10-FY07BVA050S5-LF44E18
10-PY07BVA050S5-LF44E18Y
datasheet

Vincotech

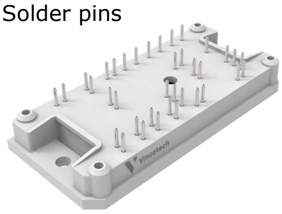
*flow*SOL 1 BI	650 V / 50 A

Features

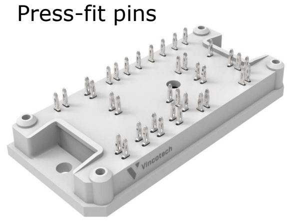
- Dual Booster with bypass diode + H6.5 Bridge
- Trenchstop S5 IGBT Chipset for higher efficiency
- Kelvin emitter for improved switching
- Integrated DC Link capacitor
- Integrated NTC
- Low inductive design

flow 1 12 mm housing

Solder pins



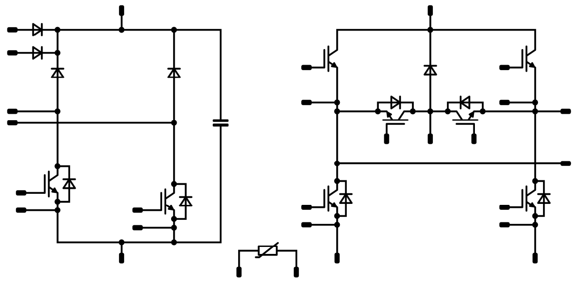
Press-fit pins



Target applications

- Power Supply
- UPS

Schematic



Types

- 10-FY07BVA050S5-LF44E18
- 10-PY07BVA050S5-LF44E18Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Low Buck / High Buck Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C			50	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	73	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Buck Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F			30	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 °C	50	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C			50	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	73	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Low Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F			30	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 °C	50	W
Maximum junction temperature	T_{jmax}			175	°C
High Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F			30	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 °C	50	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C			50	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	73	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Input Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	47	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	63	W
Maximum junction temperature	T_{jmax}			175	°C
ByPass Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	88	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms	T_j = 150 °C	600	A
Surge current capability	I^2t			1800	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	105	W
Maximum junction temperature	T_{jmax}			150	°C
Input Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F			10	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	33	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-55…+125	°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 s	6000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance		Solder pins / Press-fit pins		8,16 / 7,93	mm
Comparative Tracking Index	CTI			> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{r} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Low Buck / High Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,35 1,41 1,43	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		3100		pF
Reverse transfer capacitance	C_{res}							12		
Gate charge	Q_g		15	650	50	25		120		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,29		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	350	50	25 125 150		64 65 66		ns
Rise time	t_r					25 125 150		8 10 10		
Turn-off delay time	$t_{d(off)}$					25 125 150		81 95 99		
Fall time	t_f					25 125 150		12 20 23		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 2,2 µC Q_{rFWD} = 3,4 µC Q_{rFWD} = 3,9 µC				25 125 150		0,689 0,887 0,874		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,456 0,732 0,764		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Buck Diode										
Static										
Forward voltage	V_F				30	25 125 150		1,52 1,46 1,44	1,92	V
Reverse leakage current	I_R			650		25			1,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,92		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 6812 A/µs di/dt = 5829 A/µs di/dt = 5655 A/µs	±15	350	50	25 125 150		70 77 78		A
Reverse recovery time	t_{rr}					25 125 150		59 100 111		ns
Recovered charge	Q_r					25 125 150		2,25 3,43 3,88		µC
Reverse recovered energy	E_{rec}					25 125 150		0,608 0,922 1,04		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		5343 4706 4865		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{r} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Value Min	Value Typ	Value Max	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,35 1,41 1,43	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_{g}							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	25		25		3100		pF
Reverse transfer capacitance	C_{res}							12		
Gate charge	Q_{g}		15	650	50	25		120		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,29		K/W
Dynamic (T21-D12)										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	350	50	25 125 150		65 65 66		ns
Rise time	t_{r}					25 125 150		11 12 11		
Turn-off delay time	$t_{d(off)}$					25 125 150		80 96 101		
Fall time	t_{f}					25 125 150		11 20 24		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,5 µC Q_{rFWD} = 2,5 µC Q_{rFWD} = 2,9 µC				25 125 150		0,429 0,578 0,650		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,450 0,714 0,787		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Low Boost Diode										
Static										
Forward voltage	V_F				30	25 125 150		1,52 1,46 1,44	1,92	V
Reverse leakage current	I_R			650		25			1,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,92		K/W
Dynamic (T21-D12)										
Peak recovery current	I_{RRM}	di/dt = 5070 A/µs di/dt = 3762 A/µs di/dt = 3712 A/µs	±15	350	50	25 125 150		48 57 60		A
Reverse recovery time	t_{rr}					25 125 150		63 102 113		ns
Recovered charge	Q_r					25 125 150		1,47 2,52 2,87		µC
Reverse recovered energy	E_{rec}					25 125 150		0,423 0,686 0,779		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2718 739 888		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,35 1,41 1,43	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	25		25		3100		pF
Reverse transfer capacitance	C_{res}							12		
Gate charge	Q_g		15	650	50	25		120		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,29		K/W
Dynamic (T21-D20)										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	350	50	25 125 150		61 66 66		ns
Rise time	t_r					25 125 150		9 11 11		
Turn-off delay time	$t_{d(off)}$					25 125 150		79 96 100		
Fall time	t_f					25 125 150		9 19 23		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,4 µC Q_{rFWD} = 2,5 µC Q_{rFWD} = 2,9 µC				25 125 150		0,493 0,568 0,556		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,362 0,688 0,784		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
High Boost Diode										
Static										
Forward voltage	V_F				30	25 125 150		1,52 1,46 1,44	1,92	V
Reverse leakage current	I_R			650		25			1,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,92		K/W
Dynamic (T21-D20)										
Peak recovery current	I_{RRM}					25 125 150		52 59 63		A
Reverse recovery time	t_{rr}					25 125 150		60 105 115		ns
Recovered charge	Q_r	di/dt = 4573 A/µs di/dt = 4041 A/µs di/dt = 4075 A/µs	±15	350	50	25 125 150		1,444 2,475 2,932		µC
Reverse recovered energy	E_{rec}					25 125 150		0,362 0,682 0,811		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3629 771 814		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{r} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Input Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,35 1,41 1,43	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		3100		pF
Reverse transfer capacitance	C_{res}	f = 1 Mhz	0	25		25		12		pF
Gate charge	Q_g		15	650	50	25		120		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,29		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	0 / 15	400	50	25 125 150		26 25 25		ns
Rise time	t_r	R_{gon} = 8 Ω R_{goff} = 8 Ω	0 / 15	400	50	25 125 150		9 10 11		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	0 / 15	400	50	25 125 150		137 156 160		ns
Fall time	t_f	R_{gon} = 8 Ω R_{goff} = 8 Ω	0 / 15	400	50	25 125 150		12 17 21		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,6 µC Q_{rFWD} = 3,2 µC Q_{rFWD} = 3,6 µC	0 / 15	400	50	25 125 150		1,07 1,48 1,37		mWs
Turn-off energy (per pulse)	E_{off}		0 / 15	400	50	25 125 150		0,513 0,813 0,902		mWs

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Input Boost Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,50 1,44 1,42	1,92	V
Reverse leakage current	I_R			650		25			2,65	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,50		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 6127 A/µs di/dt = 5448 A/µs di/dt = 5124 A/µs	0 / 15	400	50	25 125 150		47 63 66		A
Reverse recovery time	t_{rr}					25 125 150		58 91 98		ns
Recovered charge	Q_r					25 125 150		1,61 3,20 3,61		µC
Reverse recovered energy	E_{rec}					25 125 150		0,424 0,884 0,993		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		564 642 635		A/µs
ByPass Diode										
Static										
Forward voltage	V_F				65	25 125 150		1,14 1,09 1,08		V
Reverse leakage current	I_R			1600		25			50	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,67		K/W

Characteristic Values

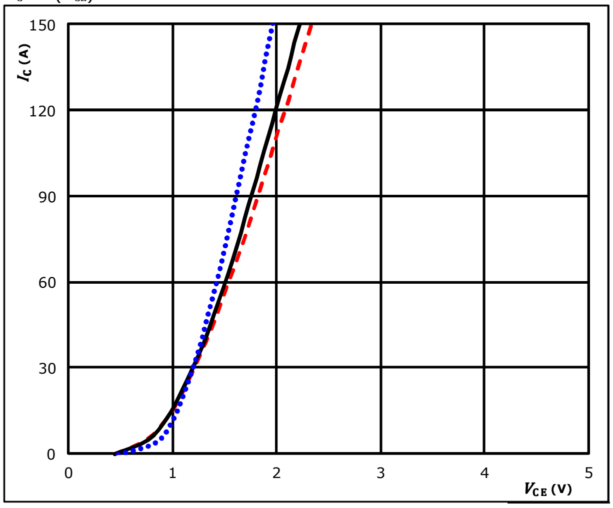
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Input Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				10	25 125		1,67 1,56	1,87	V
Reverse leakage current	I_R			650		25			0,14	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		K/W
Capacitor (DC)										
Capacitance	C							100		nF
Tolerance							-10		+10	%
Dissipation factor									2,5	%
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Low Buck / High Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

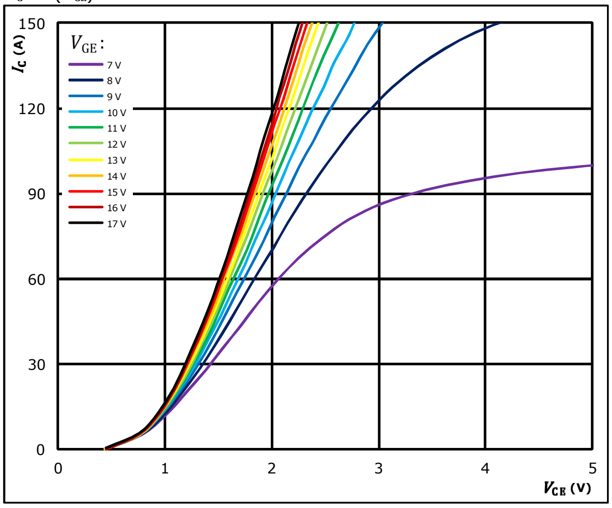


t_p =	250	µs	T_j:	25 °C
V_{GE} =	15	V		125 °C
				150 °C

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

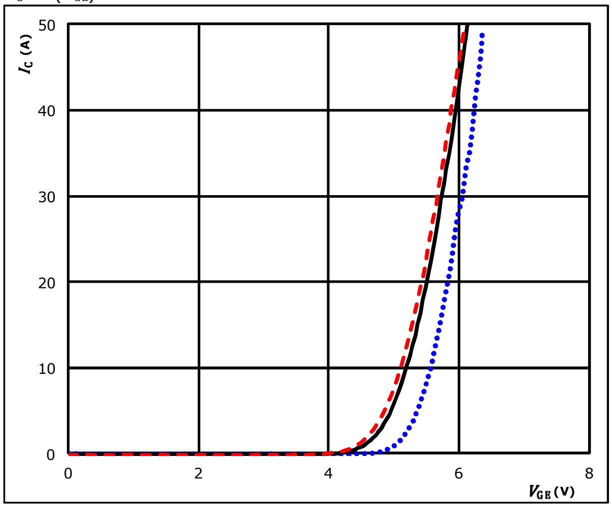


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

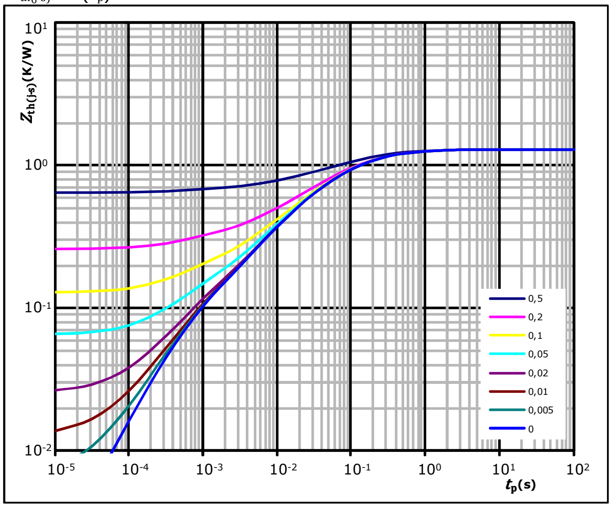


t_p =	100	µs	T_j:	25 °C
V_{CE} =	10	V		125 °C
				150 °C

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j\text{-}s)}$ = 1,29 K/W

IGBT thermal model values

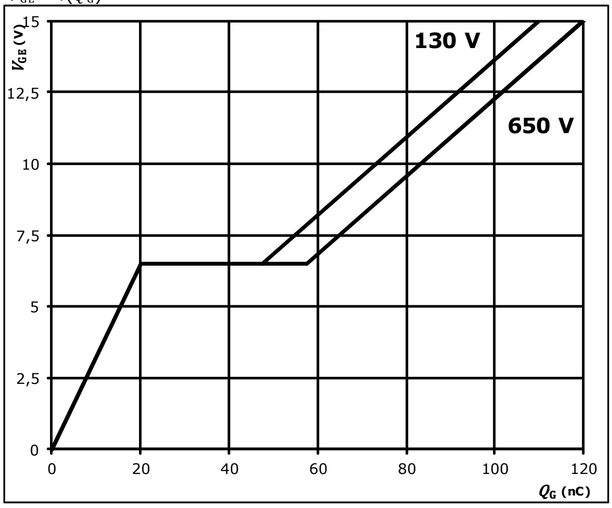
R (K/W)	τ (s)
2,09E-01	5,36E-01
6,00E-01	8,05E-02
3,10E-01	1,69E-02
1,08E-01	4,25E-03
6,63E-02	5,30E-04

Low Buck / High Buck Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

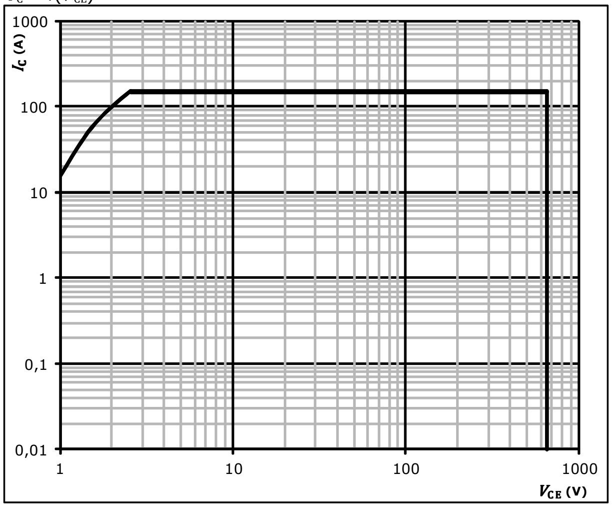


I_C = 50 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



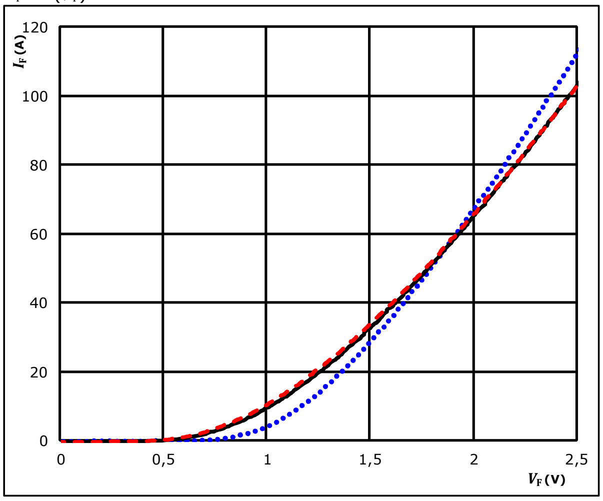
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



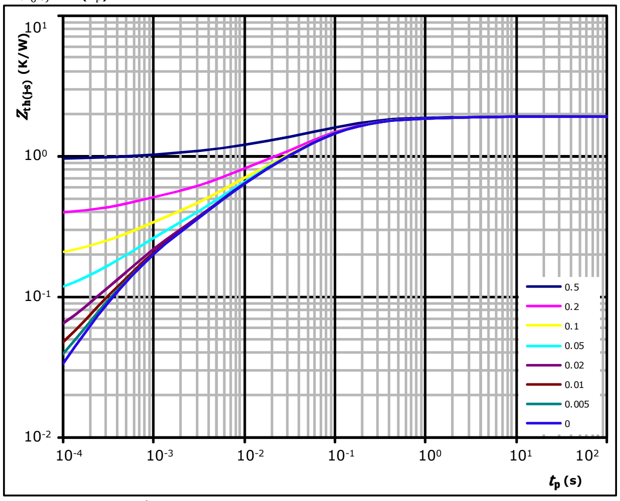
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,92 K/W

