



**flowNPC 2**

**650 V / 600 A**

**Topology features**

- Integrated DC capacitor
- Kelvin Emitter for improved switching performance
- Neutral Point Clamped Topology (I-Type)
- Split topology
- Temperature sensor

**Component features**

- High speed and smooth switching
- Low gate charge
- Very low collector emitter saturation voltage

**Housing features**

- Base isolation: Al<sub>2</sub>O<sub>3</sub>
- Convex shaped baseplate for superior thermal contact
- Cu baseplate
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

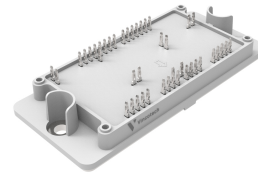
**Target applications**

- Industrial Drives
- Solar Inverters
- UPS

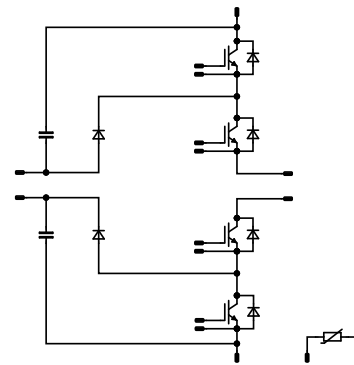
**Types**

- 30-PT07NIA600S501-PD60F58Y

**flow 2 13 mm housing**



**Schematic**





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## 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 (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	336	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	1200	A
Turn off safe operating area		$T_j = 150\text{ °C}$ , $V_{CE} = 1200\text{ V}$	1200	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	500	W
Gate-emitter voltage	$V_{GES}$		±20	V
Maximum junction temperature	$T_{jmax}$		175	°C

### Buck Diode

Peak repetitive reverse voltage	$V_{RRM}$		650	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	250	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	750	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	311	W
Maximum junction temperature	$T_{jmax}$		175	°C

### Boost Switch

Collector-emitter voltage	$V_{CES}$		650	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	285	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	1350	A
Turn off safe operating area		$T_j = 150\text{ °C}$ , $V_{CE} = 1200\text{ V}$	1350	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	403	W
Gate-emitter voltage	$V_{GES}$		±20	V
Short circuit ratings	$i_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 400\text{ V}$ $T_j = 150\text{ °C}$	3	µs
Maximum junction temperature	$T_{jmax}$		175	°C



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## 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
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	204	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	600	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	255	W
Maximum junction temperature	$T_{jmax}$		175	°C

## Boost Sw. Inv. Diode

Peak repetitive reverse voltage	$V_{RRM}$		650	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	204	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	600	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	255	W
Maximum junction temperature	$T_{jmax}$		175	°C

## Capacitor (DC)

Maximum DC voltage	$V_{MAX}$		630	V
Operation Temperature	$T_{op}$		-55 ... 150	°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			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 600	

\*100 % tested in production



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### Characteristic Values

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

#### Buck Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,006	25	3,25	4	4,75	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		600	25 125 150	1,15	1,24 1,7 1,75	1,8 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	650		25			150	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			600	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$							34200		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25		990		pF
Reverse transfer capacitance	$C_{res}$							115,8		pF
Gate charge	$Q_g$	$V_{CC} = 400$ V	±15		600	25		2520		nC

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,19		K/W
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##### Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		478,53 540,72 474,65		ns
Rise time	$t_r$					25 125 150		92,33 94,24 95,2		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		592,34 619,14 626,24		ns
Fall time	$t_f$					25 125 150		59,4 54,48 51,64		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 6,1$ μC $Q_{tFWD} = 10,84$ μC $Q_{tFWD} = 13,24$ μC				25 125 150		9,91 10,16 10,35		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		19,65 19,44 19,81		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		

#### Buck Diode

##### Static

Forward voltage	$V_F$				375	25 125 150		1,53 1,48 1,46	1,92 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_r = 650$ V				25			19	μA

##### Thermal

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

Peak recovery current	$I_{RM}$					25 125 150		107,47 147,5 166,49		A
Reverse recovery time	$t_{rr}$					25 125 150		86,78 108,36 118,17		ns
Recovered charge	$Q_r$	$di/dt=3922$ A/μs $di/dt=3987$ A/μs $di/dt=3684$ A/μs	±15	350	475	25 125 150		6,1 10,84 13,24		μC
Reverse recovered energy	$E_{rec}$					25 125 150		1,29 2,34 2,91		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		3339,33 4487,66 4481,07		A/μs



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datasheet

### Characteristic Values

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

#### Boost Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0045	25	4,35	5	5,65	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		450	25 125 150		1,52 1,7 1,75	1,65 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	650		25			120	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			600	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$							26760		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25		810		pF
Reverse transfer capacitance	$C_{res}$							276		pF
Gate charge	$Q_g$	$V_{CC} = 520$ V	15		450	25		2610		nC

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,24		K/W
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##### Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		575,24 580,24 582,18		ns
Rise time	$t_r$	$R_{gon} = 5,82$ Ω $R_{goff} = 12,8$ Ω				25 125 150		173,65 171,84 171,92		ns
Turn-off delay time	$t_{d(off)}$		±15	350	475	25 125 150		1026,85 1095,12 1114,91		ns
Fall time	$t_f$					25 125 150		123,94 101,33 96,85		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 4,52$ μC $Q_{tFWD} = 12,43$ μC $Q_{tFWD} = 14,87$ μC				25 125 150		20,62 23,57 23,96		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		35,99 35,41 35,94		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		
<b>Boost Diode</b>										
<b>Static</b>										
Forward voltage	$V_F$				300	25 125 150		1,53 1,49 1,46	1,92 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 650$ V				25			15,2	μA
<b>Thermal</b>										
Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,37		K/W
<b>Dynamic</b>										
Peak recovery current	$I_{RM}$					25 125 150		70,72 127,6 138,83		A
Reverse recovery time	$t_{rr}$					25 125 150		95,49 147,5 162,77		ns
Recovered charge	$Q_r$	$di/dt=2550$ A/μs $di/dt=2549$ A/μs $di/dt=2605$ A/μs	±15	350	475	25 125 150		4,52 12,43 14,87		μC
Reverse recovered energy	$E_{rec}$					25 125 150		0,788 2,25 2,72		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		1894,85 2463,13 1956,79		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	$V_F$				300	25 125 150		1,53 1,49 1,46	1,92 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_T = 650$ V				25			15,2	µA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,37		K/W
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#### Capacitor (DC)

##### Static

Capacitance	$C$	DC bias voltage = 0 V				25		33		nF
Tolerance							-5		5	%

#### Thermistor

##### Static

Rated resistance	$R$					25		22		kΩ
Deviation of $R_{100}$	$A_{R/R}$	$R_{100} = 1484$ Ω				100	-5		5	%
Power dissipation	$P$					25		130		mW
Power dissipation constant	$d$					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

