Vincotech

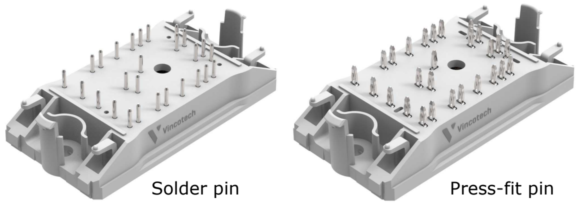
10-FZ07BVA020SM-LD44E08
10-PZ07BVA020SM-LD44E08Y
datasheet

***flow*SOL 0 BI (TL)** — **650 V / 20 A**

Features

- For one-phase solar applications
- Booster + Innovative H6.5 topology
- LVRT (Low voltage ride throught) capability
- Ultra Fast IGBT H5
- NTC

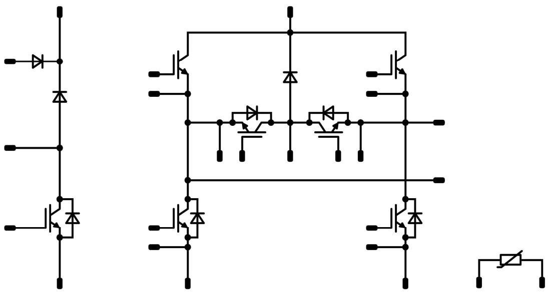
flow 0 12 mm housing



Target applications

- Solar Inverters

Schematic



Types

- 10-FZ07BVA020SM-LD44E08
- 10-PZ07BVA020SM-LD44E08Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Low Buck Switch / High Buck Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C		20	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	51	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		15	A
Repetitive peak forward current	I_{FRM}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	43	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C		15	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	45	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	50	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V Vcc = 360 V T_j = 150 °C	6	µs
Maximum junction temperature	T_{jmax}		175	°C
Low Boost Diode / High Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F		15	A
Repetitive peak forward current	I_{FRM}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	43	W
Maximum junction temperature	T_{jmax}		175	°C

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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			20	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	51	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			20	A
Repetitive peak forward current	I_{FRM}			40	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	51	W
Maximum junction temperature	T_{jmax}			175	°C
ByPass Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Continuous (direct) forward current	I_F			25	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	44	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			6	A
Repetitive peak forward current	I_{FRM}			12	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	36	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
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 pin / press-fit pin		8,66 / 8,74	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_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Low Buck Switch / High Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0002	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 125 150		1,60 1,75 1,79	2,3	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		1200		pF
Output capacitance	C_{oes}							30		
Reverse transfer capacitance	C_{res}							5,2		
Gate charge	Q_g		15	520	20	25		48		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,88		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	20	25 125 150		40 36 36		ns
Rise time	t_r					25 125 150		9 10 10		
Turn-off delay time	$t_{d(off)}$					25 125 150		55 67 69		
Fall time	t_f					25 125 150		11 12 13		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,6 µC Q_{rFWD} = 1,1 µC Q_{rFWD} = 1,3 µC				25 125 150		0,449 0,596 0,616		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,037 0,078 0,091		

Characteristic Values

Parameter	Symbol	Conditions					Value			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				15	25 125 150		1,51 1,43 1,39	2	V
Reverse leakage current	I_R			650		25			0,94	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,23		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 2028 A/µs di/dt = 1981 A/µs di/dt = 1962 A/µs	±15	350	20	25 125 150		11 17 19		A
Reverse recovery time	t_{rr}					25 125 150		92 115 127		ns
Recovered charge	Q_r					25 125 150		0,596 1,146 1,301		µC
Reverse recovered energy	E_{rec}					25 125 150		0,106 0,208 0,244		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		217 136 128		A/µs

Characteristic Values

Parameter	Symbol	Conditions	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]	Value Min	Value Typ	Value Max	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,00021	25	5,1	5,8	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		15	25 125 150	1,03	1,54 1,74 1,81	1,95	V
Collector-emitter cut-off current	I_{CES}		0	650		25			5	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	25		25		551		pF
Reverse transfer capacitance	C_{res}	f= 1 Mhz	0	25		25		17		pF
Gate charge	Q_g		15	480	15	25		87		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,89		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	15	25 125 150		48 47 49		ns
Rise time	t_r	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	15	25 125 150		17 21 21		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	15	25 125 150		115 133 134		ns
Fall time	t_f	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	15	25 125 150		87 106 122		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 1 µC Q_{rFWD} = 1,1 µC	±15	350	15	25 125 150		0,363 0,458 0,465		mWs
Turn-off energy (per pulse)	E_{off}		±15	350	15	25 125 150		0,284 0,400 0,414		mWs

Characteristic Values

Parameter	Symbol	Conditions					Value			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	
Low Boost Diode / High Boost Diode										
Static										
Forward voltage	V_F				15	25 125 150		1,51 1,43 1,39	2	V
Reverse leakage current	I_R			650		25			0,94	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,23		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1053 A/µs di/dt = 969 A/µs di/dt = 910 A/µs	±15	350	15	25 125 150		10 13 15		A
Reverse recovery time	t_{rr}					25 125 150		88 115 125		ns
Recovered charge	Q_r					25 125 150		0,504 0,961 1,081		µC
Reverse recovered energy	E_{rec}					25 125 150		0,075 0,159 0,186		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		67 195 144		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Value			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	
Input Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE} = V_{CE}			0,0002	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 125 150		1,60 1,75 1,79	2,3	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		1200		pF
Output capacitance	C_{oes}							30		
Reverse transfer capacitance	C_{res}							5,2		
Gate charge	Q_g		15	520	20	25		48		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,88		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	20	25 125 150		41 44 43		ns
Rise time	t_r					25 125 150		8 9 8		
Turn-off delay time	$t_{d(off)}$					25 125 150		54 67 70		
Fall time	t_f					25 125 150		9 11 11		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,7 µC Q_{rFWD} = 1,3 µC Q_{rFWD} = 1,4 µC				25 125 150		0,411 0,482 0,508		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,039 0,118 0,138		

Characteristic Values

Parameter	Symbol	Conditions					Value			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	
Input Boost Diode										
Static										
Forward voltage	V_F				20	25 125 150		1,56 1,51 1,51	2	V
Reverse leakage current	I_R			650		25			5	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,88		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 3021 A/µs di/dt = 2661 A/µs di/dt = 2616 A/µs	±15	350	20	25 125 150		17 24 26		A
Reverse recovery time	t_{rr}					25 125 150		62 101 110		ns
Recovered charge	Q_r					25 125 150		0,656 1,259 1,427		µC
Reverse recovered energy	E_{rec}					25 125 150		0,125 0,279 0,323		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		160 264 279		A/µs
ByPass Diode										
Static										
Forward voltage	V_F				25	25 125		1,22 1,21	1,8	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)						1,59		K/W

Characteristic Values

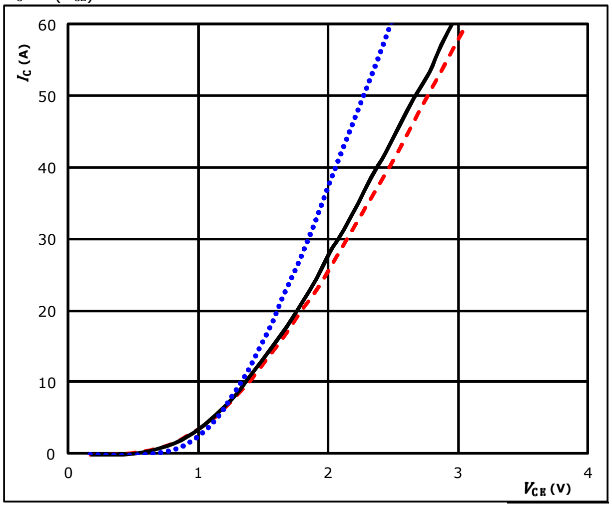
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Input Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				6	25 125 150		1,73 1,59 1,54	2	V
Reverse leakage current	I_R			650		25			5	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j\text{-}s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,65		K/W
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 Switch / High Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

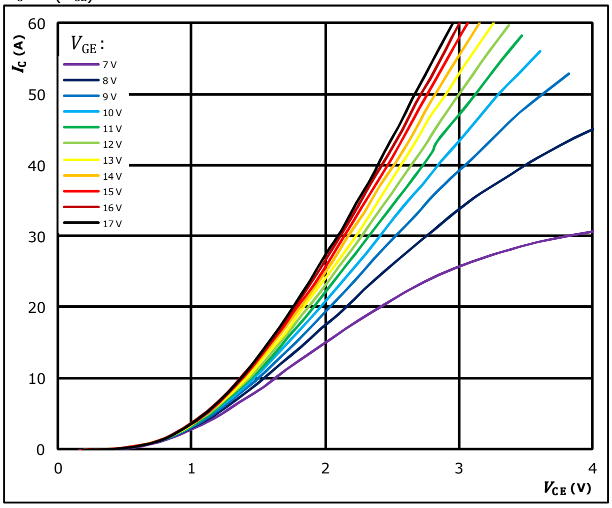


t_p =	250	μs		25 °C	········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 μs

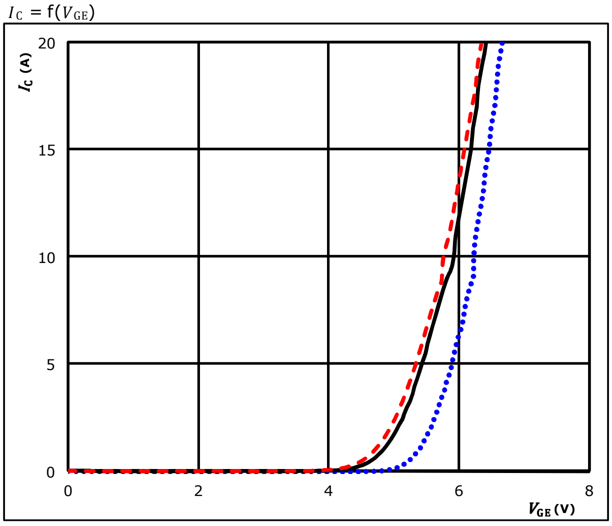
T_j = 150 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

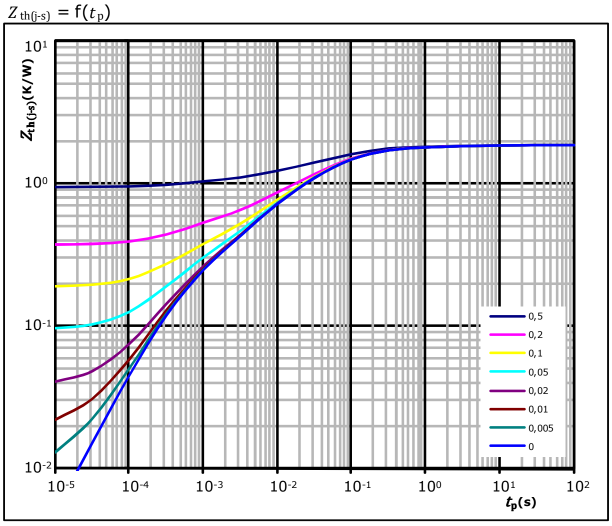


t_p =	100	μs		25 °C	········
V_{CE} =	9	V	T_j:	125 °C	———
				150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 1,88 K/W

IGBT thermal model values

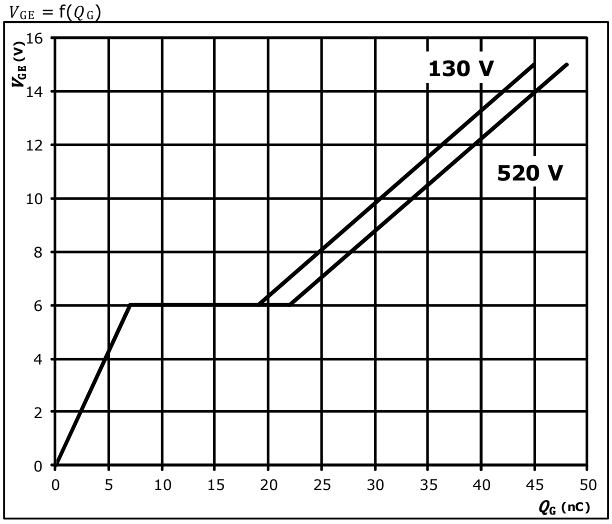
R (K/W)	τ (s)
7,73E-02	2,79E+00
1,62E-01	3,73E-01
7,45E-01	7,14E-02
4,66E-01	1,63E-02
2,69E-01	3,67E-03
1,63E-01	4,26E-04

Low Buck Switch / High Buck Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

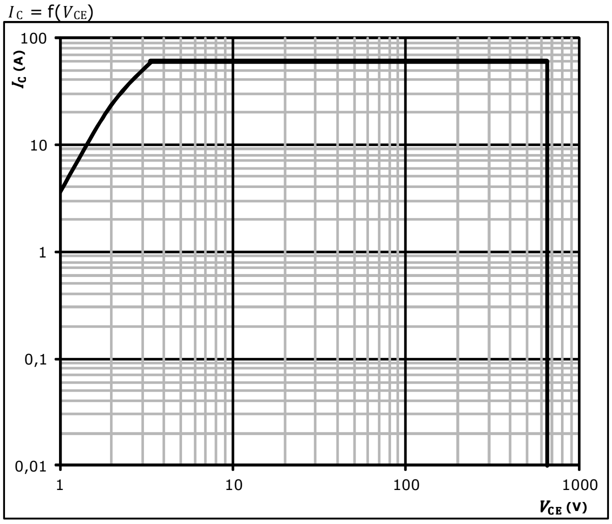


I_C = 20 A

figure 6. IGBT

Safe operating area

$I_C = f(V_{CE})$



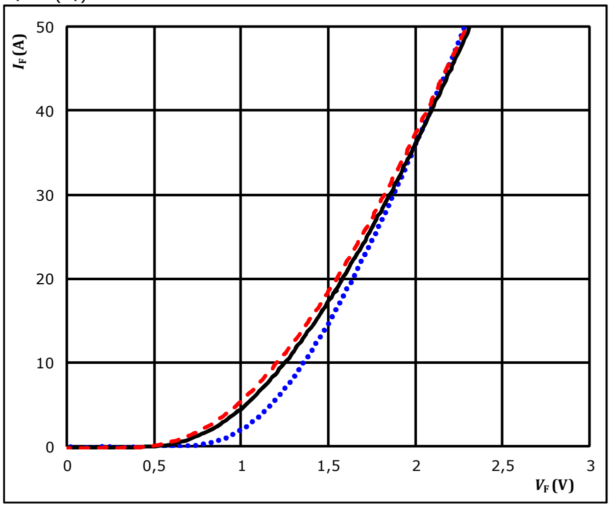
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$

