C}$  (blue line),  $150 \text{ }^\circ\text{C}$  (red line)

figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,811 \text{ K/W}$   
FWD thermal model values

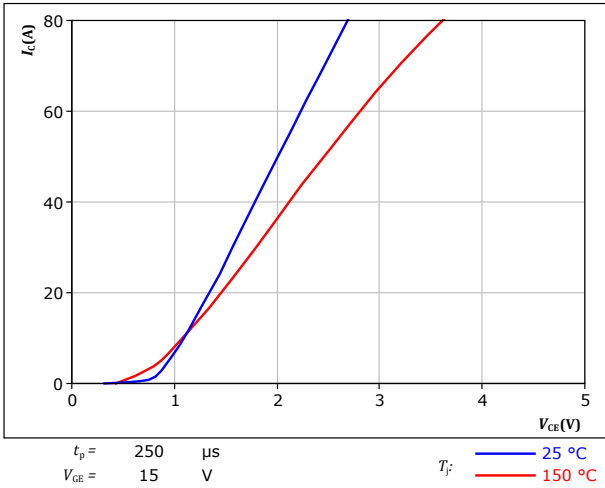
$R$ (K/W)	$\tau$ (s)
$8,35E-02$	$4,59E+00$
$2,01E-01$	$4,81E-01$
$7,60E-01$	$9,25E-02$
$4,22E-01$	$1,80E-02$
$2,13E-01$	$3,31E-03$
$1,40E-01$	$3,46E-04$



### Boost Switch Characteristics

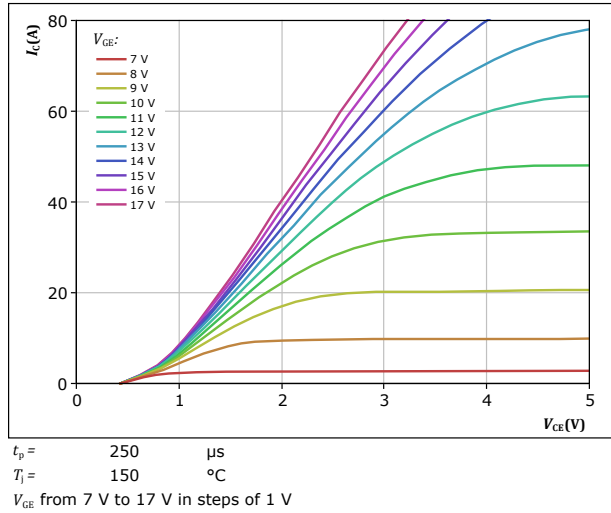
**figure 8.** IGBT

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



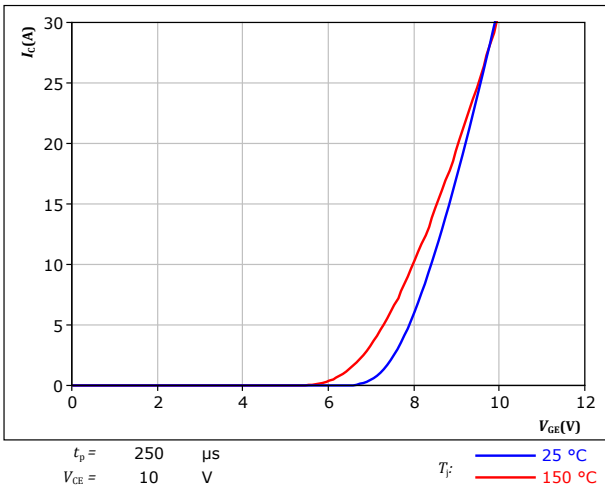
**figure 9.** IGBT

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



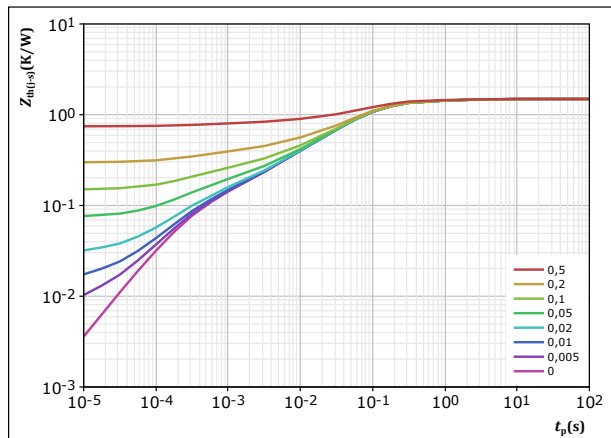
**figure 10.** IGBT

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



**figure 11.** IGBT

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,49 \text{ K/W}$

IGBT thermal model values

R (K/W)	$\tau$ (s)
7,25E-02	2,15E+00
1,02E-01	4,82E-01
6,96E-01	9,49E-02
3,56E-01	3,40E-02
1,42E-01	5,95E-03
4,77E-02	1,04E-03
7,51E-02	2,72E-04





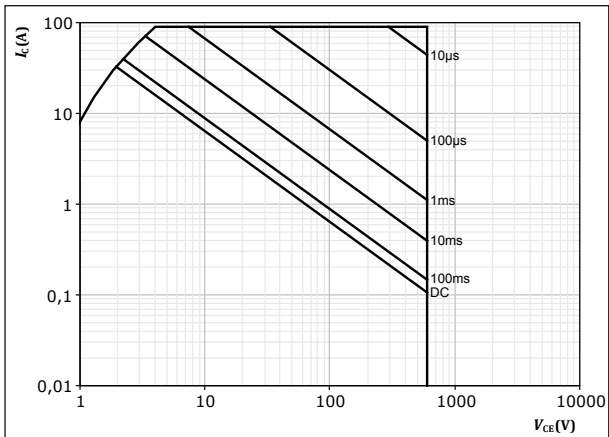
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### Boost Switch Characteristics