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

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

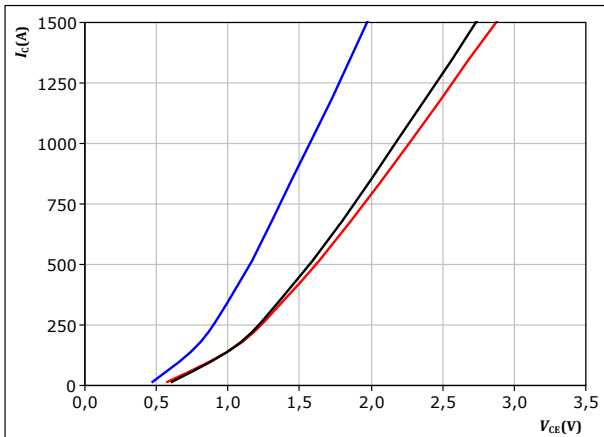


## Buck Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

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



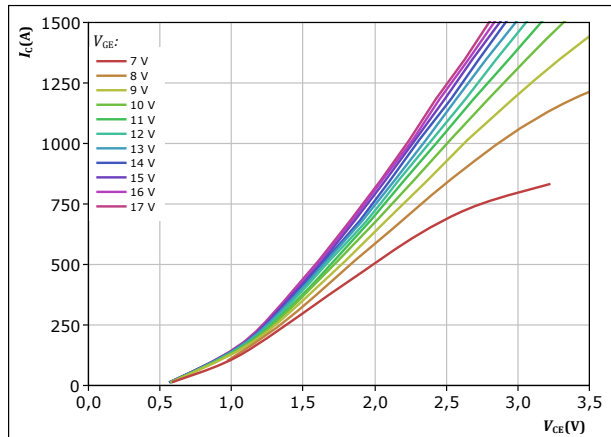
$t_p = 250 \mu s$   
 $V_{GE} = 15 V$

$T_j:$  — 25 °C  
— 125 °C  
— 150 °C

**figure 2.** IGBT

Typical output characteristics

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

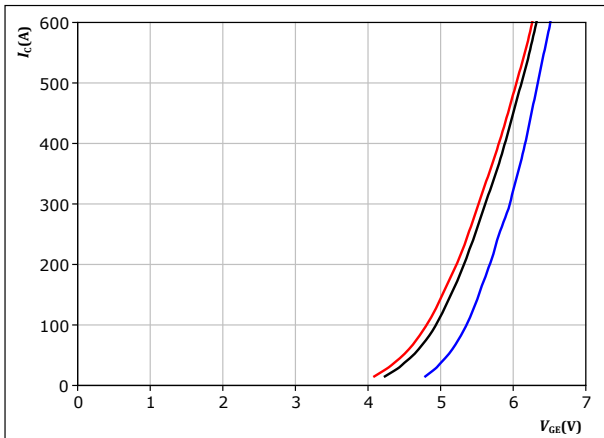


$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

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



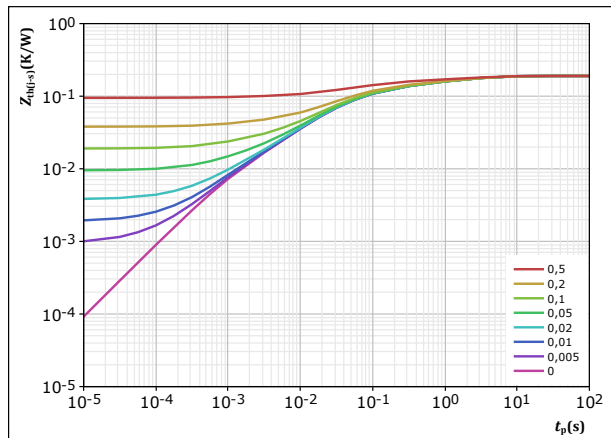
$t_p = 250 \mu s$   
 $V_{CE} = 10 V$

$T_j:$  — 25 °C  
— 125 °C  
— 150 °C

**figure 4.** IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,19 \text{ K/W}$

IGBT thermal model values

R (K/W)	$\tau$ (s)
3,23E-02	3,19E+00
3,92E-02	5,61E-01
7,54E-02	6,82E-02
3,68E-02	1,46E-02
6,28E-03	1,14E-03

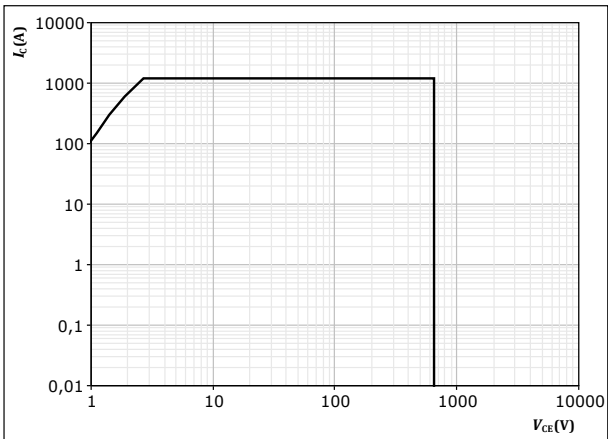


### Buck Switch Characteristics

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

$$I_F = f(V_F)$$

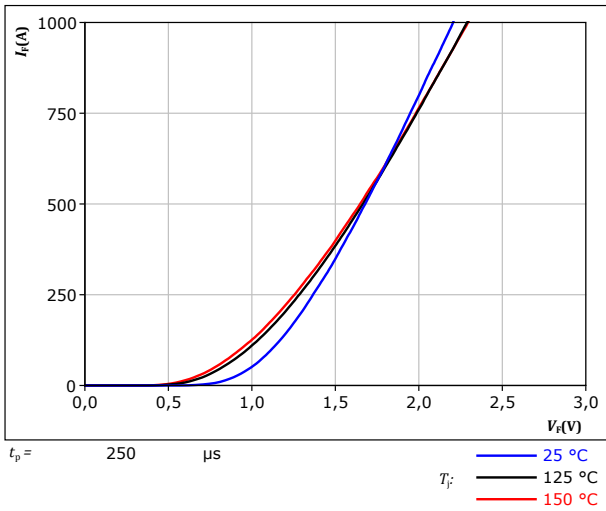
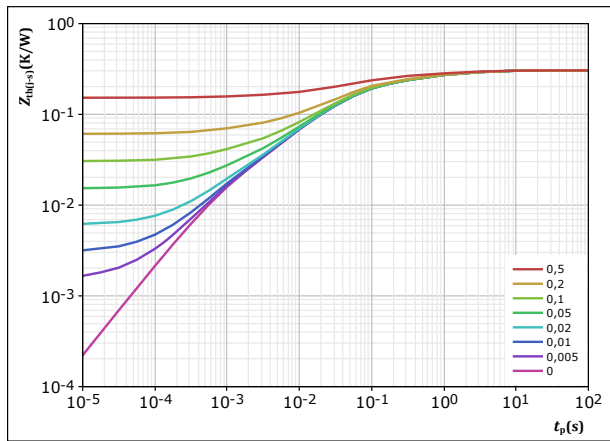


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,305 \text{ K/W}$   
 FWD thermal model values

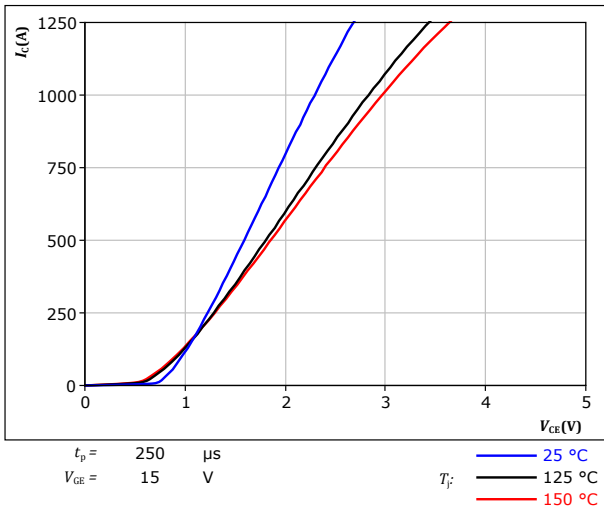
R (K/W)	$\tau$ (s)
2,75E-02	3,96E+00
7,11E-02	5,62E-01
1,43E-01	5,86E-02
5,15E-02	1,00E-02
1,23E-02	8,47E-04



### Boost Switch Characteristics

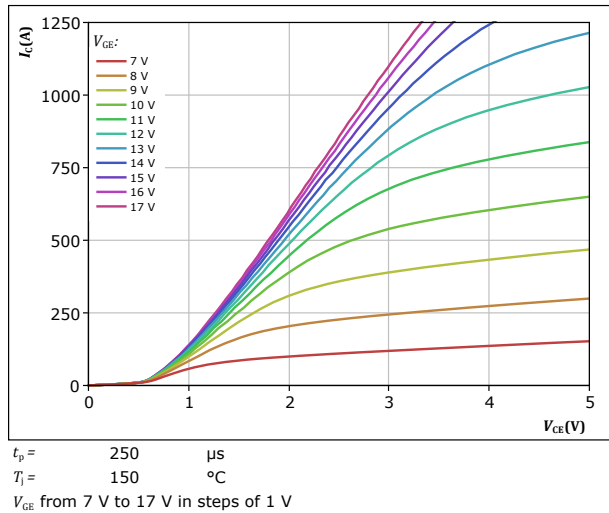
**figure 8.** IGBT

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



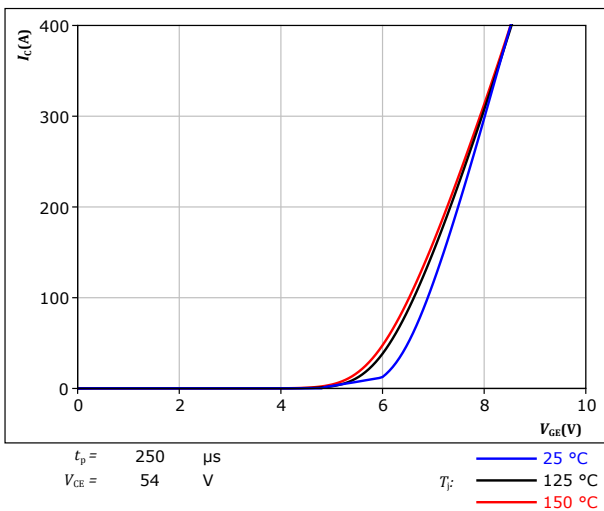
**figure 9.** IGBT

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



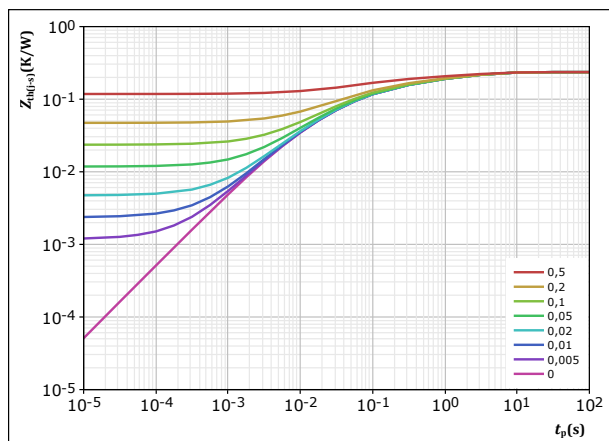
**figure 10.** IGBT

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



**figure 11.** IGBT

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,236 \text{ K/W}$

IGBT thermal model values

R (K/W)	$\tau$ (s)
4,49E-02	3,55E+00
5,32E-02	6,58E-01
6,22E-02	1,22E-01
6,22E-02	3,02E-02
1,35E-02	5,48E-03

