



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: Al₂O₃
- Convex shaped baseplate for superior thermal contact
- Cu baseplate
- Thermo-mechanical push-and-pull force relief
- Solder pin

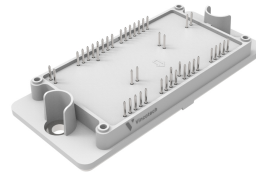
Target applications

- Industrial Drives
- Solar Inverters
- UPS

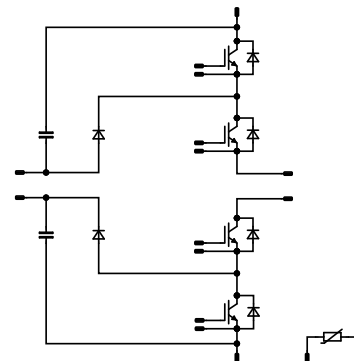
Types

- 30-FT07NIA600S501-PD60F58

flow 2 13 mm housing



Schematic





Vincotech

Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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
Boost 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

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 ⁽¹⁾	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 ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ 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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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 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 650$ V				25			19	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ 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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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 ⁽¹⁾	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 ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ 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					25 125 150		173,65 171,84 171,92		ns
Turn-off delay time	$t_{d(off)}$					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



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max		
Boost Diode										
Static										
Forward voltage	V_F			300	25 125 150		1,53 1,49 1,46	1,92 ⁽¹⁾		V
Reverse leakage current	I_R	$V_r = 650$ V			25			15,2		μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,37			K/W
Dynamic										
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 ⁽¹⁾	V
Reverse leakage current	I_R	$V_T = 650$ V				25			15,2	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ 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	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.

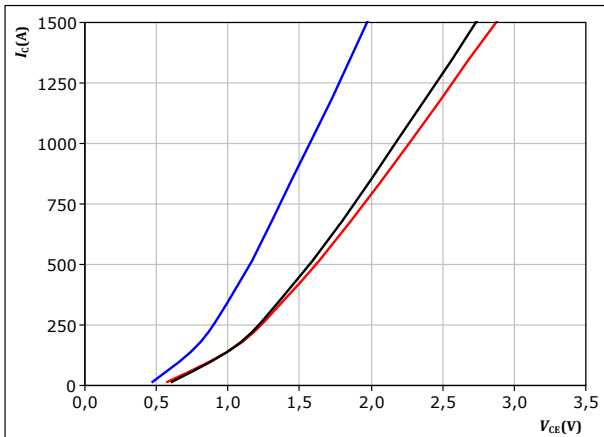


Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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



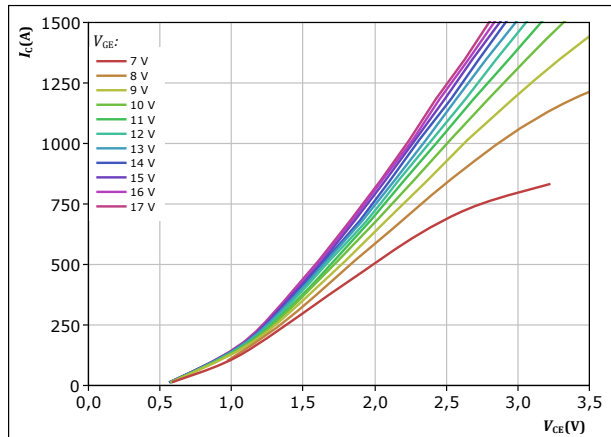
$t_p = 250 \mu\text{s}$
 $V_{GE} = 15 \text{ V}$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 2. IGBT

Typical output characteristics

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

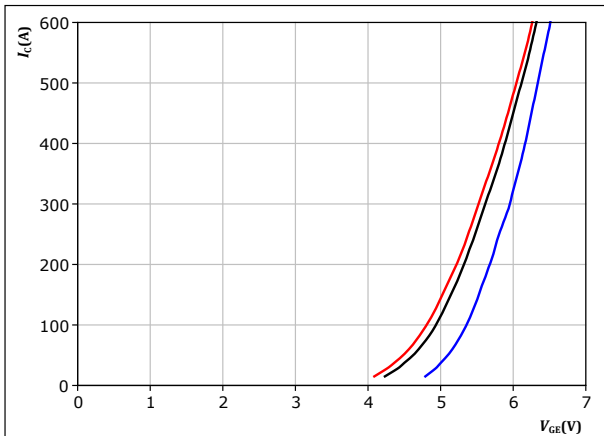


$t_p = 250 \mu\text{s}$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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



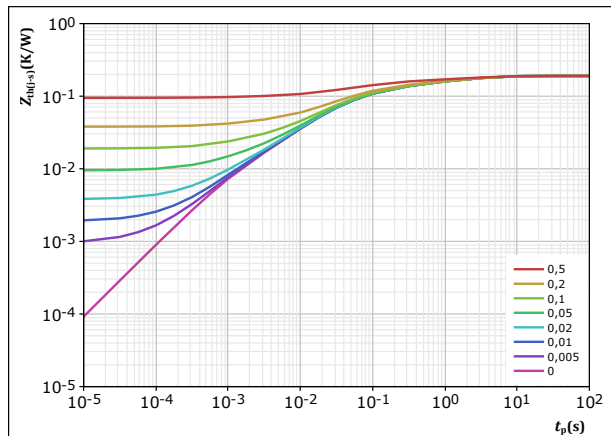
$t_p = 250 \mu\text{s}$
 $V_{CE} = 10 \text{ V}$

$T_j:$ — 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)	τ (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

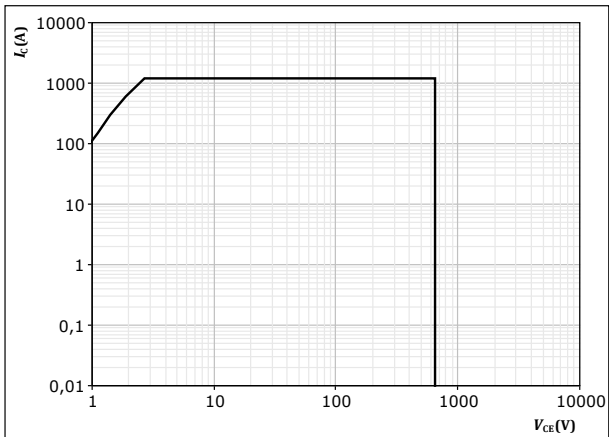


Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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