FWD thermal model values

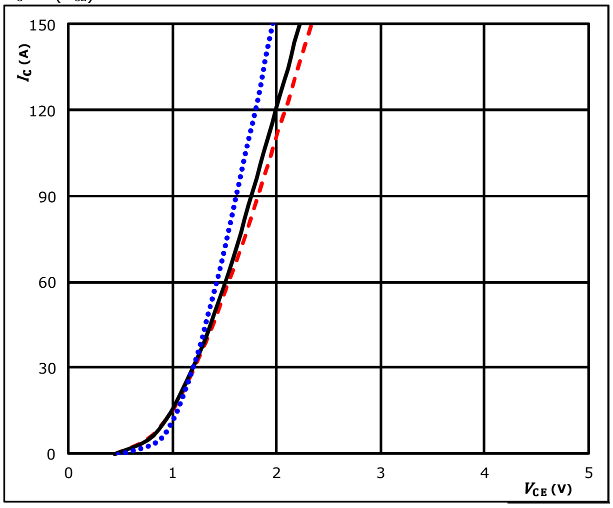
R (K/W)	τ (s)
9,41E-02	2,25E+00
3,44E-01	2,12E-01
8,56E-01	5,84E-02
3,61E-01	9,83E-03
1,37E-01	2,89E-03
1,27E-01	4,79E-04

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

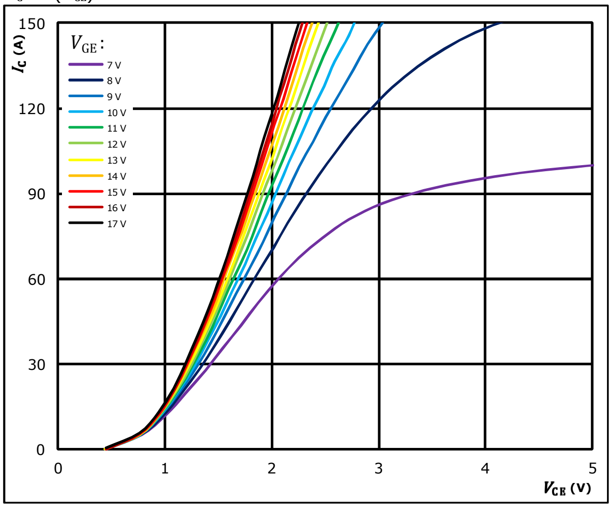


t_p =	250	µs		25 °C	···········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

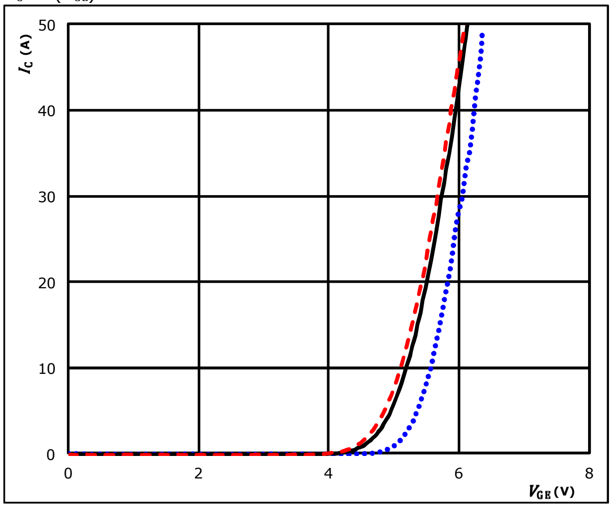


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

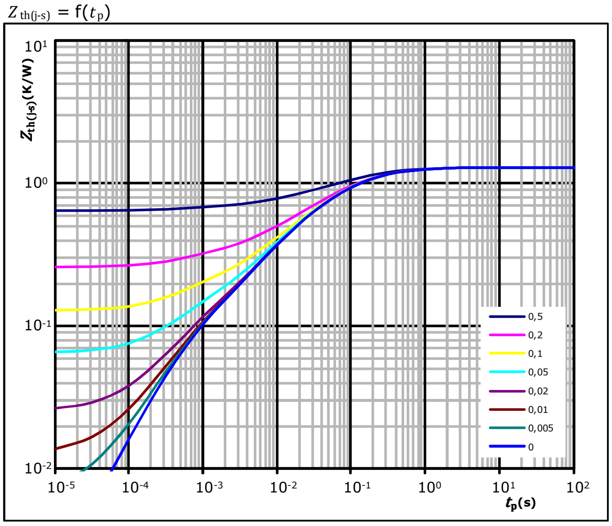


t_p =	100	µs		25 °C	···········
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 1,29 K/W

IGBT thermal model values

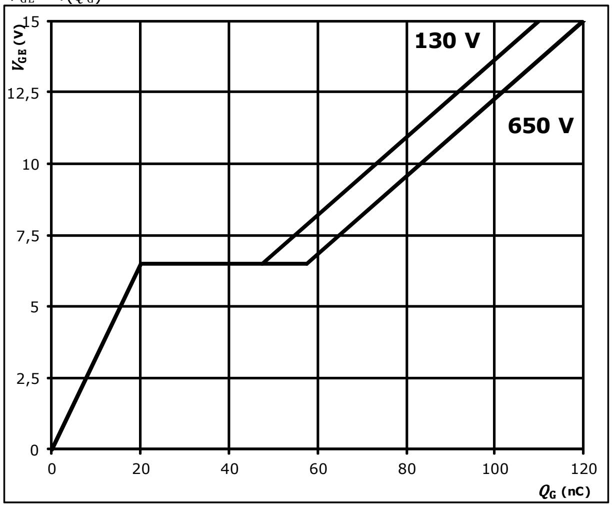
R (K/W)	τ (s)
2,09E-01	5,36E-01
6,00E-01	8,05E-02
3,10E-01	1,69E-02
1,08E-01	4,25E-03
6,63E-02	5,30E-04

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

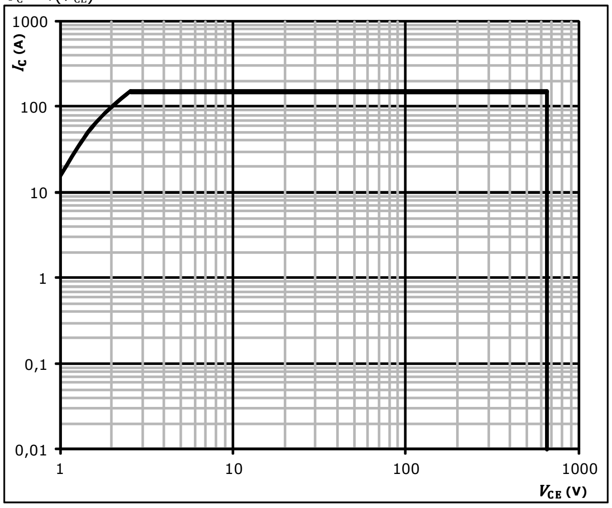


$I_C =$ 50 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



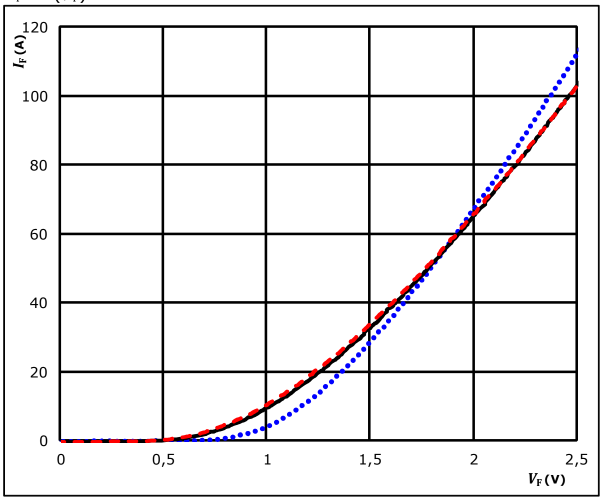
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Low / High Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



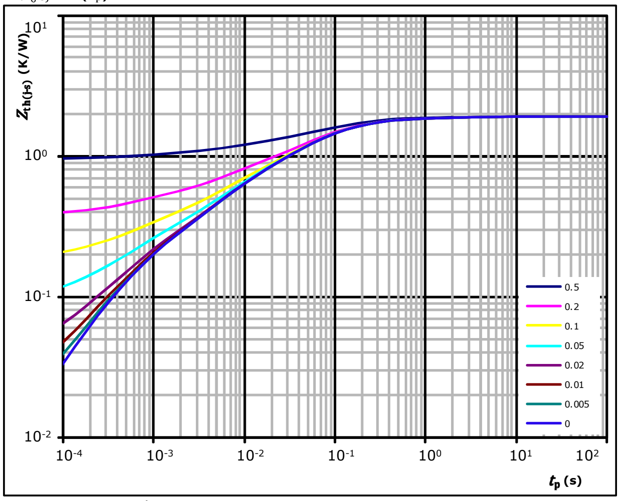
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,92 K/W

FWD thermal model values

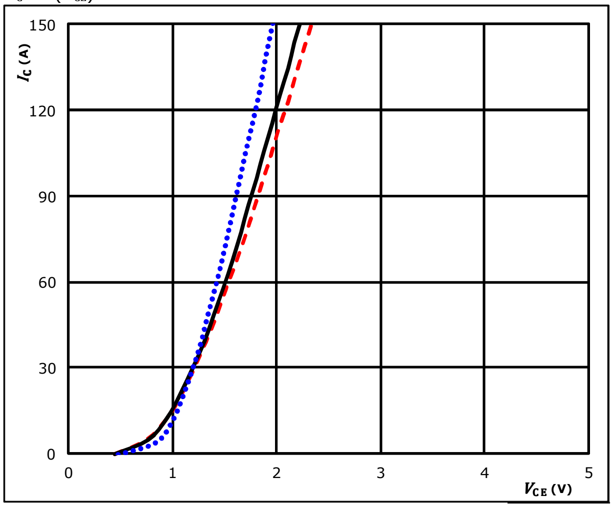
R (K/W)	τ (s)
9,41E-02	2,25E+00
3,44E-01	2,12E-01
8,56E-01	5,84E-02
3,61E-01	9,83E-03
1,37E-01	2,89E-03
1,27E-01	4,79E-04

Input Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

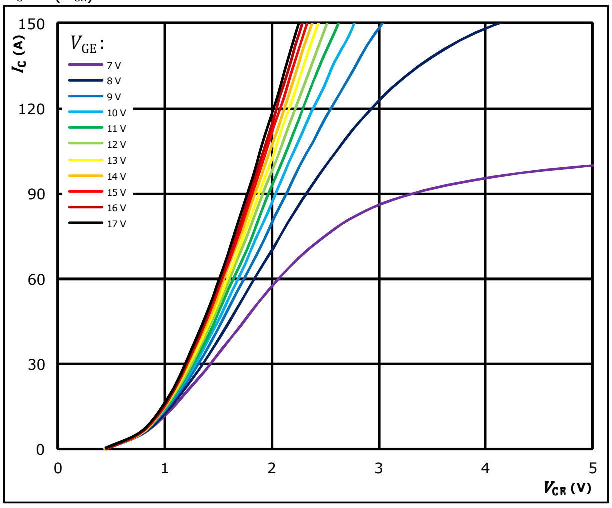


t_p =	250	µs		25 °C	···········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

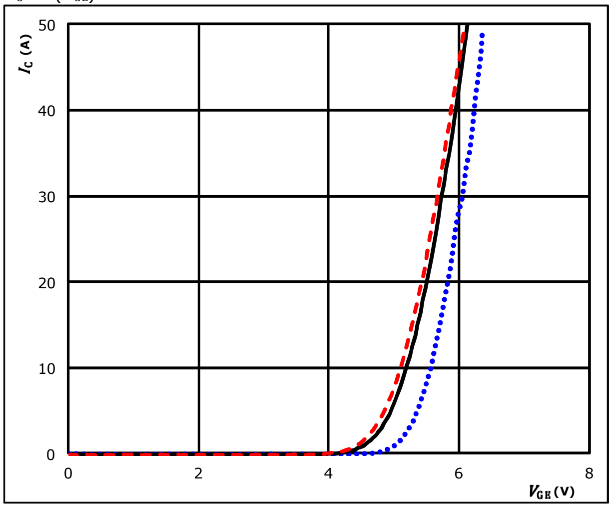


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

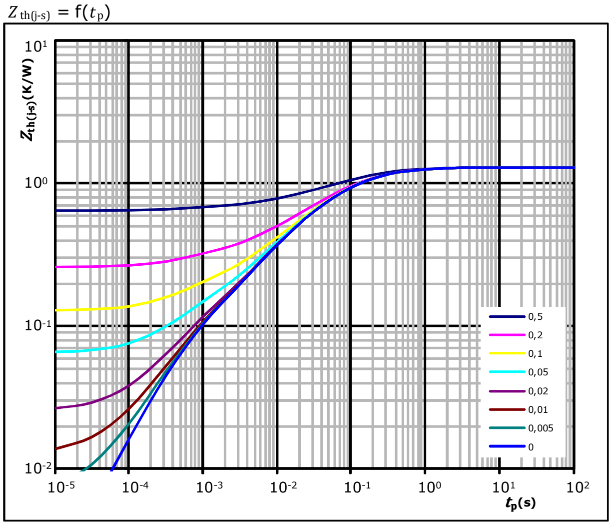


t_p =	100	µs		25 °C	···········
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,29 K/W

IGBT thermal model values

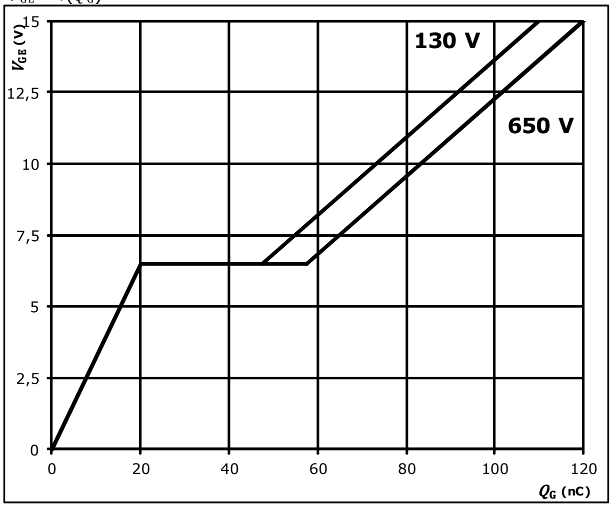
R (K/W)	τ (s)
2,09E-01	5,36E-01
6,00E-01	8,05E-02
3,10E-01	1,69E-02
1,08E-01	4,25E-03
6,63E-02	5,30E-04

Input Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

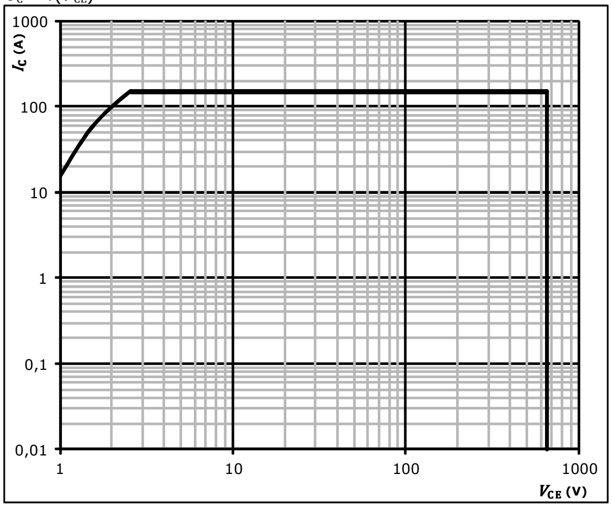


I_C = 50 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



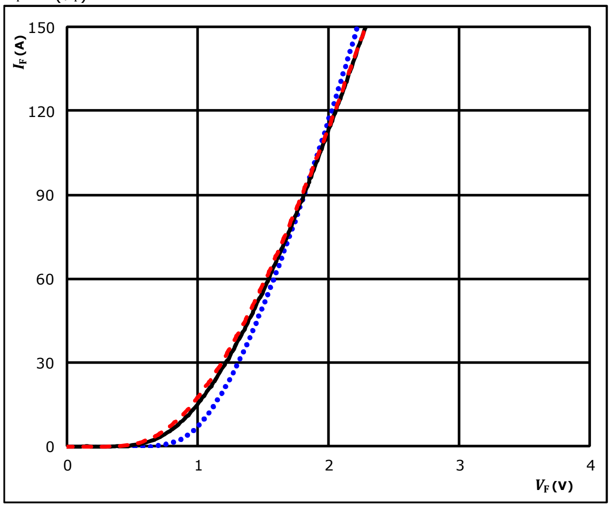
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Input Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



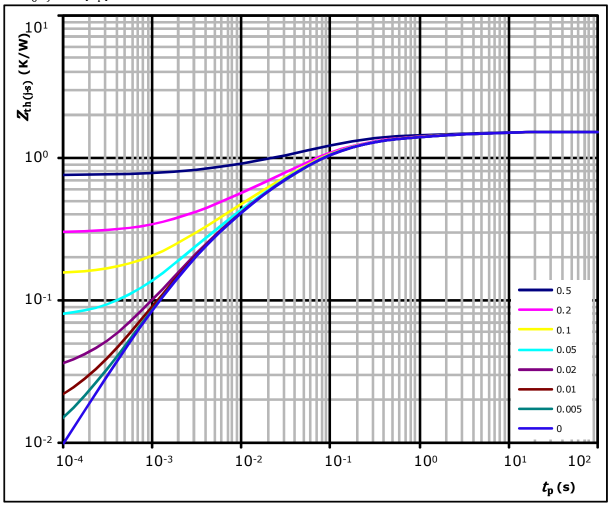
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,50 K/W