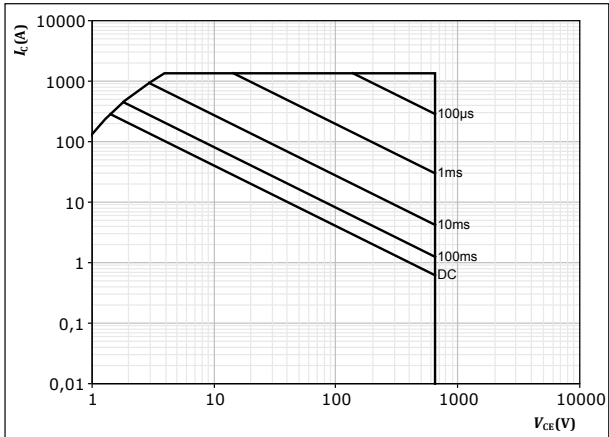




### Boost Switch Characteristics

figure 12. IGBT

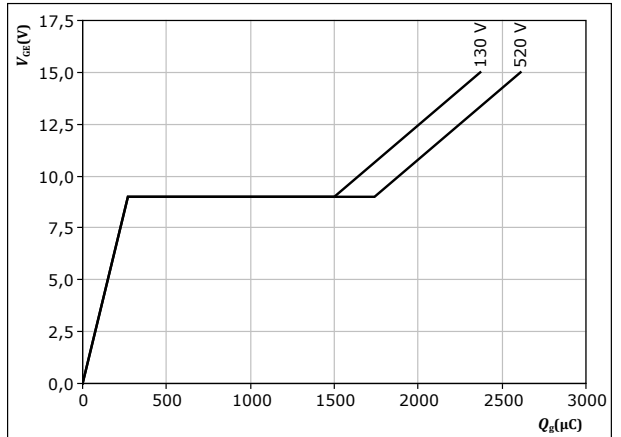
Safe operating area  
 $I_C = f(V_{CE})$



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

figure 13. IGBT

Gate voltage vs gate charge  
 $V_{GE} = f(Q_g)$



$I_C = 75$  A  
 $T_j = 25$  °C



### Boost Diode Characteristics

figure 14. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

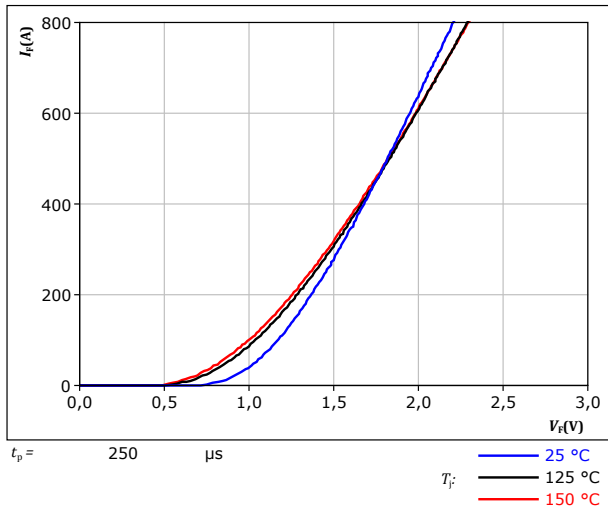
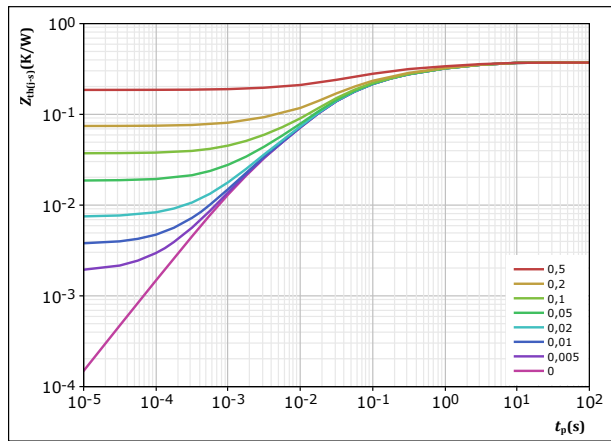


figure 15. FWD

Transient thermal impedance as a function of pulse width

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



$D = \frac{t_p}{T}$   
 $R_{th(j-s)} = 0,372 \text{ K/W}$   
 FWD thermal model values

R (K/W)	$\tau$ (s)
4,80E-02	3,48E+00
8,21E-02	5,95E-01
1,26E-01	8,65E-02
9,93E-02	1,93E-02
1,63E-02	1,99E-03



### Boost Sw. Inv. Diode Characteristics

figure 16. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

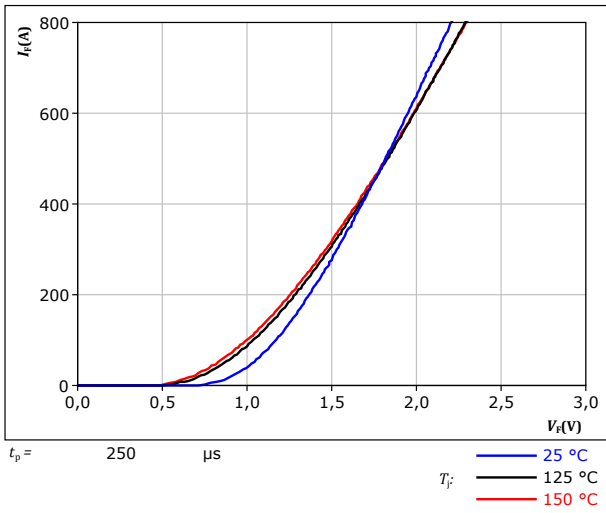
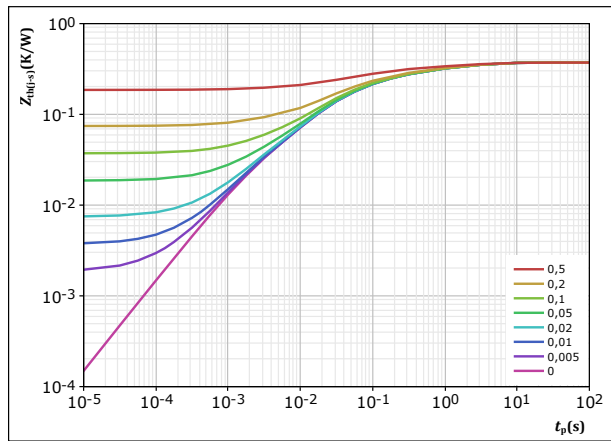


figure 17. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,372 \text{ K/W}$   
 FWD thermal model values

R (K/W)	$\tau$ (s)
4,80E-02	3,48E+00
8,21E-02	5,95E-01
1,26E-01	8,65E-02
9,93E-02	1,93E-02
1,63E-02	1,99E-03