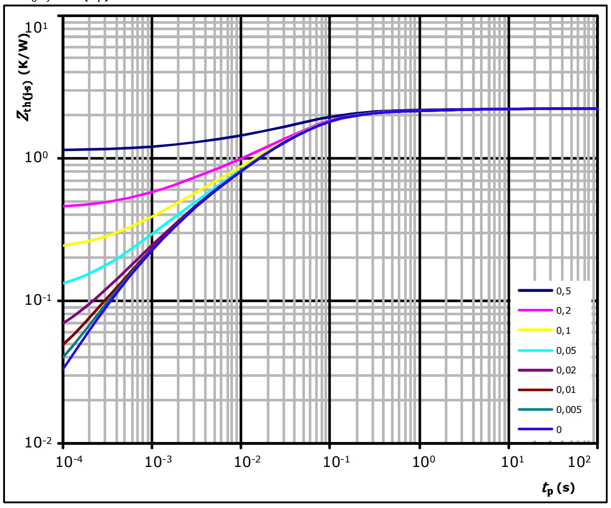


t_p =	250	µs	T_j:	25 °C
				125 °C
				150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,23 K/W

FWD thermal model values

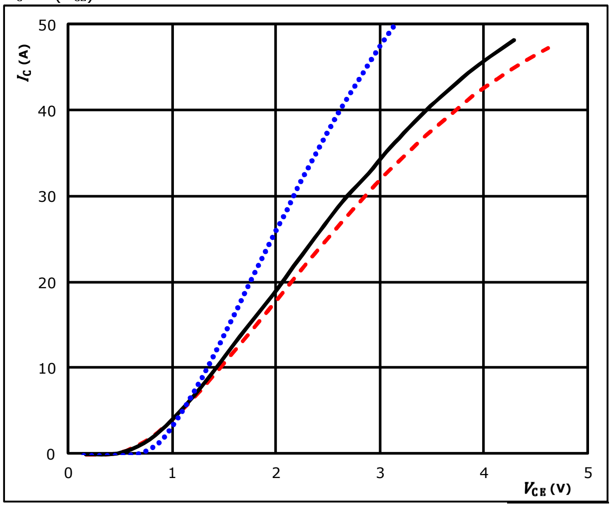
R (K/W)	τ (s)
1,05E-01	2,52E+00
2,43E-01	2,26E-01
1,06E+00	5,21E-02
4,77E-01	1,22E-02
2,72E-01	2,29E-03
7,91E-02	4,79E-04

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

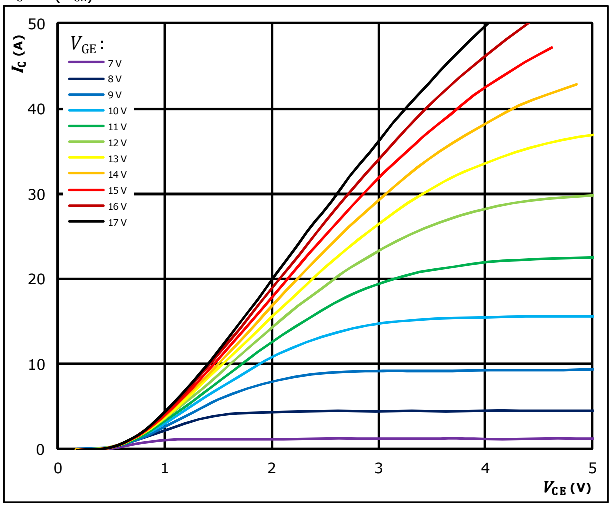


t_p =	250	µs		25	°C
V_{GE} =	15	V	T_j:	125	°C
				150	°C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

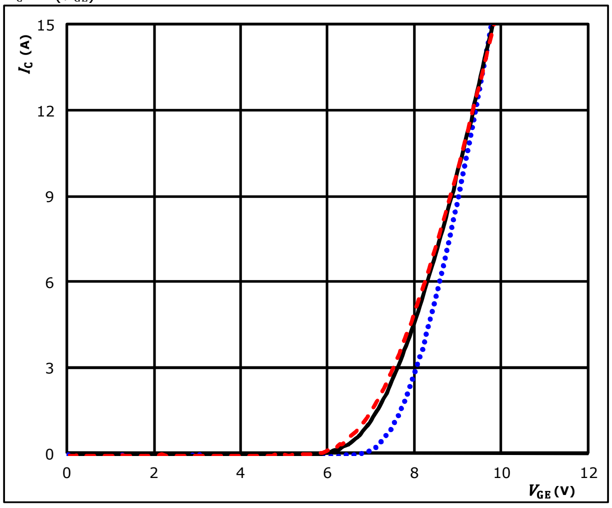


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

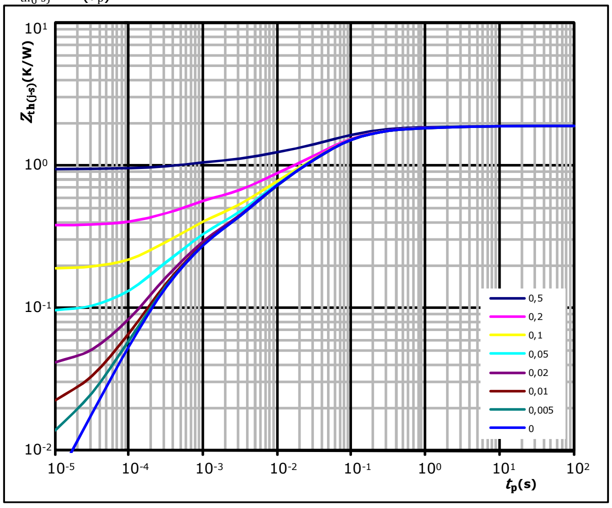


t_p =	100	µs		25	°C
V_{CE} =	10	V	T_j:	125	°C
				150	°C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 1,89 K/W

IGBT thermal model values

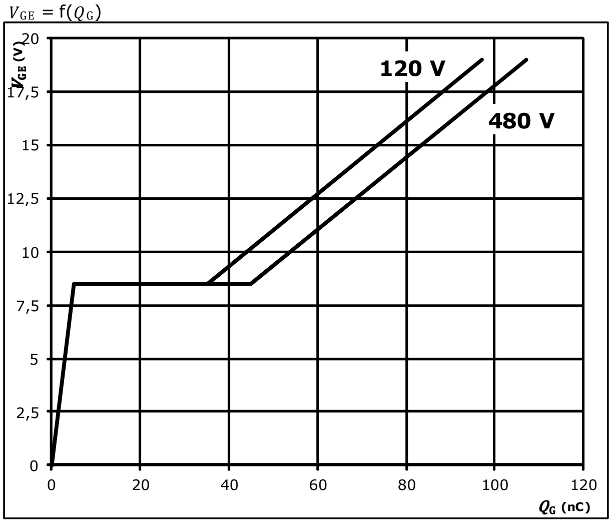
R (K/W)	τ (s)
5,08E-02	4,13E+00
1,07E-01	6,48E-01
5,07E-01	1,07E-01
6,69E-01	3,27E-02
3,46E-01	5,10E-03
2,08E-01	4,07E-04

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

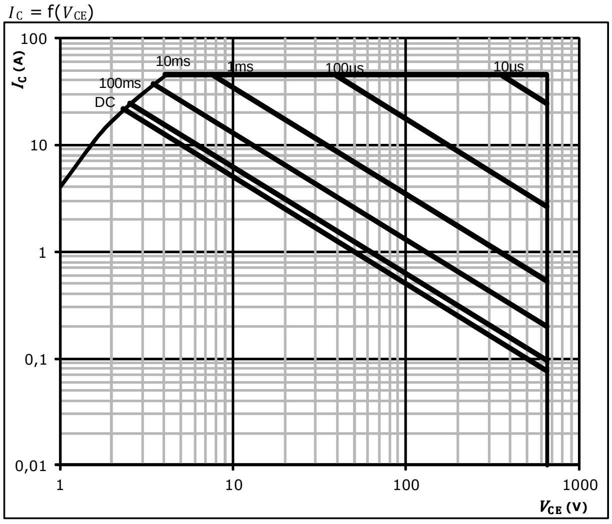


I_C = 15 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

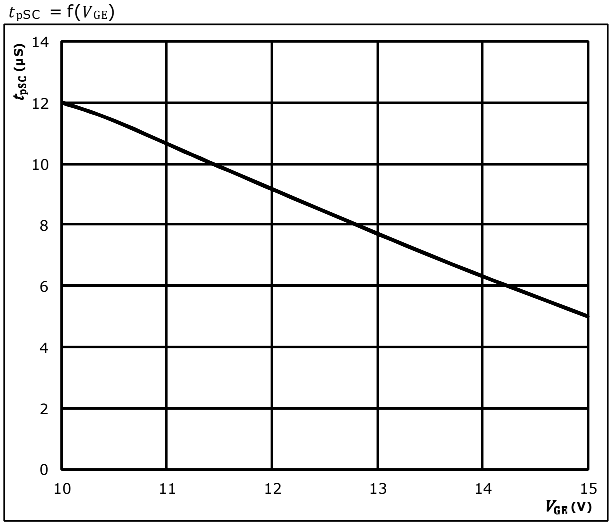


D = single pulse
T_s = 80 ºC
V_{GE} = ±15 V
T_j = T_{jmax}

figure 7. **IGBT**

Short circuit duration as a function of V_{GE}

$t_{pSC} = f(V_{GE})$

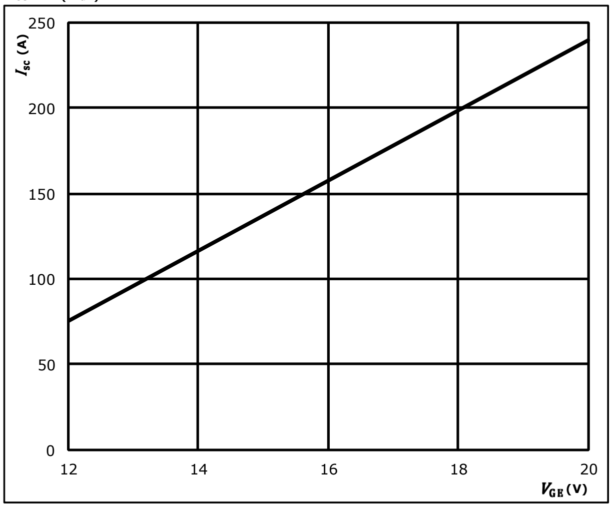


V_{CE} = 400 V
T_j ≤ 150 ºC

figure 8. **IGBT**

Typical short circuit current as a function of V_{GE}

$I_{SC} = f(V_{GE})$



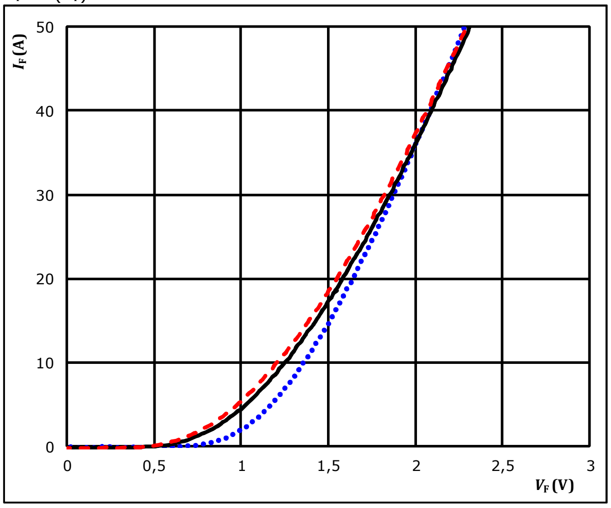
V_{CE} ≤ 400 V
T_j ≤ 150 ºC

Low Boost Diode / High Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$

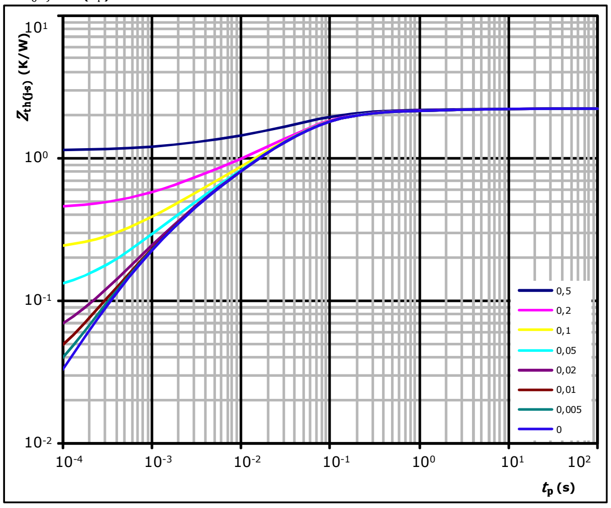


t_p =	250	µs	T_j:	25 °C
				125 °C
				150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 2,23 K/W