FWD thermal model values

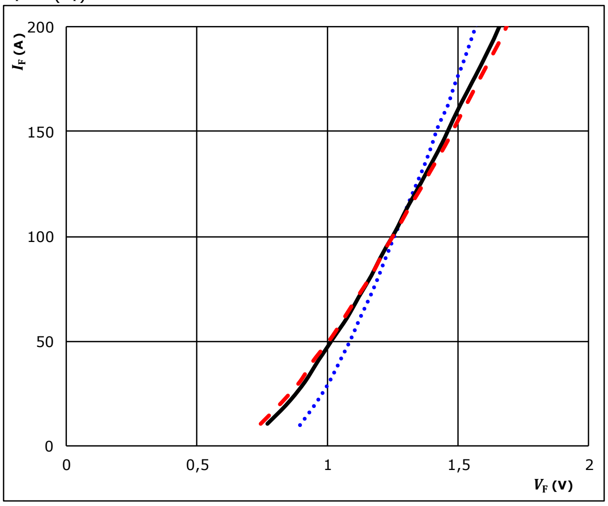
R (K/W)	τ (s)
1,03E-01	4,73E+00
2,05E-01	5,53E-01
6,39E-01	8,31E-02
3,39E-01	2,02E-02
1,71E-01	4,42E-03
4,45E-02	1,30E-03

ByPass Diode Characteristics

figure 1. **Bypass diode**

Typical forward characteristics

$I_F = f(V_F)$



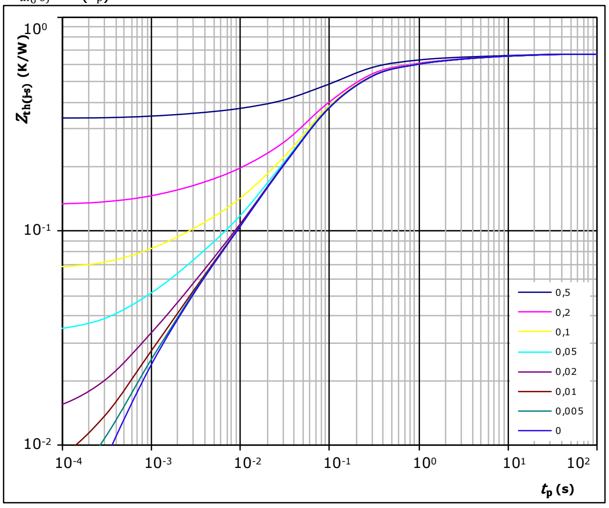
t_p = 250 µs

T_j: 25 °C / 125 °C / 150 °C

figure 2. **Bypass diode**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,67 K/W

Diode thermal model values

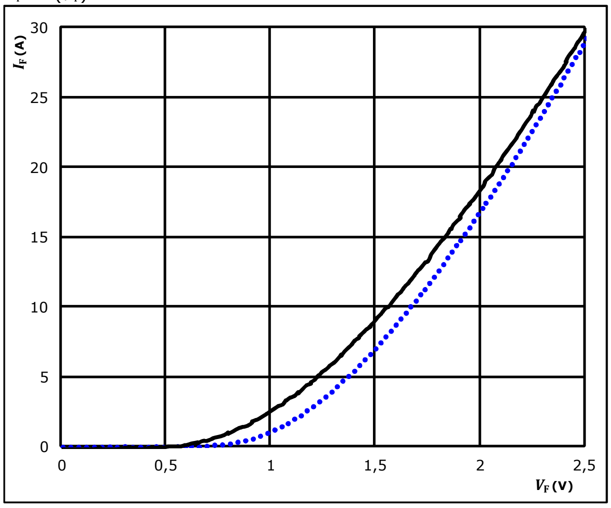
R (K/W)	τ (s)
4,15E-02	9,04E+00
7,27E-02	1,12E+00
1,99E-01	1,91E-01
2,89E-01	6,88E-02
4,54E-02	7,76E-03
2,21E-02	1,16E-03

Input Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



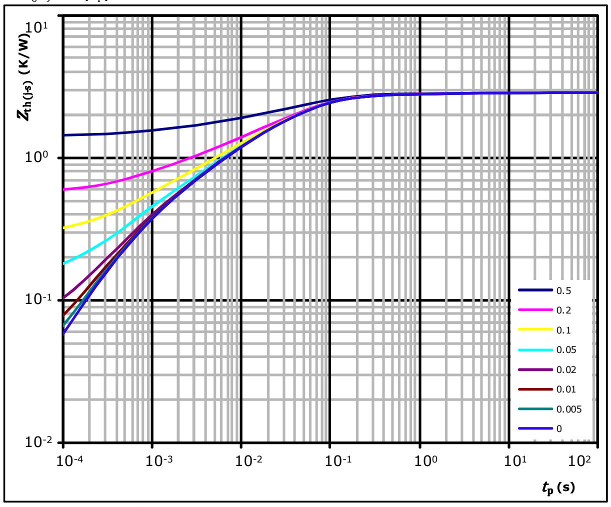
t_p = 250 μs

T_j: 25 °C (dotted); 125 °C (solid)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} =$ 2,87 K/W

FWD thermal model values

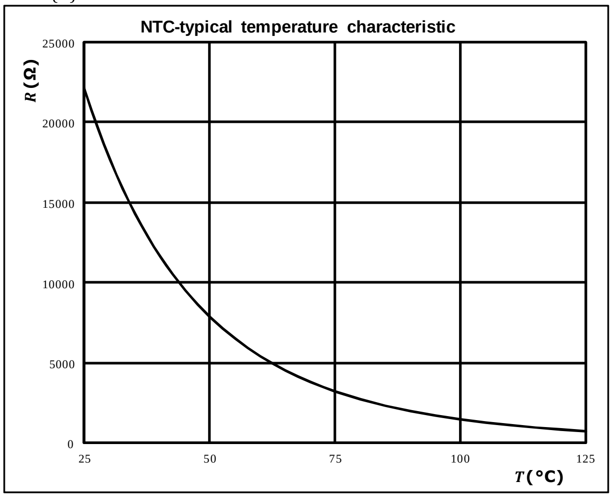
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

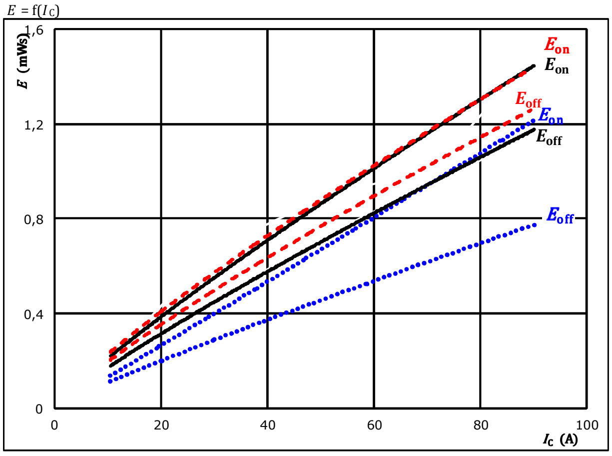


Low Buck / High Buck Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



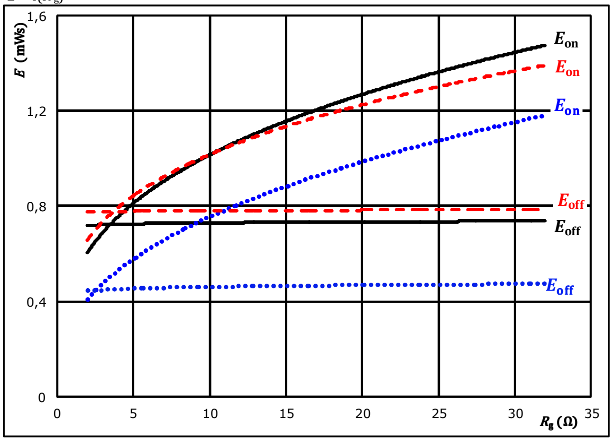
With an inductive load at

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

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



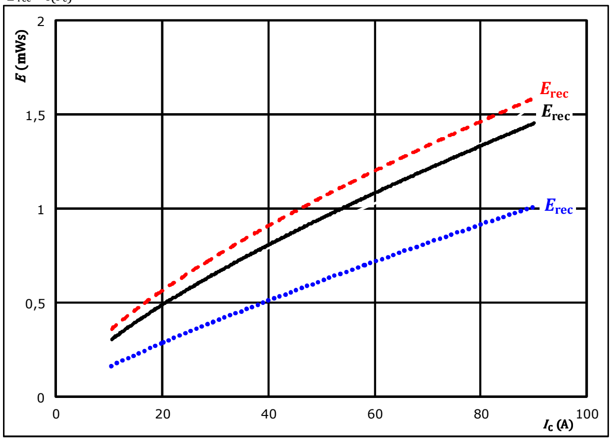
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		150 °C

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



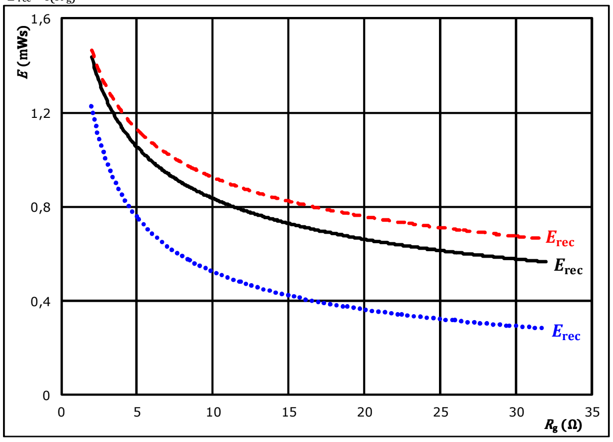
With an inductive load at

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

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

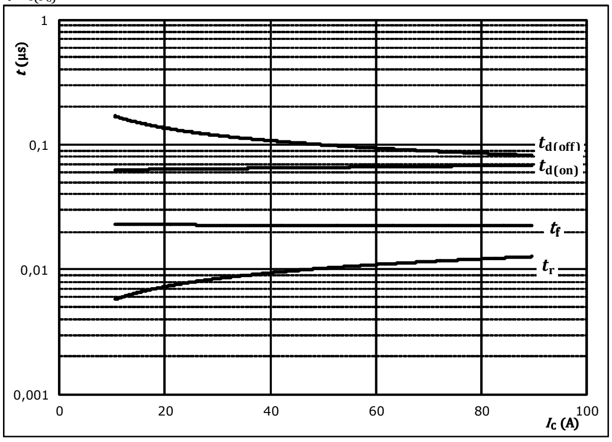
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		150 °C

Low Buck / High Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



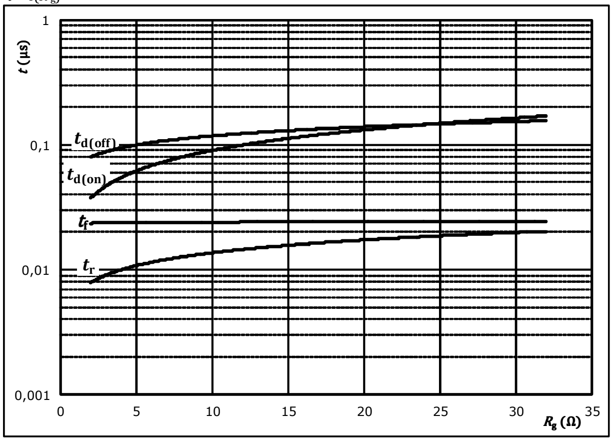
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



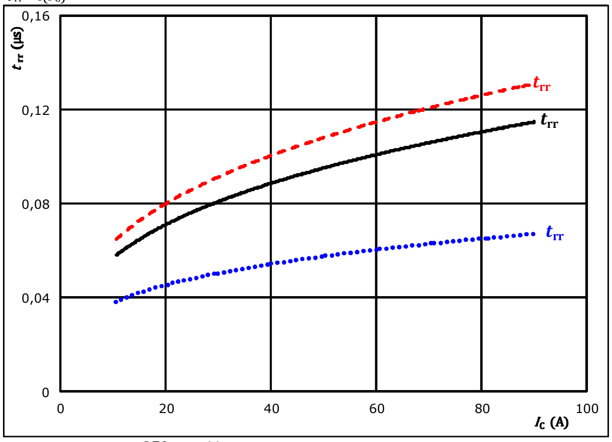
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

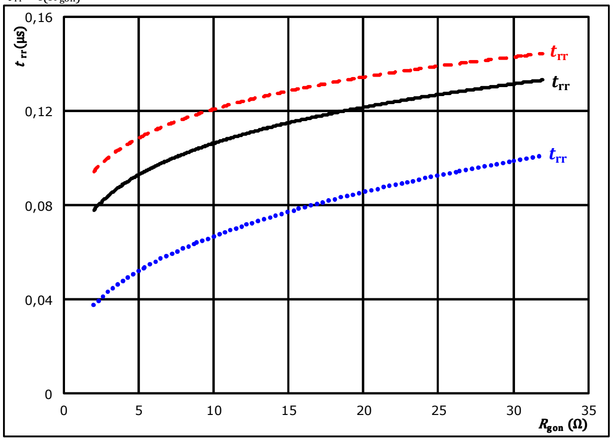


At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 8. **FWD**

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

$t_{rr} = f(R_{gon})$



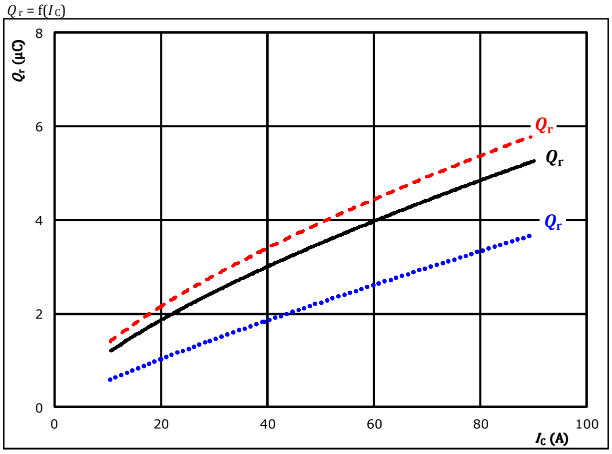
At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
I_C =	50	A		150 °C	dashed

Low Buck / High Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

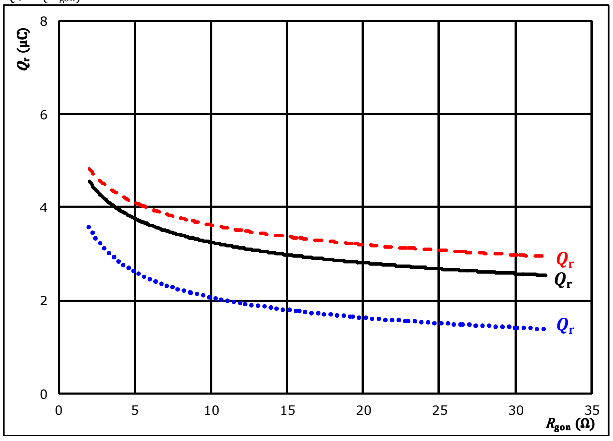


At						
	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	8	Ω		150 °C	– – –

figure 10. FWD

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

$Q_r = f(R_{gon})$

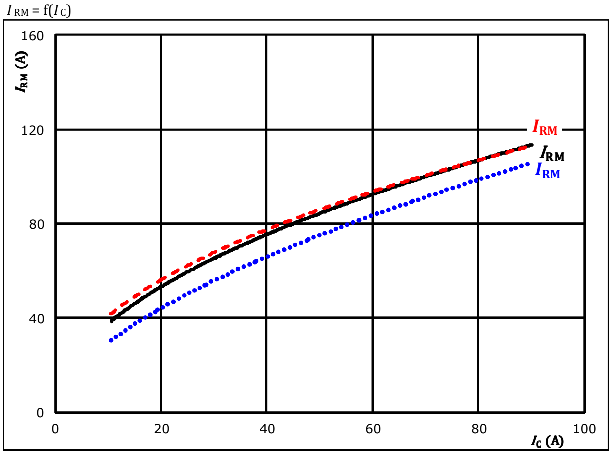


At						
	V_{CE}=	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	50	A		150 °C	– – –