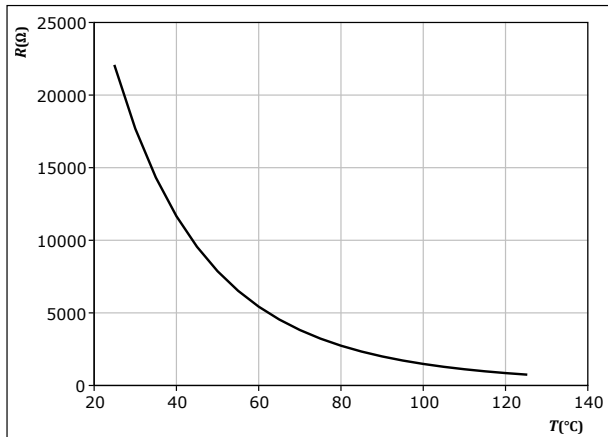


### Thermistor Characteristics

figure 18. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$



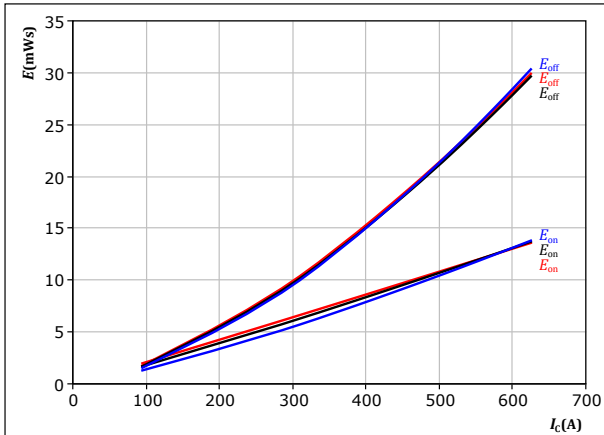


## Buck Switching Characteristics

**figure 19.** IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

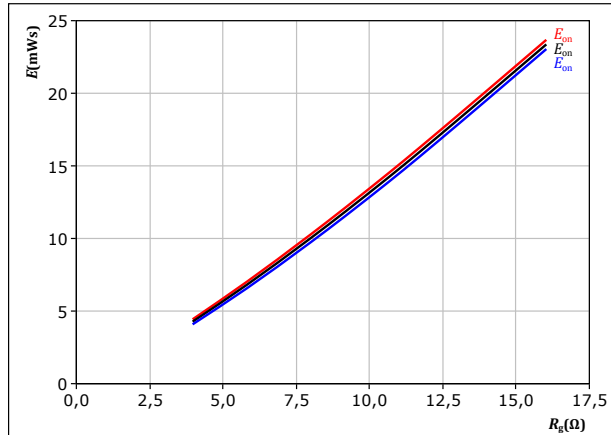
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 8 \ \Omega$   
 $R_{goff} = 16 \ \Omega$

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

**figure 20.** IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$$E = f(R_g)$$



With an inductive load at

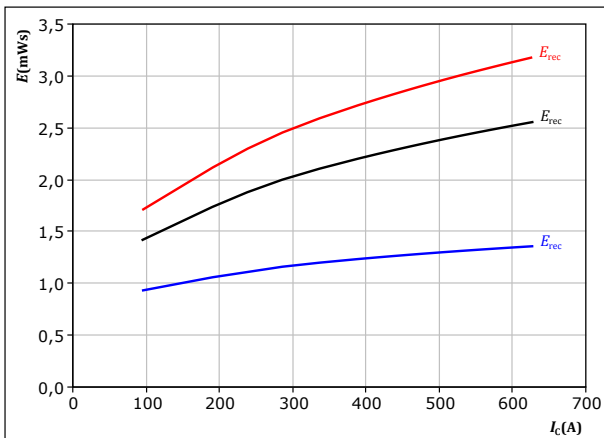
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

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

**figure 21.** FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

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

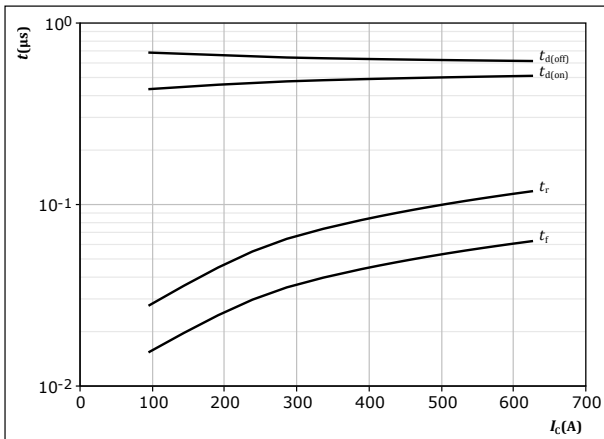
$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C



## Buck Switching Characteristics

**figure 23.** IGBT

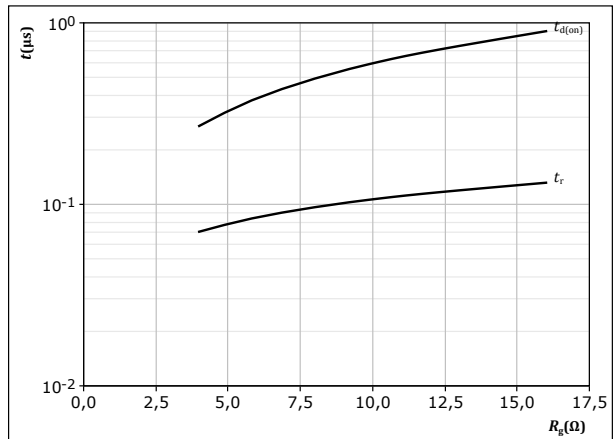
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 8 \text{ } \Omega$   
 $R_{goff} = 16 \text{ } \Omega$

**figure 24.** IGBT

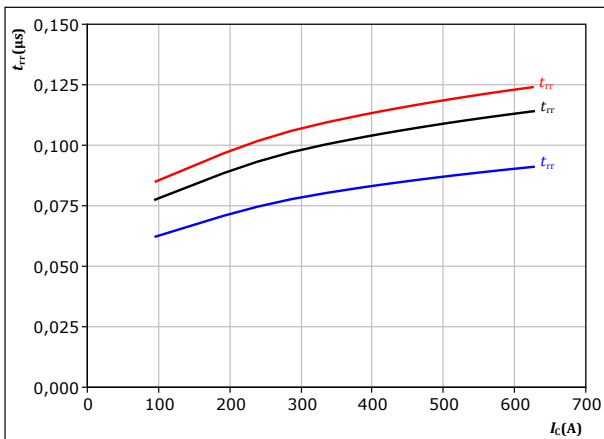
Typical switching times as a function of IGBT turn on gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

**figure 25.** FWD

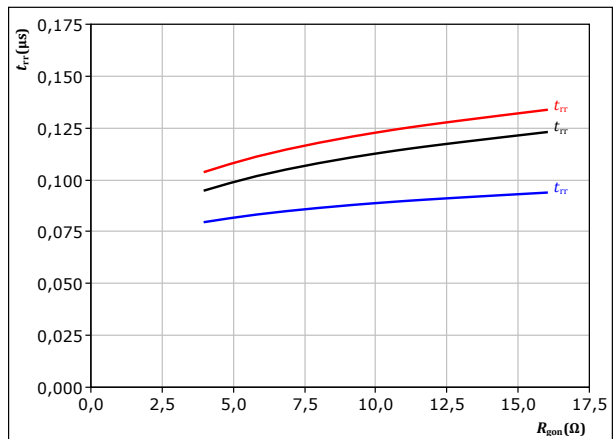
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 8 \text{ } \Omega$   
 $T_j:$  — 25 °C  
 — 125 °C  
 — 150 °C

**figure 26.** FWD

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



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$   
 $T_j:$  — 25 °C  
 — 125 °C  
 — 150 °C

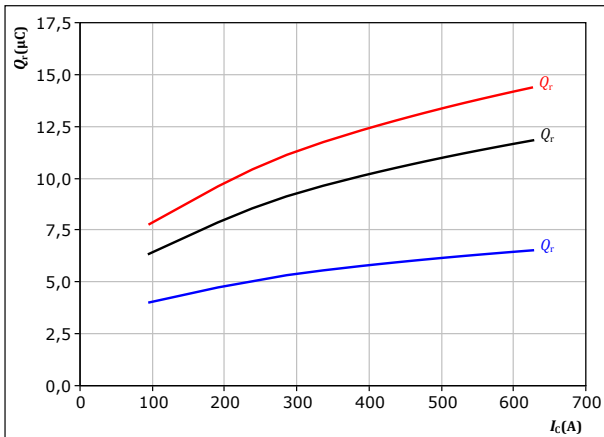


## Buck Switching Characteristics

**figure 27.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

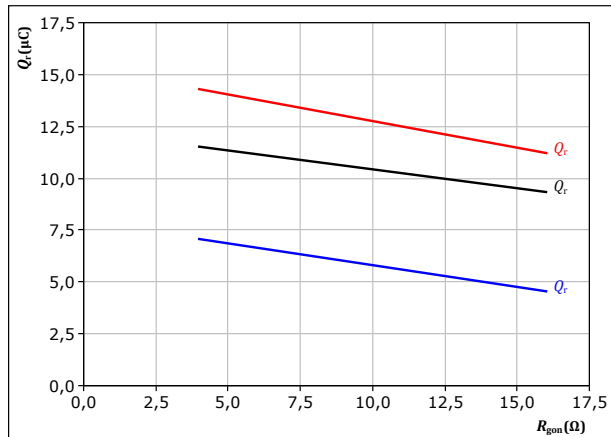
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 8 \ \Omega$