FWD thermal model values

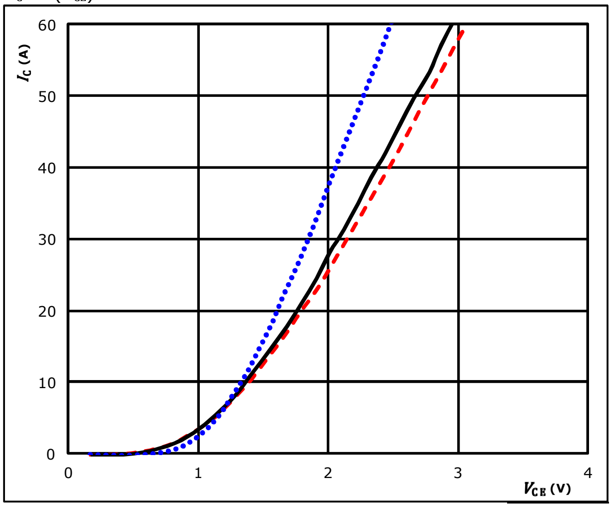
R (K/W)	τ (s)
1,05E-01	2,52E+00
2,43E-01	2,26E-01
1,06E+00	5,21E-02
4,77E-01	1,22E-02
2,72E-01	2,29E-03
7,91E-02	4,79E-04

Input Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

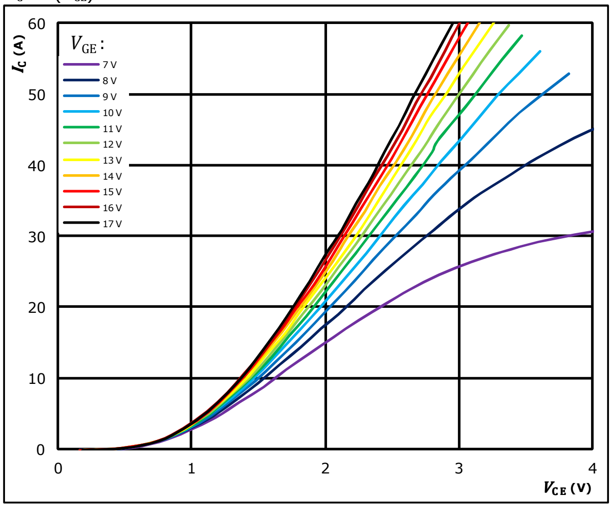


t_p =	250	µs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

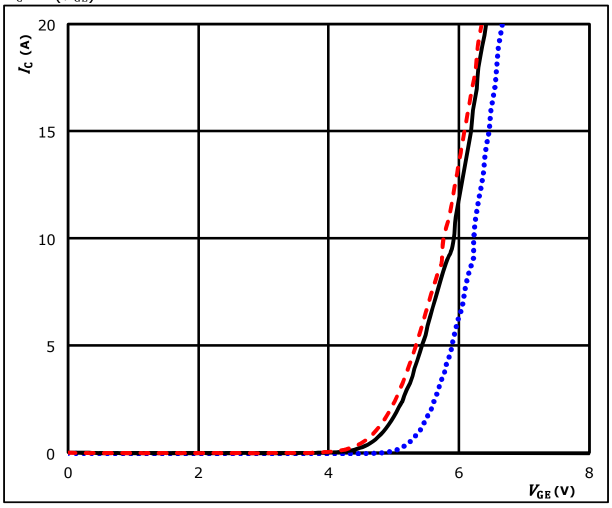


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

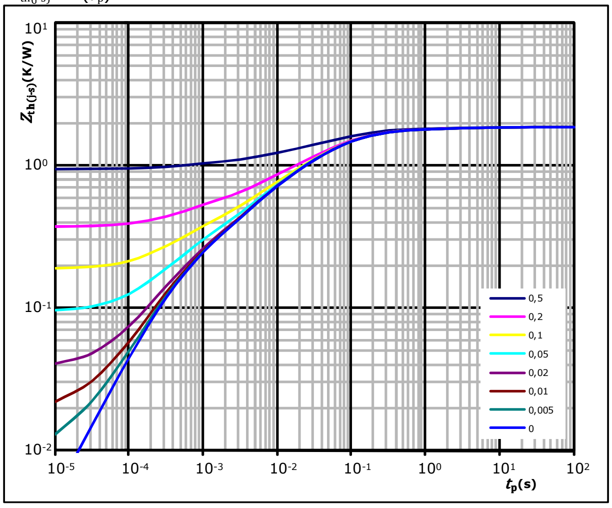


t_p =	100	µs		25 °C	············
V_{CE} =	9	V	T_j:	125 °C	———
				150 °C	– – – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,88 K/W

IGBT thermal model values

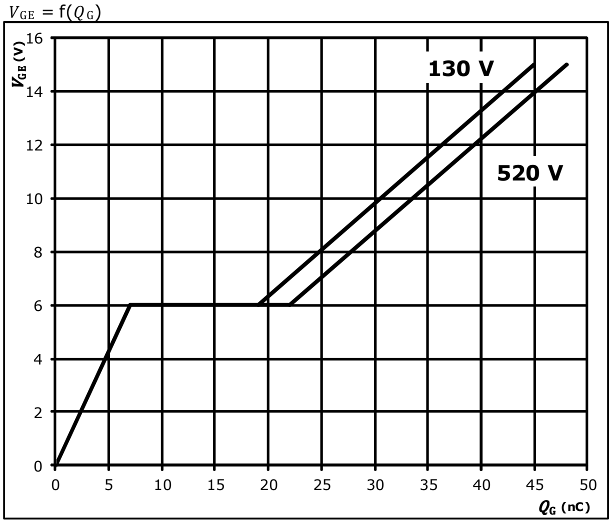
R (K/W)	τ (s)
7,73E-02	2,79E+00
1,62E-01	3,73E-01
7,45E-01	7,14E-02
4,66E-01	1,63E-02
2,69E-01	3,67E-03
1,63E-01	4,26E-04

Input Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

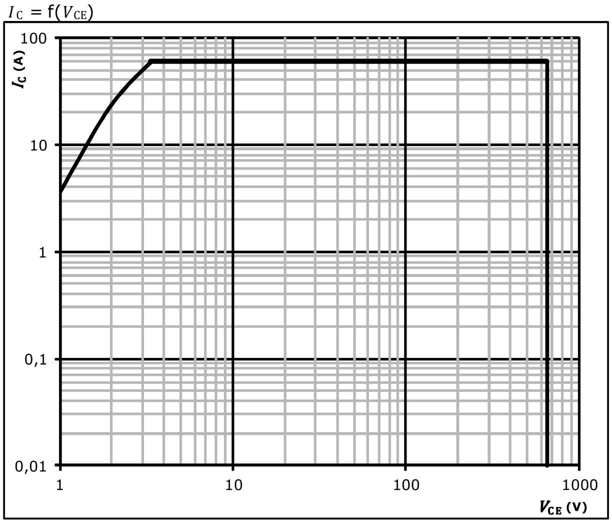


$I_C =$ 20 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



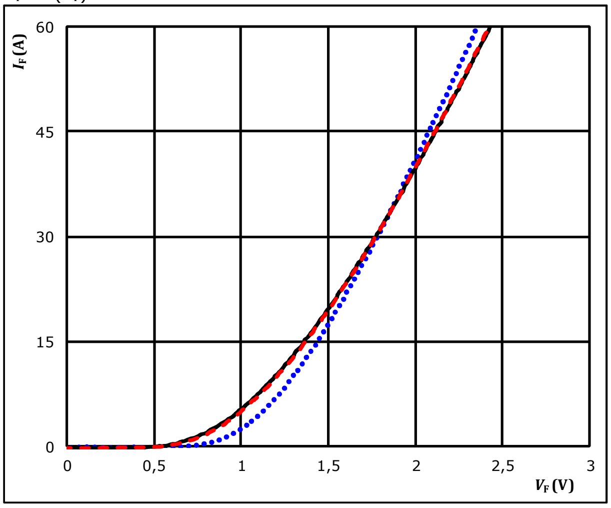
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Input Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



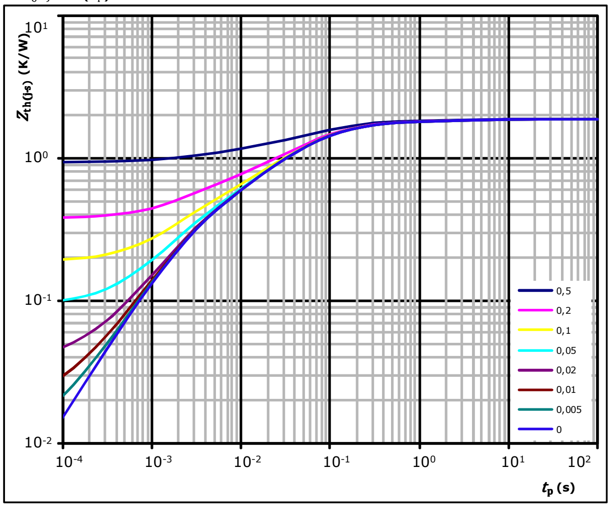
t_p = 250 µs

T_j: 25 °C
125 °C
150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,88 K/W

FWD thermal model values

R (K/W)	τ (s)
8,42E-02	3,60E+00
1,79E-01	3,95E-01
8,86E-01	7,08E-02
4,50E-01	1,69E-02
2,75E-01	2,45E-03

10-FZ07BVA020SM-LD44E08
10-PZ07BVA020SM-LD44E08Y

datasheet

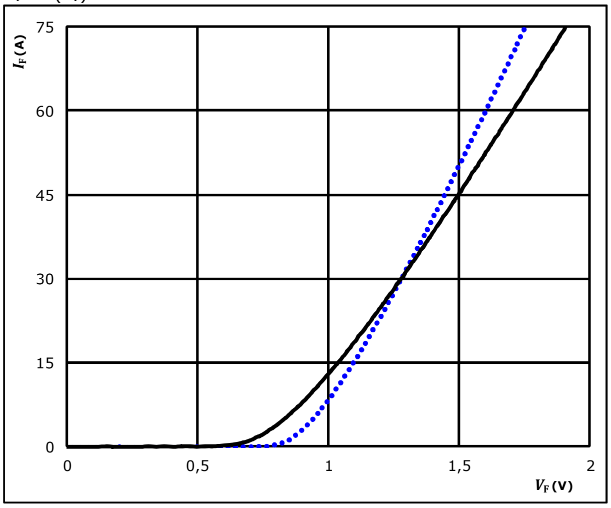
Vincotech

ByPass Diode Characteristics

figure 1. **Rectifier Diode**

Typical forward characteristics

$I_F = f(V_F)$



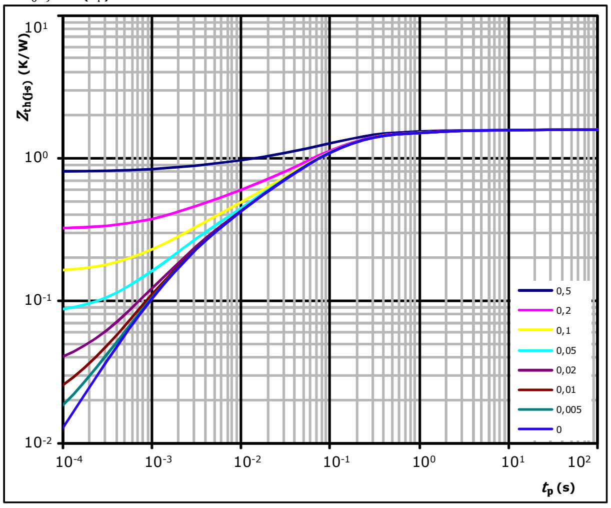
t_p = 250 μs

T_j: 25 °C, 125 °C

figure 2. **Rectifier Diode**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,59 K/W

Diode thermal model values

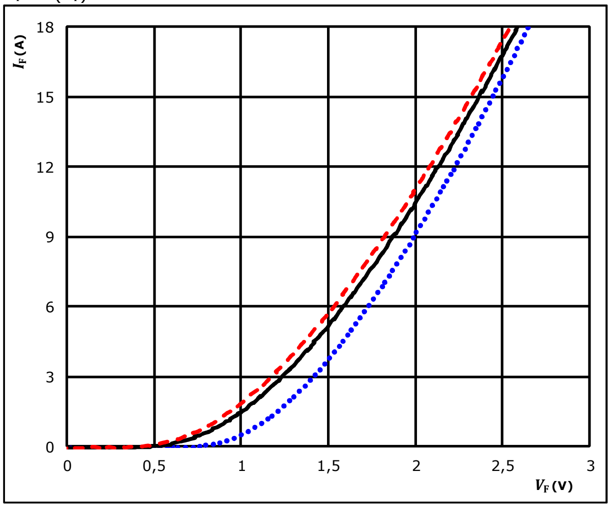
R (K/W)	τ (s)
3,44E-02	9,66E+00
1,12E-01	1,22E+00
5,81E-01	1,45E-01
4,89E-01	5,05E-02
2,38E-01	9,26E-03
1,22E-01	1,79E-03
1,81E-02	7,88E-04

Input Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



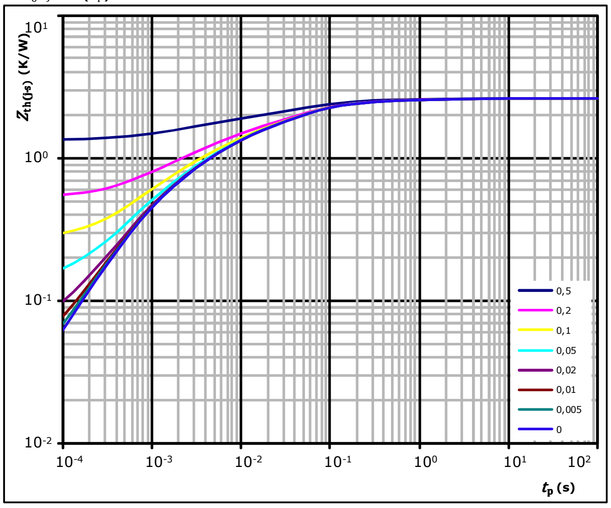
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 2,65 K/W

