



flowNPC S3

650 V / 300 A

Features

- Three-level high efficient topology
- Compact and low inductive design
- Integrated NTC
- High speed IGBT

Target applications

- UPS

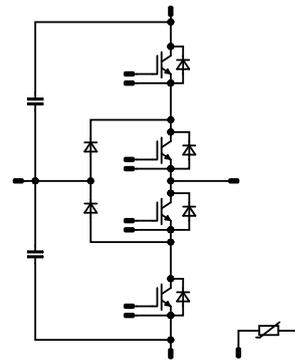
Types

- B0-SP07NIA300S5-LM38F58T

flow S3 12 mm housing



Schematic





Vincotech

B0-SP07NIA300S5-LM38F58T
datasheet

Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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Buck Switch

Collector-emitter voltage	V_{CES}		650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	211	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	291	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C

Buck Diode

Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	217	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	278	W
Maximum junction temperature	T_{jmax}		175	°C

Boost Switch

Collector-emitter voltage	V_{CES}		650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	211	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	291	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C



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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	217	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	278	W
Maximum junction temperature	T_{jmax}		175	°C

Boost Sw. Inv. Diode

Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	217	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	278	W
Maximum junction temperature	T_{jmax}		175	°C

Capacitor (DC)

Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55 ... 150	°C

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{jop}		-40...+($T_{jmax} - 25$)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			10,35	mm
Clearance			7,81	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



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datasheet

Characteristic Values

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

Buck Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,003	25	3,2	4	4,8	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		300	25 125 150		1,43 1,52 1,55	1,75 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	650		25			200	μA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}							18000		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	0	25		25		520		pF
Reverse transfer capacitance	C_{res}							68		pF
Gate charge	Q_g	$V_{CC} = 520$ V	15		300	25		656		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						0,33		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		88,96 91,2 92,16		ns
Rise time	t_r					25 125 150		19,84 21,76 22,4		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		105,92 132,8 139,2		ns
Fall time	t_f					25 125 150		20,2 27,34 29,64		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tfwd} = 5,58$ μC $Q_{tfwd} = 11,73$ μC $Q_{tfwd} = 13,36$ μC				25 125 150		0,893 1,34 1,43		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,48 3,86 4,42		mWs



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datasheet

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max		
Buck Diode										
Static										
Forward voltage	V_F				300	25 125 150		1,53 1,49 1,46	1,92 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 650$ V				25			15,2	μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						0,34		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		155,22 218,33 230,41		A
Reverse recovery time	t_{rr}					25 125 150		56,96 81,67 90,55		ns
Recovered charge	Q_r	$di/dt=7367$ A/μs $di/dt=7132$ A/μs $di/dt=6860$ A/μs	±15	350	180	25 125 150		5,58 11,73 13,36		μC
Reverse recovered energy	E_{rec}					25 125 150		1,73 3,43 3,83		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		12043 9166 7027		A/μs



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datasheet

Characteristic Values

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

Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,003	25	3,2	4	4,8	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		300	25 125 150		1,43 1,52 1,55	1,75 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	650		25			200	μA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}							18000		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	0	25		25		520		pF
Reverse transfer capacitance	C_{res}							68		pF
Gate charge	Q_g	$V_{CC} = 520$ V	15		300	25		656		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						0,33		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		86,4 88,32 89,28		ns
Rise time	t_r					25 125 150		20,8 23,04 24,64		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		105,28 129,92 135,36		ns
Fall time	t_f					25 125 150		21,01 27,37 29,84		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 5,49$ μC $Q_{tFWD} = 11,25$ μC $Q_{tFWD} = 13,54$ μC				25 125 150		0,679 1,14 1,23		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,58 3,82 4,37		mWs



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datasheet

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max		
Boost Diode										
Static										
Forward voltage	V_F			300	25 125 150		1,53 1,49 1,46	1,92 ⁽¹⁾		V
Reverse leakage current	I_R	$V_r = 650$ V			25			15,2		μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)					0,34			K/W
Dynamic										
Peak recovery current	I_{RRM}				25 125 150		141,65 189,98 199,72			A
Reverse recovery time	t_{rr}				25 125 150		58,8 87,75 100,54			ns
Recovered charge	Q_r	$di/dt=6815$ A/μs $di/dt=6267$ A/μs $di/dt=6189$ A/μs	±15	350	180	25 125 150	5,49 11,25 13,54			μC
Reverse recovered energy	E_{rec}				25 125 150		1,42 2,73 3,21			mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$				25 125 150		12123 8097 5133			A/μs