figure 12. IGBT

Safe operating area

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



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

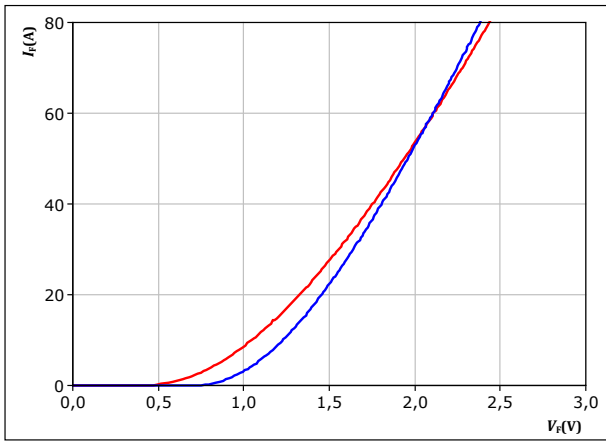


### Boost Diode Characteristics

figure 13. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

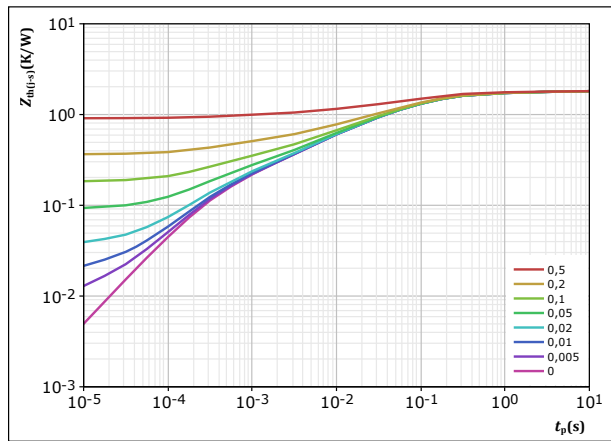


$t_p = 250 \mu s$   
 $T_j: 25 \text{ }^\circ\text{C}$  (blue line),  $150 \text{ }^\circ\text{C}$  (red line)

figure 14. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,811 \text{ K/W}$   
FWD thermal model values

$R$ (K/W)	$\tau$ (s)
$8,35E-02$	$4,59E+00$
$2,01E-01$	$4,81E-01$
$7,60E-01$	$9,25E-02$
$4,22E-01$	$1,80E-02$
$2,13E-01$	$3,31E-03$
$1,40E-01$	$3,46E-04$

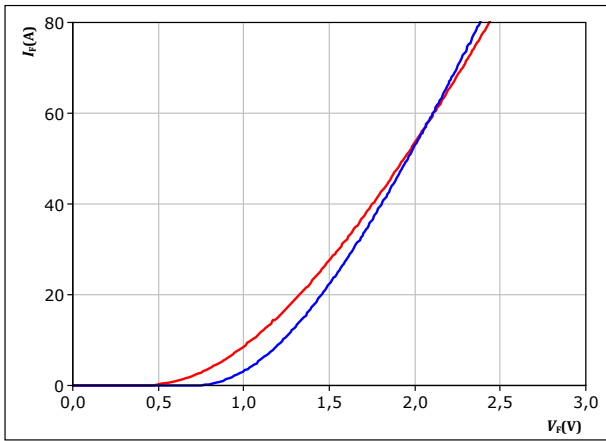


### Boost Sw. Inv. Diode Characteristics

figure 15. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

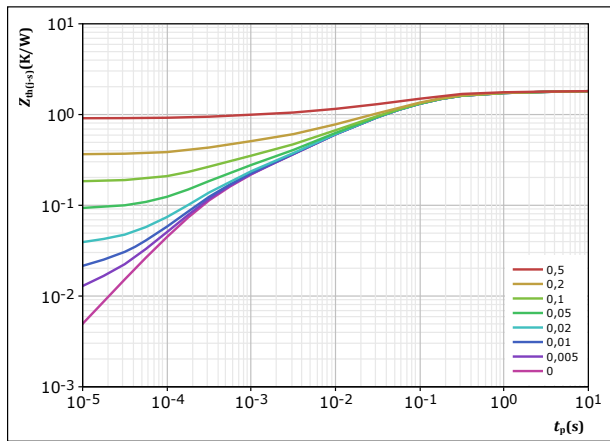


$t_p = 250 \mu s$   
 $T_j$ : — 25 °C  
 — 150 °C

figure 16. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,811 \text{ K/W}$   
 FWD thermal model values

R (K/W)	$\tau$ (s)
8,35E-02	4,59E+00
2,01E-01	4,81E-01
7,60E-01	9,25E-02
4,22E-01	1,80E-02
2,13E-01	3,31E-03
1,40E-01	3,46E-04

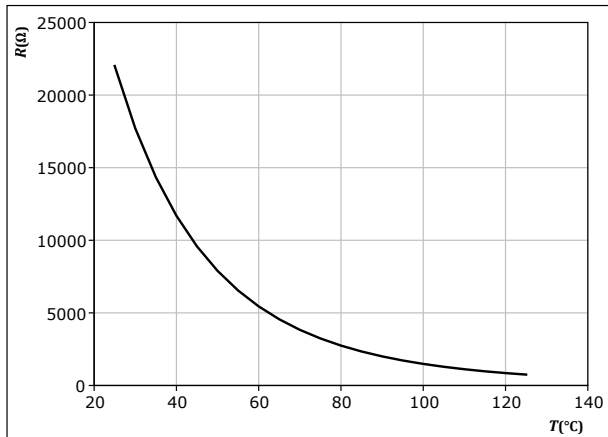


## Thermistor Characteristics

figure 17. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

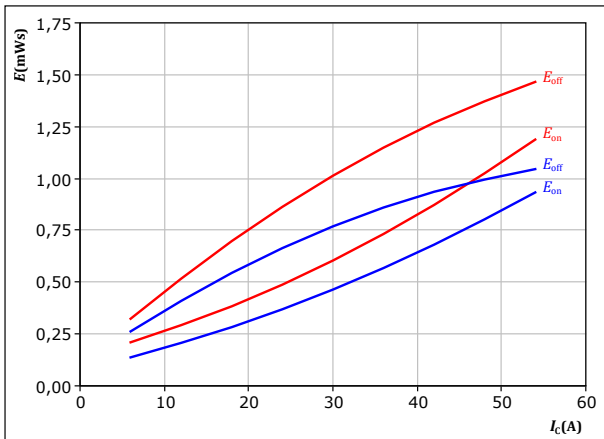




## Buck Switching Characteristics

**figure 18.** IGBT

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



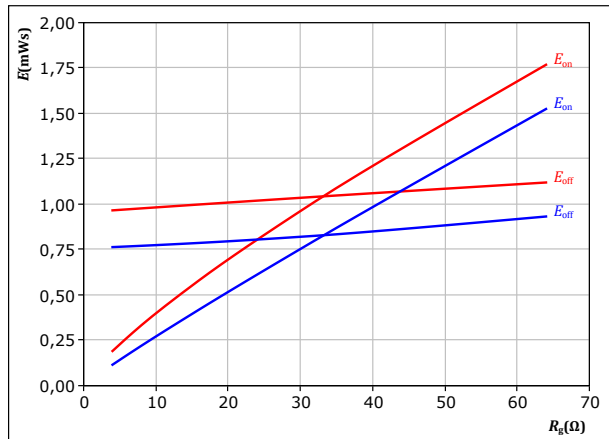
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{g\text{on}} = 16$   $\Omega$   
 $R_{g\text{off}} = 16$   $\Omega$