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

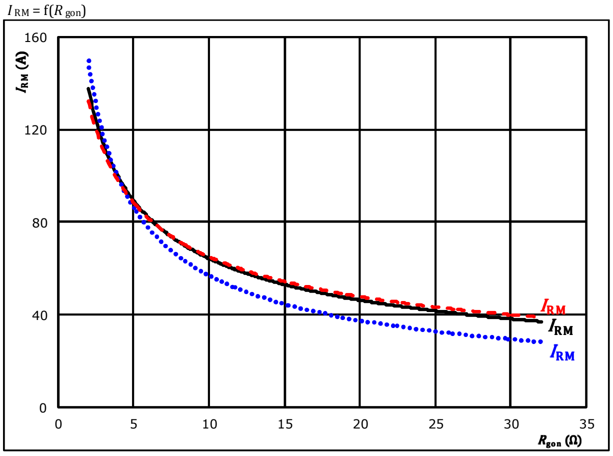


At						
	V_{CE}:	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	8	Ω		150 °C	– – –

figure 12. FWD

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

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



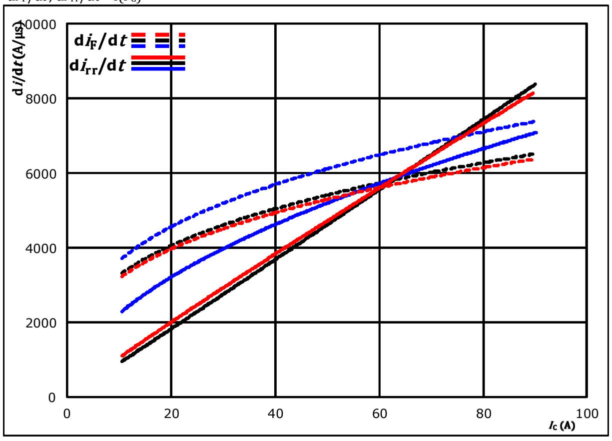
At						
	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C =	50	A		150 °C	– – –

Low Buck / High Buck Switching Characteristics

figure 13. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

$di_F/dt, di_{rr}/dt = f(I_C)$

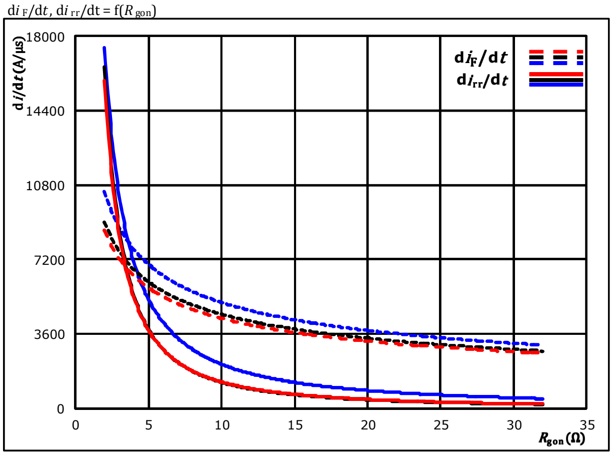


At V_{CE} = 350 V, V_{GE} = ±15 V, R_{gon} = 8 Ω, T_j: 25 °C, 125 °C, 150 °C

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

$di_F/dt, di_{rr}/dt = f(R_{gon})$

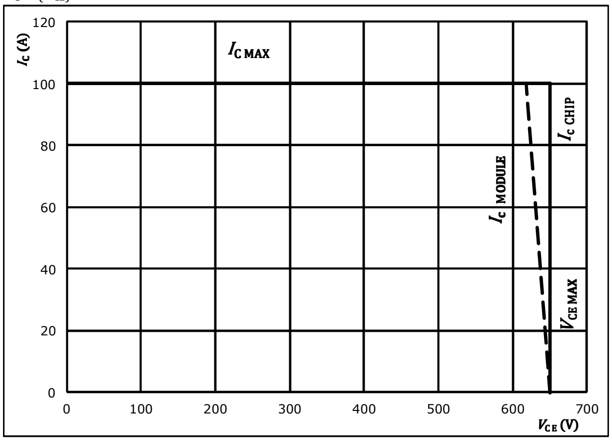


At V_{CE} = 350 V, V_{GE} = ±15 V, I_C = 50 A, T_j: 25 °C, 125 °C, 150 °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



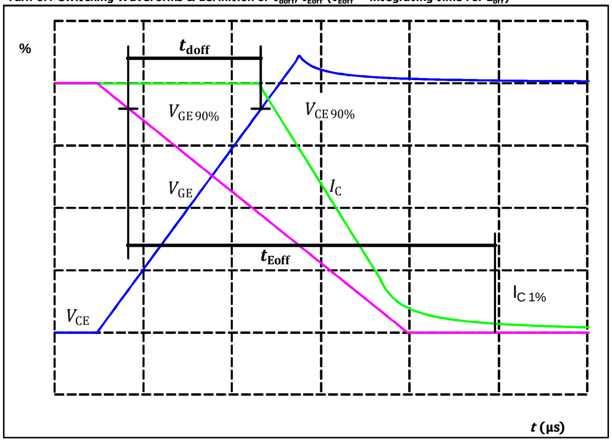
At T_j = 175 °C, R_{gon} = 8 Ω, R_{goff} = 8 Ω

Low Buck / High Buck Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

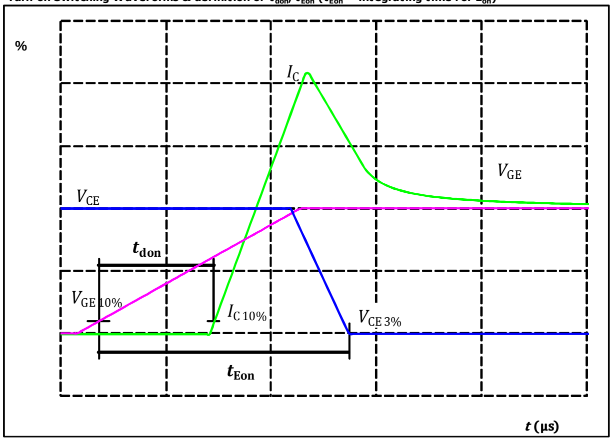
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{doff} =	95	ns

figure 2. IGBT

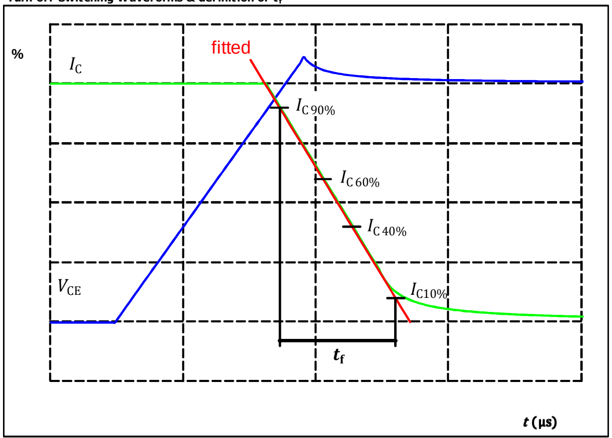
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{don} =	65	ns

figure 3. IGBT

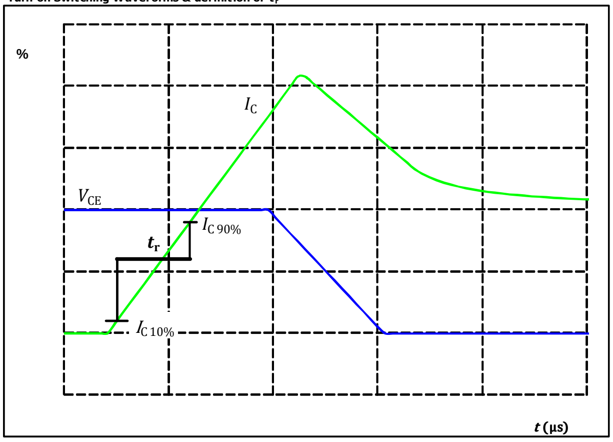
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_f =	20	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

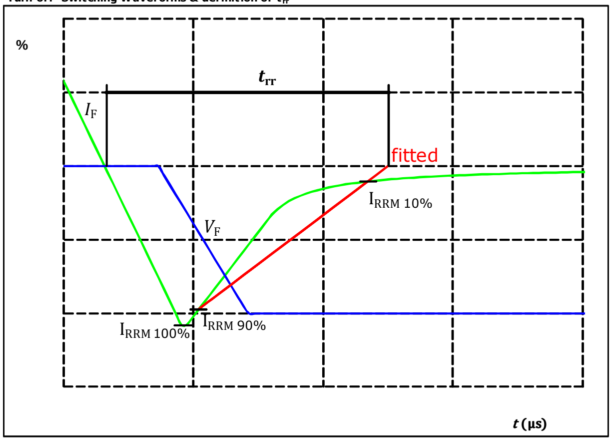


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_r =	10	ns

Low Buck / High Buck Switching Characteristics

figure 5. FWD

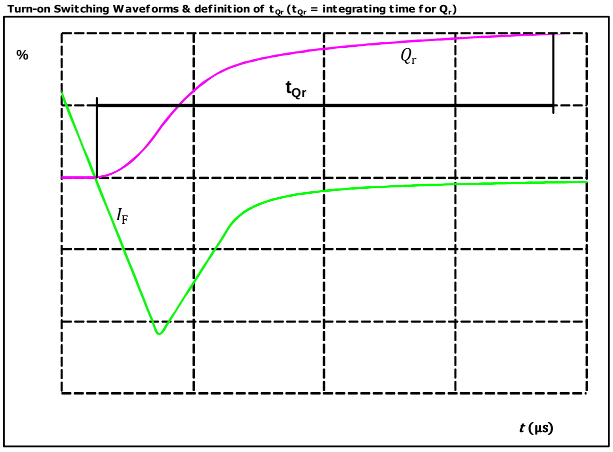
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	50	A
I_{RRM} (100%) =	77	A
t_{rr} =	100	ns

figure 6. FWD

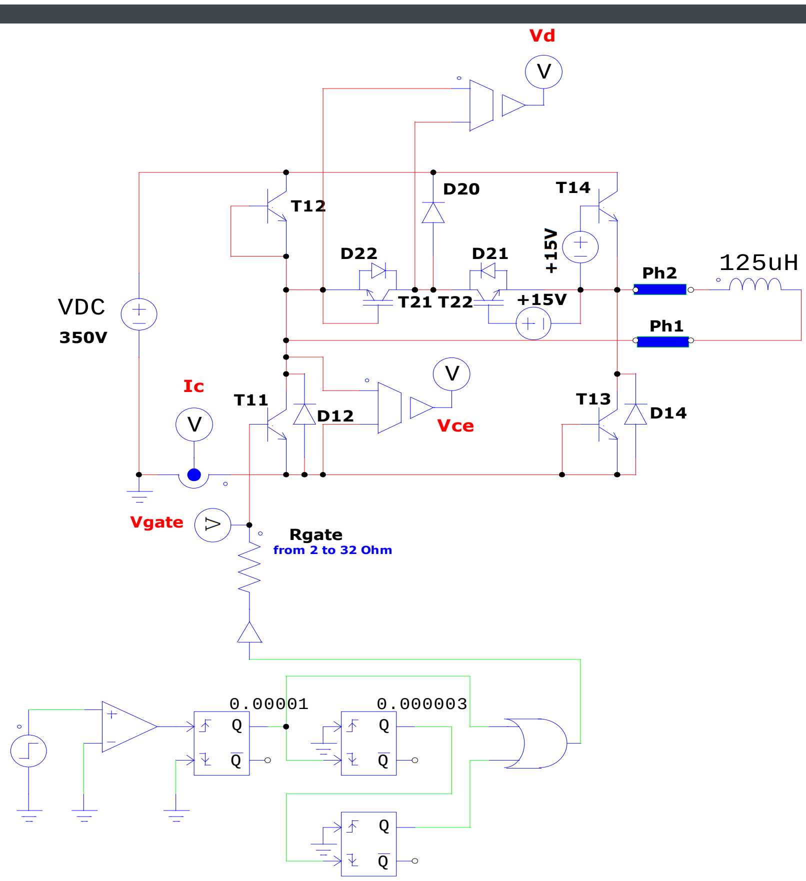
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	3,43	µC

Low Buck / High Buck Measurement circuits

figure 1.

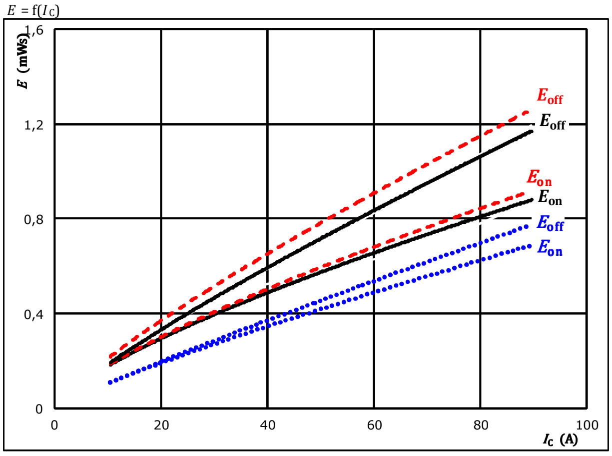


Low Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



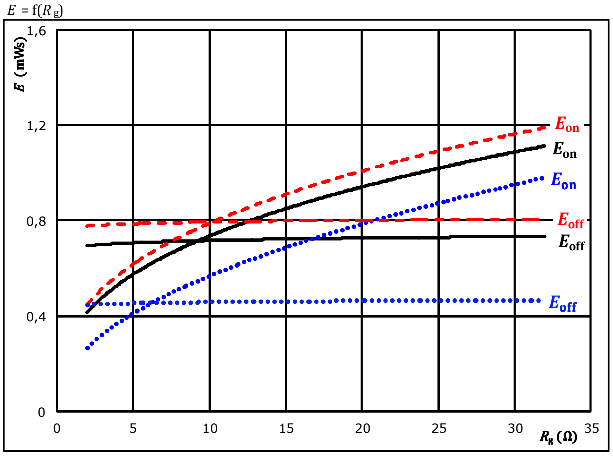
With an inductive load at

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

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



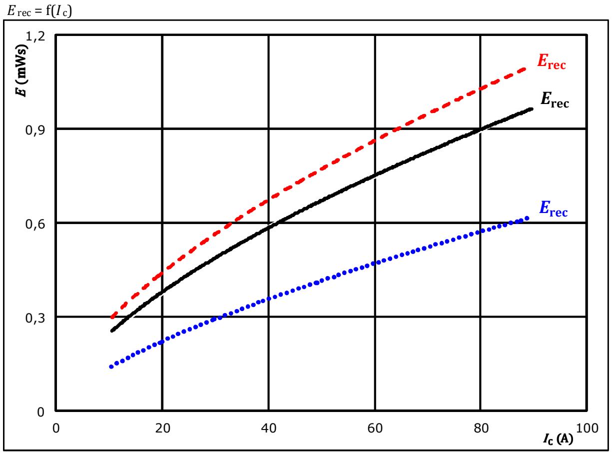
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		150 °C

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



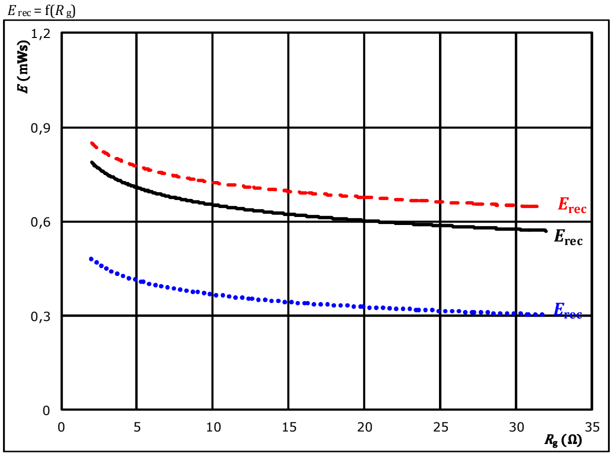
With an inductive load at

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

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

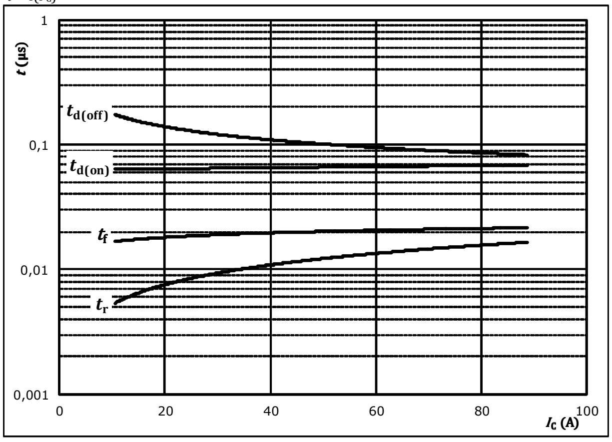
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		150 °C

Low Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



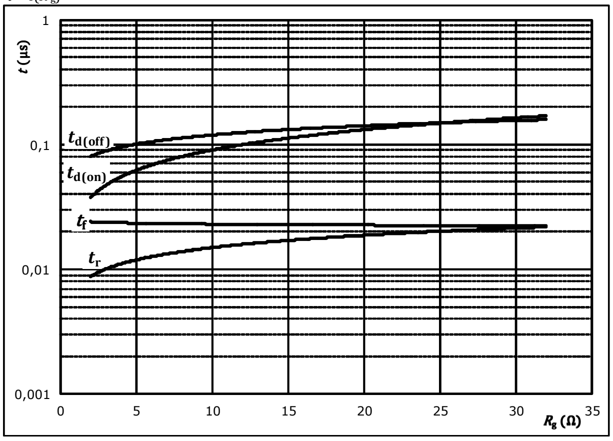
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