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Characteristic Values

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

Boost Sw. Inv. Diode

Static

Forward voltage	V_F				300	25 125 150		1,53 1,49 1,46	1,92 ⁽¹⁾	V
Reverse leakage current	I_R	$V_T = 650$ V				25			15,2	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						0,34		K/W
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Capacitor (DC)

Static

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

Thermistor

Static

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

⁽¹⁾ Value at chip level

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

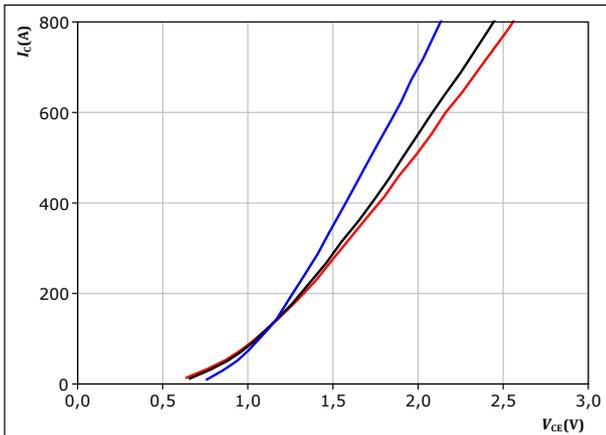


Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

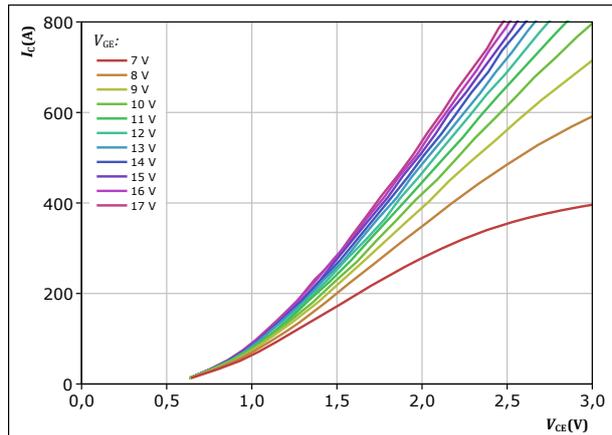


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

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

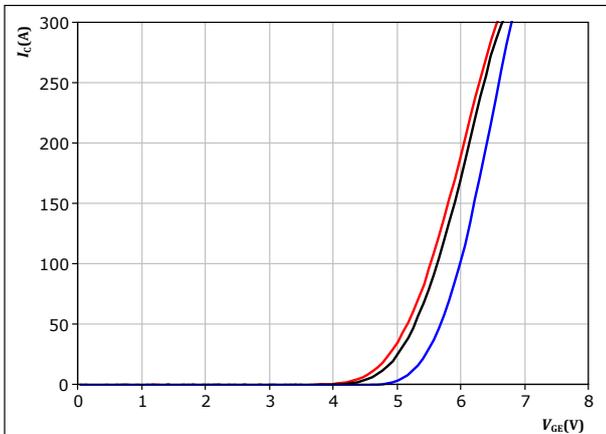


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

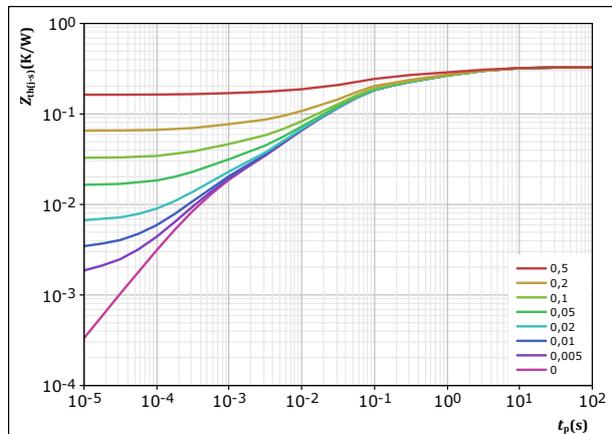


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,326 \text{ K/W}$
IGBT thermal model values