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



Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

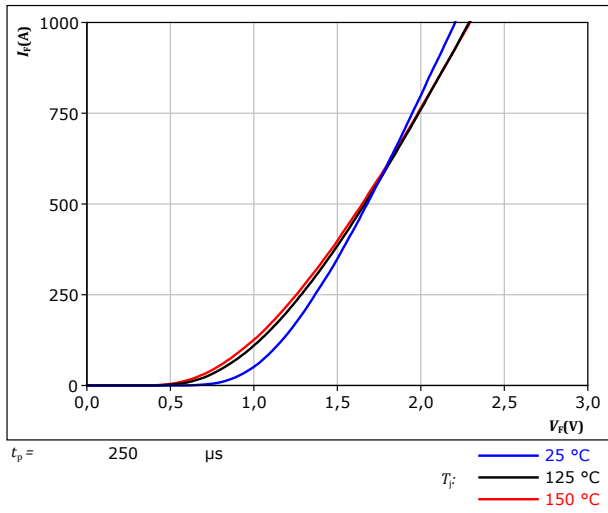
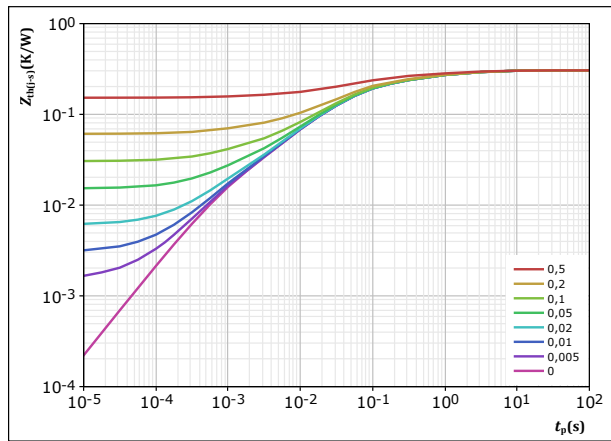


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



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

R (K/W)	τ (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
 $I_C = f(V_{CE})$

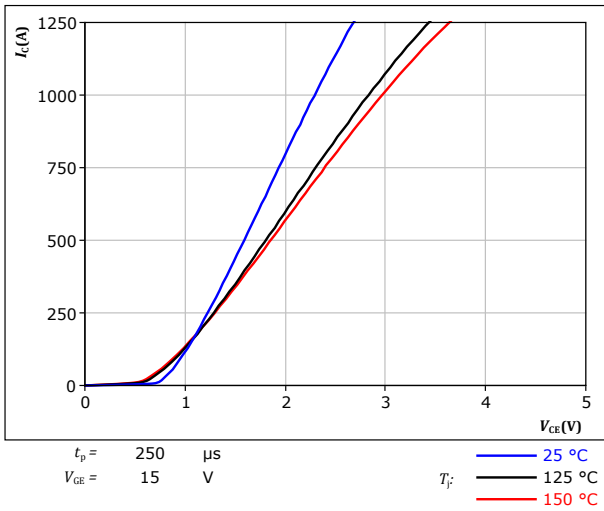


figure 9. IGBT

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

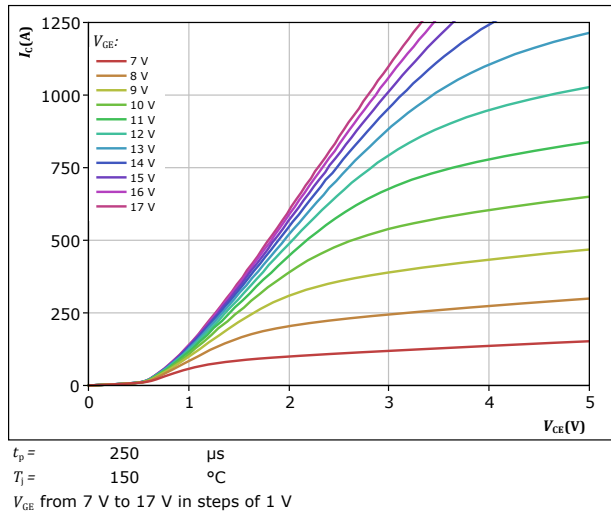


figure 10. IGBT

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

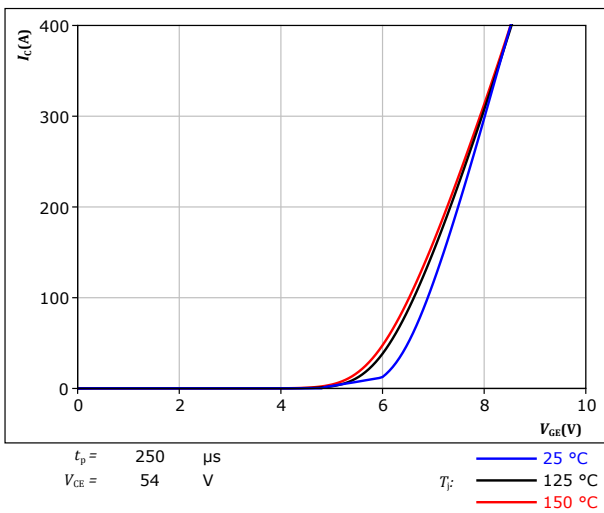
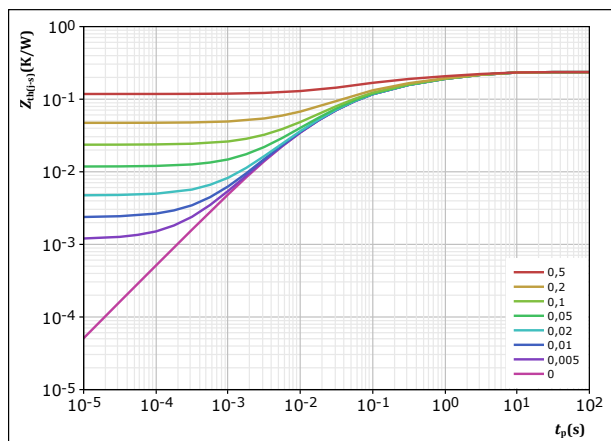


figure 11. IGBT

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



IGBT thermal model values

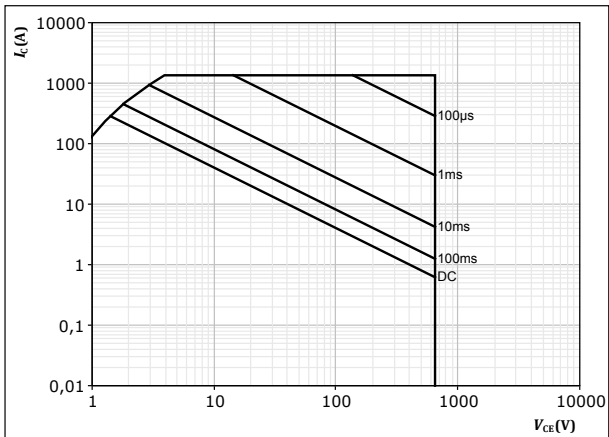
R (K/W)	τ (s)
4,49E-02	3,55E+00
5,32E-02	6,58E-01
6,22E-02	1,22E-01
6,22E-02	3,02E-02
1,35E-02	5,48E-03