$T_j$ : — 25 °C  
— 125 °C

**figure 19.** IGBT

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



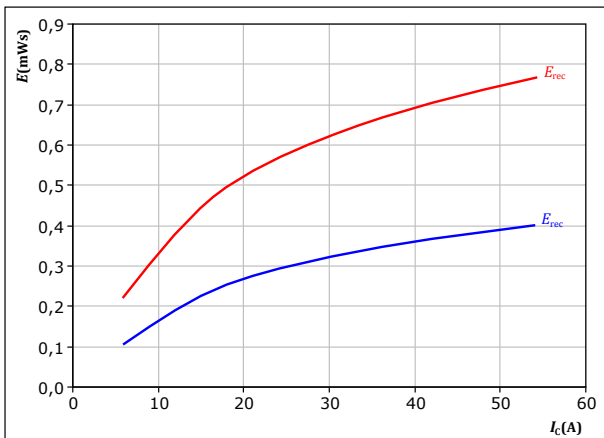
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

$T_j$ : — 25 °C  
— 125 °C

**figure 20.** FWD

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



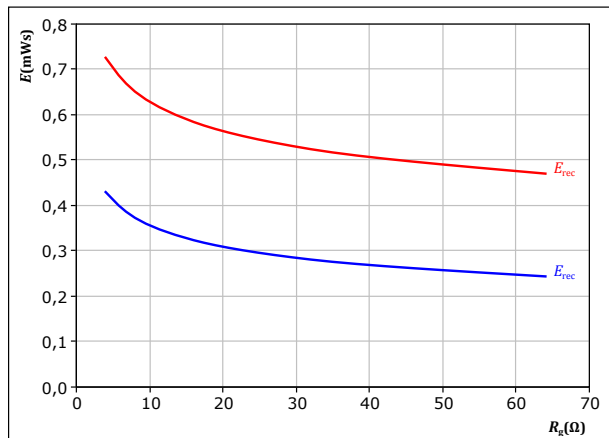
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{g\text{on}} = 16$   $\Omega$

$T_j$ : — 25 °C  
— 125 °C

**figure 21.** FWD

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

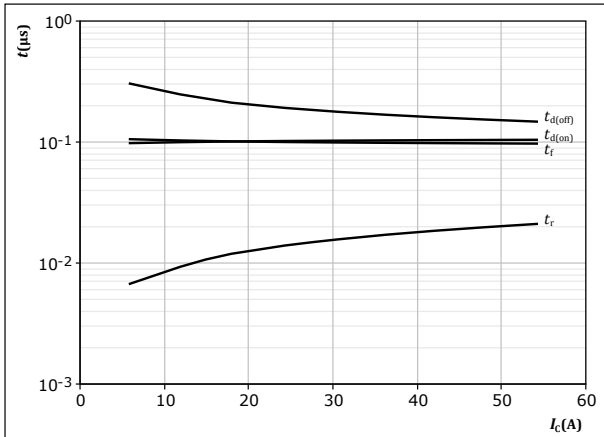
$T_j$ : — 25 °C  
— 125 °C



## Buck Switching Characteristics

**figure 22.** IGBT

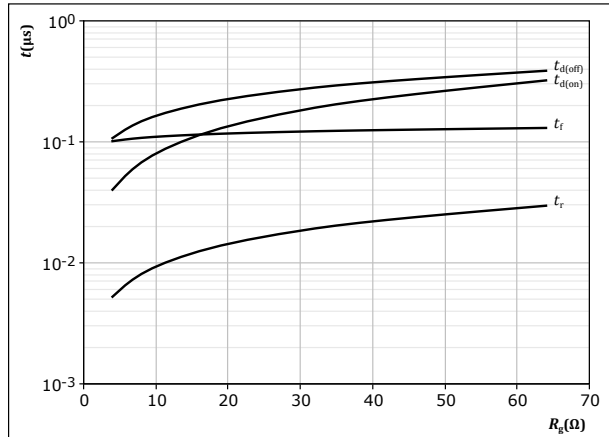
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 125 \text{ } ^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 16 \text{ } \Omega$   
 $R_{goff} = 16 \text{ } \Omega$

**figure 23.** IGBT

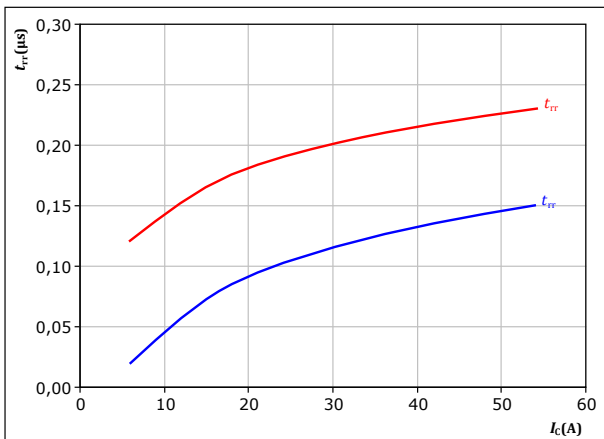
Typical switching times as a function of IGBT turn on gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 125 \text{ } ^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 30 \text{ A}$

**figure 24.** FWD

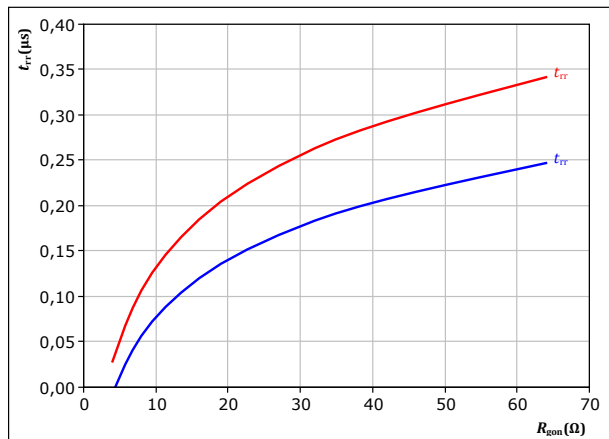
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 16 \text{ } \Omega$   
 $T_j: \text{ — } 25 \text{ } ^\circ\text{C}$   
 $\text{ — } 125 \text{ } ^\circ\text{C}$

**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  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 30 \text{ A}$   
 $T_j: \text{ — } 25 \text{ } ^\circ\text{C}$   
 $\text{ — } 125 \text{ } ^\circ\text{C}$