FWD thermal model values

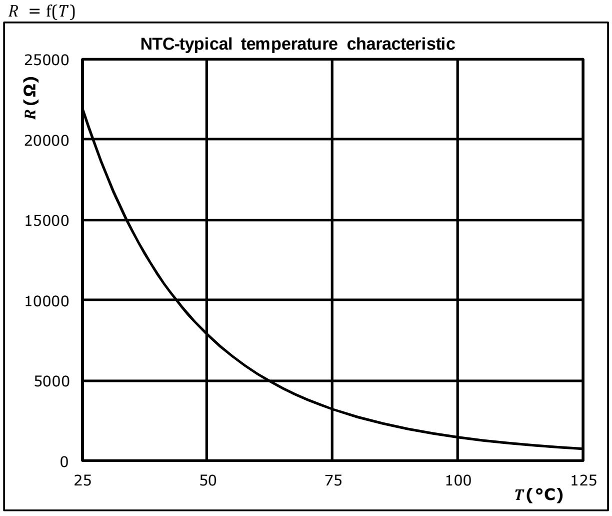
R (K/W)	τ (s)
1,02E-01	2,56E+00
3,50E-01	1,72E-01
9,53E-01	3,96E-02
7,66E-01	5,83E-03
4,76E-01	9,87E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

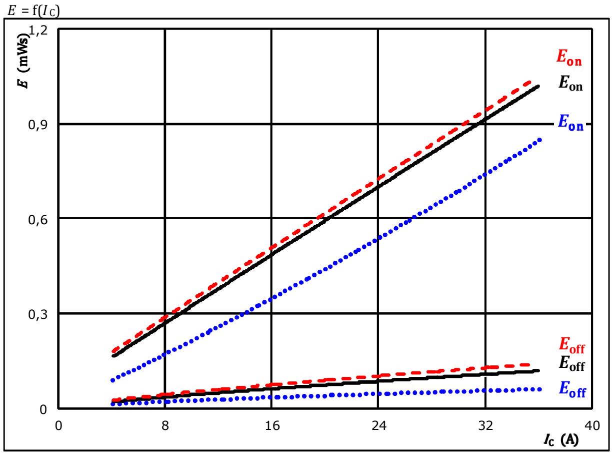


Buck Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$

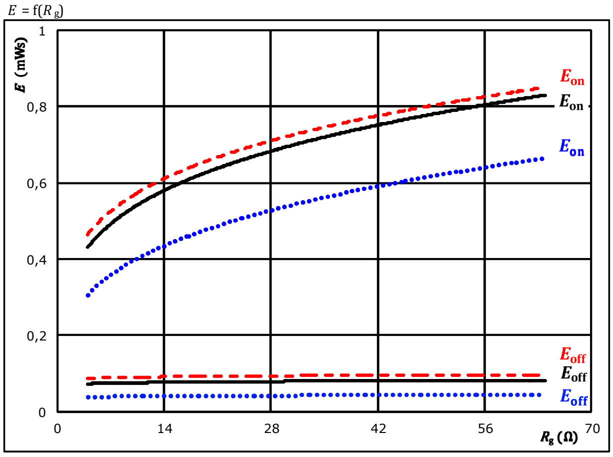


With an inductive load at					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed
R_{goff} =	16	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$

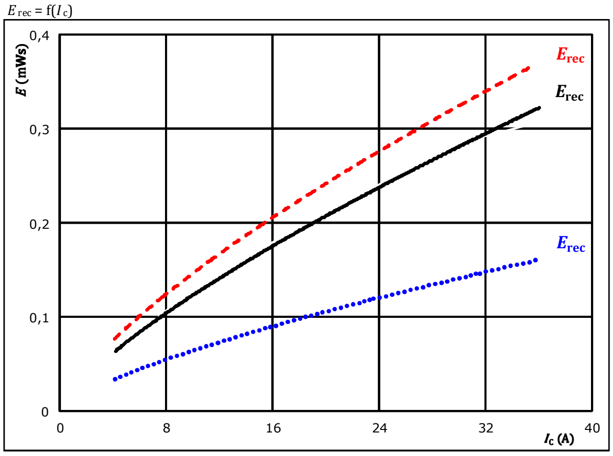


With an inductive load at					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	20	A		150 °C	dashed

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$

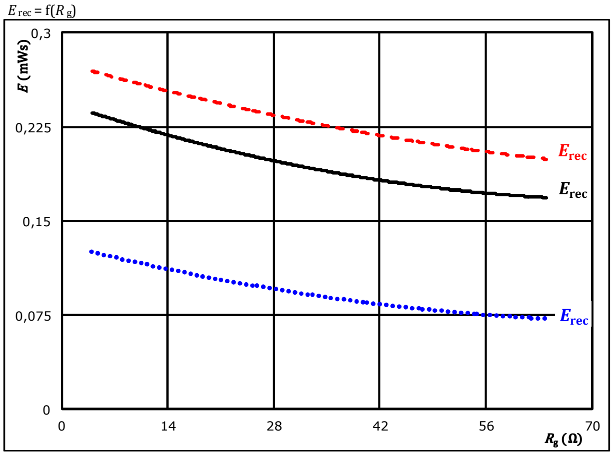


With an inductive load at					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



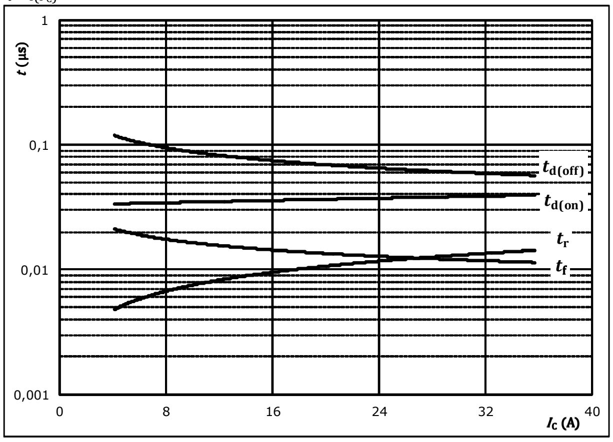
With an inductive load at					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	20	A		150 °C	dashed

Buck Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



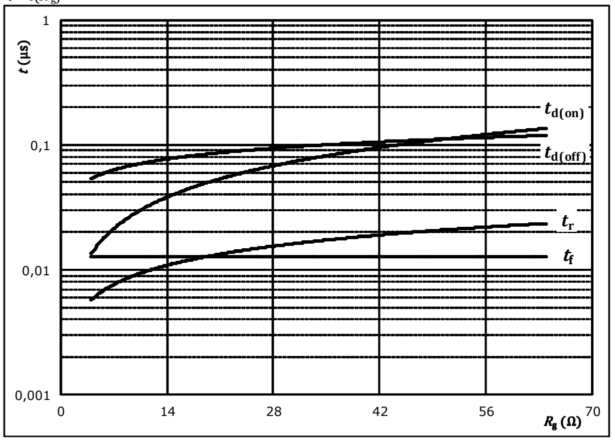
With an inductive load at

T_j = 150 °C
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 16 Ω
R_{goff} = 16 Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



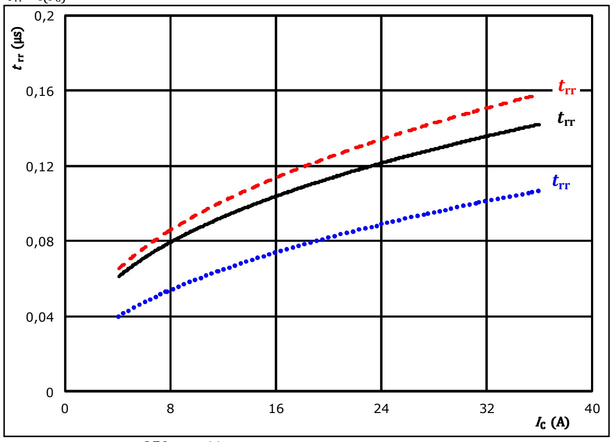
With an inductive load at

T_j = 150 °C
V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 20 A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



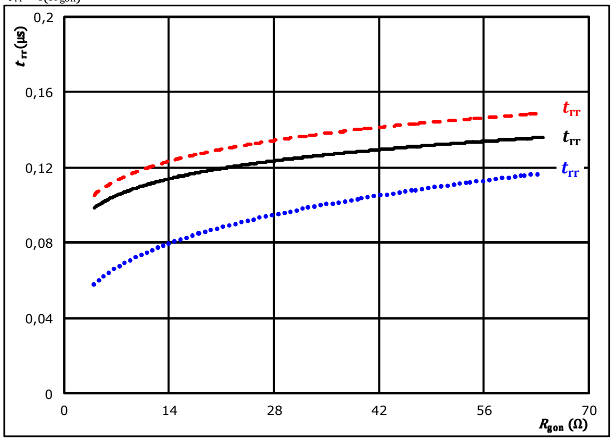
At V_{CE} = 350 V, V_{GE} = ±15 V, R_{gon} = 16 Ω

T_j: 25 °C, 125 °C, 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, V_{GE} = ±15 V, I_C = 20 A

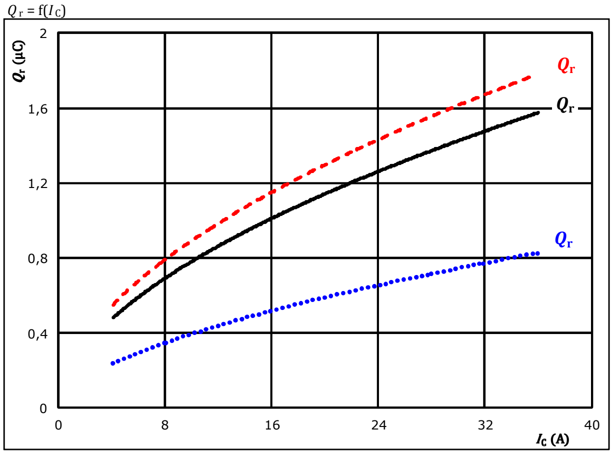
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

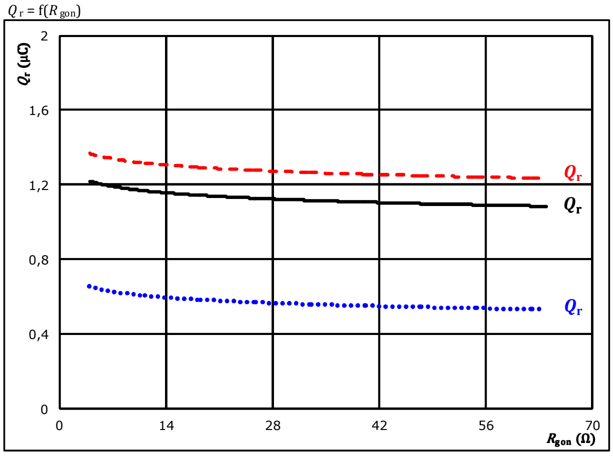


At				
V_{CE} =	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
R_{gon} =	16	Ω		150 °C

figure 10. FWD

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

$Q_r = f(R_{gon})$

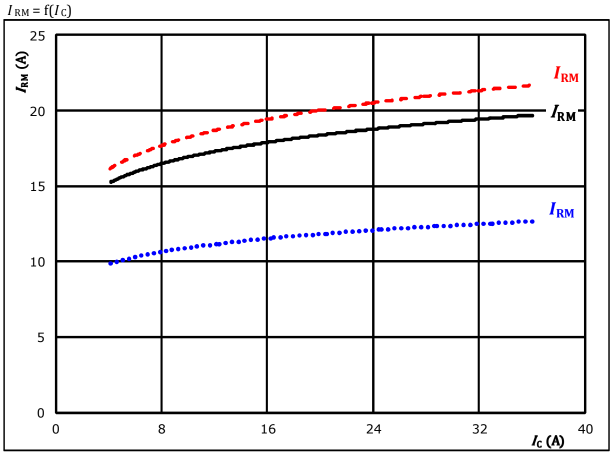


At				
V_{CE}=	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
I_C=	20	A		150 °C

figure 11. FWD

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

$I_{RM} = f(I_C)$

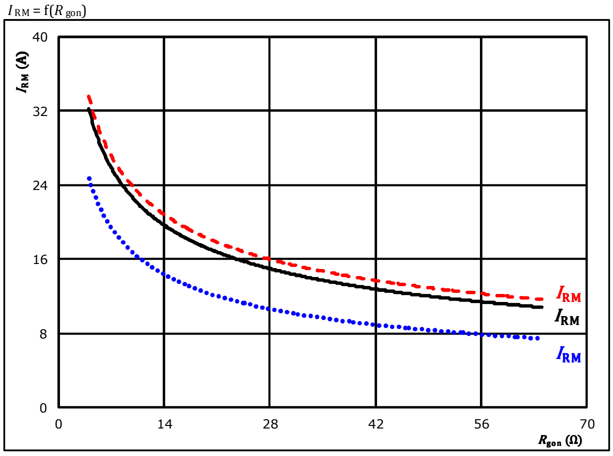


At				
V_{CE}:	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
R_{gon} =	16	Ω		150 °C

figure 12. FWD

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

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



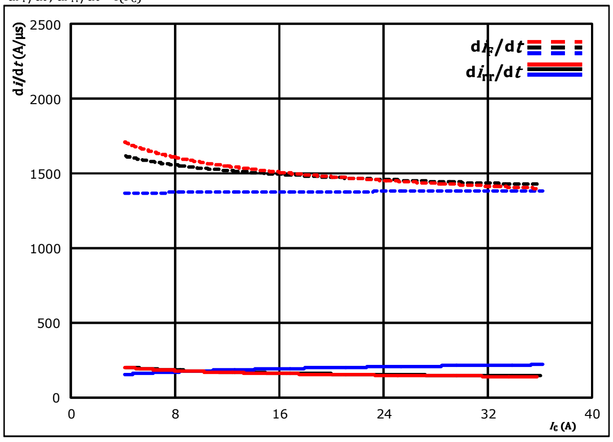
At				
V_{CE} =	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
I_C =	20	A		150 °C