R (K/W)	τ (s)
5,25E-02	4,41E+00
8,00E-02	6,71E-01
1,45E-01	5,30E-02
3,51E-02	7,06E-03
1,33E-02	5,20E-04

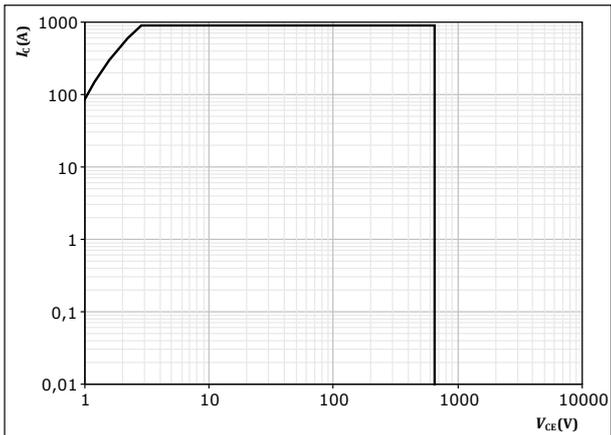


Buck Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$



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



Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

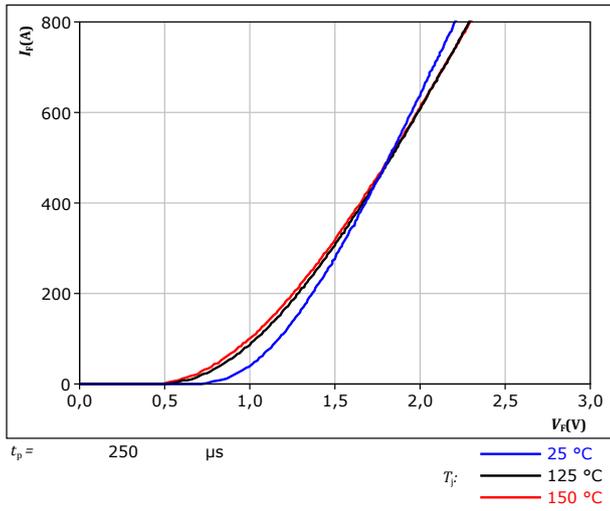
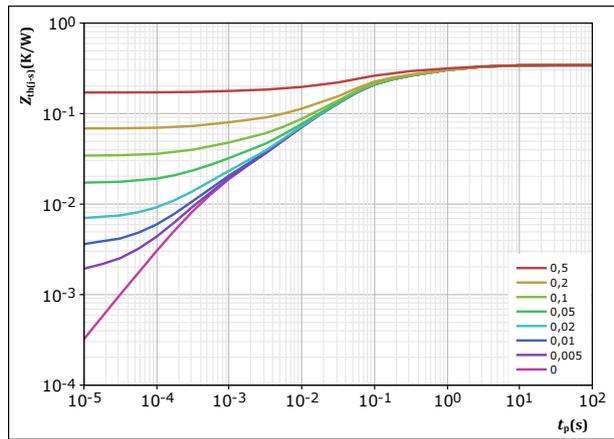


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	0,342	K/W
FWD thermal model values		
R (K/W)	τ (s)	
3,55E-02	2,97E+00	
8,34E-02	5,51E-01	
1,74E-01	5,48E-02	
3,60E-02	6,87E-03	
1,28E-02	5,34E-04	