Boost Switch Characteristics

figure 12. IGBT

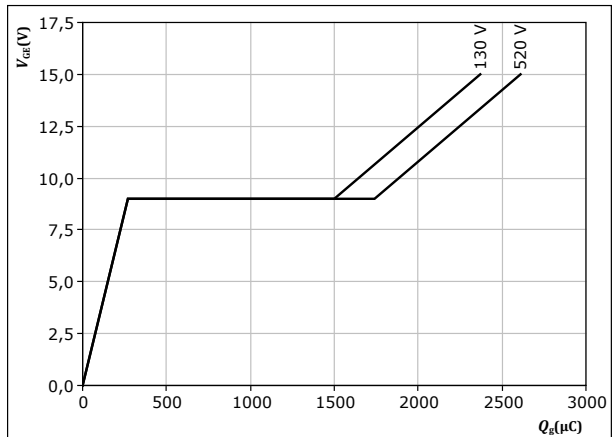
Safe operating area
 $I_C = f(V_{CE})$



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

figure 13. IGBT

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



$I_C = 75 \text{ A}$
 $T_j = 25 \text{ } ^\circ\text{C}$



Boost Diode Characteristics

figure 14. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

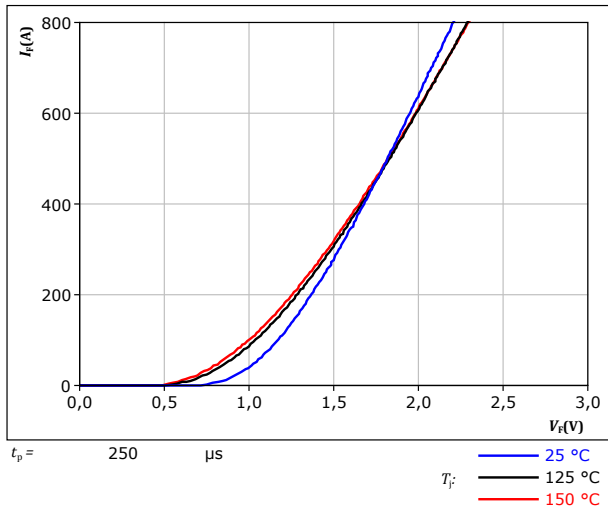
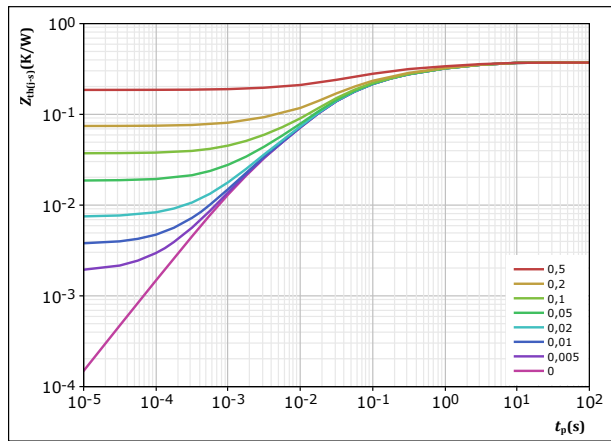


figure 15. FWD

Transient thermal impedance as a function of pulse width

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



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

R (K/W)	τ (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

$$I_F = f(V_F)$$

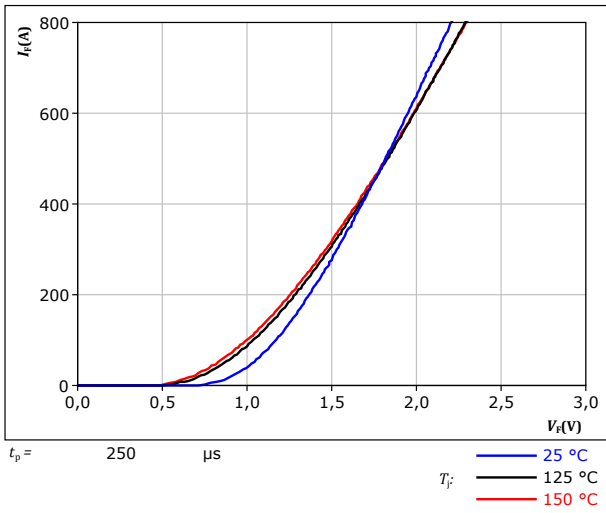
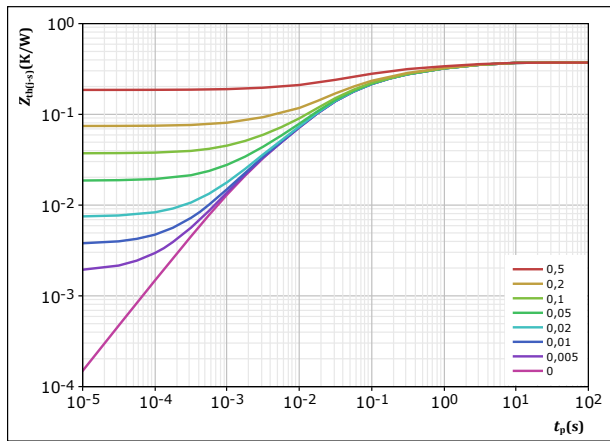


figure 17. FWD

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)	τ (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