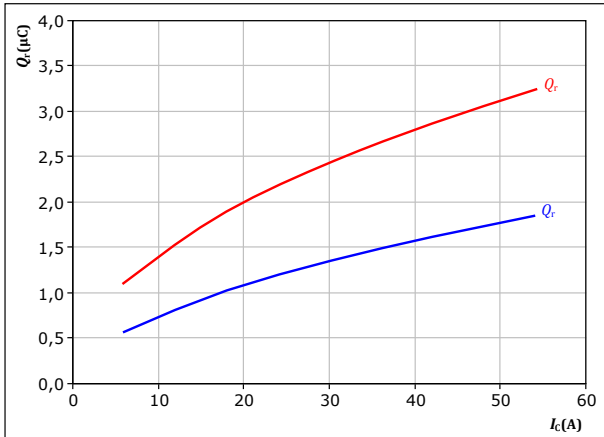


## Buck Switching Characteristics

**figure 26.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

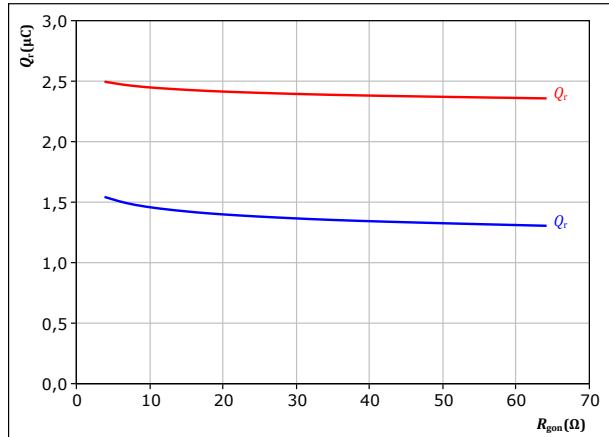
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 16$  Ω

$T_j$ : — 25 °C  
— 125 °C

**figure 27.** FWD

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

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



With an inductive load at

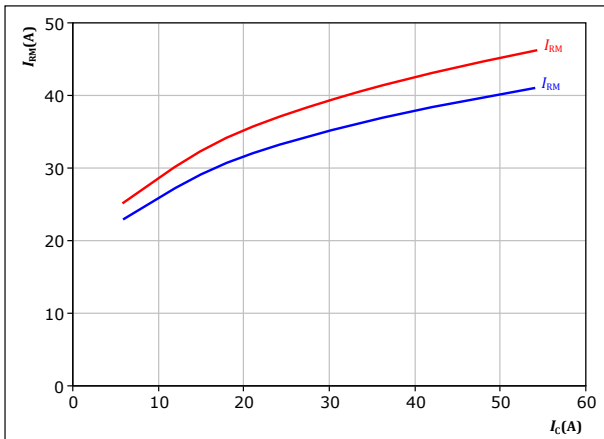
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

$T_j$ : — 25 °C  
— 125 °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

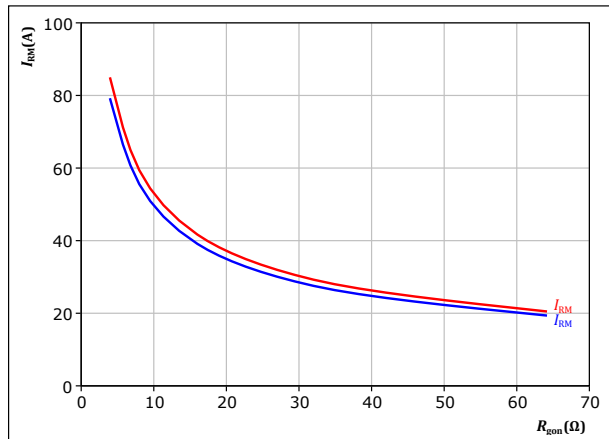
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 16$  Ω

$T_j$ : — 25 °C  
— 125 °C

**figure 29.** FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

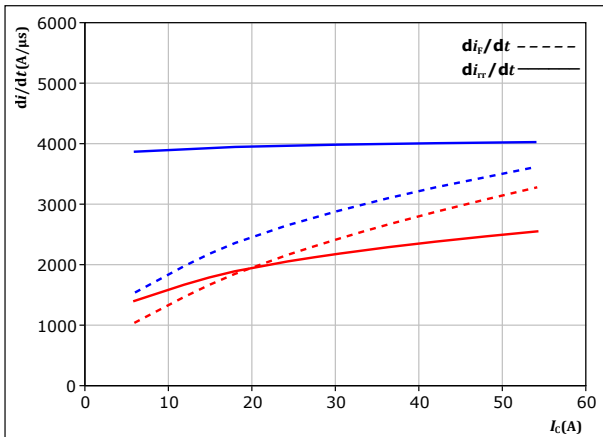
$T_j$ : — 25 °C  
— 125 °C



## Buck Switching Characteristics

**figure 30.** FWD

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



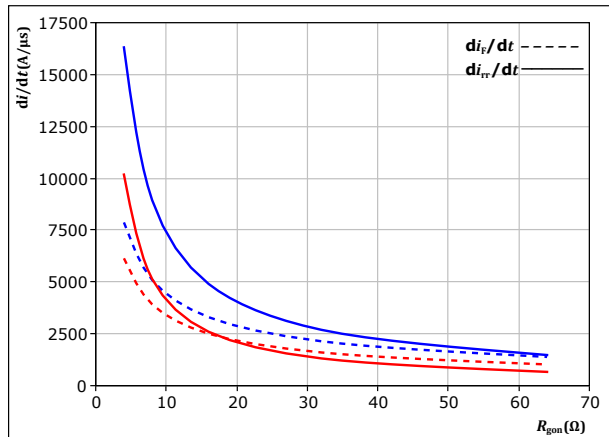
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 16$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °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

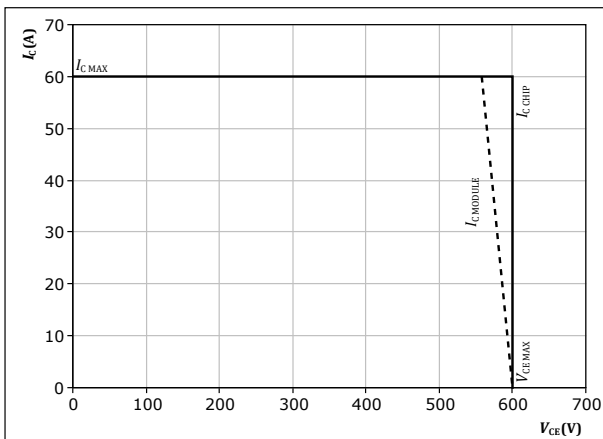
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

$T_j$ : — 25 °C  
 — 125 °C

**figure 32.** IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At  $T_j = 125$  °C  
 $R_{gon} = 16$   $\Omega$   
 $R_{goff} = 16$   $\Omega$