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)

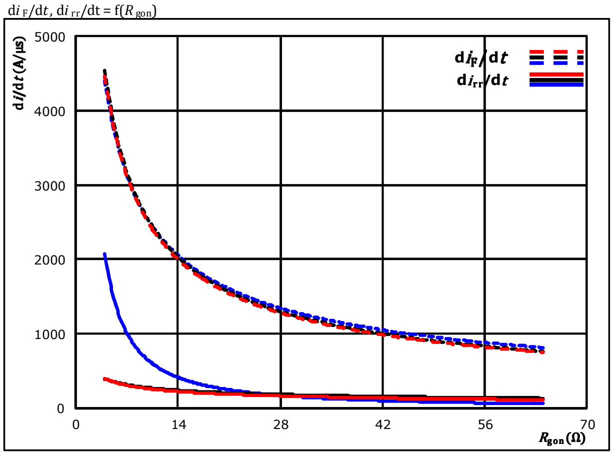


At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	16	Ω		150	°C

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})

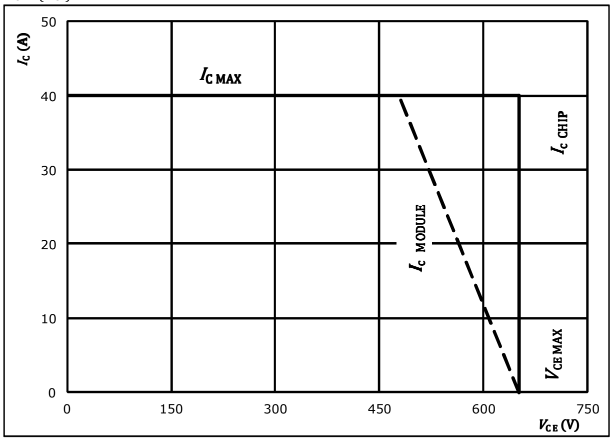


At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C=	20	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

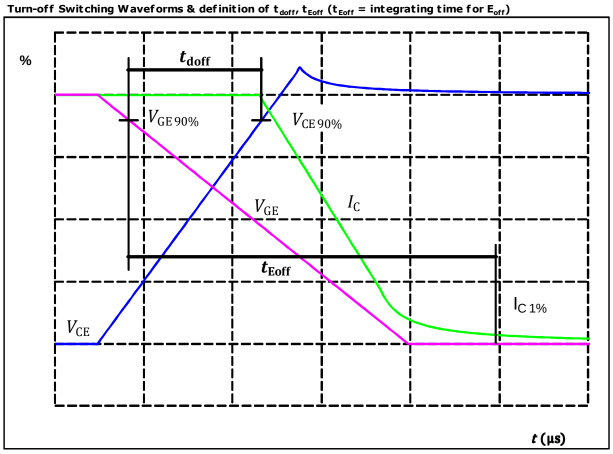
Buck Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. IGBT

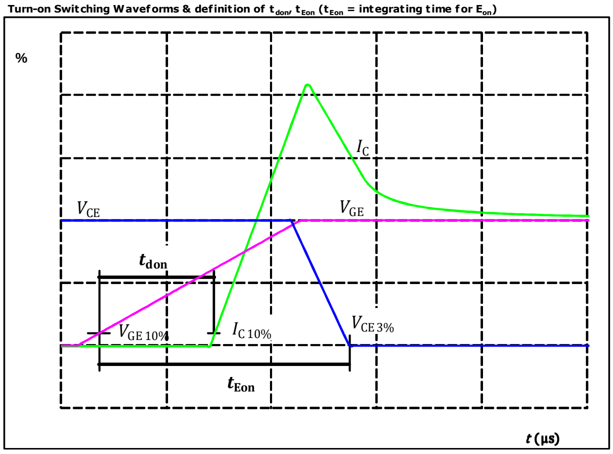
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_{doff} =	67	ns

figure 2. IGBT

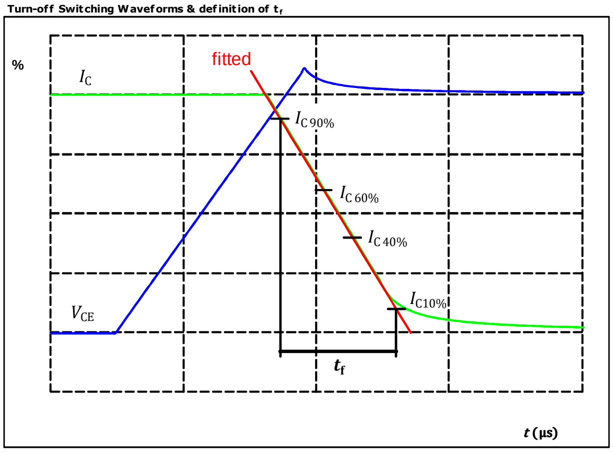
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_{don} =	36	ns

figure 3. IGBT

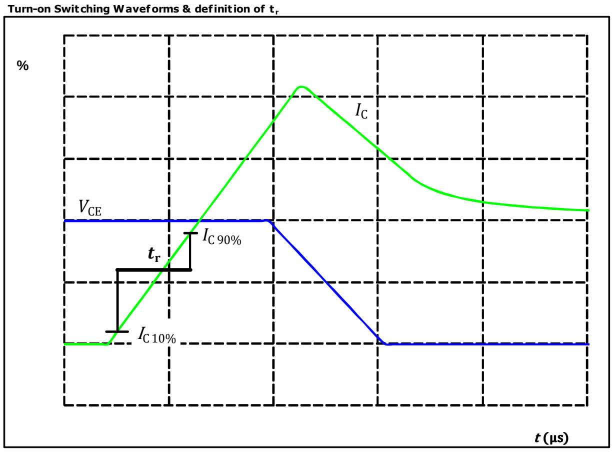
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_f =	12	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

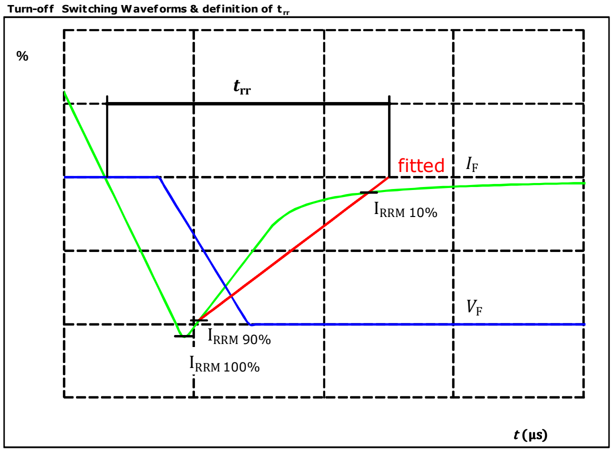


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_r =	10	ns

Buck Switching Characteristics

figure 5. **FWD**

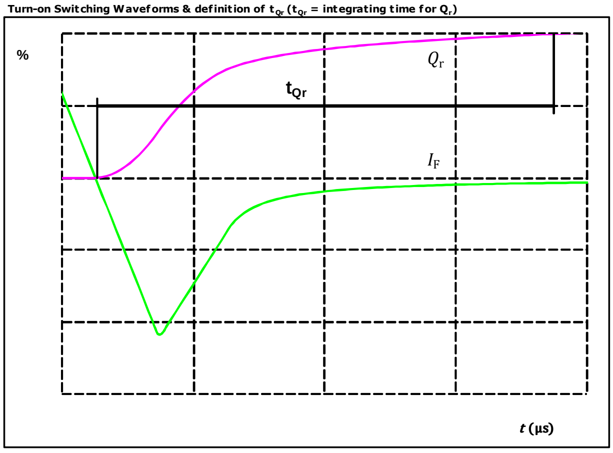
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	20	A
I_{RRM} (100%) =	17	A
t_{rr} =	115	ns

figure 6. **FWD**

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



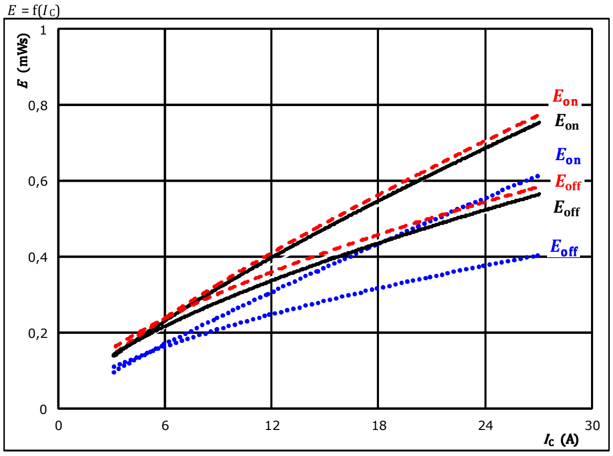
I_F (100%) =	20	A
Q_r (100%) =	1,15	µC

Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



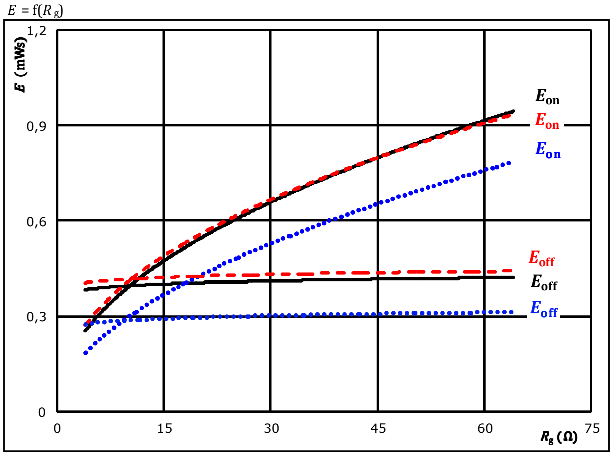
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed
R_{goff} =	16	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



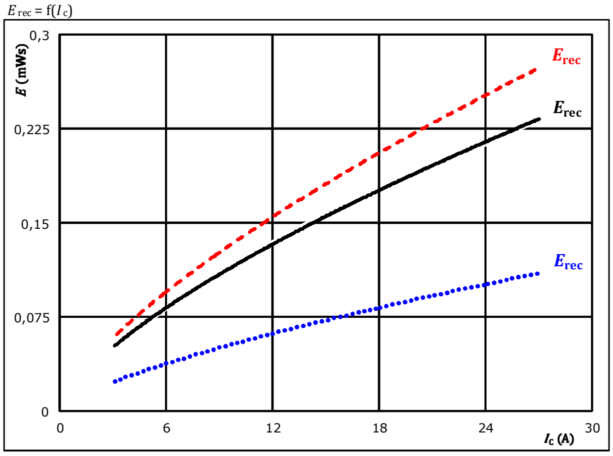
With an inductive load at

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

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



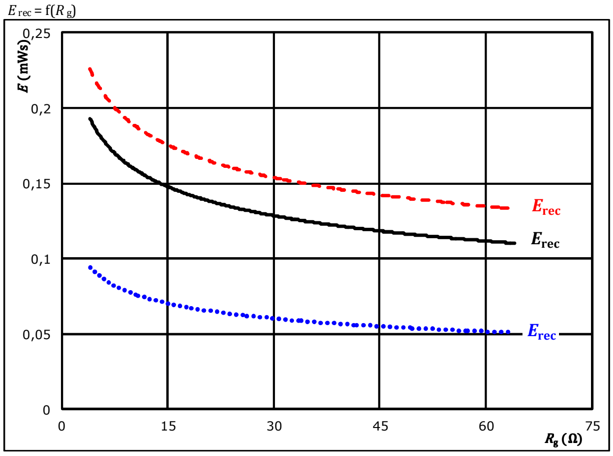
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	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

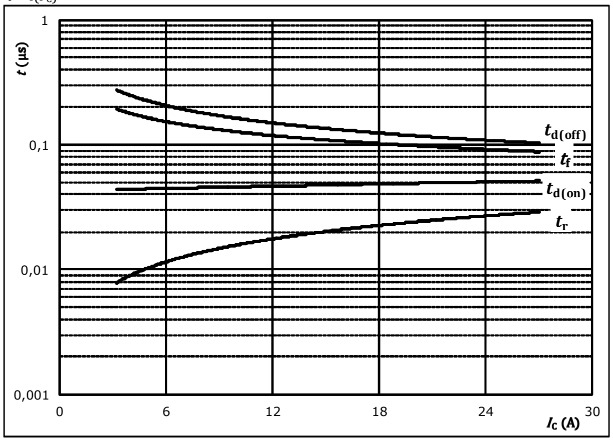
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	15	A		150 °C	dashed

Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



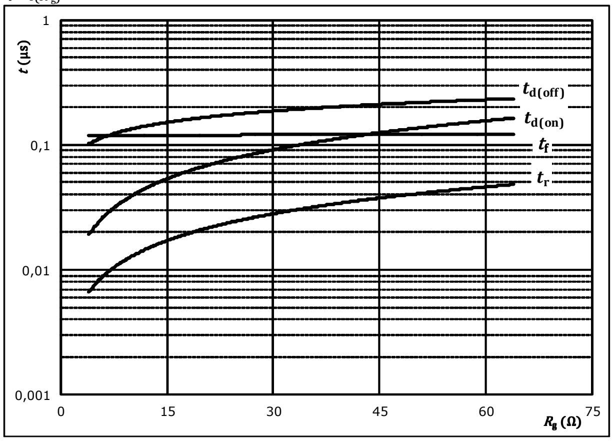
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