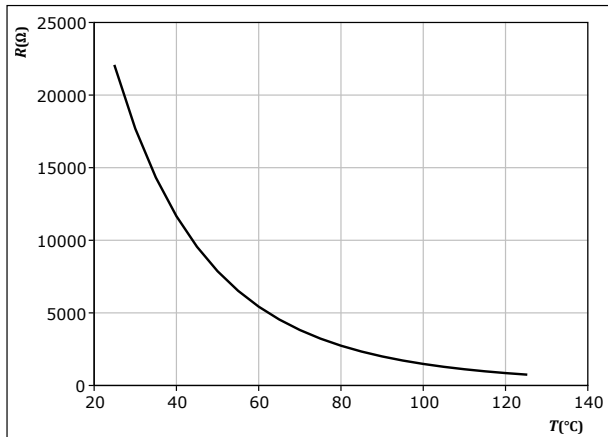


Thermistor Characteristics

figure 18. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$



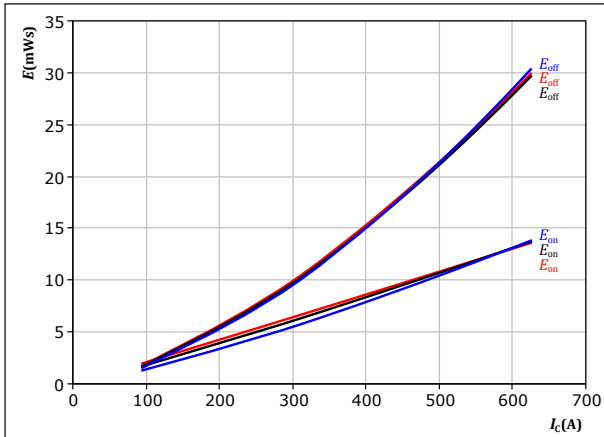


Buck Switching Characteristics

figure 19. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

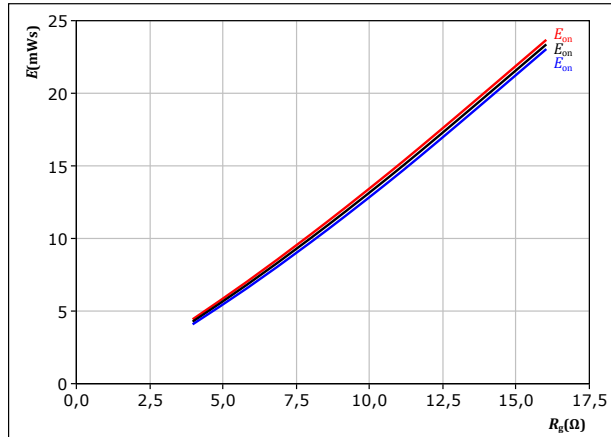
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{g\text{on}} = 8 \ \Omega$
 $R_{g\text{off}} = 16 \ \Omega$

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

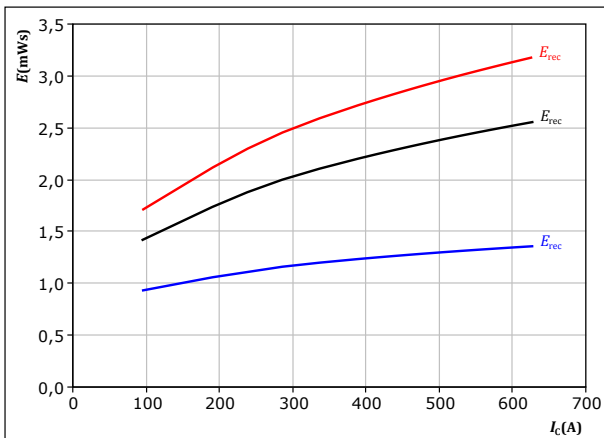
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 475 \text{ A}$

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

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

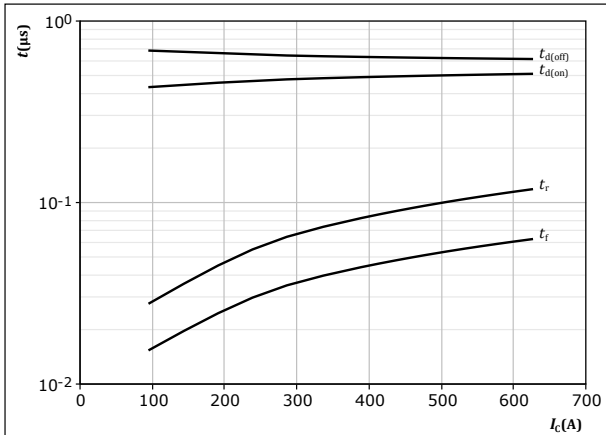
T_j : — 25 °C
 — 125 °C
 — 150 °C



Buck Switching Characteristics

figure 23. IGBT

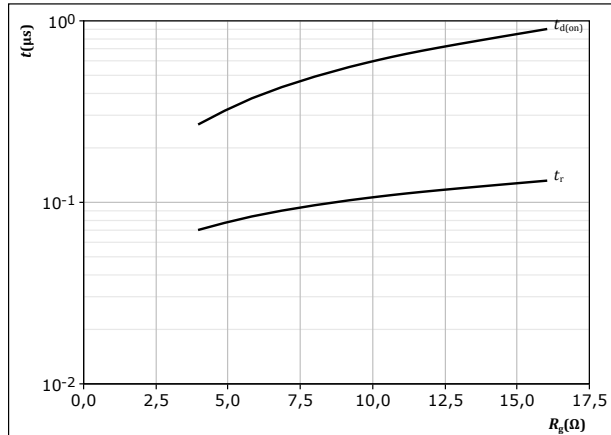
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{g(on)} = 8 \text{ } \Omega$
 $R_{g(off)} = 16 \text{ } \Omega$

figure 24. IGBT

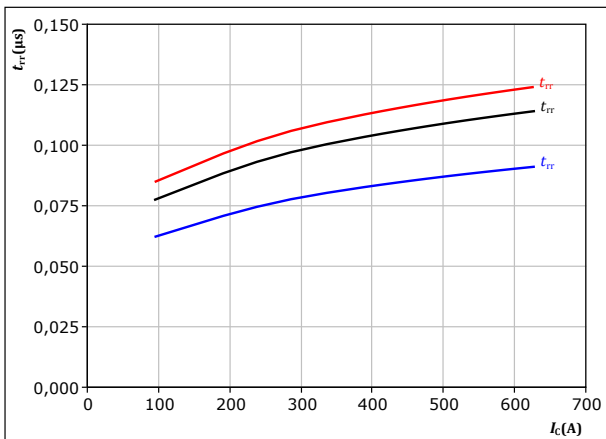
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



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

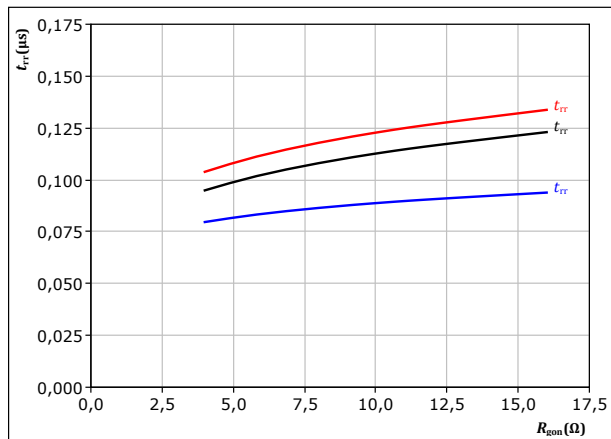
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