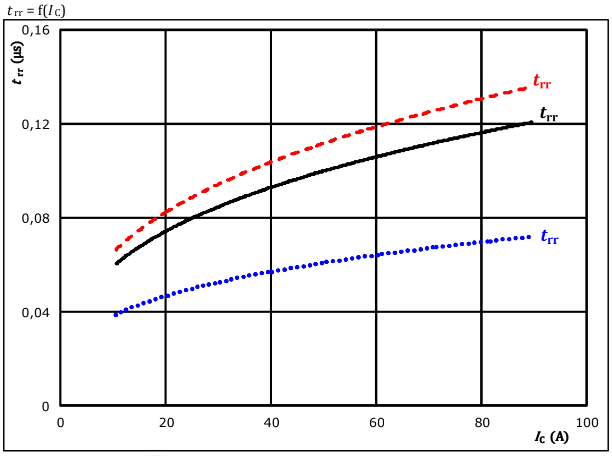
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

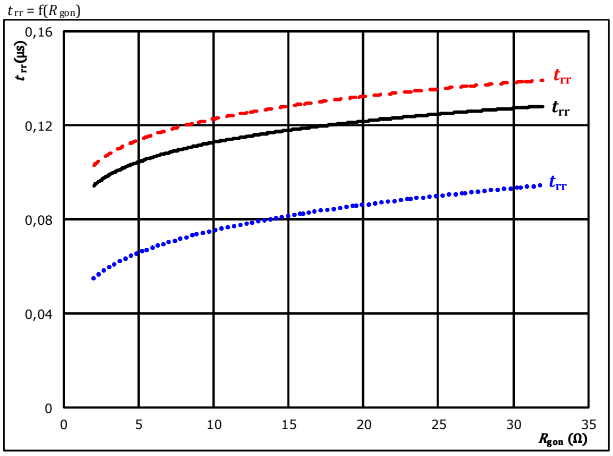


At				
V_{CE} =	350	V		25 °C (dotted)
V_{GE} =	±15	V	T_j:	125 °C (solid)
R_{gon} =	8	Ω		150 °C (dashed)

figure 8. FWD

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

$t_{rr} = f(R_{gon})$



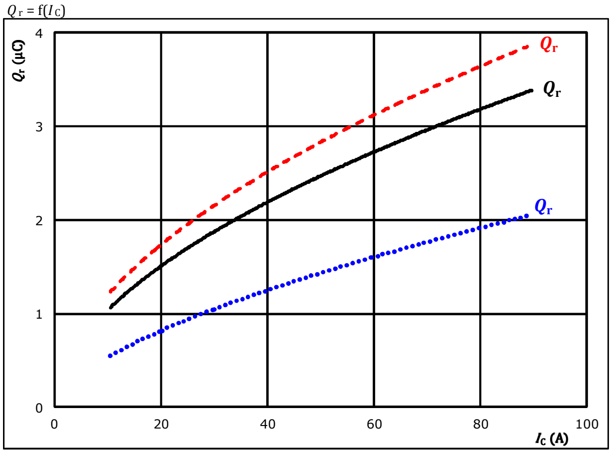
At				
V_{CE} =	350	V		25 °C (dotted)
V_{GE} =	±15	V	T_j:	125 °C (solid)
I_C =	50	A		150 °C (dashed)

Low Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

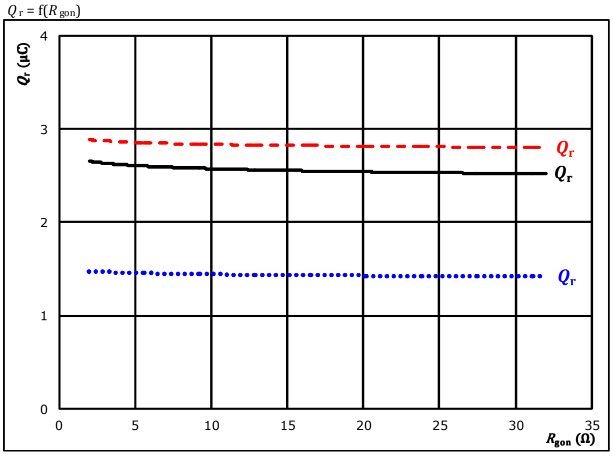


At	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	8	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

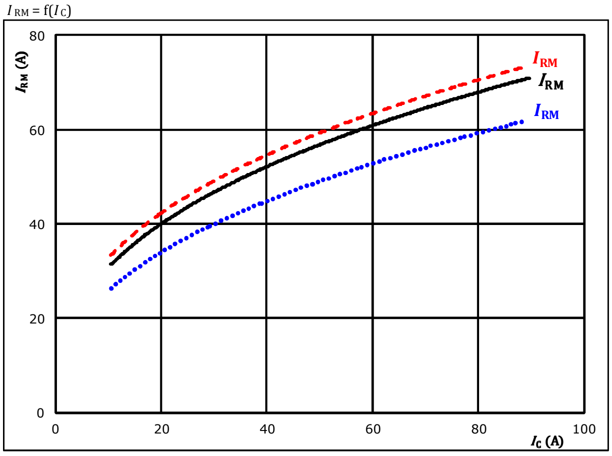


At	V_{CE}=	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	50	A		150 °C	– – –

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

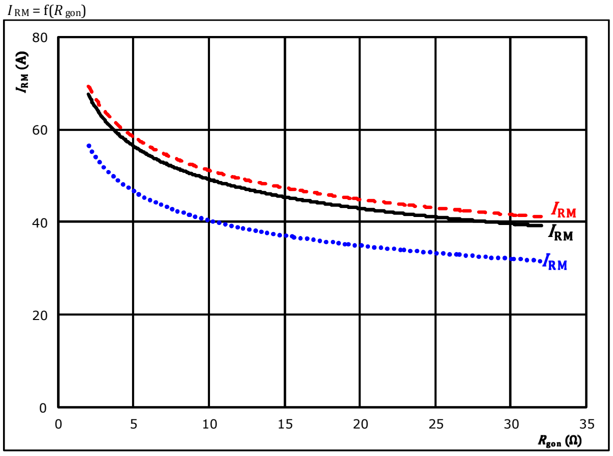


At	V_{CE}:	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	8	Ω		150 °C	– – –

figure 12. **FWD**

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

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



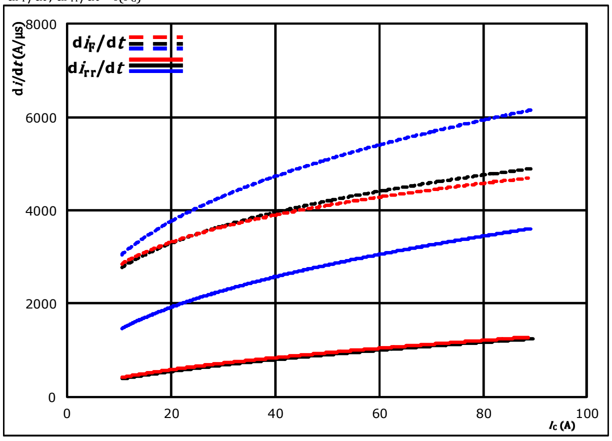
At	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C =	50	A		150 °C	– – –

Low Boost Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

di_F/dt, $di_{rr}/dt = f(I_C)$

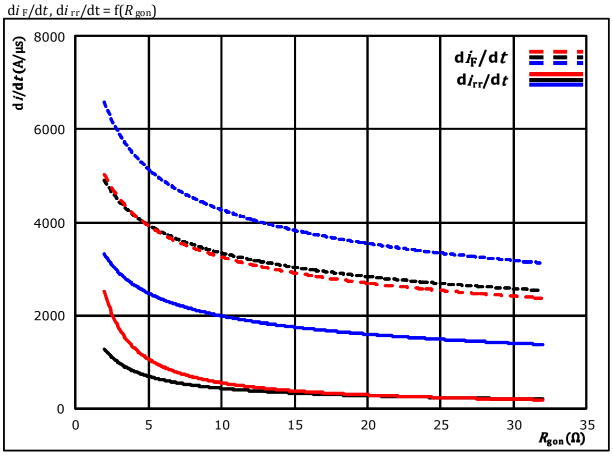


At				
V_{CE} =	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
R_{gon} =	8	Ω		150 °C

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

di_F/dt, $di_{rr}/dt = f(R_{gon})$

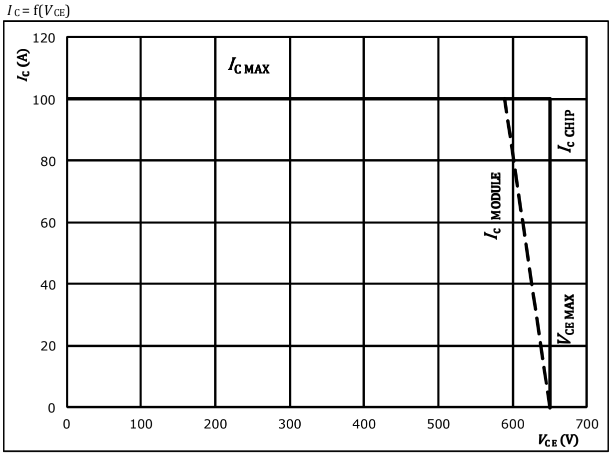


At				
V_{CE} =	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
I_C =	50	A		150 °C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

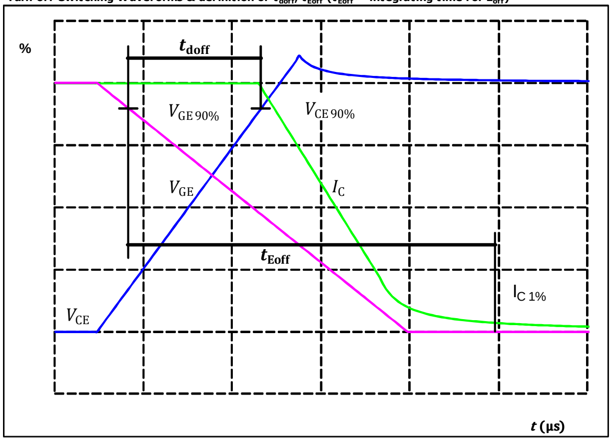
Low Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

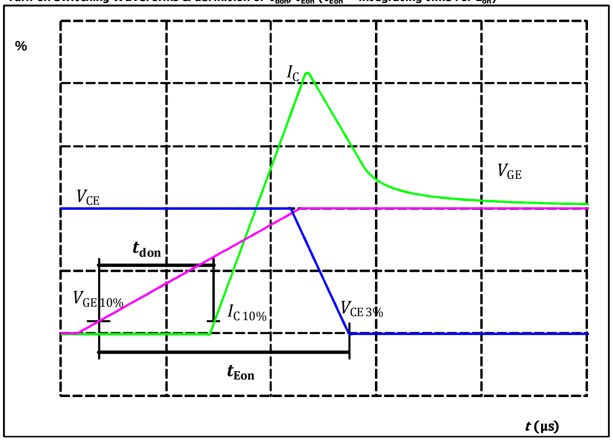
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{doff} =	96	ns

figure 2. IGBT

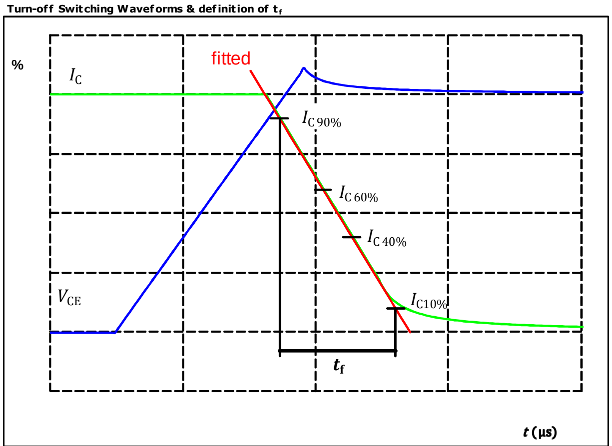
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{don} =	65	ns

figure 3. IGBT

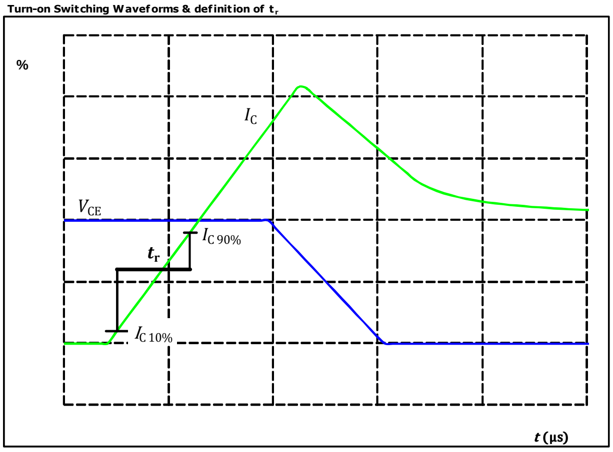
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_f =	20	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

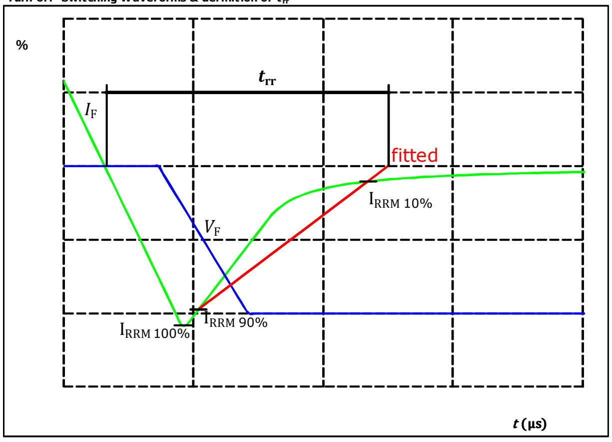


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_r =	12	ns

Low Boost Switching Characteristics

figure 5. FWD

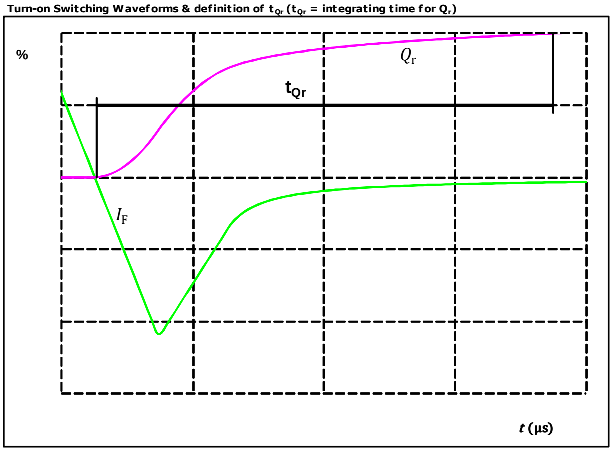
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	50	A
I_{RRM} (100%) =	57	A
t_{rr} =	102	ns

figure 6. FWD

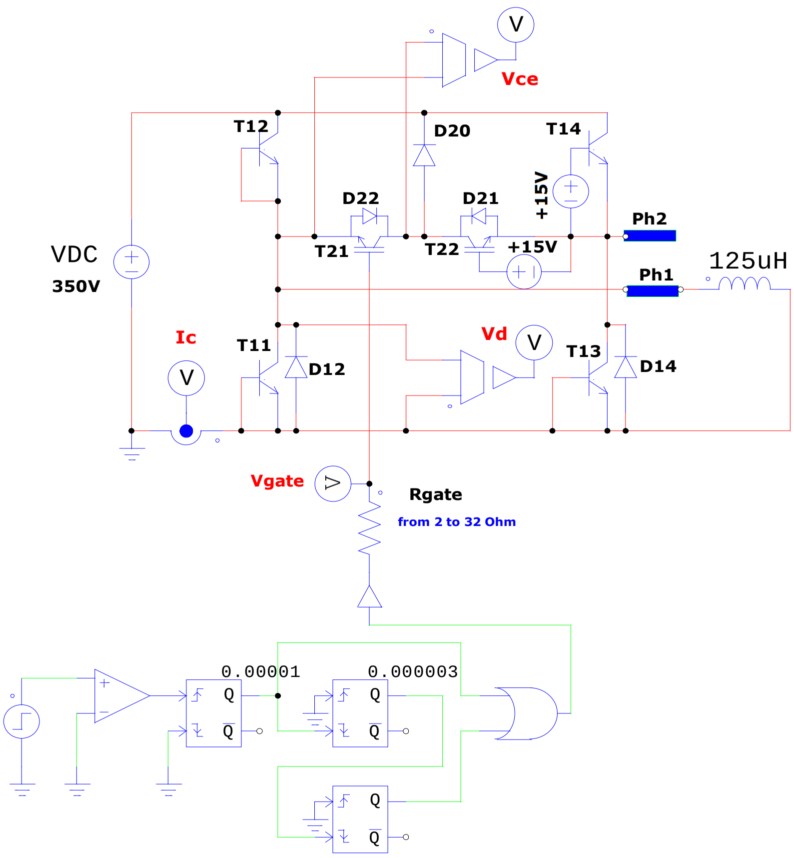
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	2,52	µC

Low Boost Measurement circuits

figure 1.