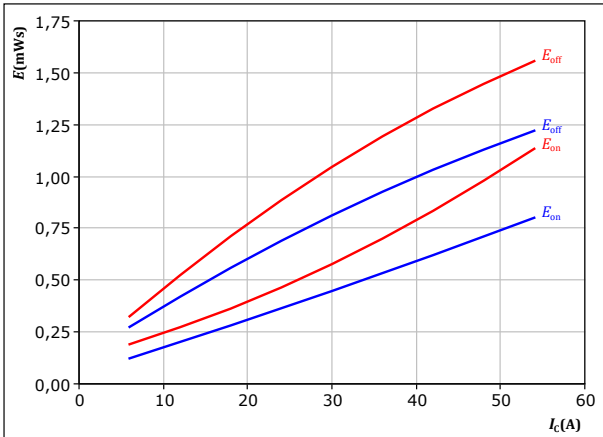




## Boost Switching Characteristics

**figure 33.** IGBT

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



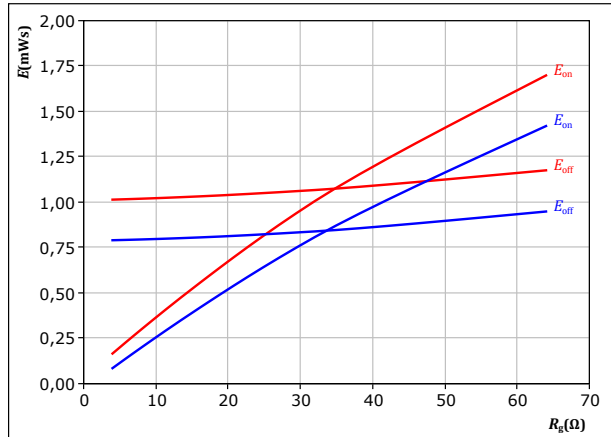
With an inductive load at

V<sub>CE</sub> = 350 V  
 V<sub>GE</sub> = ±15 V  
 R<sub>gon</sub> = 16 Ω  
 R<sub>goff</sub> = 16 Ω

T<sub>j</sub>: — 25 °C  
 — 125 °C

**figure 34.** IGBT

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



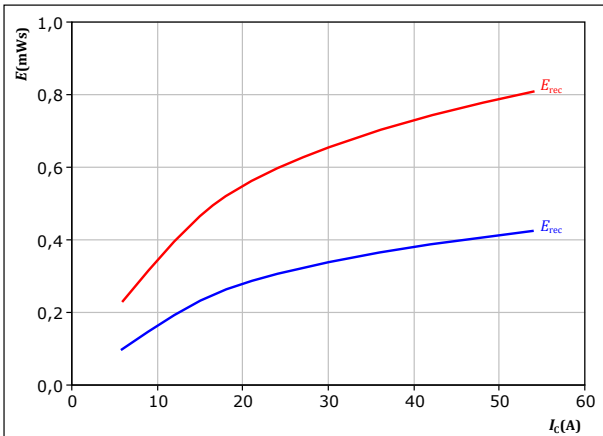
With an inductive load at

V<sub>CE</sub> = 350 V  
 V<sub>GE</sub> = ±15 V  
 I<sub>c</sub> = 30 A

T<sub>j</sub>: — 25 °C  
 — 125 °C

**figure 35.** FWD

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



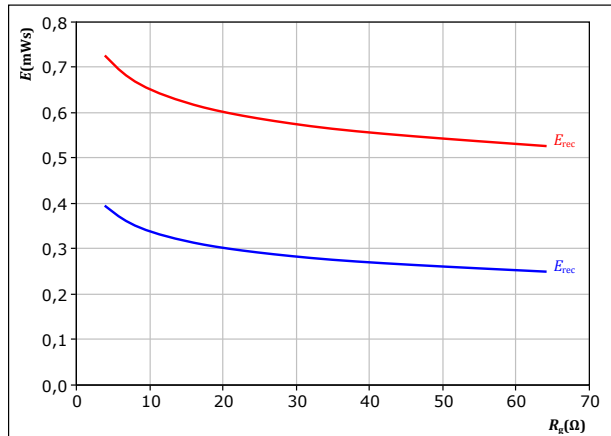
With an inductive load at

V<sub>CE</sub> = 350 V  
 V<sub>GE</sub> = ±15 V  
 R<sub>gon</sub> = 16 Ω

T<sub>j</sub>: — 25 °C  
 — 125 °C

**figure 36.** FWD

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



With an inductive load at

V<sub>CE</sub> = 350 V  
 V<sub>GE</sub> = ±15 V  
 I<sub>c</sub> = 30 A

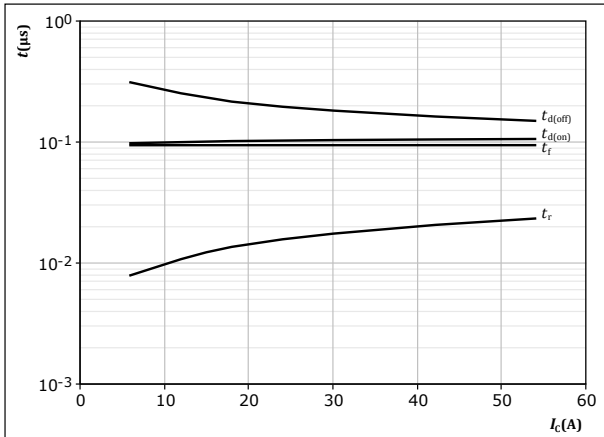
T<sub>j</sub>: — 25 °C  
 — 125 °C



## Boost Switching Characteristics

**figure 37.** IGBT

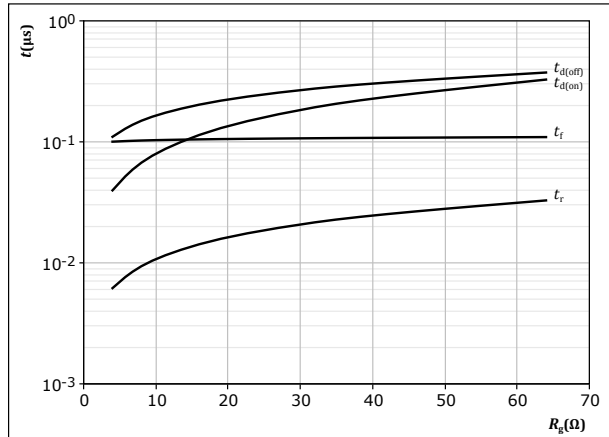
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 125 \text{ } ^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 16 \text{ } \Omega$   
 $R_{goff} = 16 \text{ } \Omega$

**figure 38.** IGBT

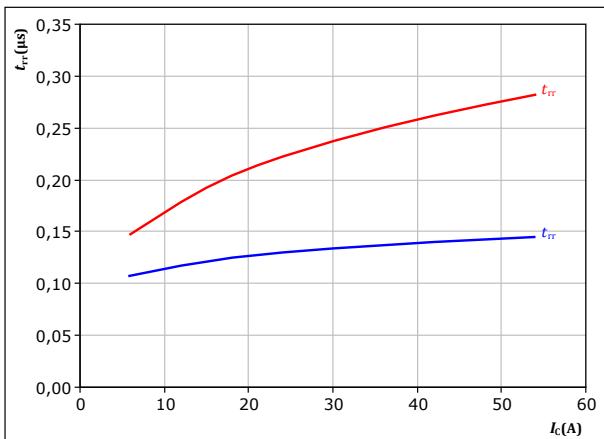
Typical switching times as a function of IGBT turn on gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 125 \text{ } ^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 30 \text{ A}$