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

figure 26. FWD

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



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

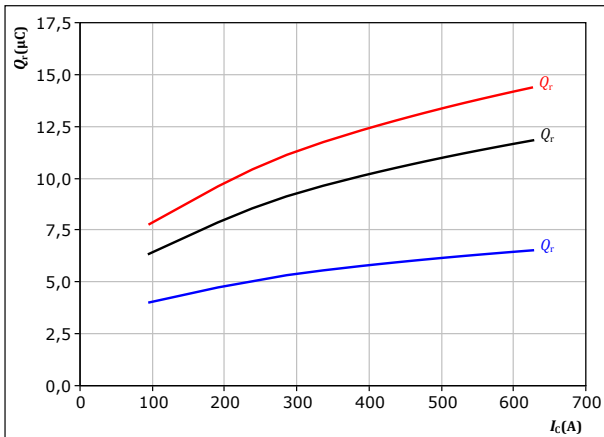


Buck Switching Characteristics

figure 27. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



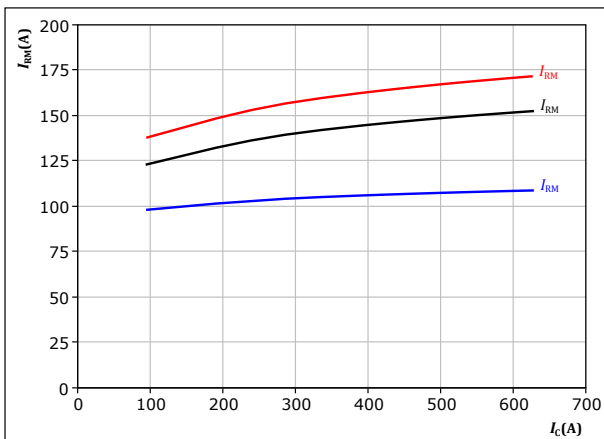
With an inductive load at

$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	± 15	V		125 °C
$R_{gon} =$	8	Ω		150 °C

figure 29. FWD

Typical peak reverse recovery current as a function of collector current

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



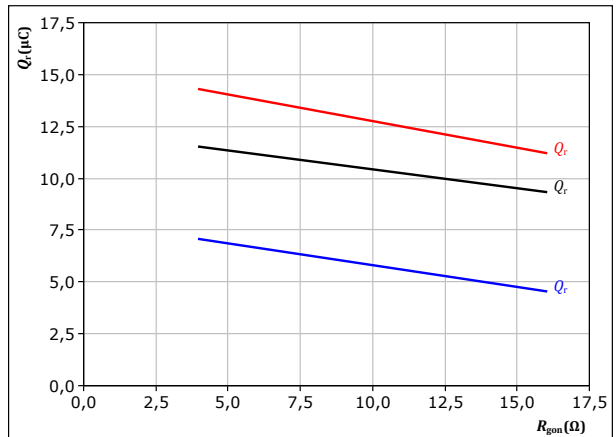
With an inductive load at

$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	± 15	V		125 °C
$R_{gon} =$	8	Ω		150 °C

figure 28. FWD

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

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



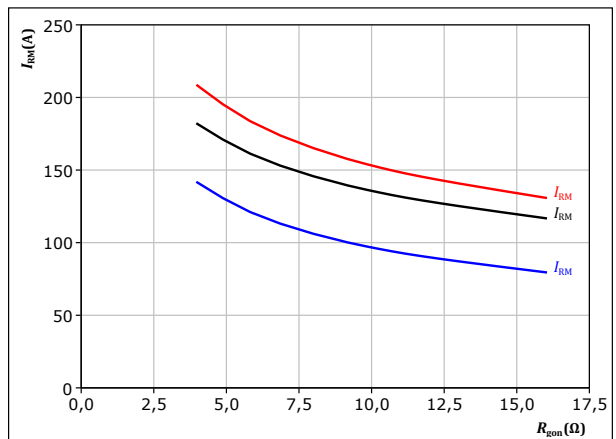
With an inductive load at

$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	± 15	V		125 °C
$I_c =$	475	A		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

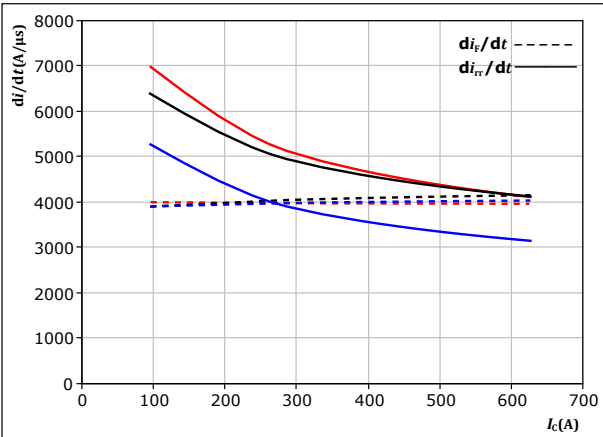
$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	± 15	V		125 °C
$I_c =$	475	A		150 °C



Buck Switching Characteristics

figure 31. FWD

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

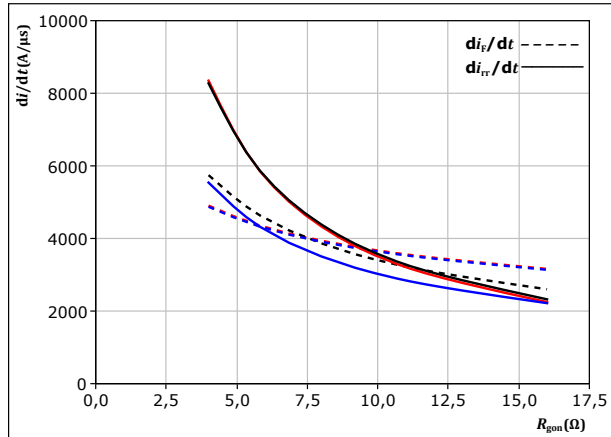


With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 32. FWD

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

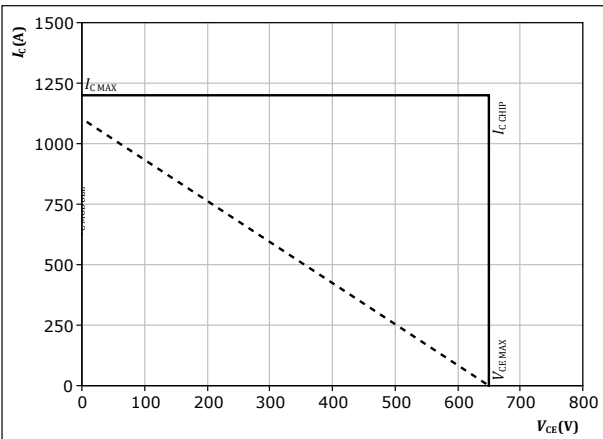


With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 475 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 33. IGBT