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

**figure 28.** FWD

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

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



With an inductive load at

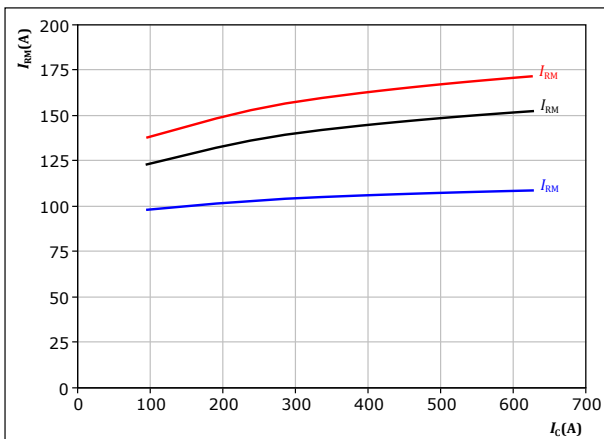
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

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

**figure 29.** FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

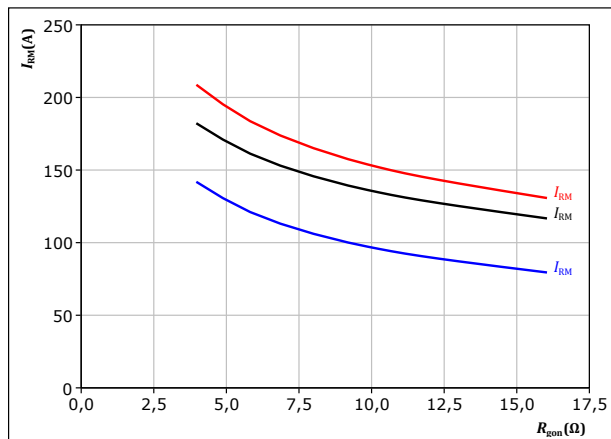
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 8 \ \Omega$

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

**figure 30.** 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

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

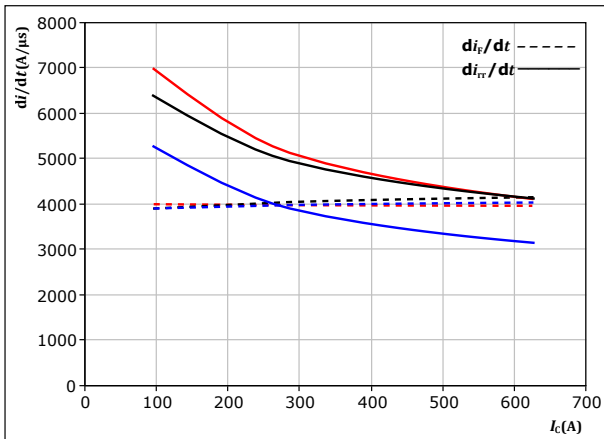
$T_j$ :  
 — 25 °C  
 — 125 °C  
 — 150 °C



## Buck Switching Characteristics

**figure 31.** FWD

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



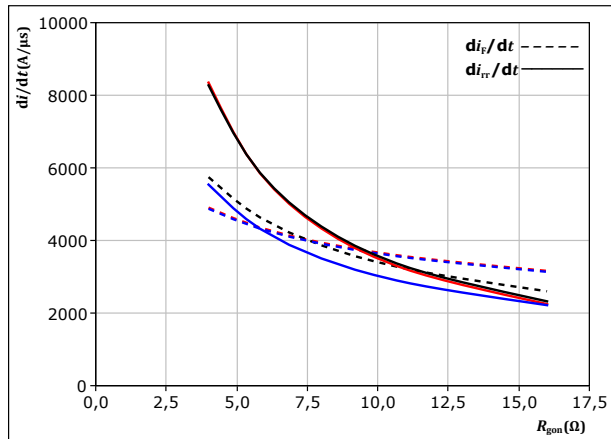
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$   $\Omega$

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

**figure 32.** 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

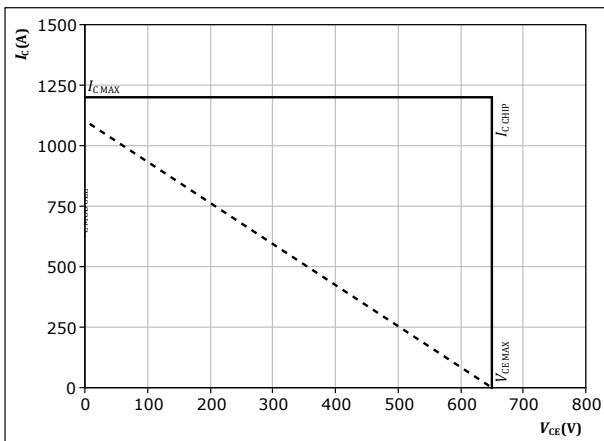
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 475$  A

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

**figure 33.** IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At  $T_j = 150$  °C  
 $R_{gon} = 8$   $\Omega$   
 $R_{goff} = 16$   $\Omega$



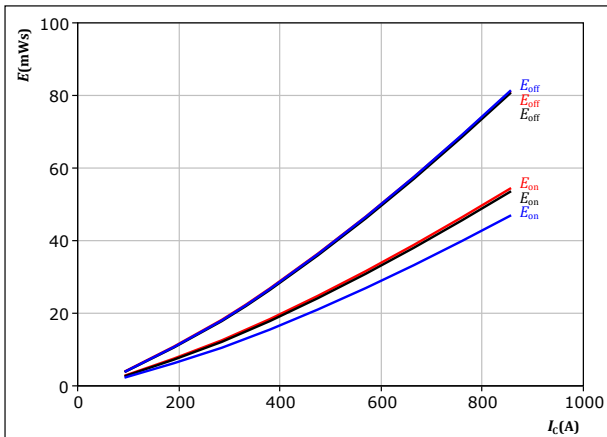


## Boost Switching Characteristics

**figure 34.** IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

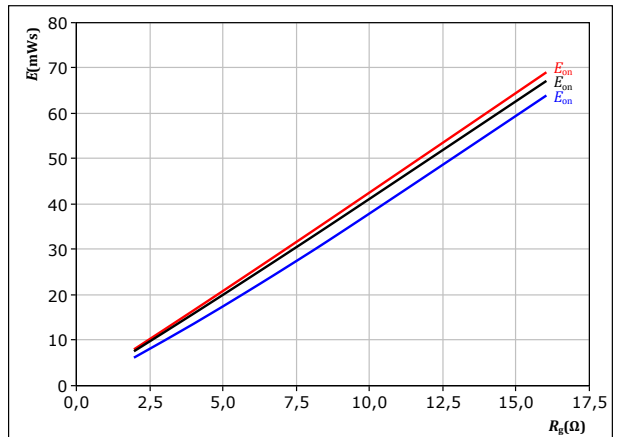
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 5,82 \ \Omega$   
 $R_{goff} = 12,8 \ \Omega$

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

**figure 35.** IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$$E = f(R_g)$$



With an inductive load at

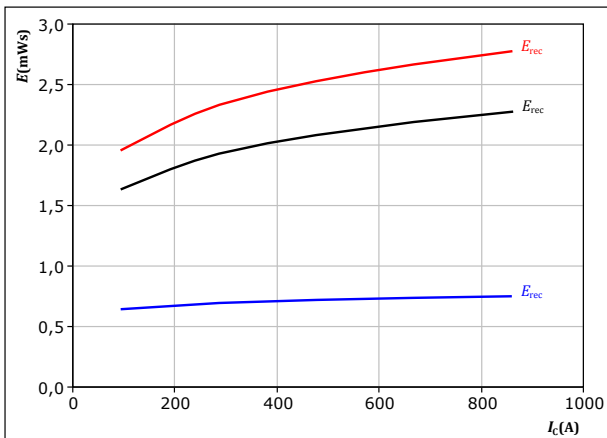
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

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

**figure 36.** FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 5,82 \ \Omega$

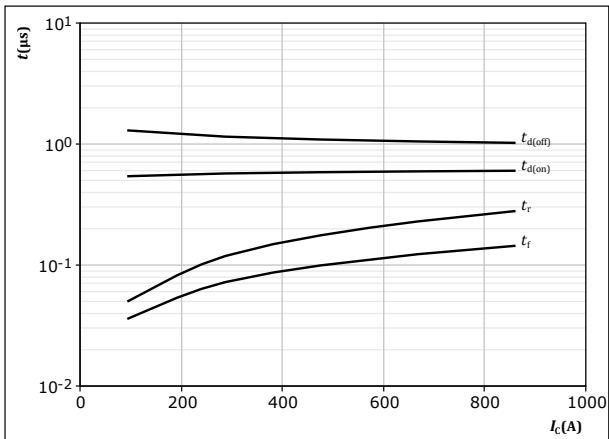
$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C