**figure 39.** FWD

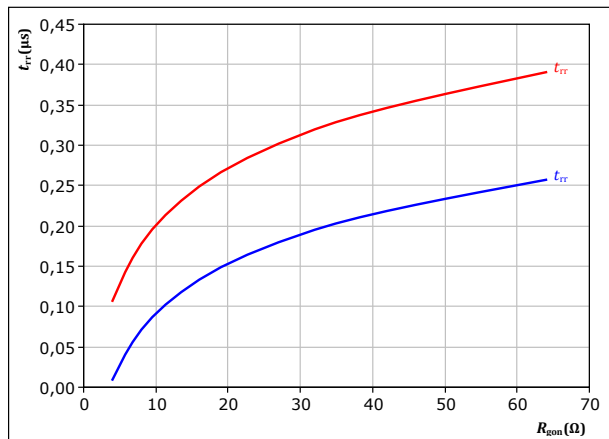
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 16 \text{ } \Omega$   
 $T_j: \text{ — } 25 \text{ } ^\circ\text{C}$   
 $\text{ — } 125 \text{ } ^\circ\text{C}$

**figure 40.** FWD

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



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 30 \text{ A}$   
 $T_j: \text{ — } 25 \text{ } ^\circ\text{C}$   
 $\text{ — } 125 \text{ } ^\circ\text{C}$

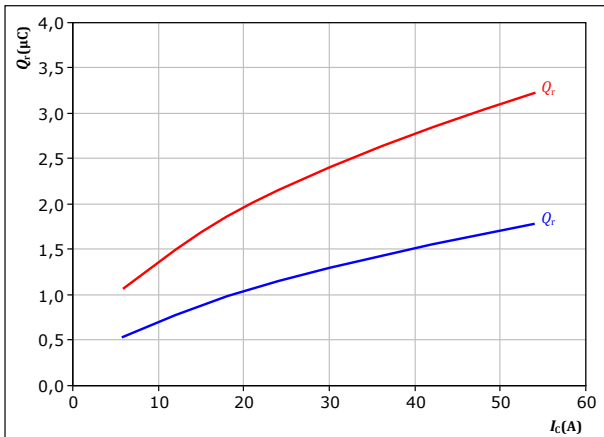


## Boost Switching Characteristics

figure 41. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

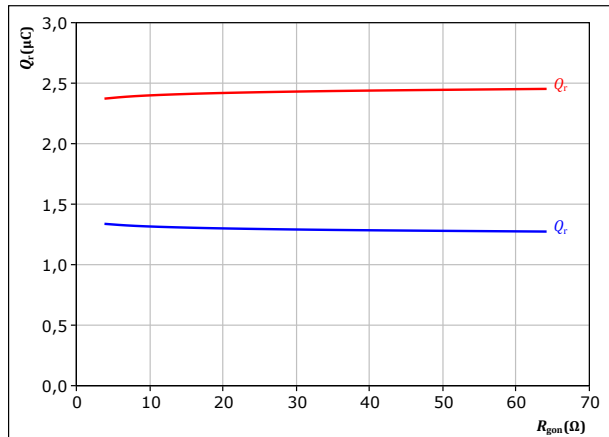
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 16$  Ω

$T_j$ : — 25 °C  
— 125 °C

figure 42. FWD

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

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



With an inductive load at

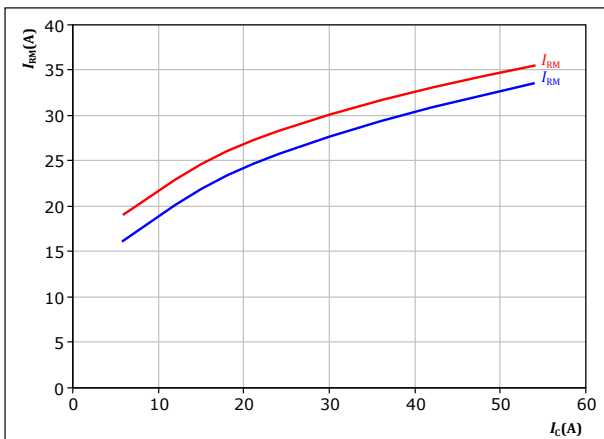
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

$T_j$ : — 25 °C  
— 125 °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

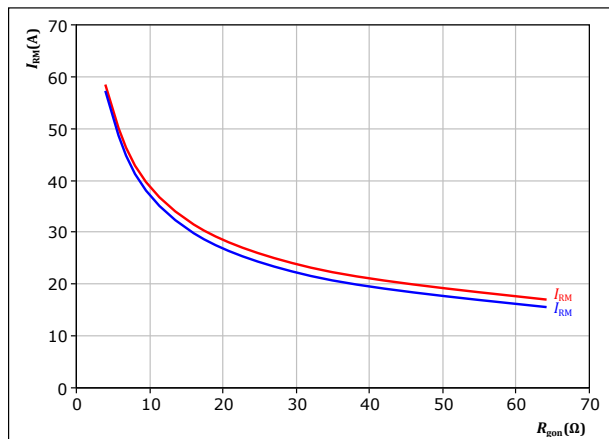
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 16$  Ω

$T_j$ : — 25 °C  
— 125 °C

figure 44. FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

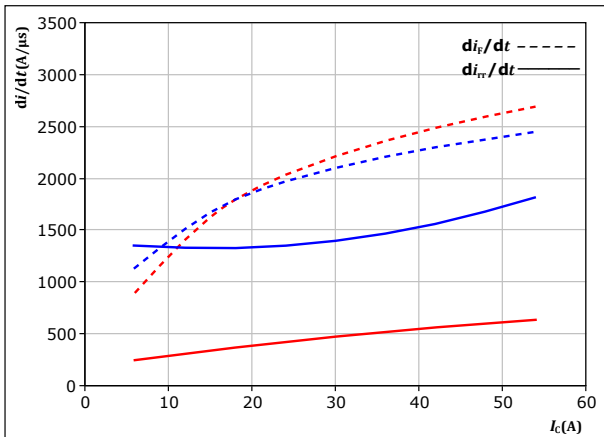
$T_j$ : — 25 °C  
— 125 °C



## Boost Switching Characteristics

**figure 45.** FWD

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



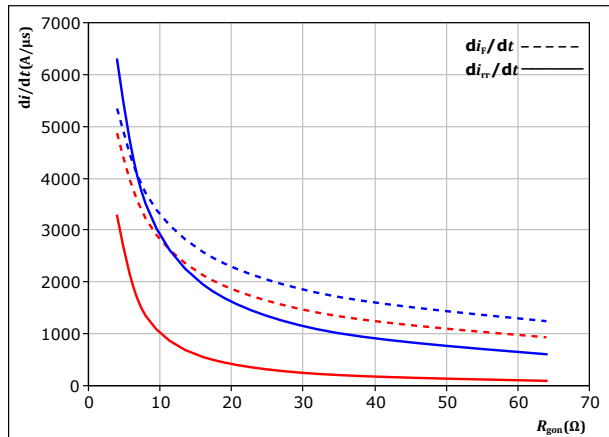
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 16$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C