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



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$

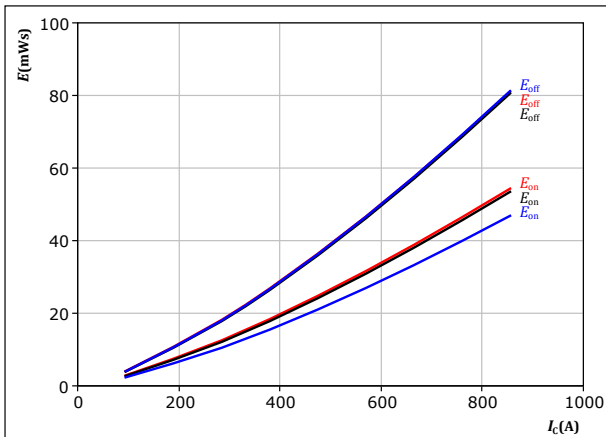


Boost Switching Characteristics

figure 34. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

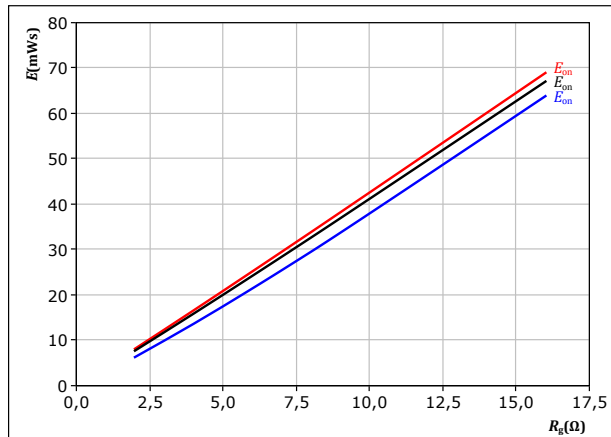
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 5,82 \ \Omega$
 $R_{goff} = 12,8 \ \Omega$

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

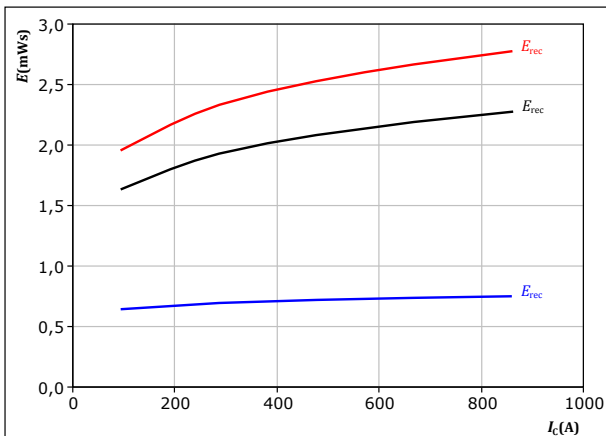
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 475 \text{ A}$

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

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

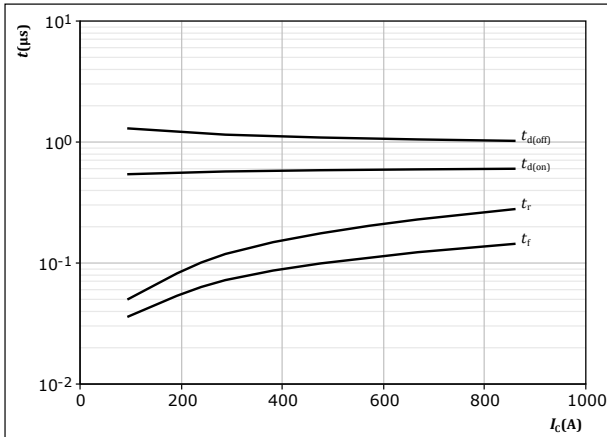
T_j : — 25 °C
 — 125 °C
 — 150 °C



Boost Switching Characteristics

figure 38. IGBT

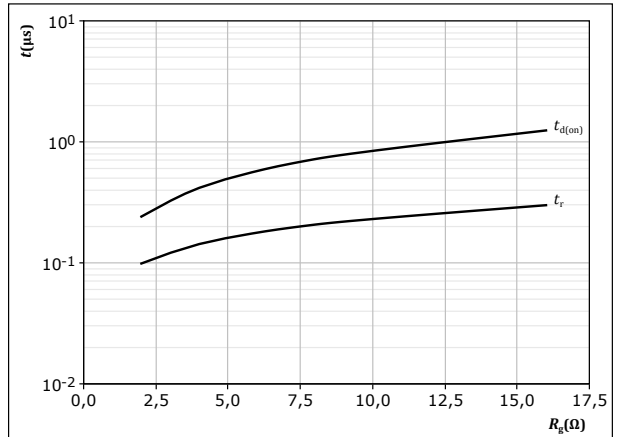
Typical switching times as a function of collector current
 $t = f(I_c)$



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

figure 39. IGBT

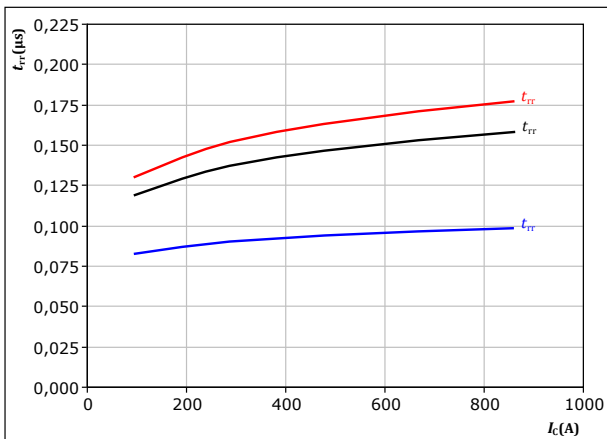
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