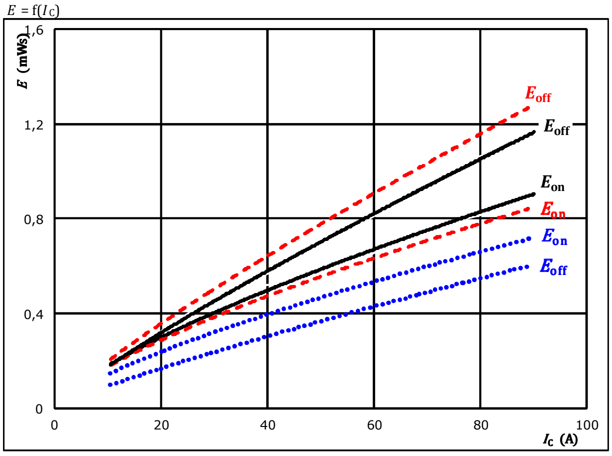


High Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



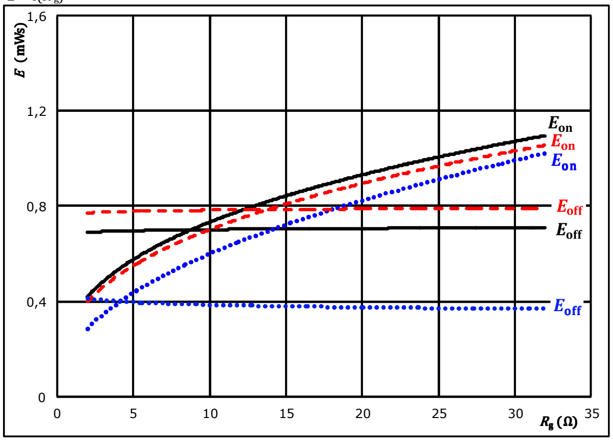
With an inductive load at

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

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



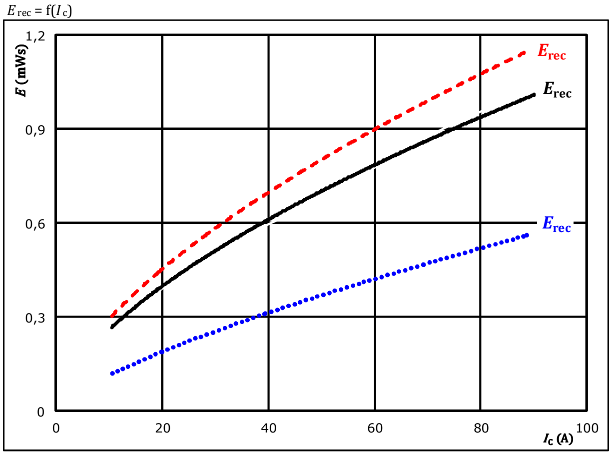
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	———
I_C =	50	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



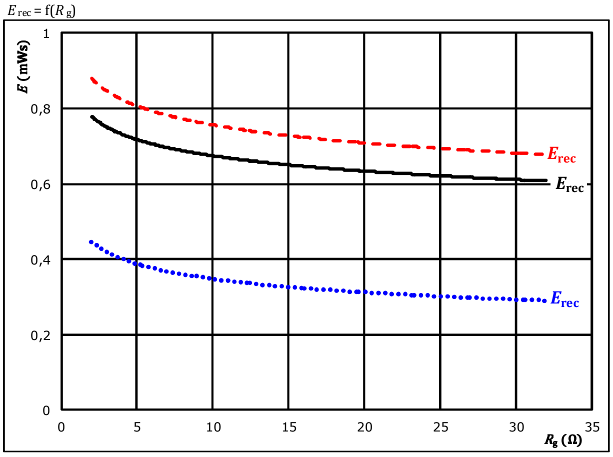
With an inductive load at

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

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

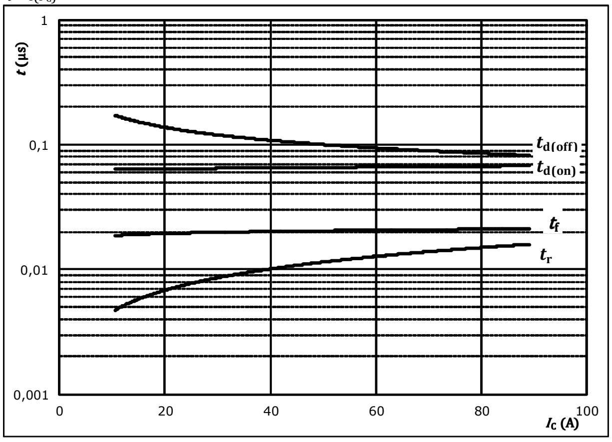
V_{CE} =	350	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	———
I_C =	50	A		150 °C	– – –

High Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



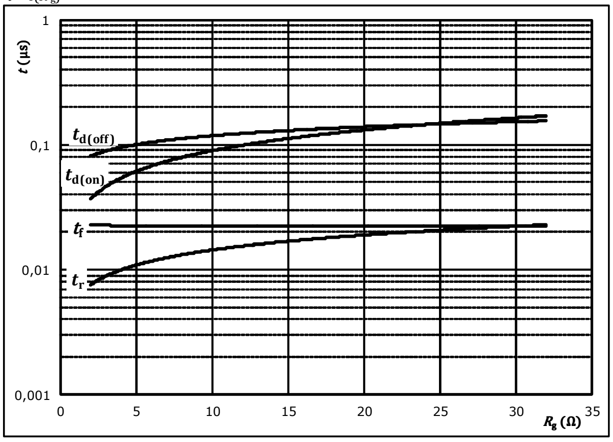
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



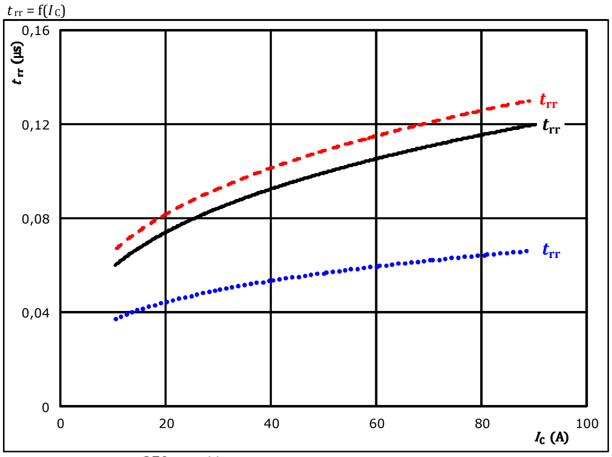
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

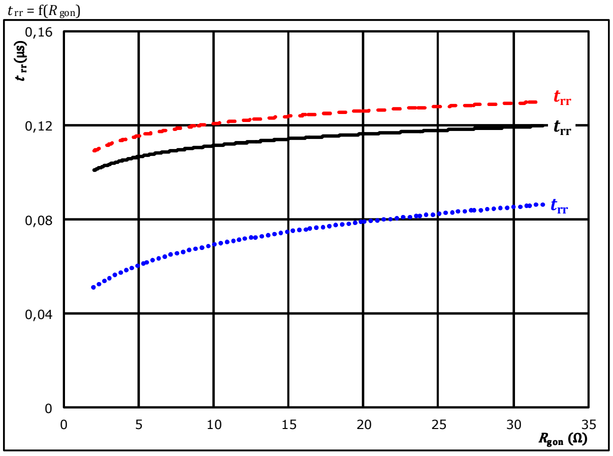


At	V_{CE}=	350	V	T_j:	25 °C	···········
	V_{GE} =	±15	V		125 °C	———
	R_{gon} =	8	Ω		150 °C	– – –

figure 8. **FWD**

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

$t_{rr} = f(R_{gon})$



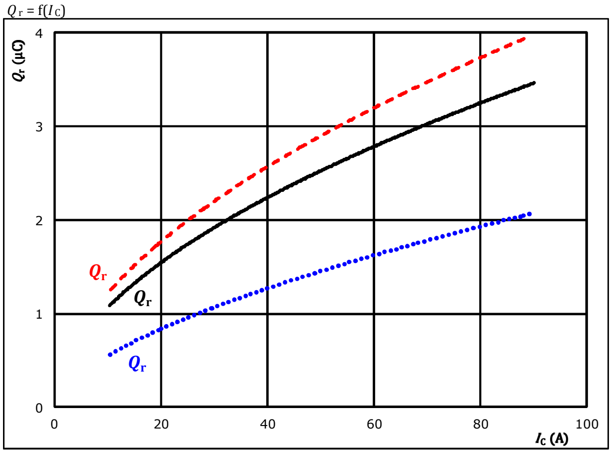
At	V_{CE} =	350	V	T_j:	25 °C	···········
	V_{GE} =	±15	V		125 °C	———
	I_C =	50	A		150 °C	– – –

High Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

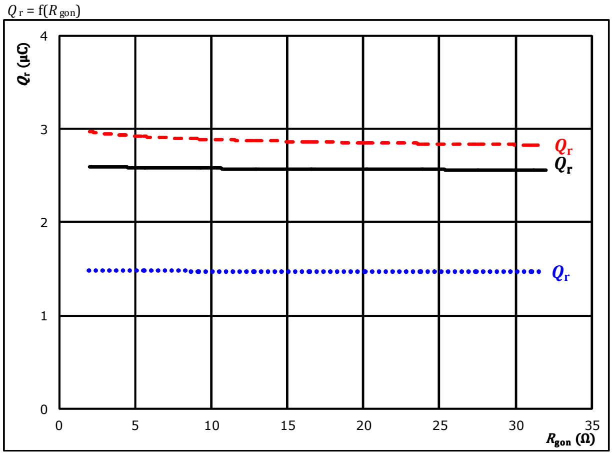


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

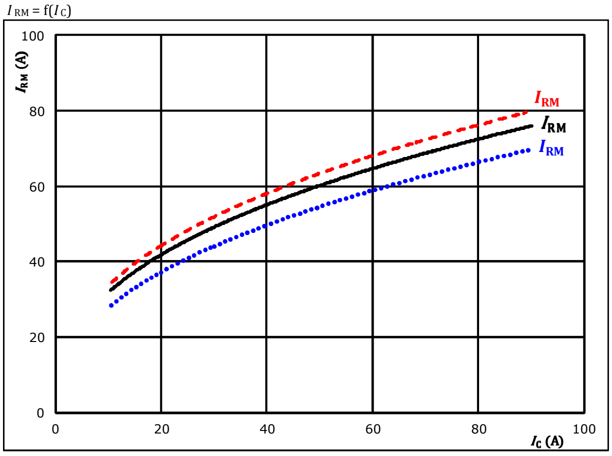


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	50	A		150 °C	dashed

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

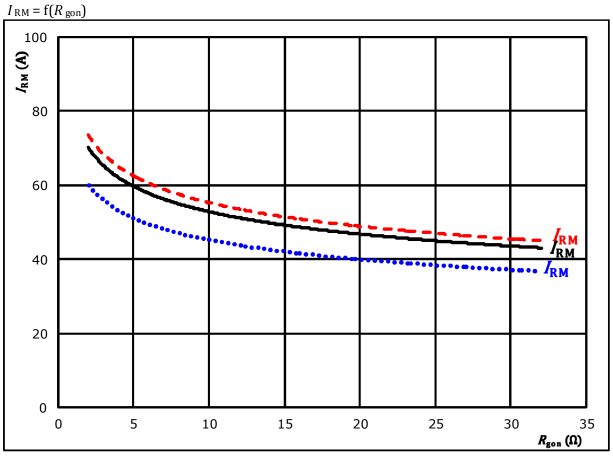


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 12. **FWD**

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

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



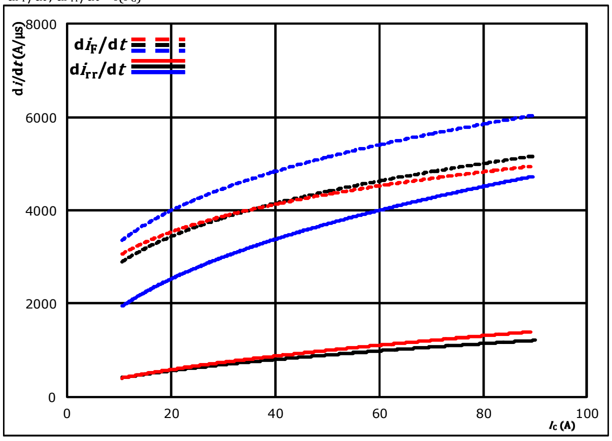
At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	50	A		150 °C	dashed

High Boost Switching Characteristics

figure 13. **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)

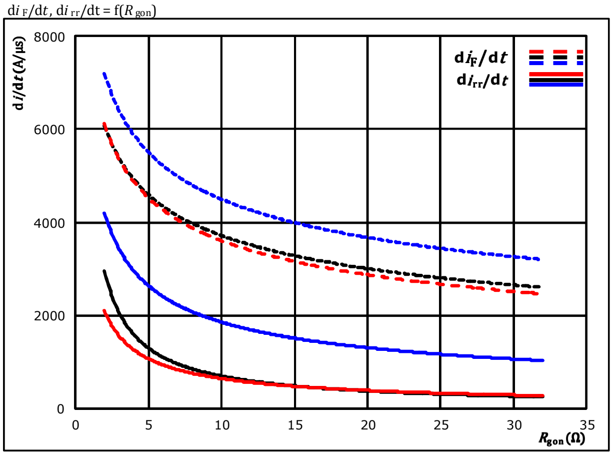


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

di_F/dt, di_{rr}/dt = f(R_{gon})

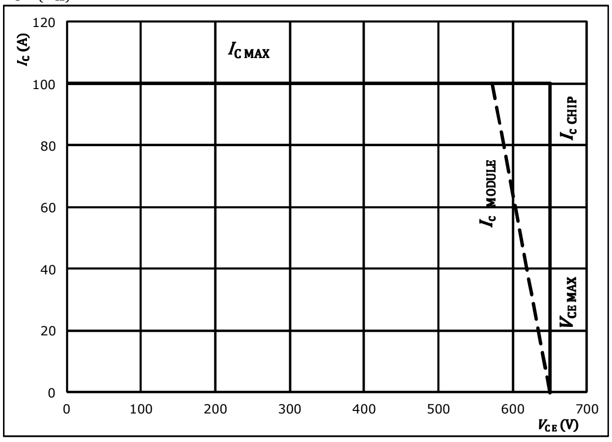


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C=	50	A		150 °C

figure 15. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At		
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

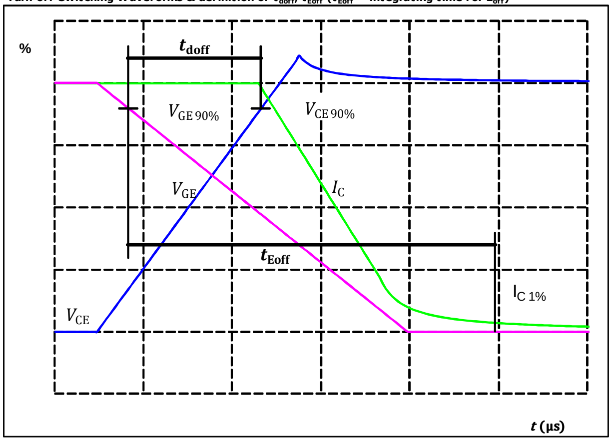
Hihg Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

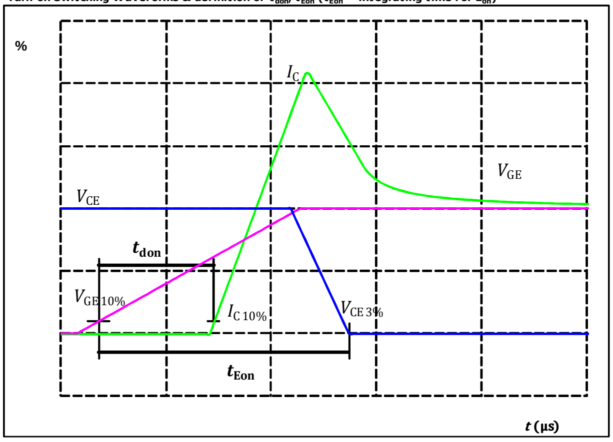
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	50	A
t_{doff} =	96	ns

figure 2. IGBT

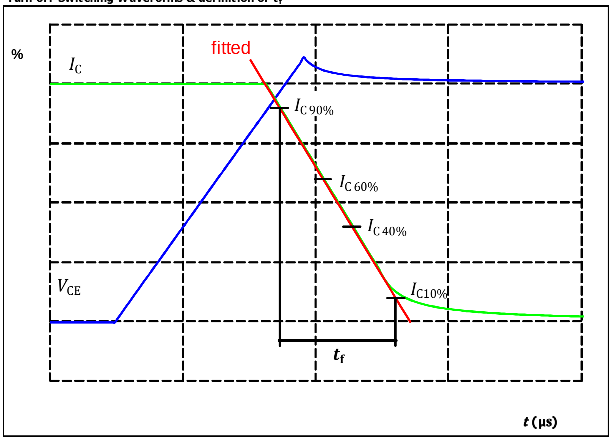
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	50	A
t_{don} =	66	ns

figure 3. IGBT

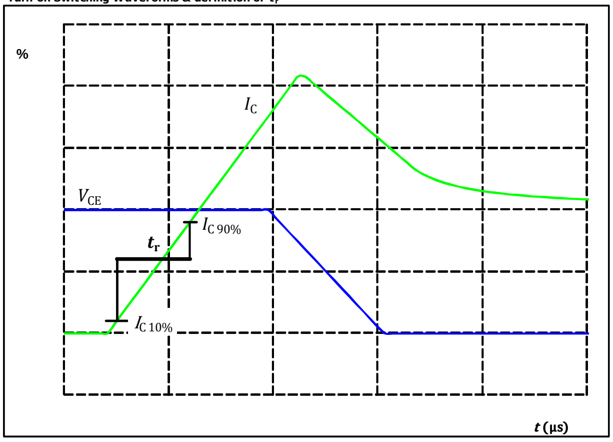
Turn-off Switching Waveforms & definition of t_f