## Boost Switching Characteristics

**figure 38.** IGBT

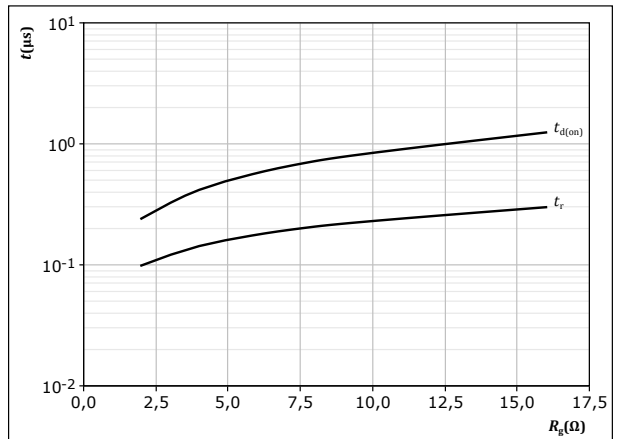
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 5,82 \text{ } \Omega$   
 $R_{goff} = 12,8 \text{ } \Omega$

**figure 39.** IGBT

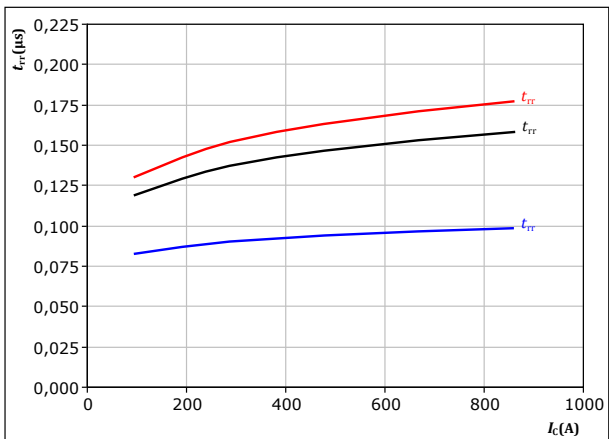
Typical switching times as a function of IGBT turn on gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

**figure 40.** FWD

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

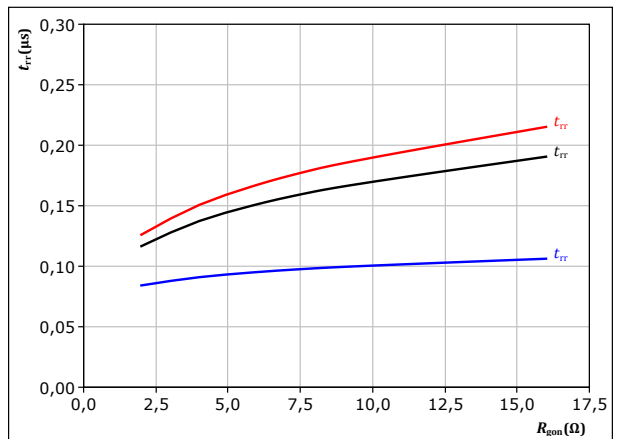


With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 5,82 \text{ } \Omega$

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

**figure 41.** FWD

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



With an inductive load at  
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 475 \text{ A}$

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

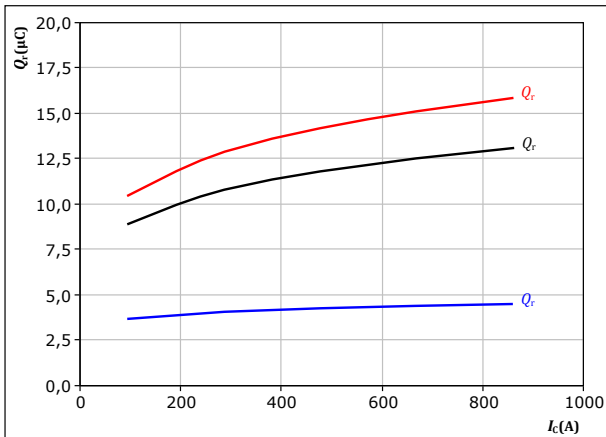


## Boost Switching Characteristics

figure 42. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



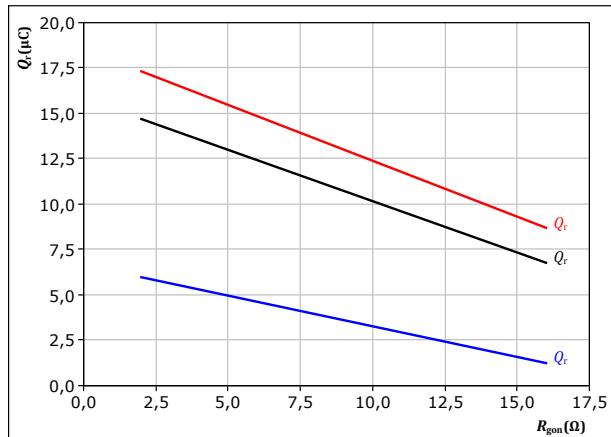
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 5,82$  Ω  
 $T_j:$  25 °C (blue), 125 °C (black), 150 °C (red)

figure 43. FWD

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

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



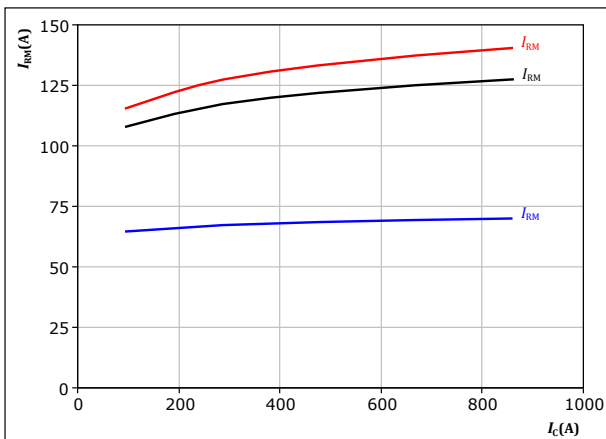
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 475$  A  
 $T_j:$  25 °C (blue), 125 °C (black), 150 °C (red)

figure 44. FWD

Typical peak reverse recovery current as a function of collector current

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



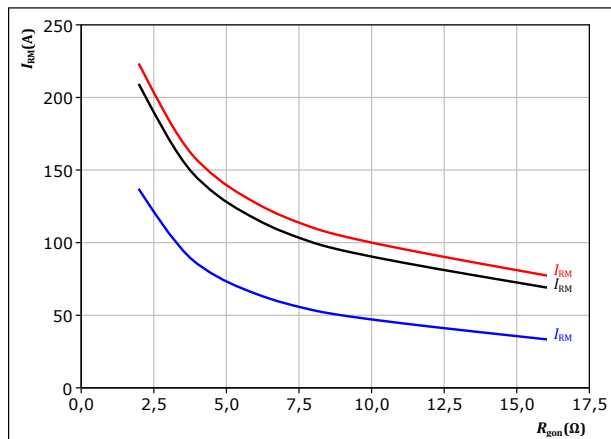
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 5,82$  Ω  
 $T_j:$  25 °C (blue), 125 °C (black), 150 °C (red)

figure 45. 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

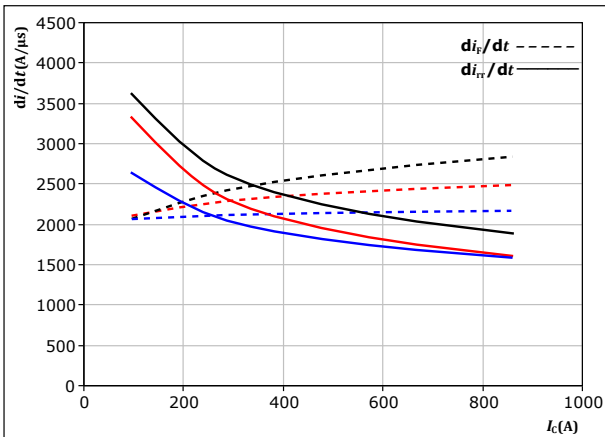
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 475$  A  
 $T_j:$  25 °C (blue), 125 °C (black), 150 °C (red)



## Boost Switching Characteristics

**figure 46.** FWD

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

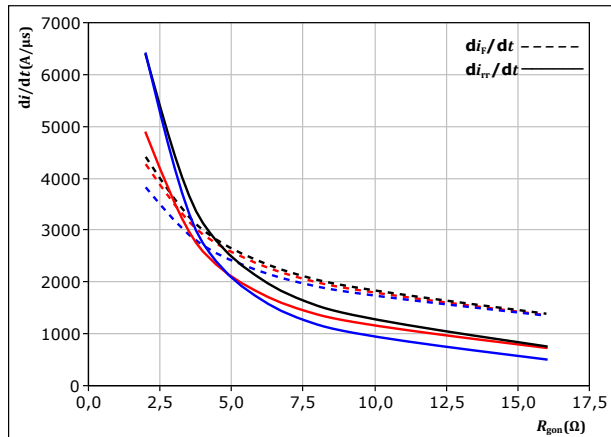


With an inductive load at

$V_{CE} = 350$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$R_{g(on)} = 5,82$ Ω	$T_j = 150$ °C