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
 $t_{rr} = f(I_c)$

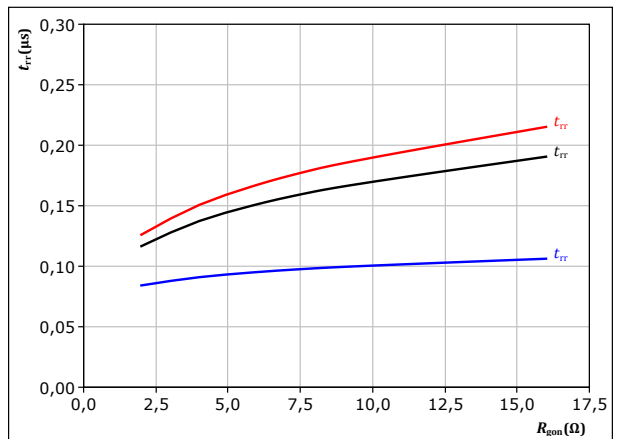


With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{g(on)} = 5,82 \text{ } \Omega$

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 41. FWD

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



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

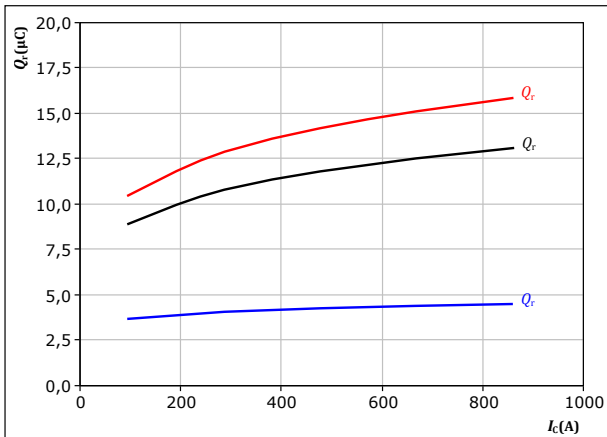


Boost Switching Characteristics

figure 42. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

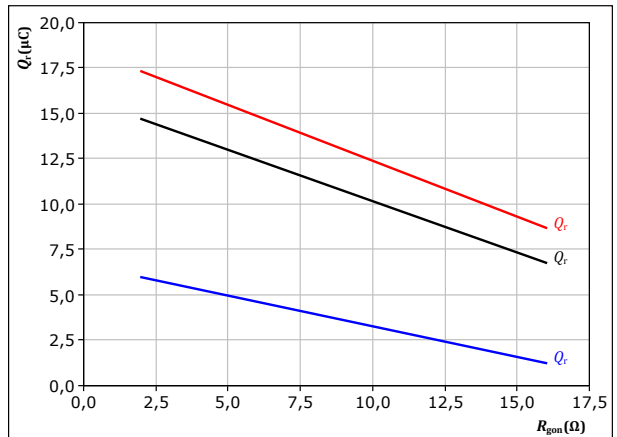
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 5,82$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

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

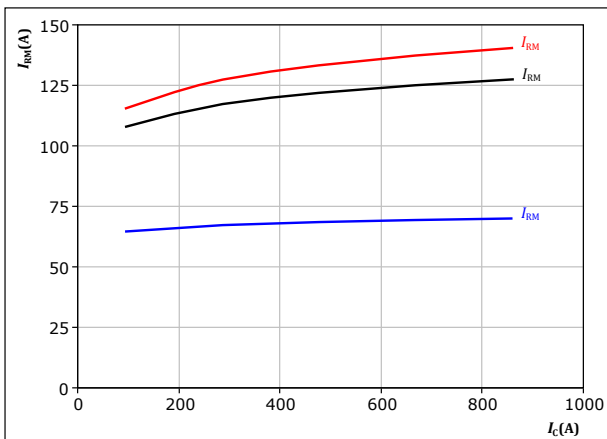
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 475$ A

T_j : — 25 °C
— 125 °C
— 150 °C

figure 44. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

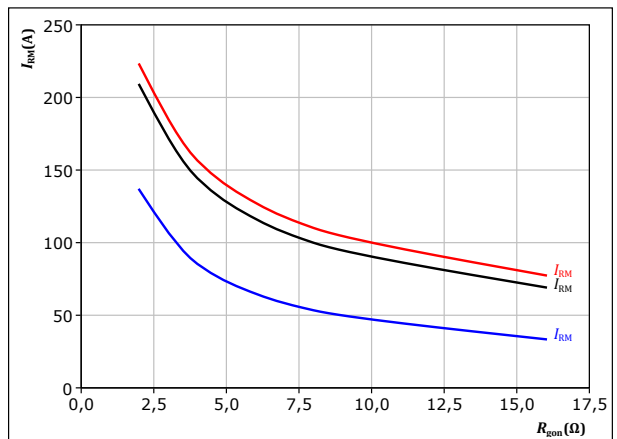
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 5,82$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

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

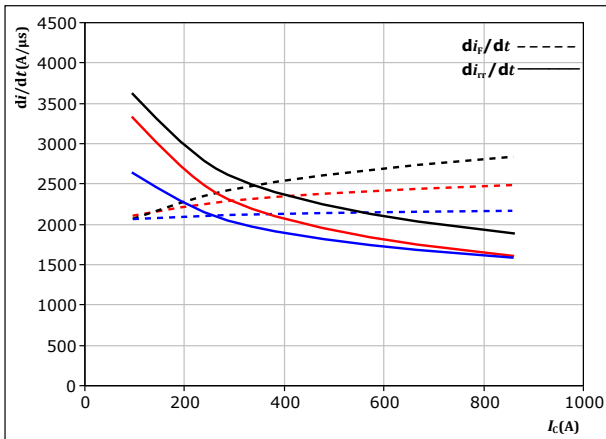
T_j : — 25 °C
— 125 °C
— 150 °C



Boost Switching Characteristics

figure 46. FWD

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



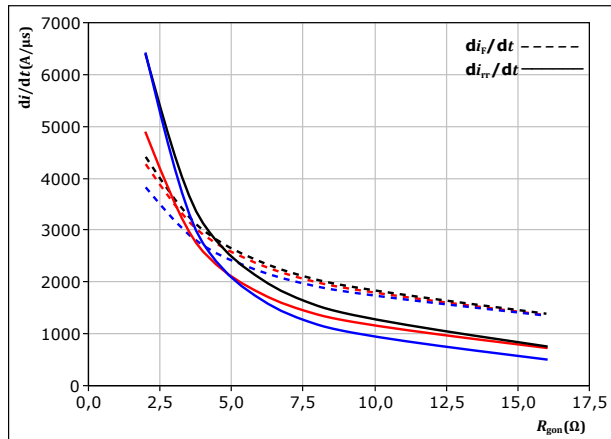
With an inductive load at

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

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 47. 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