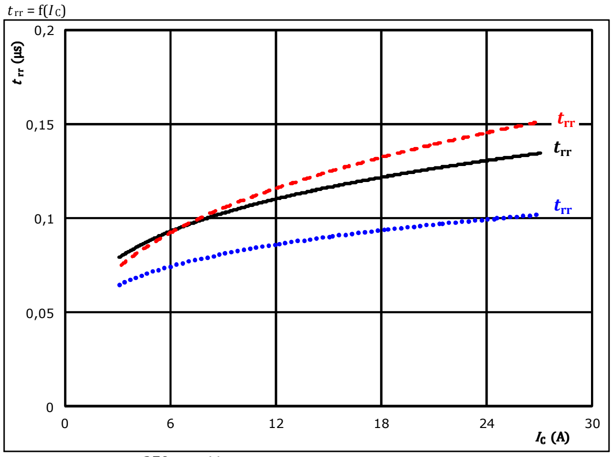
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

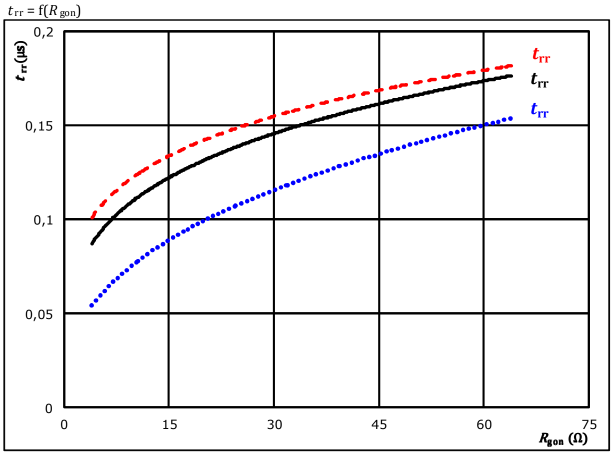


At					
V_{CE}=	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	16	Ω		150	°C

figure 8. **FWD**

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

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



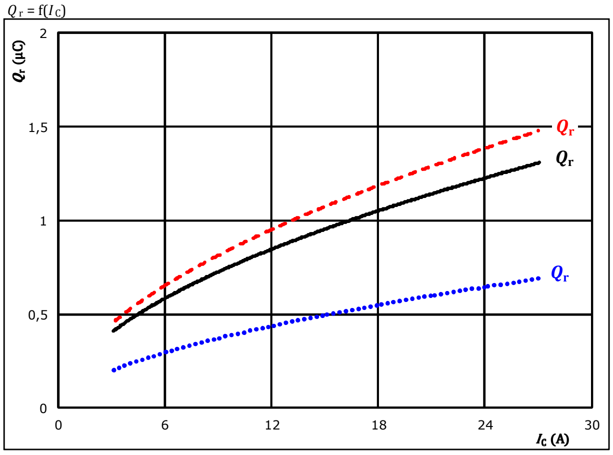
At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C =	15	A		150	°C

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

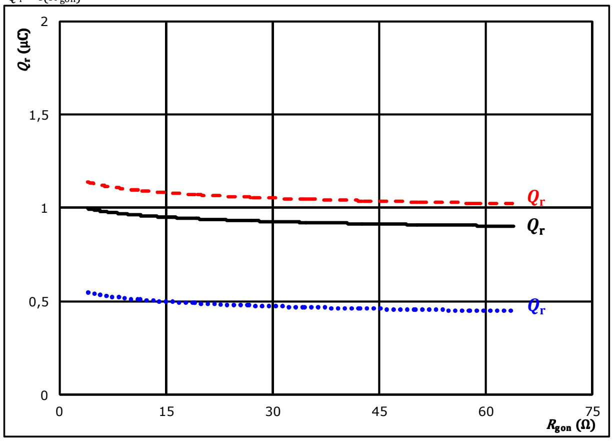


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 10. FWD

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

$Q_r = f(R_{gon})$

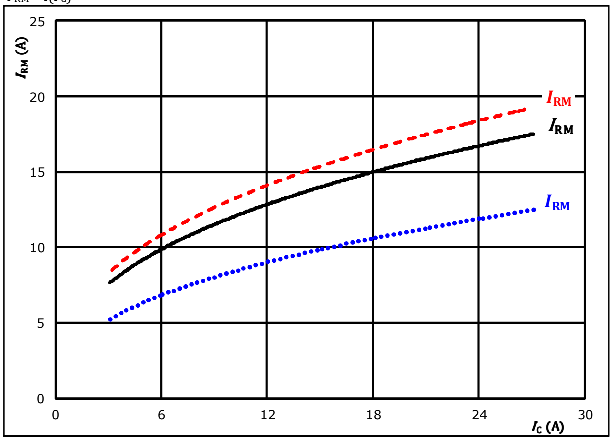


At				
V_{CE}=	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C=	15	A		150 °C

figure 11. FWD

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

$I_{RM} = f(I_C)$

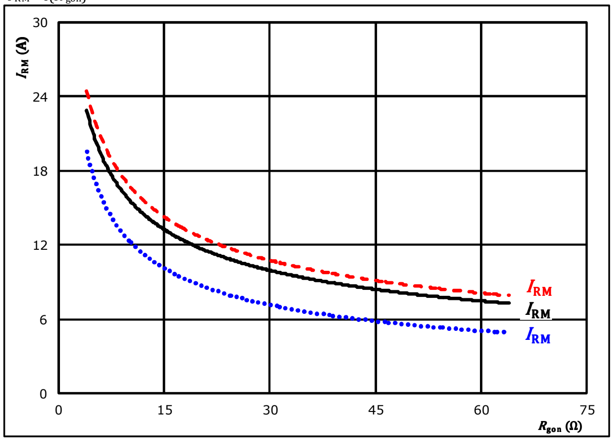


At				
V_{CE}:	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 12. FWD

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

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



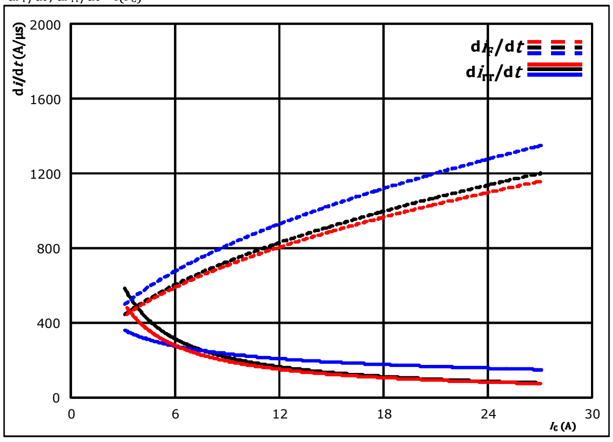
At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	15	A		150 °C

Boost Switching Characteristics

figure 13. **FWD**

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

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

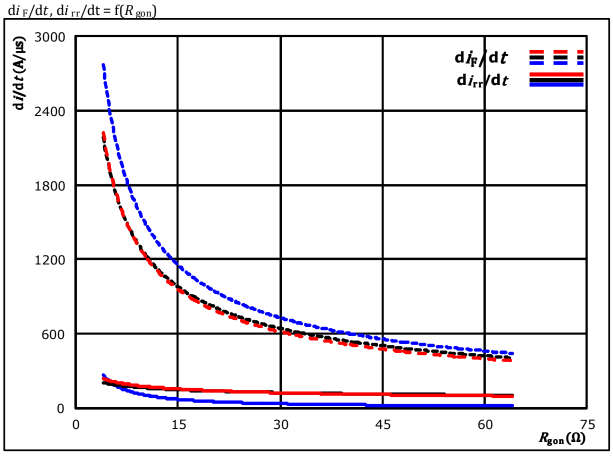


At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	16	Ω		150	°C

figure 14. **FWD**

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

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

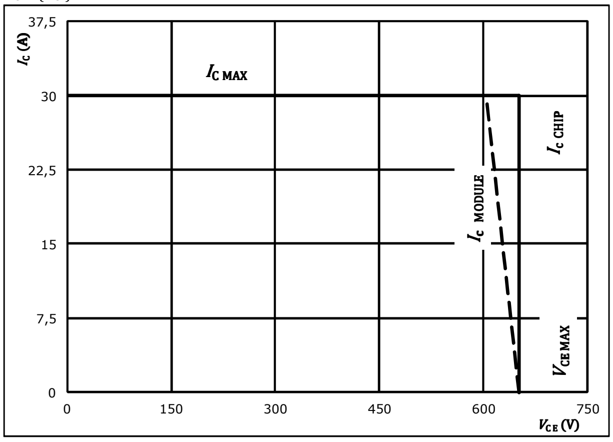


At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C =	15	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



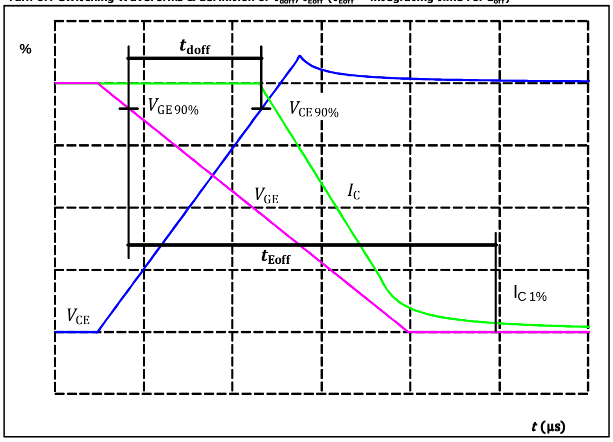
At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Boost Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. IGBT

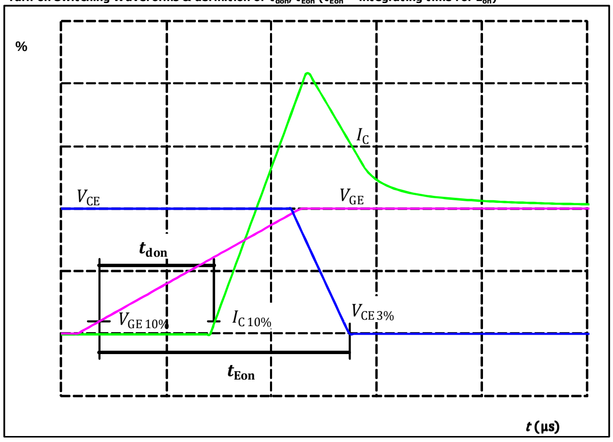
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	15	A
t_{doff} =	133	ns

figure 2. IGBT

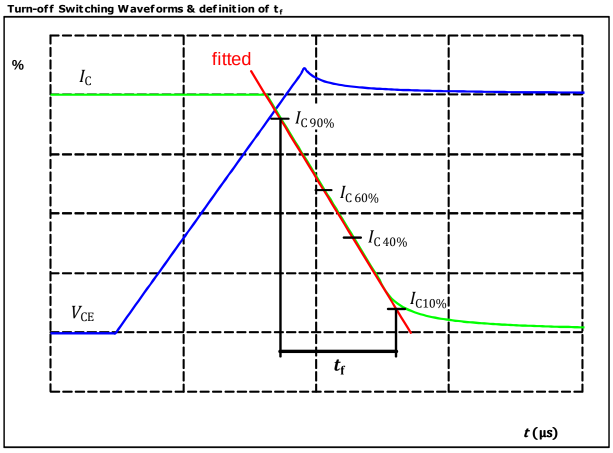
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	15	A
t_{don} =	47	ns

figure 3. IGBT

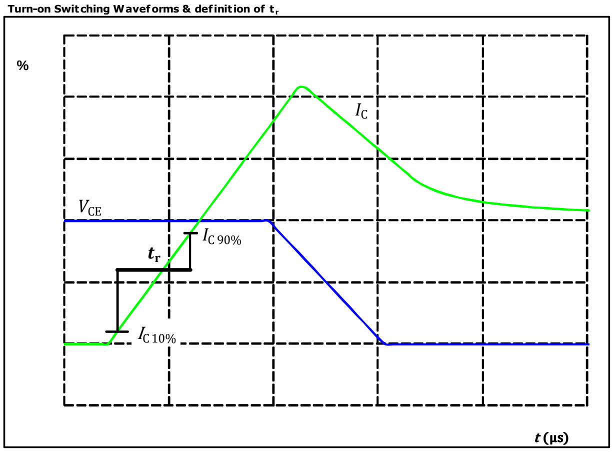
Turn-off Switching Waveforms & definition of t_f



V_C(100%) =	350	V
I_C(100%) =	15	A
t_f =	106	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