**figure 47.** FWD

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

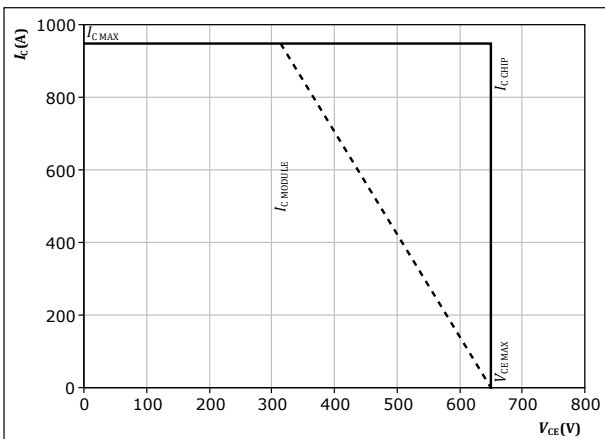


With an inductive load at

$V_{CE} = 350$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$I_C = 475$ A	$T_j = 150$ °C

**figure 48.** IGBT

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



At  $T_j = 150$  °C  
 $R_{g(on)} = 5,82$  Ω  
 $R_{g(off)} = 12,8$  Ω



## Switching Definitions

figure 49. IGBT

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

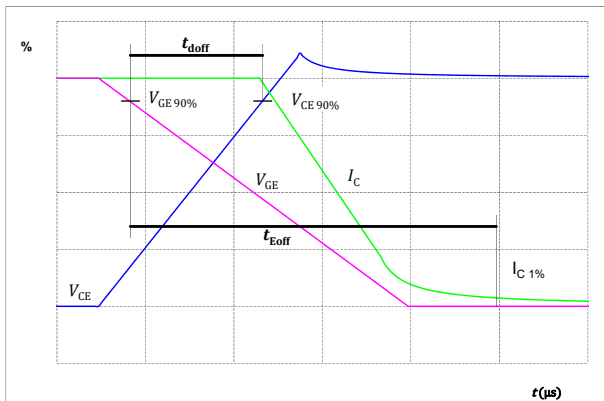


figure 50. IGBT

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

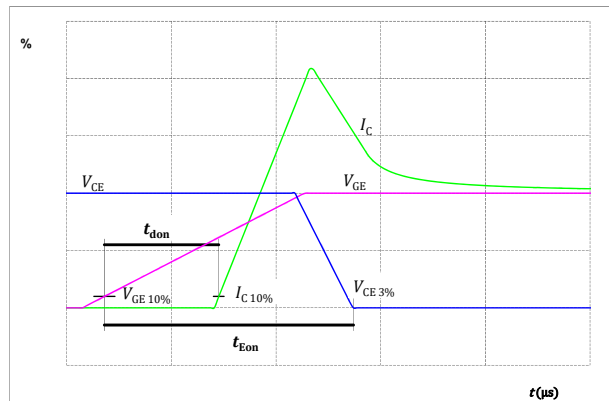


figure 51. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

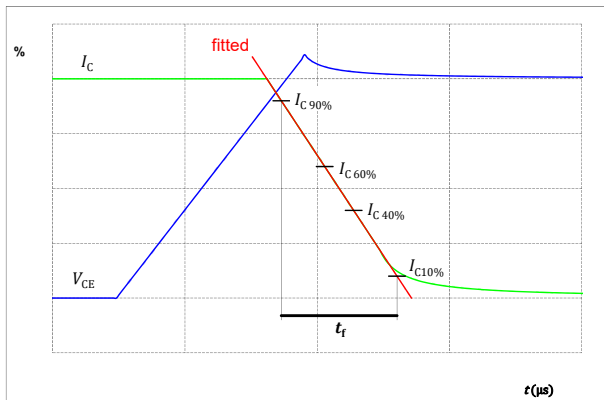
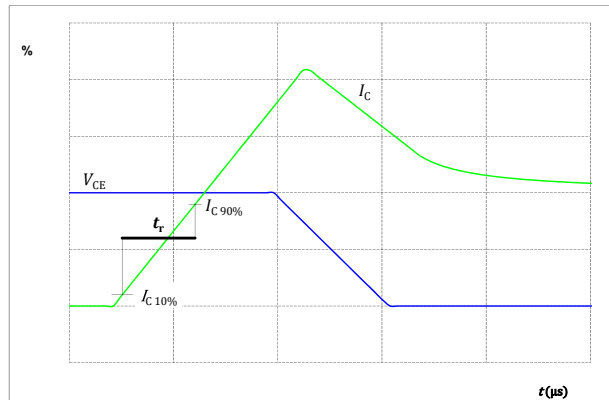


figure 52. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





### Switching Definitions

figure 53. FWD

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

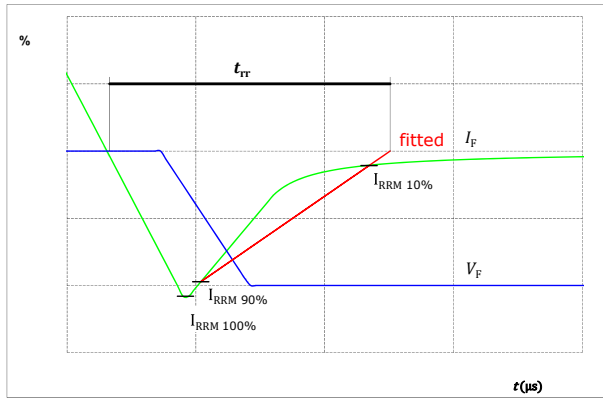
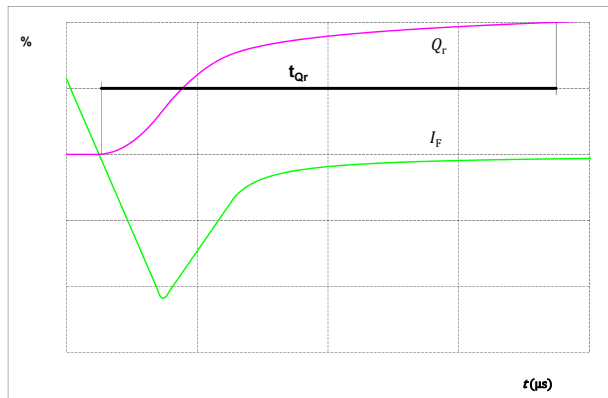


figure 54. FWD

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






Vincotech

**30-PT07NIA600S501-PD60F58Y**  
datasheet

Ordering Code	
<b>Version</b>	<b>Ordering Code</b>
Without thermal paste	30-PT07NIA600S501-PD60F58Y
With thermal paste (3,4 W/mK, PSX-P7)	30-PT07NIA600S501-PD60F58Y-/3/

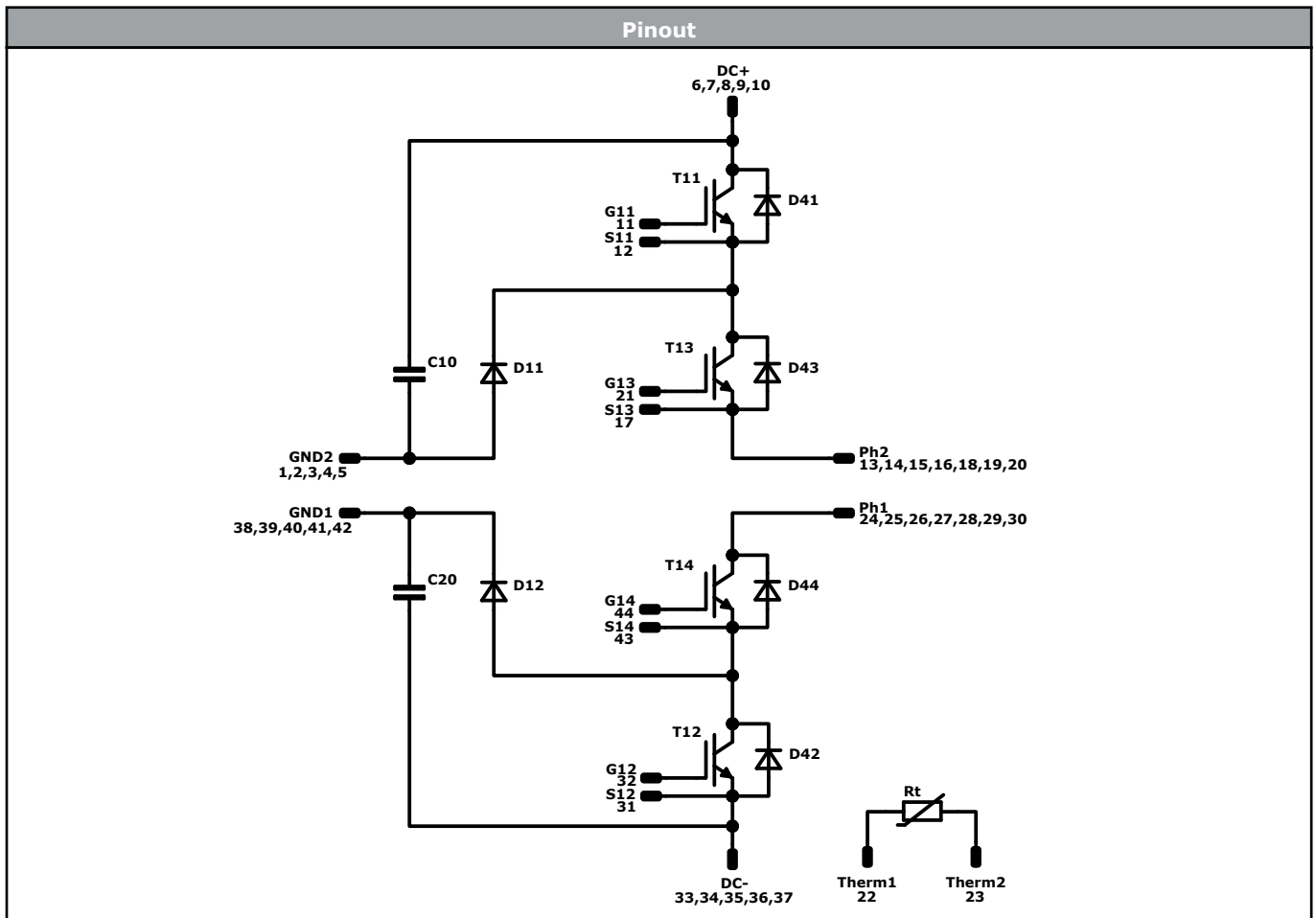
Marking						
	<b>Text</b>	<b>Name</b> NN-NNNNNNNNNNNNNN- TTTTTWWYY UL VIN LLLLL SSSS	<b>Date code</b> WWYY	<b>UL &amp; VIN</b> UL VIN	<b>Lot</b> LLLLL	<b>Serial</b> SSSS
	<b>Datamatrix</b>	<b>Type&amp;Ver</b> TTTTTTTV	<b>Lot number</b> LLLLL	<b>Serial</b> SSSS	<b>Date code</b> WWYY	