V_C(100%) =	350	V
I_C(100%) =	50	A
t_f =	19	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

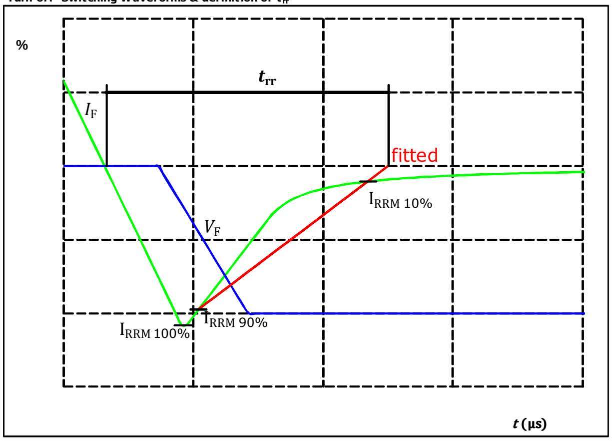


V_C(100%) =	350	V
I_C(100%) =	50	A
t_r =	11	ns

High Boost Switching Characteristics

figure 5. FWD

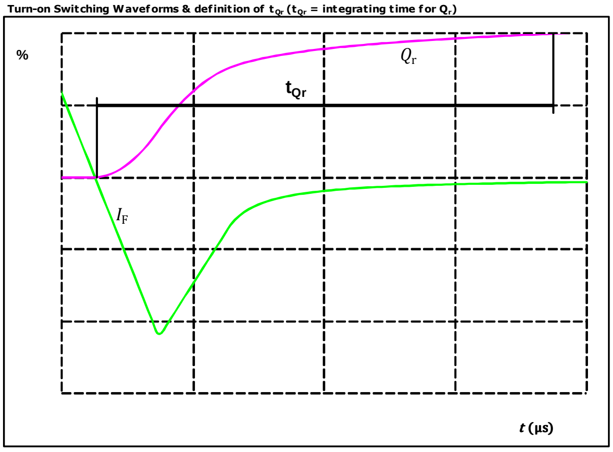
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	50	A
I_{RRM} (100%) =	59	A
t_{rr} =	105	ns

figure 6. FWD

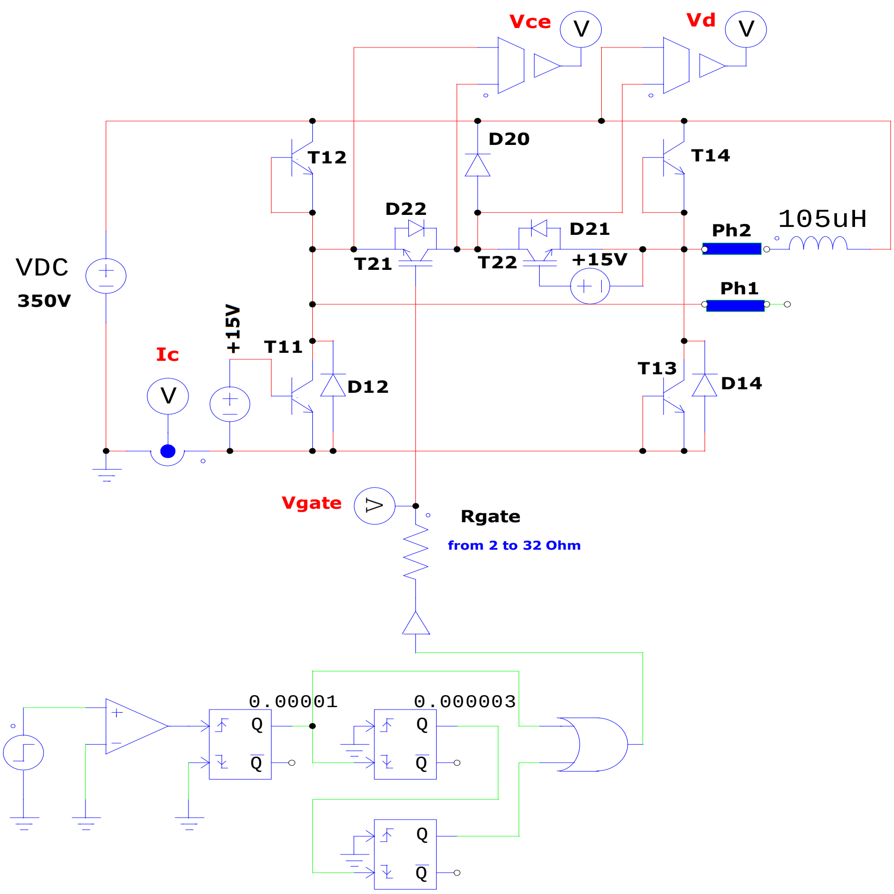
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	2,48	µC

High Boost Measurement circuits

figure 1.

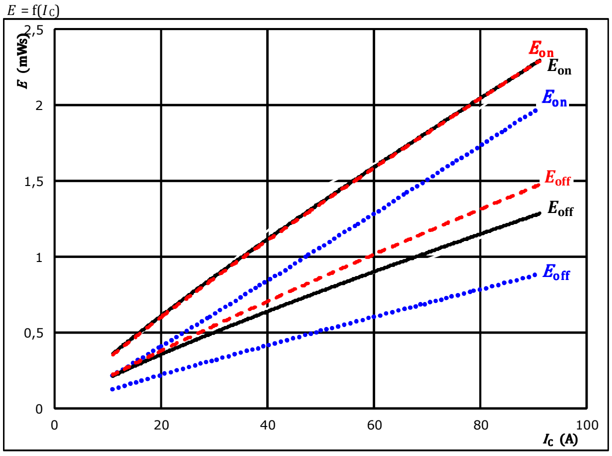


Input Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



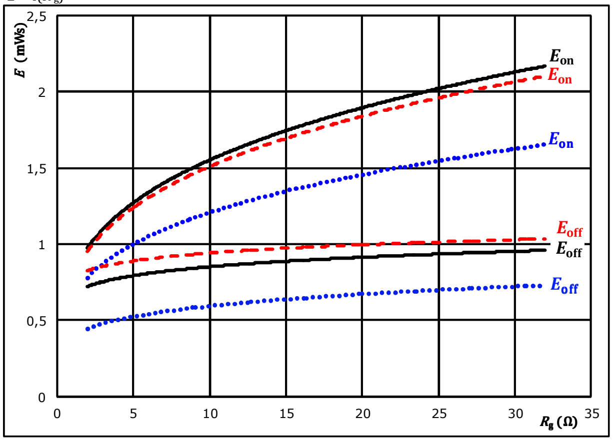
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed
R_{goff} =	8	Ω			

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



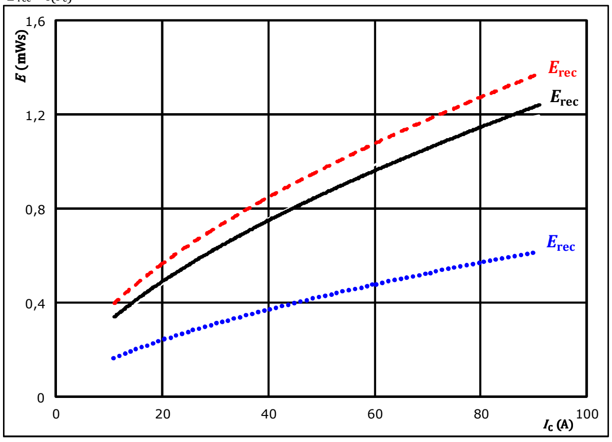
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C =	50	A		150 °C	dashed

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



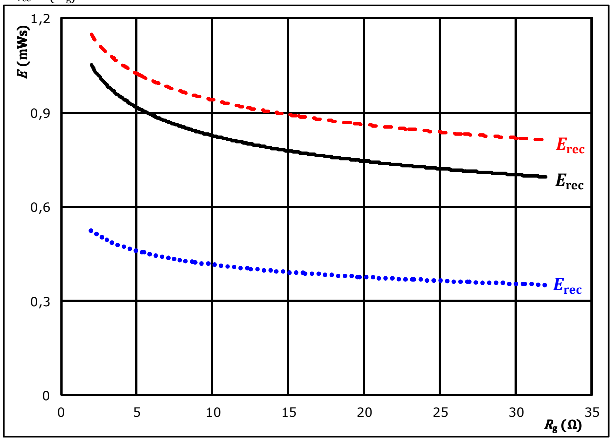
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

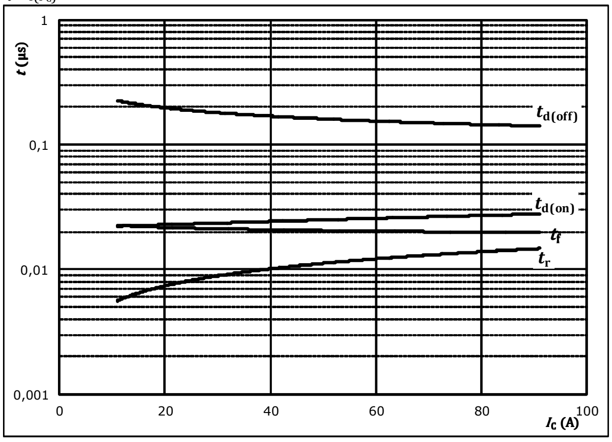
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C =	50	A		150 °C	dashed

Input Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



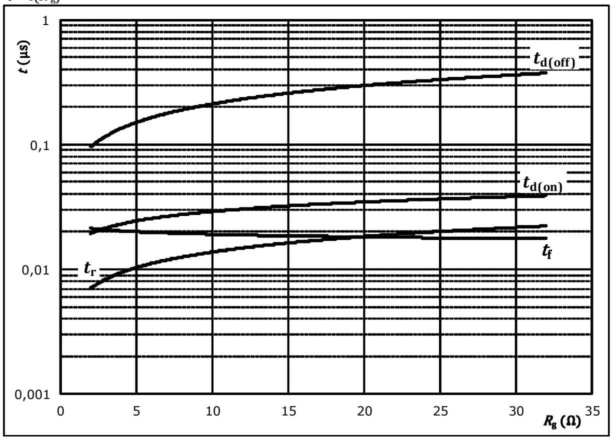
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0 / 15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



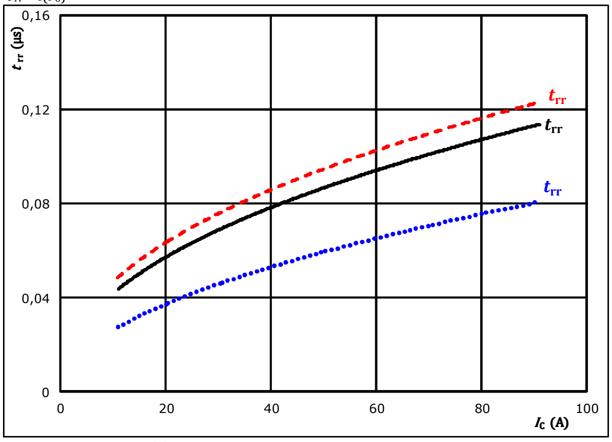
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0 / 15	V
I_C =	50	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

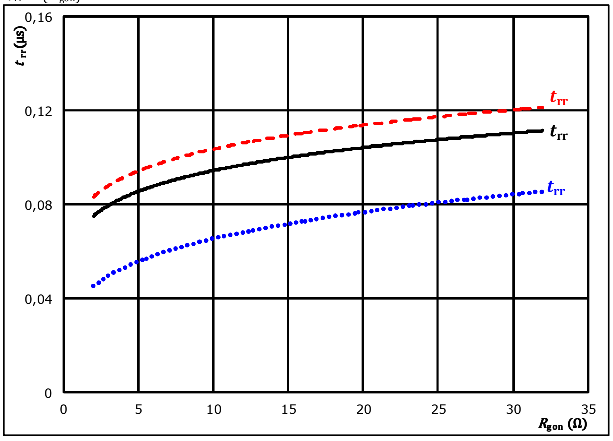


At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 8. **FWD**

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

$t_{rr} = f(R_{gon})$



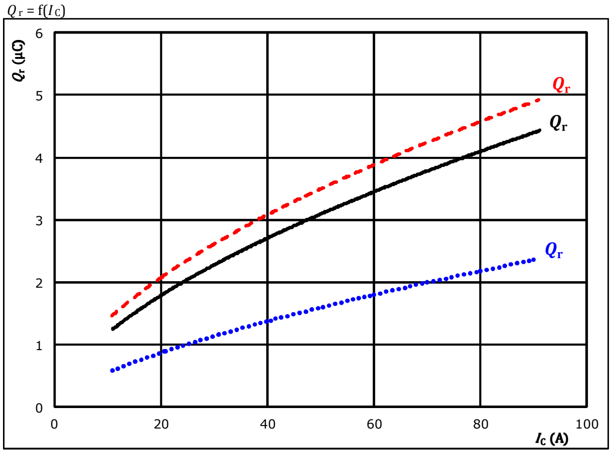
At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C =	50	A		150 °C	dashed

Input Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

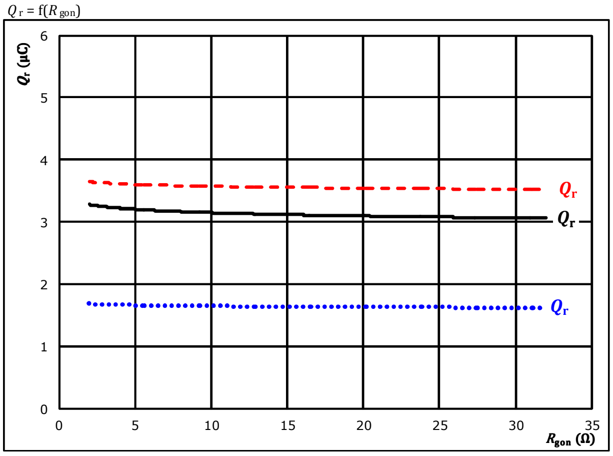


At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

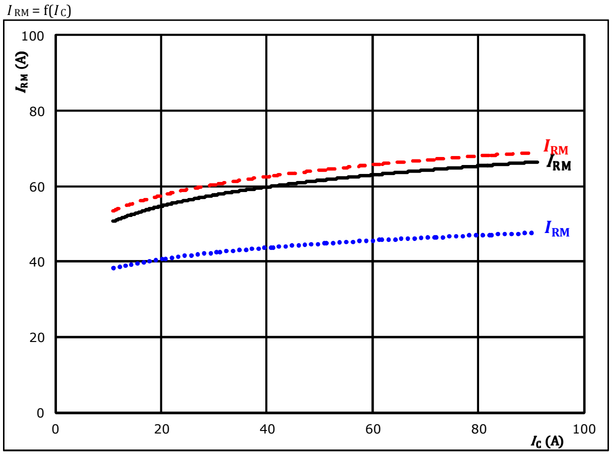


At					
V_{CE}=	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C=	50	A		150 °C	dashed

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

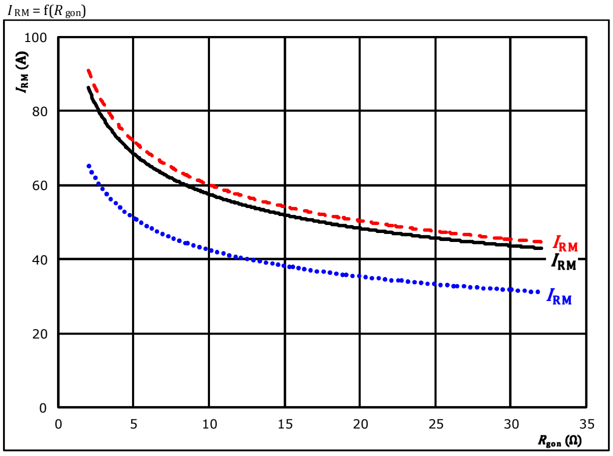


At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 12. **FWD**

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

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



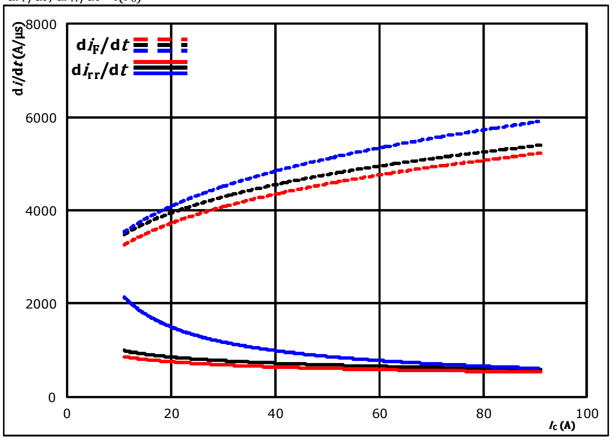
At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C =	50	A		150 °C	dashed