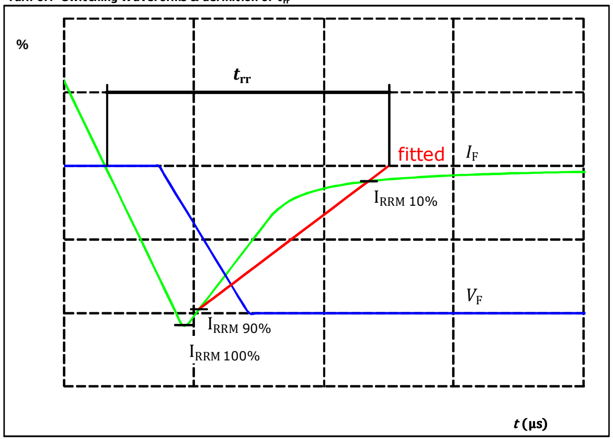


V_C(100%) =	350	V
I_C(100%) =	15	A
t_r =	21	ns

Boost Switching Characteristics

figure 5. **FWD**

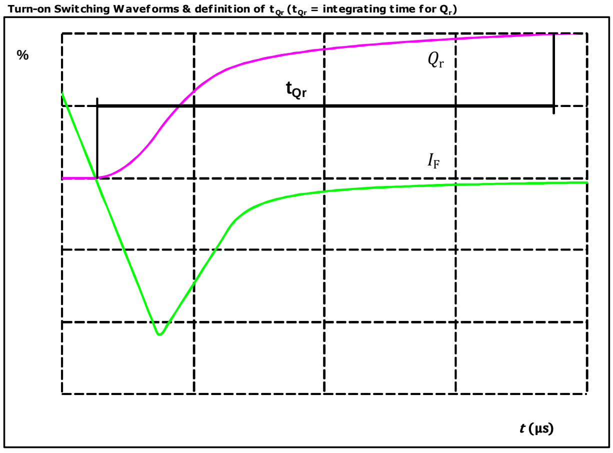
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	15	A
I_{RRM} (100%) =	13	A
t_{rr} =	115	ns

figure 6. **FWD**

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



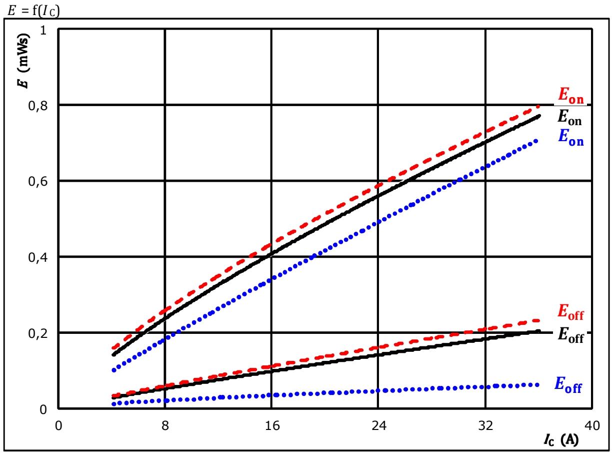
I_F (100%) =	15	A
Q_r (100%) =	0,96	µC

Input Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



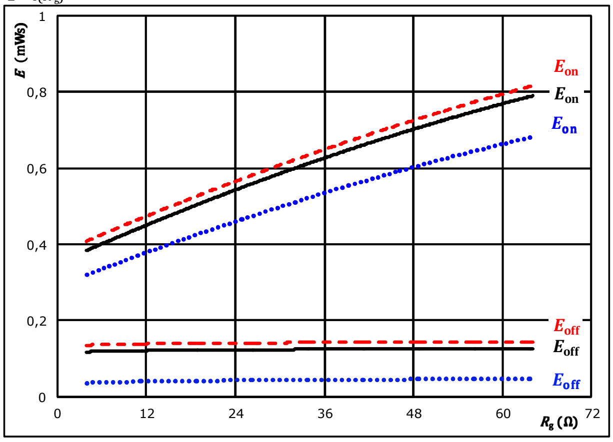
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed
R_{goff} =	16	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



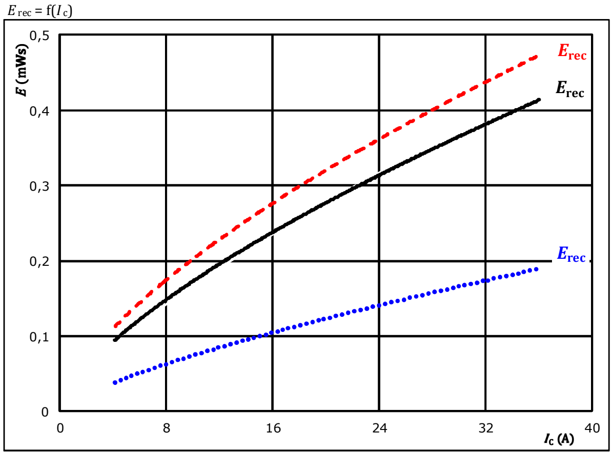
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	20	A		150 °C	dashed

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



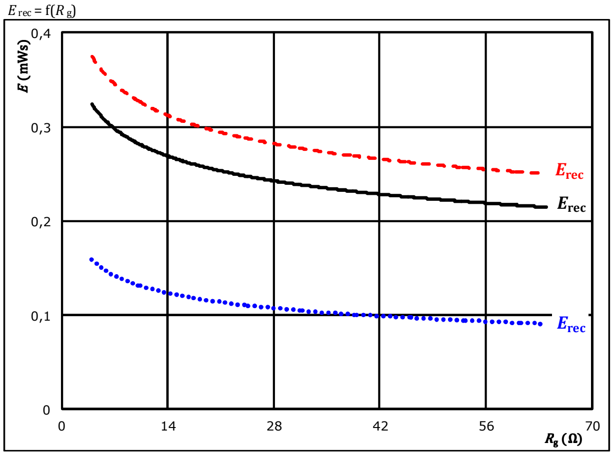
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	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

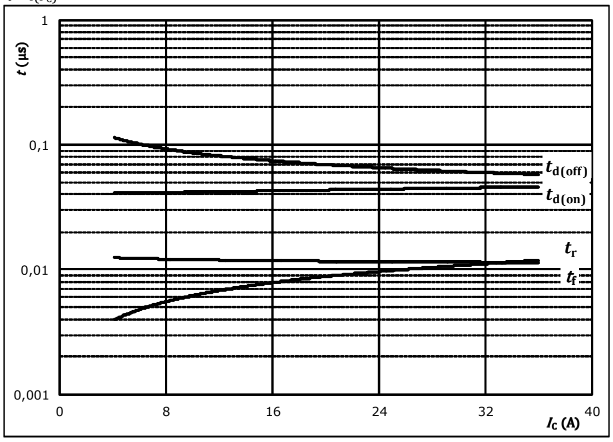
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	20	A		150 °C	dashed

Input Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



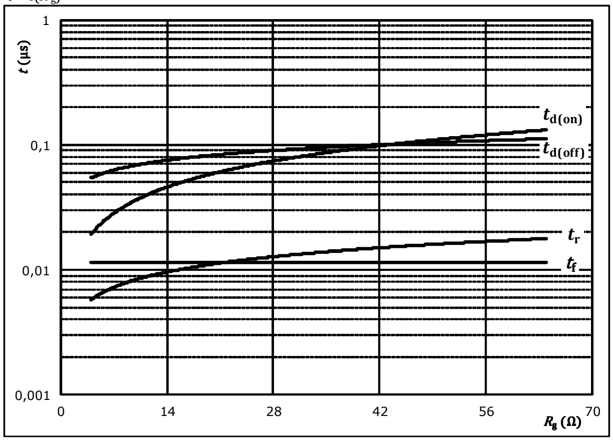
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



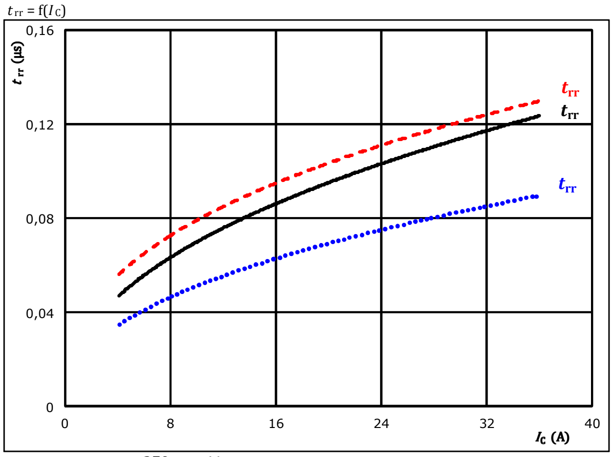
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	20	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

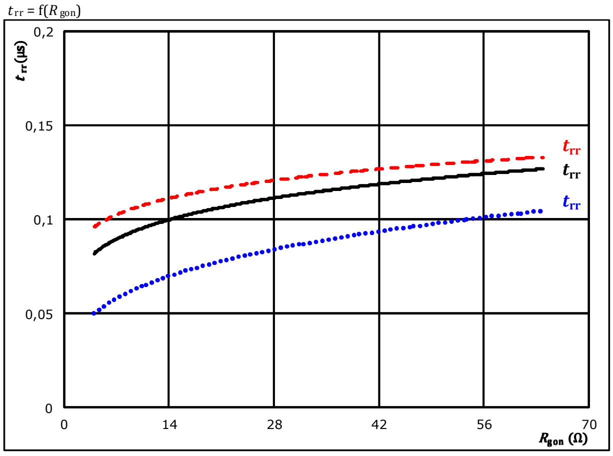


At						
V_{CE}=	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed

figure 8. FWD

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

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



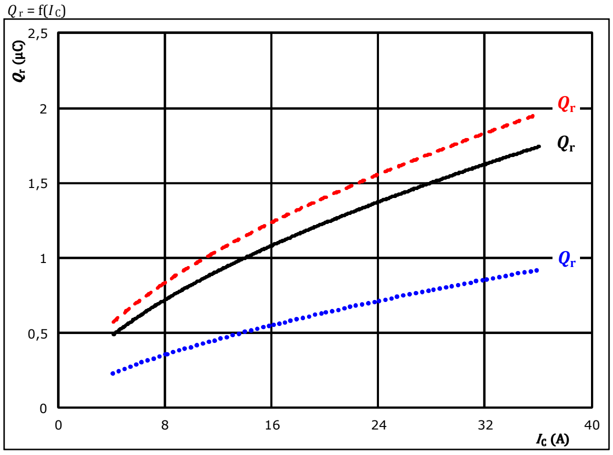
At					
V_{CE} =	350	V		25 °C
V_{GE} =	±15	V	T_j:	125 °C
I_C =	20	A		150 °C

Input Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

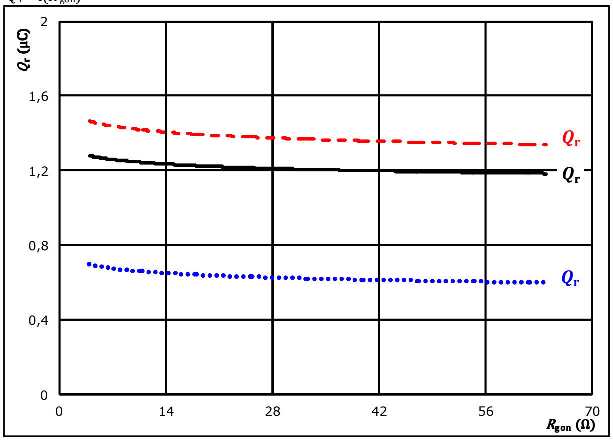


At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

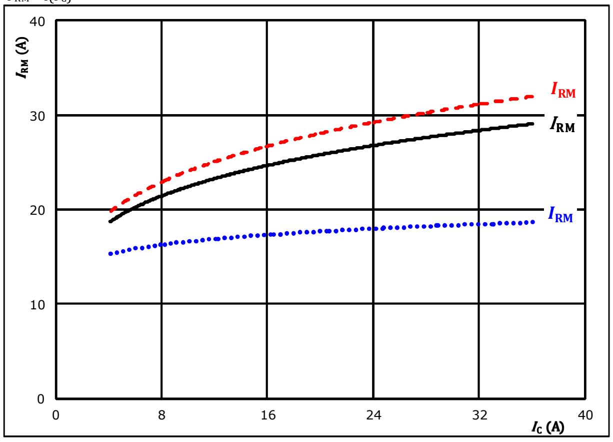


At					
V_{CE}=	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
I_C=	20	A		150 °C	dashed

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

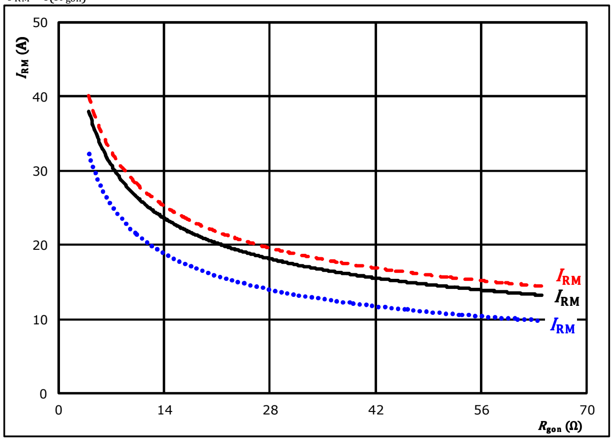


At					
V_{CE}:	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed

figure 12. **FWD**

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

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



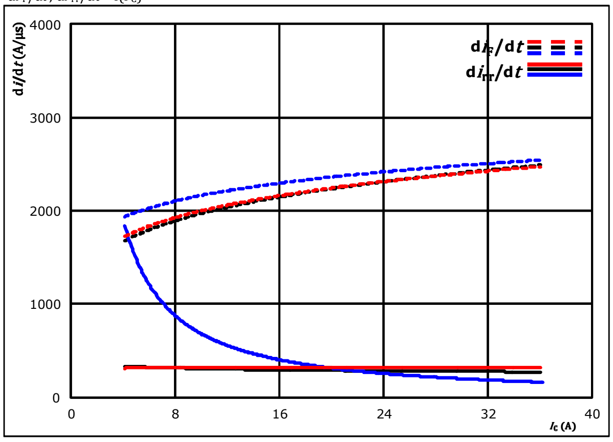
At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
I_C =	20	A		150 °C	dashed

Input Boost Switching Characteristics

figure 13. FWD

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

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

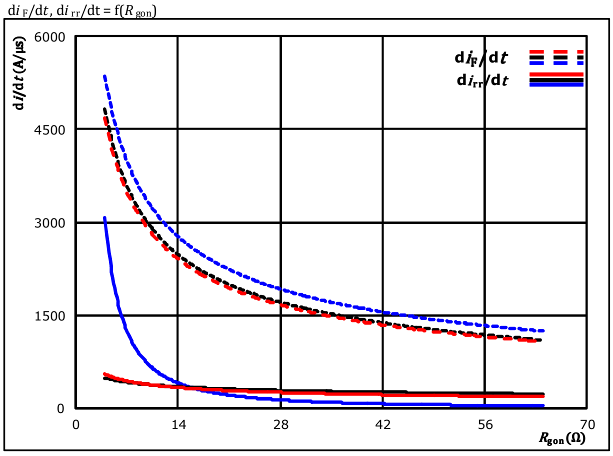


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 14. FWD

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

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

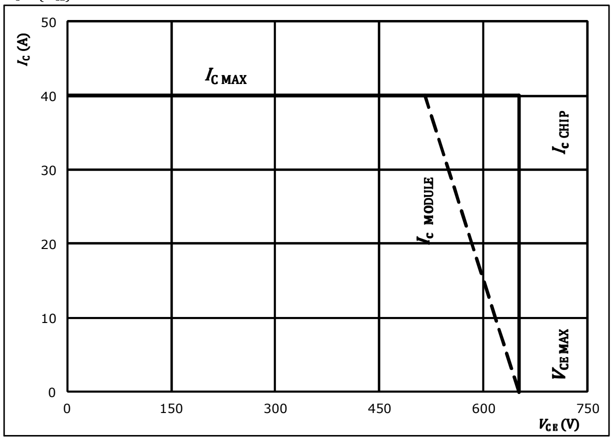


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	20	A		150 °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