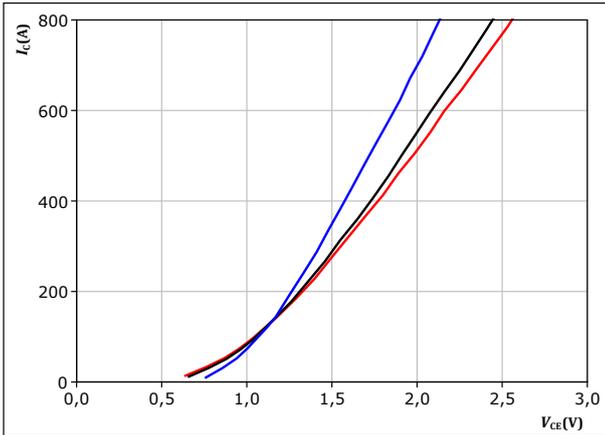


Boost Switch Characteristics

figure 8. IGBT

Typical output characteristics

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



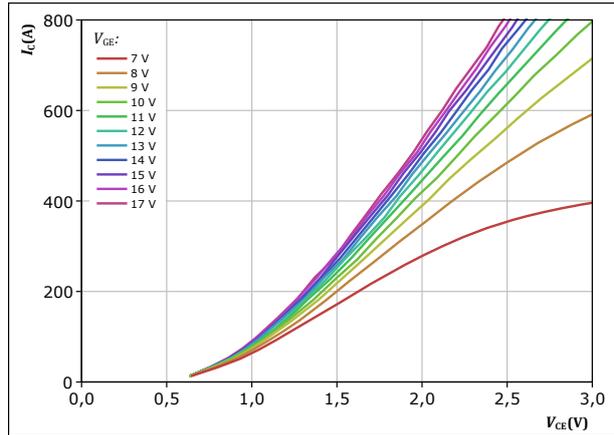
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 9. IGBT

Typical output characteristics

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

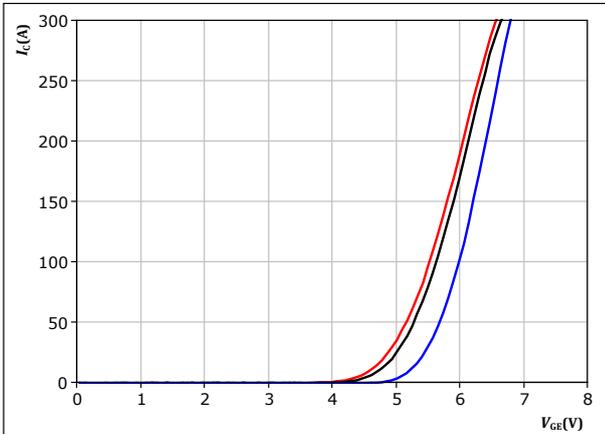


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 10. IGBT

Typical transfer characteristics

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



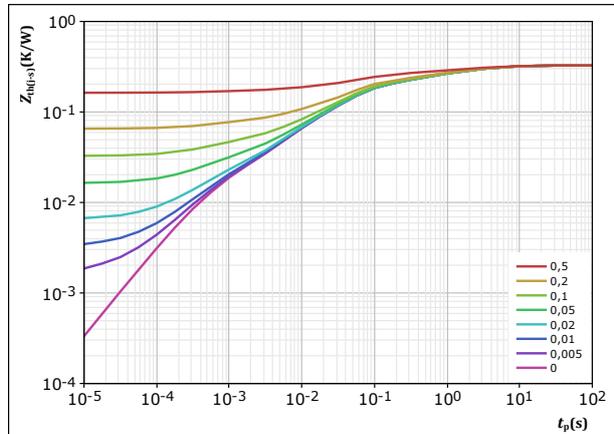
$t_p = 250 \mu s$
 $V_{CE} = 10 V$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,326 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
5,25E-02	4,41E+00
8,00E-02	6,71E-01
1,45E-01	5,30E-02
3,51E-02	7,06E-03
1,33E-02	5,20E-04