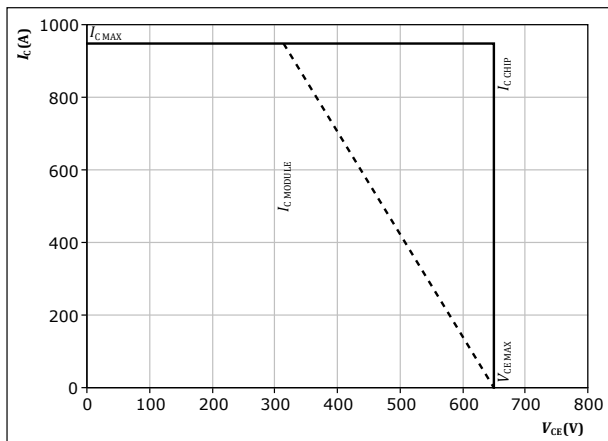
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 475 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 48. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ °C}$
 $R_{gon} = 5,82 \ \Omega$
 $R_{goff} = 12,8 \ \Omega$



Switching Definitions

figure 49. IGBT
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})

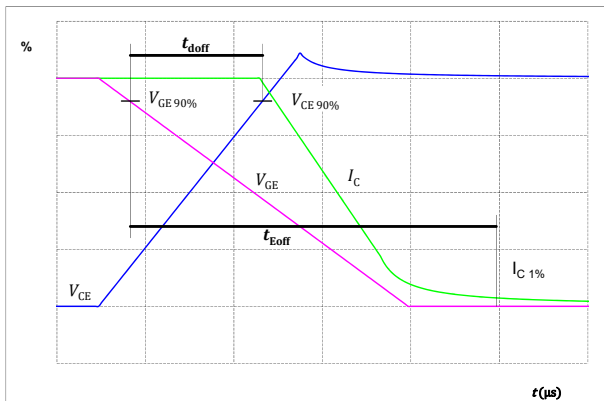


figure 50. IGBT
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})

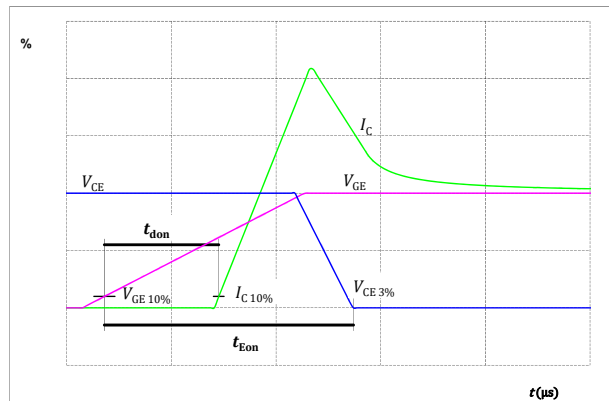


figure 51. IGBT
Turn-off Switching Waveforms & definition of t_f

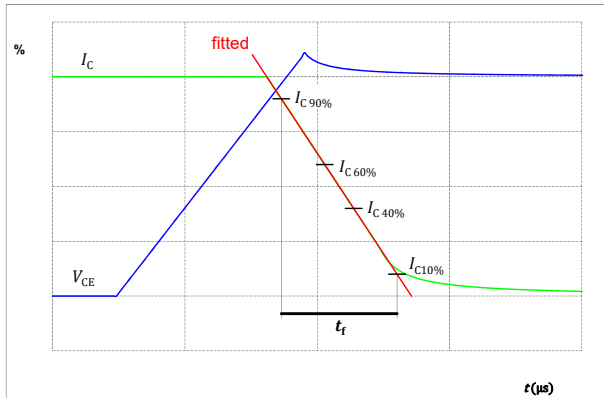
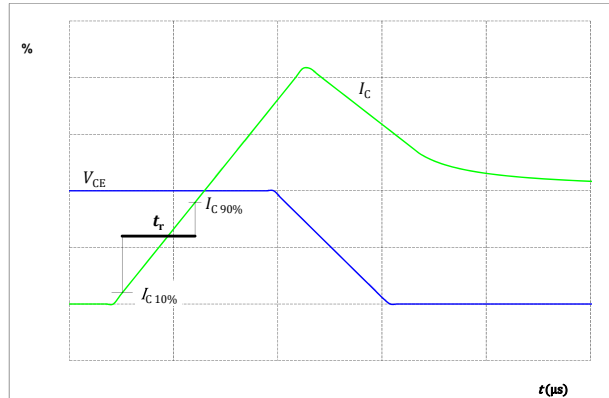


figure 52. IGBT
Turn-on Switching Waveforms & definition of t_r





Switching Definitions

figure 53. FWD

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

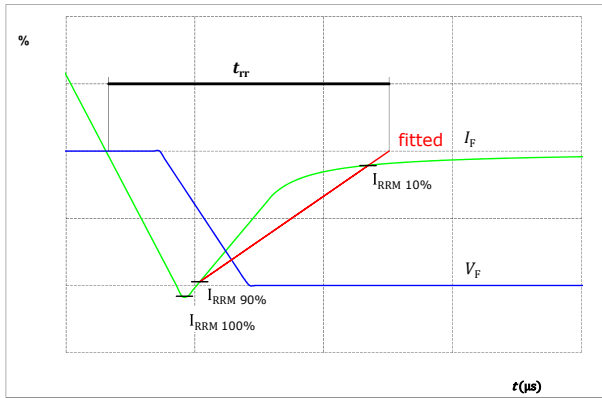
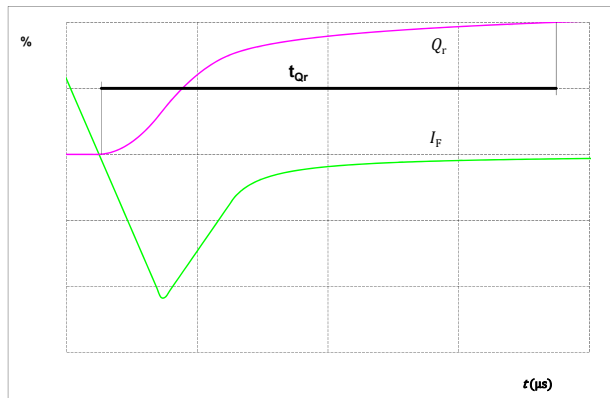


figure 54. FWD

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






Vincotech

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-FT07NIA600S501-PD60F58-D1-14	1 Jul. 2022		
30-FT07NIA600S501-PD60F58-D2-14	12 Aug. 2022	Boost Switch Rth corrected. Module unchanged.	

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