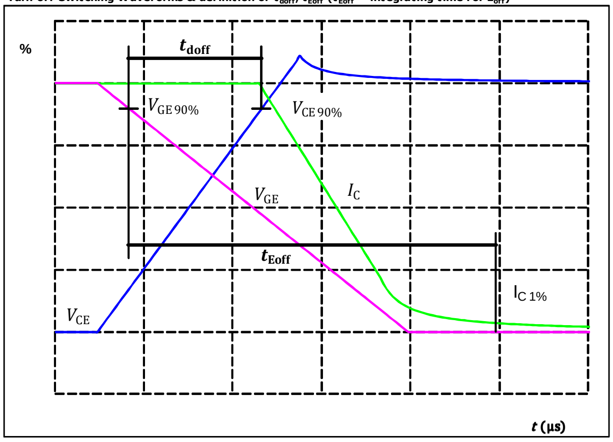
At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Input Boost Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. IGBT

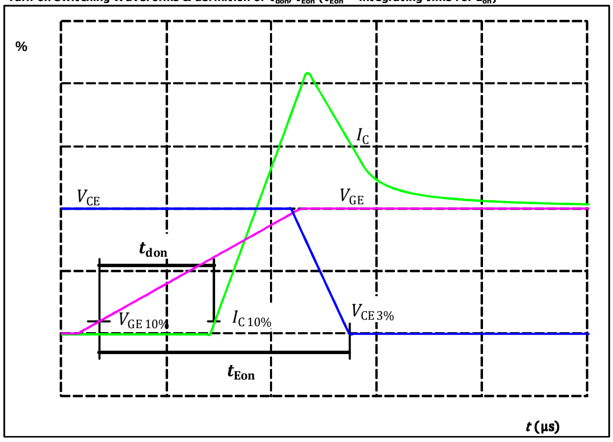
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_{doff} =	67	ns

figure 2. IGBT

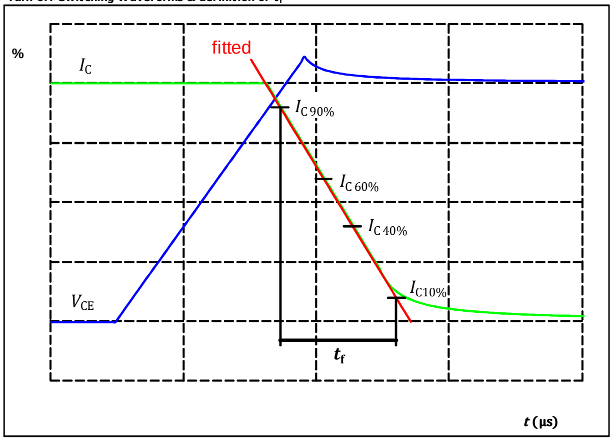
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_{don} =	44	ns

figure 3. IGBT

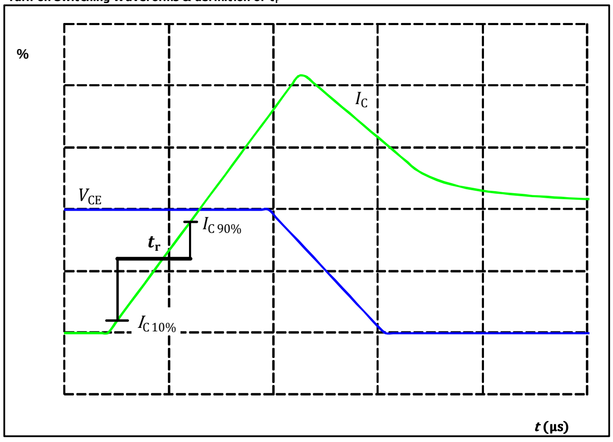
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_f =	11	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

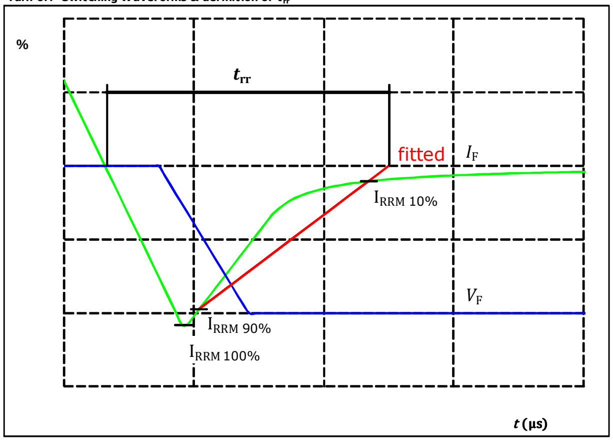


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	20	A
t_r =	9	ns

Input Boost Switching Characteristics

figure 5. **FWD**

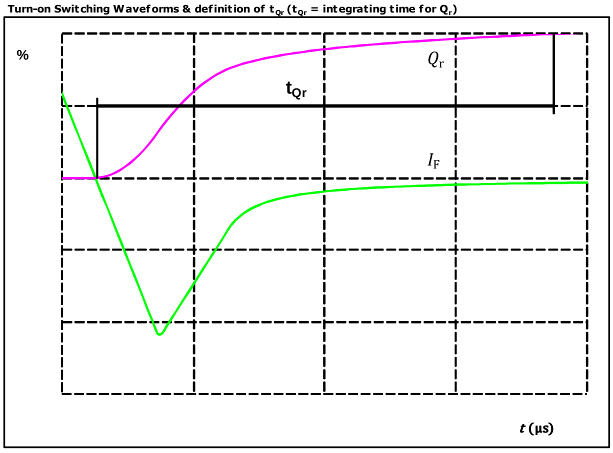
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	20	A
I_{RRM} (100%) =	24	A
t_{rr} =	101	ns

figure 6. **FWD**

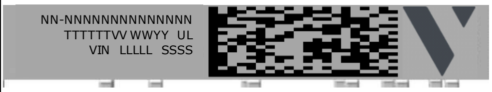
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	20	A
Q_r (100%) =	1,26	µC

Ordering Code & Marking

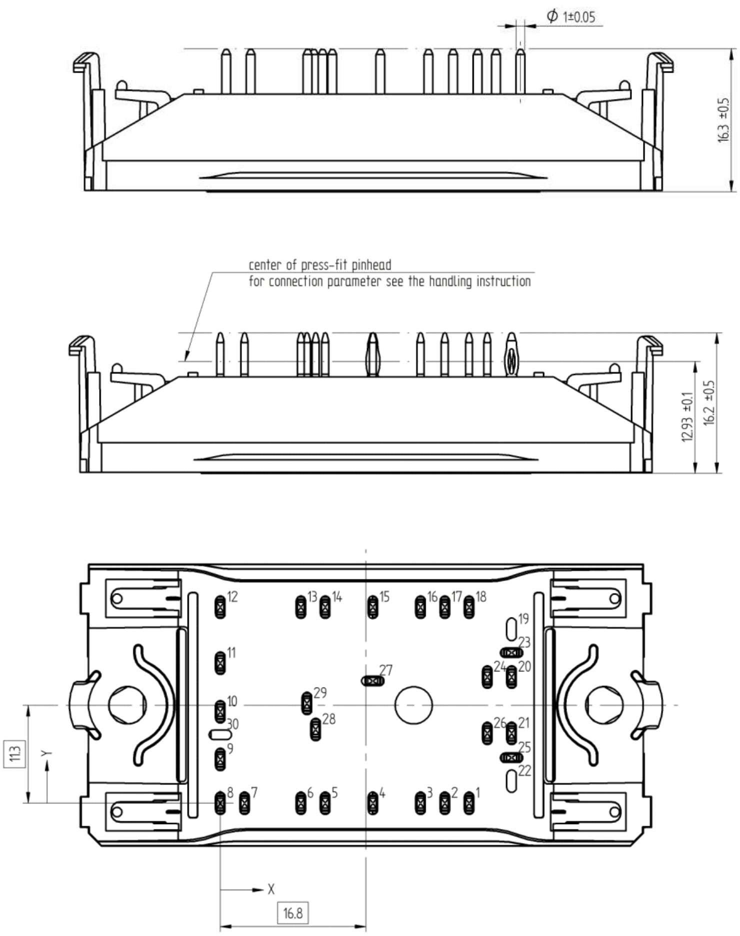
Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FZ07BVA020SM-LD44E08
with thermal paste 12 mm housing with solder pins	10-FZ07BVA020SM-LD44E08-/3/
without thermal paste 12 mm housing with press-fit pins	10-PZ07BVA020SM-LD44E08Y
with thermal paste 12 mm housing with press-fit pins	10-PZ07BVA020SM-LD44E08Y-/3/



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

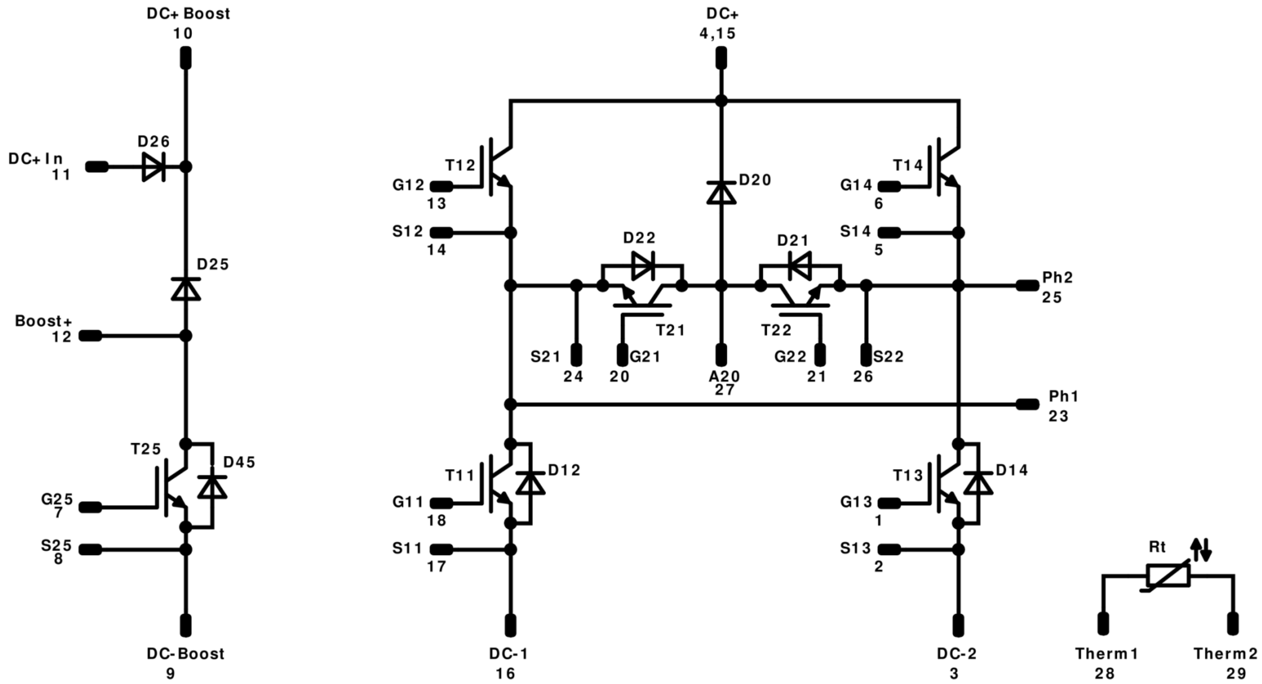
Outline

Pin	X	Y	Function
1	28,7	0	G13
2	25,9	0	S13
3	23,1	0	DC-2
4	17,6	0	DC+
5	12,1	0	S14
6	9,3	0	G14
7	2,8	0	G25
8	0	0	S25
9	0	5,05	DC-Boost
10	0	10,55	DC+Boost
11	0	16,15	DC+In
12	0	22,6	Boost+
13	9,3	22,6	G12
14	12,1	22,6	S12
15	17,6	22,6	DC+
16	23,1	22,6	DC-1
17	25,9	22,6	S11
18	28,7	22,6	G11
19	Not assembled		
20	33,6	14,55	G21
21	33,6	8,05	G22
22	Not assembled		
23	33,6	17,35	Ph1
24	30,8	14,55	S21
25	33,6	5,25	Ph2
26	30,8	8,05	S22
27	17,6	14,1	A20
28	11	8,5	Therm1
29	10	11,5	Therm2
30	Not assembled		



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

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14	IGBT	650 V	20 A	Low Buck Switch / High Buck Switch	
D21, D22	FWD	650 V	15 A	Buck Diode	
T21, T22	IGBT	650 V	15 A	Boost Switch	
D12, D14, D20	FWD	650 V	15 A	Low Boost Diode / High Boost Diode	
T25	IGBT	650 V	20 A	Input Boost Switch	
D25	FWD	650 V	20 A	Input Boost Diode	
D26	Rectifier	1600 V	25 A	ByPass Diode	
D45	FWD	650 V	6 A	Input Boost Sw. Protection Diode	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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-xZ07BVA020SM-LD44E08x-D2-14	04 Apr. 2018	Added Protection Diode, corrected Dynamic values	All