Input Boost Switching Characteristics

figure 13. **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)

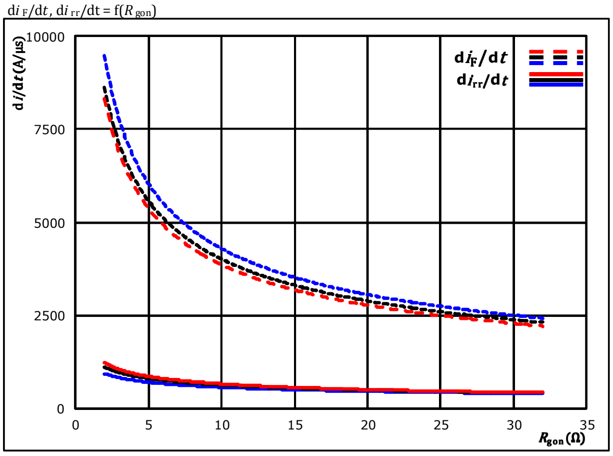


At					
V_{CE} =	400	V		25	°C
V_{GE} =	0 / 15	V	T_j:	125	°C
R_{gon} =	8	Ω		150	°C

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

di_F/dt, di_{rr}/dt = f(R_{gon})

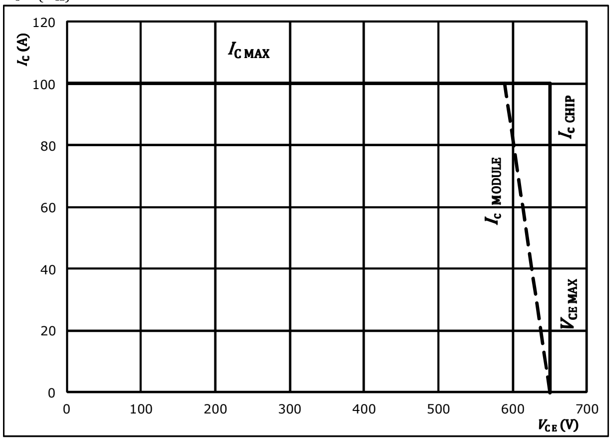


At					
V_{CE} =	400	V		25	°C
V_{GE} =	0 / 15	V	T_j:	125	°C
I_C =	50	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



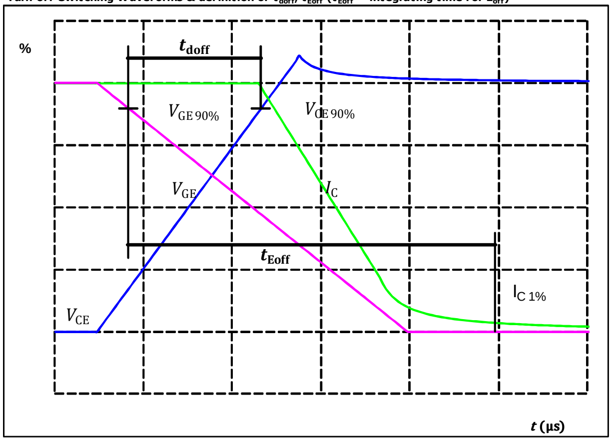
At		
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

Input Boost Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

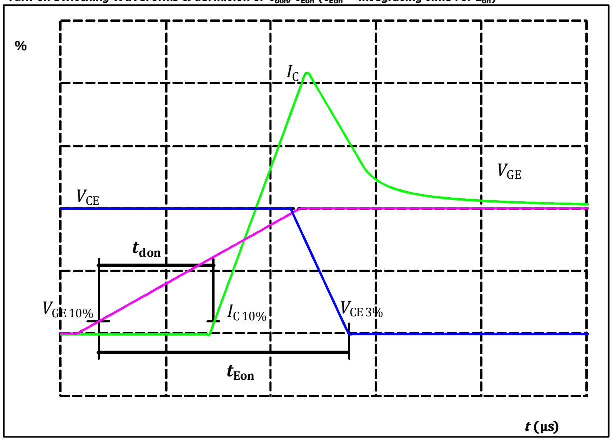
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE}(0%) =	0	V
V_{GE}(100%) =	15	V
V_C(100%) =	400	V
I_C(100%) =	50	A
t_{doff} =	156	ns

figure 2. IGBT

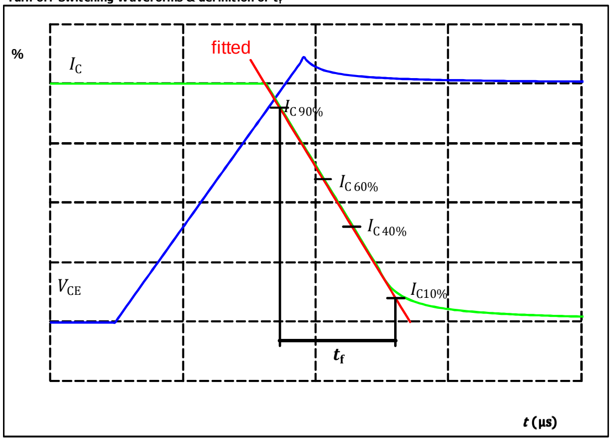
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE}(0%) =	0	V
V_{GE}(100%) =	15	V
V_C(100%) =	400	V
I_C(100%) =	50	A
t_{don} =	25	ns

figure 3. IGBT

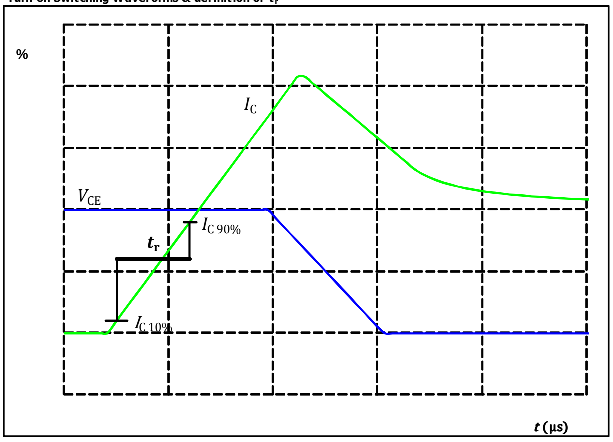
Turn-off Switching Waveforms & definition of t_f



V_C(100%) =	400	V
I_C(100%) =	50	A
t_f =	17	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

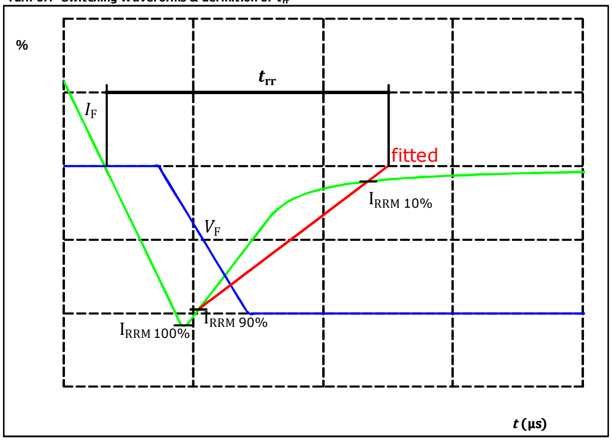


V_C(100%) =	400	V
I_C(100%) =	50	A
t_r =	10	ns

Input Boost Switching Characteristics

figure 5. **FWD**

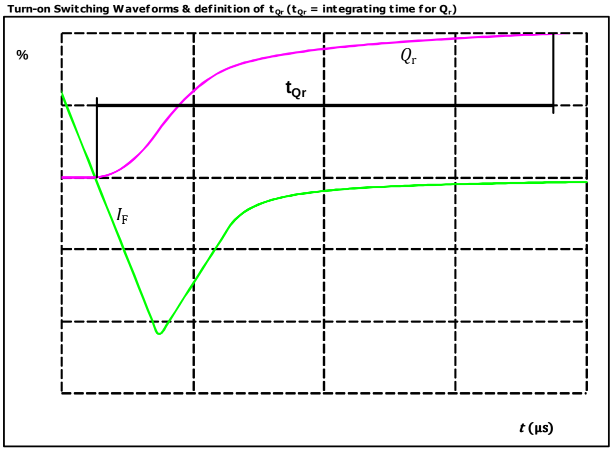
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	400	V
I_F (100%) =	50	A
I_{RRM} (100%) =	63	A
t_{rr} =	91	ns

figure 6. **FWD**

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



I_F (100%) =	50	A
Q_r (100%) =	3,20	µC

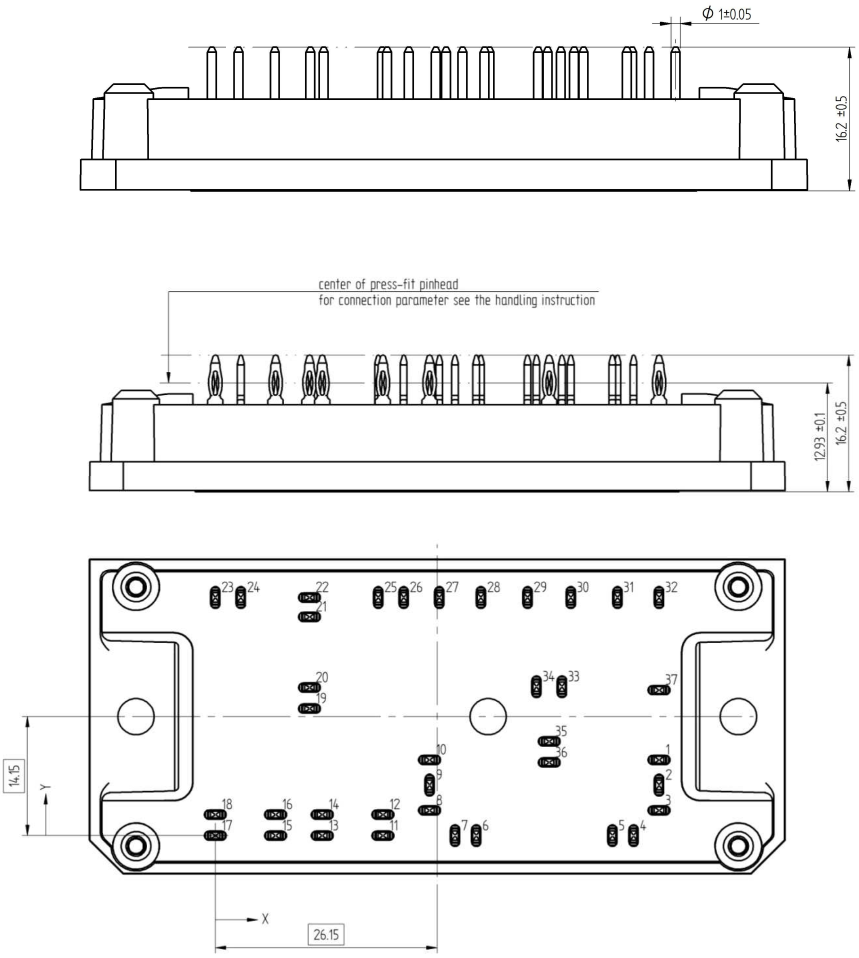
Ordering Code & Marking	
Version	**Ordering Code**
without thermal paste 12 mm housing with solder pins	10-FY07BVA050S5-LF44E18
without thermal paste 12 mm housing with press-fit pins	10-PY07BVA050S5-LF44E18Y

Text	**Name**		**Date code**	**UL & VIN**	**Lot**	**Serial**
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table

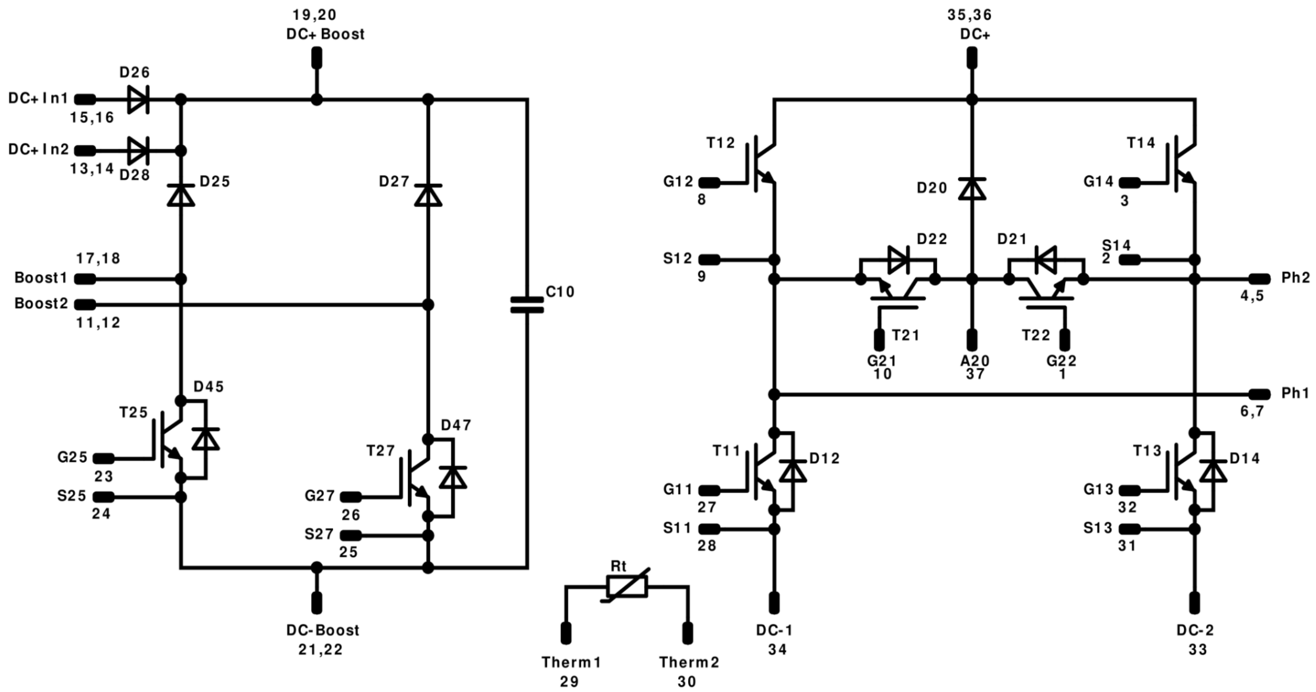
Pin	X	Y	Function
1	52,3	9	G22
2	52,3	6	S14
3	52,3	3	G14
4	49,3	0	Ph2
5	46,8	0	Ph2
6	30,75	0	Ph1
7	28,25	0	Ph1
8	25,25	3	G12
9	25,25	6	S12
10	25,25	9	G21
11	19,75	0	Boost2
12	19,75	2,5	Boost2
13	12,6	0	DC+In2
14	12,6	2,5	DC+In2
15	7,1	0	DC+In1
16	7,1	2,5	DC+In1
17	0	0	Boost1
18	0	2,5	Boost1
19	11,1	15,1	DC+Boost
20	11,1	17,6	DC+Boost
21	11,1	26	DC-Boost
22	11,1	28,3	DC-Boost
23	0	28,3	G25
24	3	28,3	S25
25	19,2	28,3	S27
26	22,2	28,3	G27
27	26,4	28,3	G11
28	31,3	28,3	S11
29	36,8	28,3	Therm1
30	41,9	28,3	Therm2
31	47,4	28,3	S13
32	52,3	28,3	G13
33	40,85	17,7	DC-2
34	37,85	17,7	DC-1
35	39,35	11,2	DC+
36	39,35	8,7	DC+
37	52,3	17,3	A20



Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Vincotech

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T13	IGBT	650 V	50 A	Low Buck Switch	
T12, T14	IGBT	650 V	50 A	High Buck Switch	
D21, D22	FWD	650 V	30 A	Buck Diode	
T21, T22	IGBT	650 V	50 A	Boost Switch	
D12, D14	FWD	650 V	30 A	Low Boost Diode	
D20	FWD	650 V	30 A	High Boost Diode	
T25, T27	IGBT	650 V	50 A	Input Boost Switch	
D25, D27	FWD	650 V	50 A	Input Boost Diode	
D26, D28	Rectifer	1600 V	65 A	ByPass Diode	
D45, D47	FWD	650 V	10 A	Input Boost Sw. Protection Diode	
C10	Capacitor	630 V		Capacitor (DC)	
Rt	NTC			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ) 100		>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-xY07BVA050S5-LF44E18x-D1-14	23 Feb. 2018		