**figure 46.** FWD

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



With an inductive load at

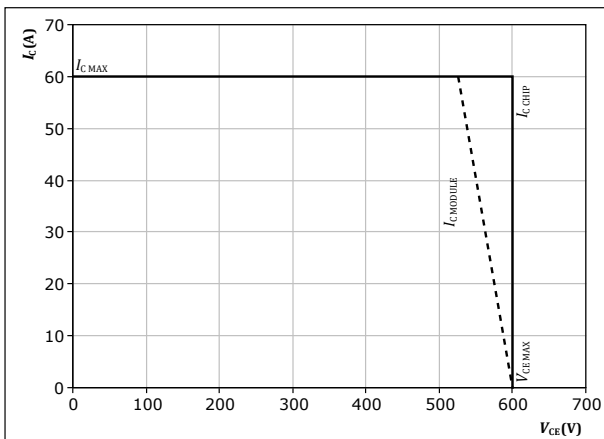
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 30$  A

$T_j$ : — 25 °C  
 — 125 °C

**figure 47.** IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At  $T_j = 125$  °C  
 $R_{gon} = 16$   $\Omega$   
 $R_{goff} = 16$   $\Omega$



## Switching Definitions

figure 48. IGBT

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

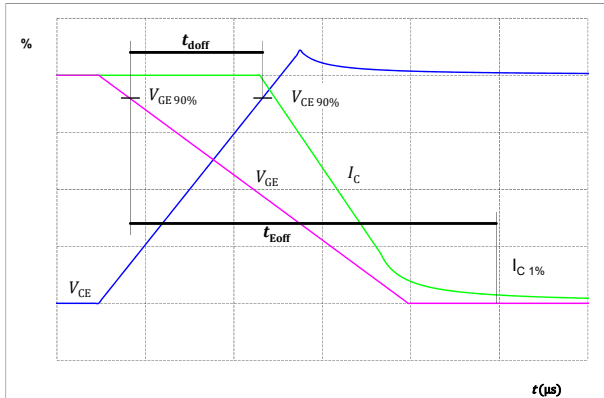


figure 49. IGBT

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

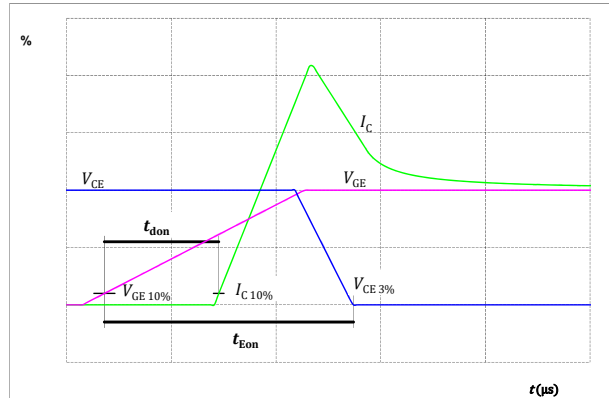


figure 50. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

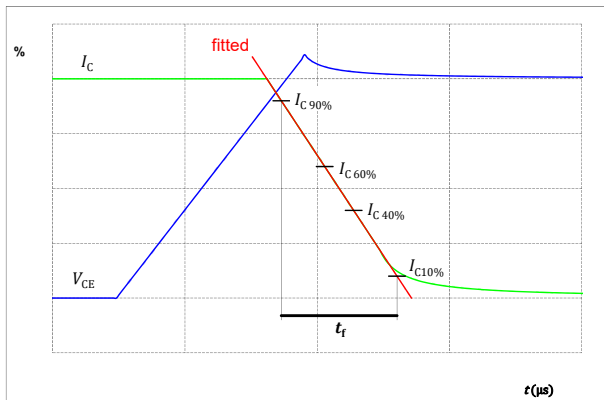
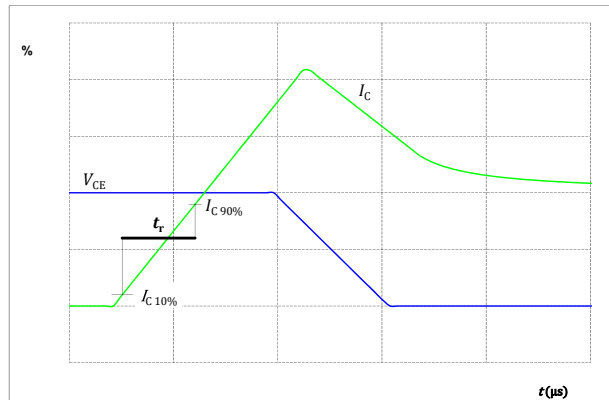


figure 51. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





### Switching Definitions

figure 52. FWD

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

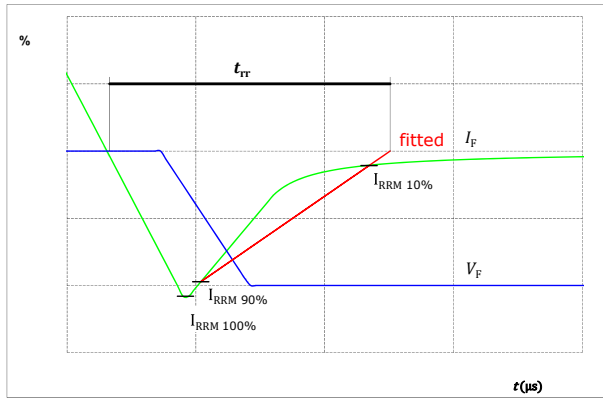
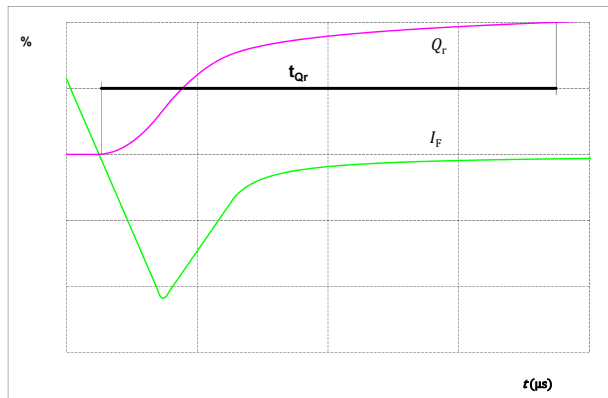