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<table border="1"> <thead> <tr> <th colspan="4">Pin table [mm]</th> </tr> <tr> <th>Pin</th> <th>X</th> <th>Y</th> <th>Function</th> </tr> </thead> <tr><td>1</td><td>32,9</td><td>2,7</td><td>GND2</td></tr> <tr><td>2</td><td>32,9</td><td>0</td><td>GND2</td></tr> <tr><td>3</td><td>30,2</td><td>0</td><td>GND2</td></tr> <tr><td>4</td><td>27,5</td><td>0</td><td>GND2</td></tr> <tr><td>5</td><td>24,8</td><td>0</td><td>GND2</td></tr> <tr><td>6</td><td>16,4</td><td>0</td><td>DC+</td></tr> <tr><td>7</td><td>13,7</td><td>0</td><td>DC+</td></tr> <tr><td>8</td><td>11</td><td>0</td><td>DC+</td></tr> <tr><td>9</td><td>8,3</td><td>0</td><td>DC+</td></tr> <tr><td>10</td><td>5,6</td><td>0</td><td>DC+</td></tr> <tr><td>11</td><td>20,8</td><td>12,2</td><td>G11</td></tr> <tr><td>12</td><td>23,8</td><td>12,2</td><td>S11</td></tr> <tr><td>13</td><td>32,9</td><td>36,9</td><td>Ph2</td></tr> <tr><td>14</td><td>30,2</td><td>36,9</td><td>Ph2</td></tr> <tr><td>15</td><td>27,5</td><td>36,9</td><td>Ph2</td></tr> <tr><td>16</td><td>24,8</td><td>36,9</td><td>Ph2</td></tr> <tr><td>17</td><td>22,1</td><td>36,9</td><td>S13</td></tr> <tr><td>18</td><td>19,4</td><td>36,9</td><td>Ph2</td></tr> <tr><td>19</td><td>16,7</td><td>36,9</td><td>Ph2</td></tr> <tr><td>20</td><td>14</td><td>36,9</td><td>Ph2</td></tr> <tr><td>21</td><td>22,1</td><td>33,9</td><td>G13</td></tr> <tr><td>22</td><td>0</td><td>36,9</td><td>Therm1</td></tr> <tr><td>23</td><td>0</td><td>33,9</td><td>Therm2</td></tr> <tr><td>24</td><td>38</td><td>36,9</td><td>Ph1</td></tr> <tr><td>25</td><td>40,7</td><td>36,9</td><td>Ph1</td></tr> <tr><td>26</td><td>43,4</td><td>36,9</td><td>Ph1</td></tr> <tr><td>27</td><td>46,1</td><td>36,9</td><td>Ph1</td></tr> <tr><td>28</td><td>48,8</td><td>36,9</td><td>Ph1</td></tr> <tr><td>29</td><td>51,5</td><td>36,9</td><td>Ph1</td></tr> <tr><td>30</td><td>54,2</td><td>36,9</td><td>Ph1</td></tr> <tr><td>31</td><td>70,9</td><td>25,35</td><td>S12</td></tr> <tr><td>32</td><td>67,9</td><td>25,35</td><td>G12</td></tr> <tr><td>33</td><td>65,3</td><td>0</td><td>DC-</td></tr> <tr><td>34</td><td>62,6</td><td>0</td><td>DC-</td></tr> <tr><td>35</td><td>59,9</td><td>0</td><td>DC-</td></tr> <tr><td>36</td><td>57,2</td><td>0</td><td>DC-</td></tr> <tr><td>37</td><td>54,5</td><td>0</td><td>DC-</td></tr> <tr><td>38</td><td>46,1</td><td>0</td><td>GND1</td></tr> <tr><td>39</td><td>43,4</td><td>0</td><td>GND1</td></tr> <tr><td>40</td><td>40,7</td><td>0</td><td>GND1</td></tr> <tr><td>41</td><td>38</td><td>0</td><td>GND1</td></tr> <tr><td>42</td><td>38</td><td>2,7</td><td>GND1</td></tr> <tr><td>43</td><td>48,25</td><td>20,75</td><td>S14</td></tr> <tr><td>44</td><td>48,25</td><td>23,75</td><td>G14</td></tr> </table>					Pin table [mm]				Pin	X	Y	Function	1	32,9	2,7	GND2	2	32,9	0	GND2	3	30,2	0	GND2	4	27,5	0	GND2	5	24,8	0	GND2	6	16,4	0	DC+	7	13,7	0	DC+	8	11	0	DC+	9	8,3	0	DC+	10	5,6	0	DC+	11	20,8	12,2	G11	12	23,8	12,2	S11	13	32,9	36,9	Ph2	14	30,2	36,9	Ph2	15	27,5	36,9	Ph2	16	24,8	36,9	Ph2	17	22,1	36,9	S13	18	19,4	36,9	Ph2	19	16,7	36,9	Ph2	20	14	36,9	Ph2	21	22,1	33,9	G13	22	0	36,9	Therm1	23	0	33,9	Therm2	24	38	36,9	Ph1	25	40,7	36,9	Ph1	26	43,4	36,9	Ph1	27	46,1	36,9	Ph1	28	48,8	36,9	Ph1	29	51,5	36,9	Ph1	30	54,2	36,9	Ph1	31	70,9	25,35	S12	32	67,9	25,35	G12	33	65,3	0	DC-	34	62,6	0	DC-	35	59,9	0	DC-	36	57,2	0	DC-	37	54,5	0	DC-	38	46,1	0	GND1	39	43,4	0	GND1	40	40,7	0	GND1	41	38	0	GND1	42	38	2,7	GND1	43	48,25	20,75	S14	44	48,25	23,75	G14
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| center of press-fit pin head pin head type "Y" PEG plated through-hole Ø155 mm ±0.09 / -0.06 for further PEG design rules refer to the latest handling instruction  Tolerance of positions: ±0.5mm at the end of pins Dimension of coordinate axis is only offset without tolerance | | | | |



Vincotech



**Identification**

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	650 V	600 A	Buck Switch	
D11, D12	FWD	650 V	375 A	Buck Diode	
T13, T14	IGBT	650 V	474 A	Boost Switch	
D42, D41	FWD	650 V	300 A	Boost Diode	
D43, D44	FWD	650 V	300 A	Boost Sw. Inv. Diode	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	






Vincotech

Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 2</i> packages see vincotech.com website.

Package data
Package data for <i>flow 2</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
30-PT07NIA600S501-PD60F58Y-D1-14	1 Jul. 2022		
30-PT07NIA600S501-PD60F58Y-D2-14	12 Aug. 2022	Boost Switch Rth corrected. Module unchanged.	

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

单击下面可查看定价，库存，交付和生命周期等信息

[>>Vincotech\(威科\)](#)