figure 53. FWD

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



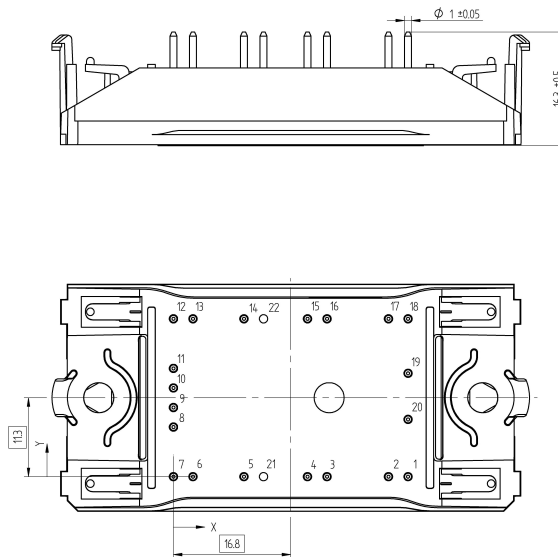


Ordering Code	
Version	Ordering Code
Without thermal paste	10-FZ06NIA030SA-P924F33
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ06NIA030SA-P924F33-/-7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ06NIA030SA-P924F33-/-3/

Marking						
	Text	Name	Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN- TTTTTV	WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTV	LLLLL	SSSS	WWYY	

**Outline**

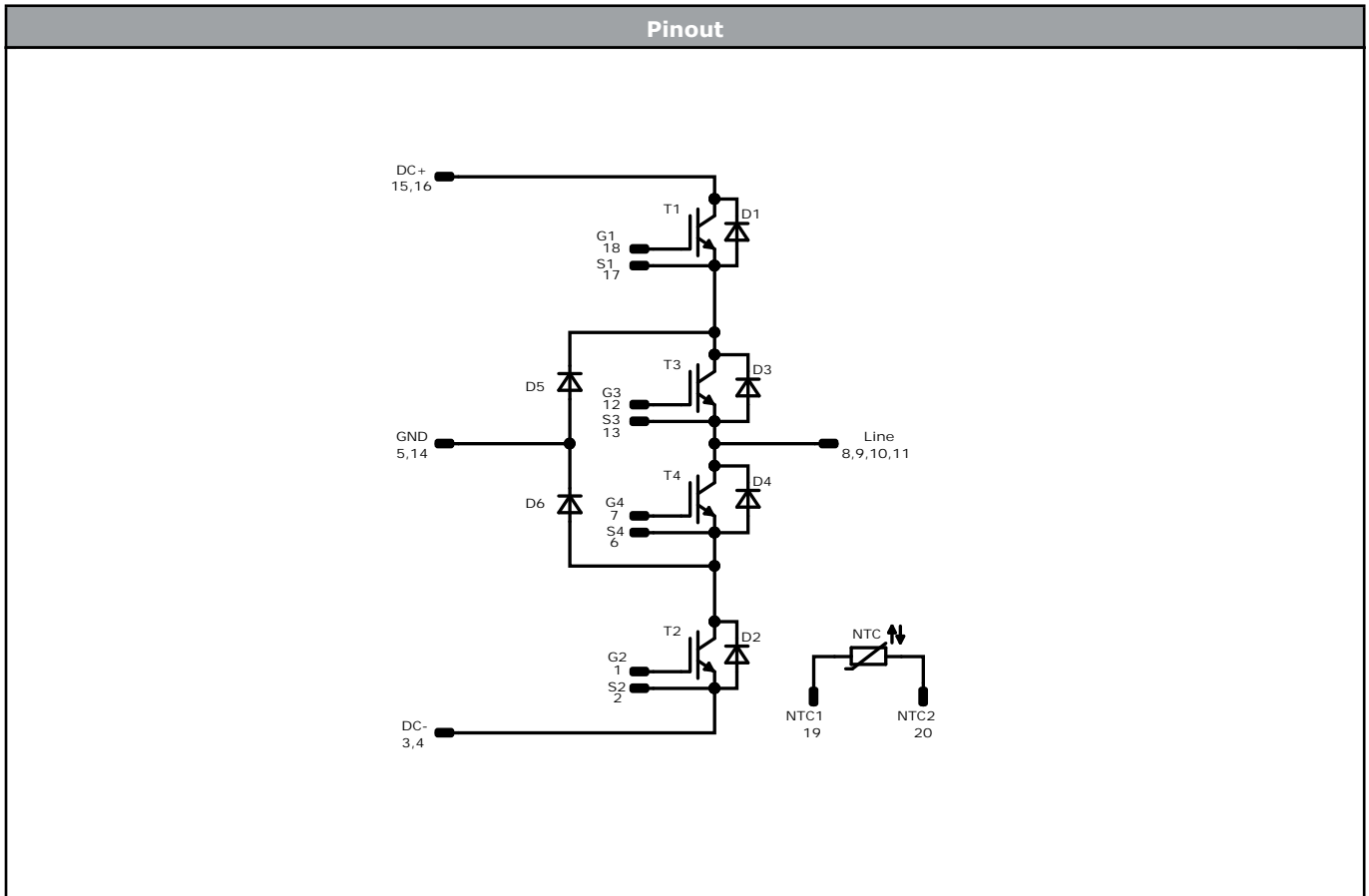
Pin table [mm]			
Pin	X	Y	Function
1	33,6	0	G2
2	30,8	0	S2
3	22	0	-DC
4	19,2	0	-DC
5	10,1	0	GND
6	2,8	0	S4
7	0	0	G4
8	0	7,1	Line
9	0	9,9	Line
10	0	12,7	Line
11	0	15,5	Line
12	0	22,6	G3
13	2,8	22,6	S3
14	10,1	22,6	GND
15	19,2	22,6	+DC
16	22	22,6	+DC
17	30,8	22,6	S1
18	33,6	22,6	G1
19	33,6	14,8	NTC1
20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



Tolerance of pinpositions:  $\pm 0,5$ mm 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	600 V	30 A	Buck Switch	
D5, D6	FWD	600 V	30 A	Buck Diode	
T3, T4	IGBT	600 V	30 A	Boost Switch	
D2, D1	FWD	600 V	30 A	Boost Diode	
D4, D3	FWD	600 V	30 A	Boost Sw. Inv. Diode	
NTC	Thermistor			Thermistor	






Packaging instruction				
Standard packaging quantity (SPQ) 0	>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-FZ06NIA030SA-P924F33-D3-14	8 Jun. 2022	New Datasheet format, module is unchanged	

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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.