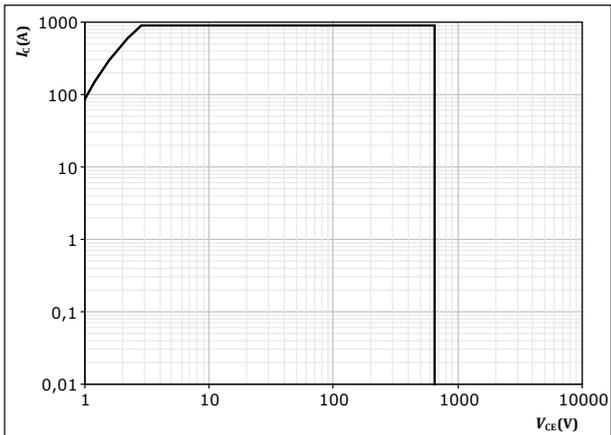


Boost Switch Characteristics

figure 12. IGBT

Safe operating area

$I_C = f(V_{CE})$



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



Boost Diode Characteristics

figure 13. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

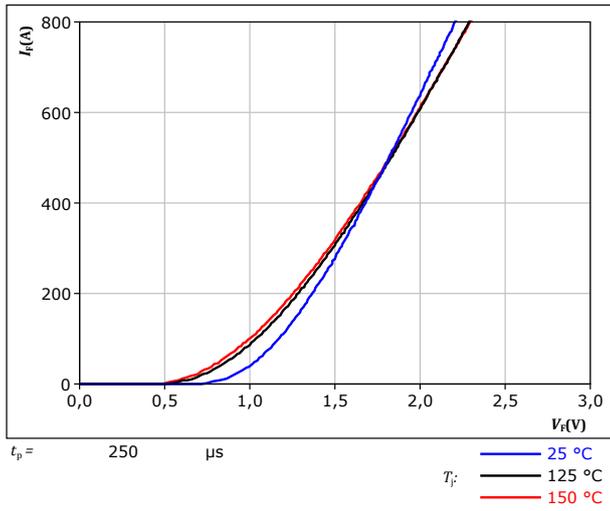
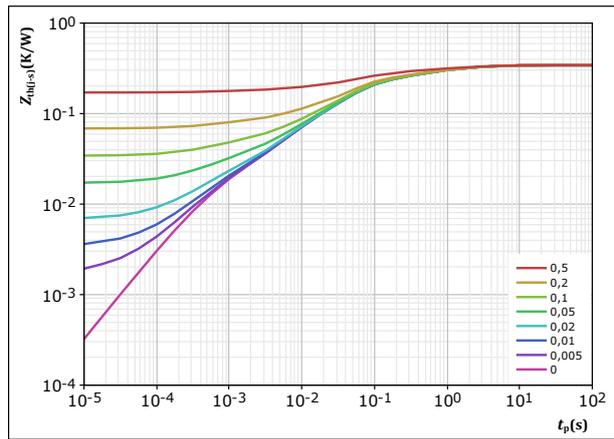


figure 14. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,342$ K/W
 FWD thermal model values

R (K/W)	τ (s)
3,55E-02	2,97E+00
8,34E-02	5,51E-01
1,74E-01	5,48E-02
3,60E-02	6,87E-03
1,28E-02	5,34E-04



Boost Sw. Inv. Diode Characteristics

figure 15. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

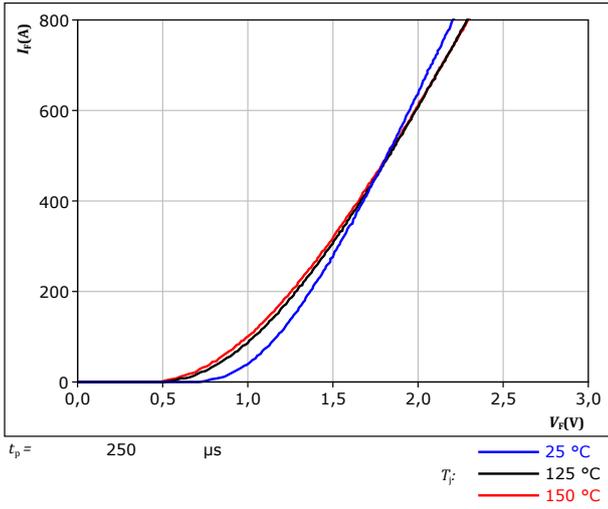
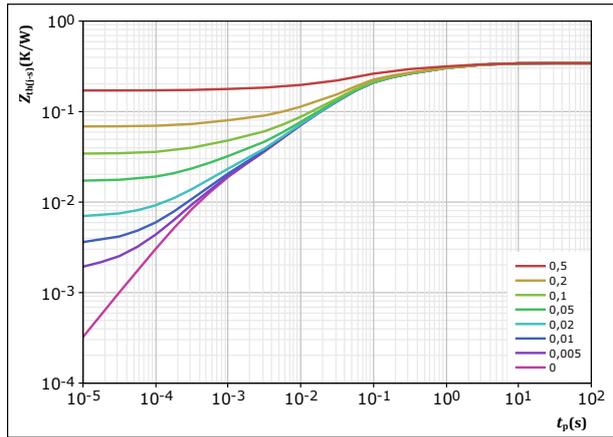


figure 16. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,342$ K/W
 FWD thermal model values

R (K/W)	τ (s)
3,55E-02	2,97E+00
8,34E-02	5,51E-01
1,74E-01	5,48E-02
3,60E-02	6,87E-03
1,28E-02	5,34E-04

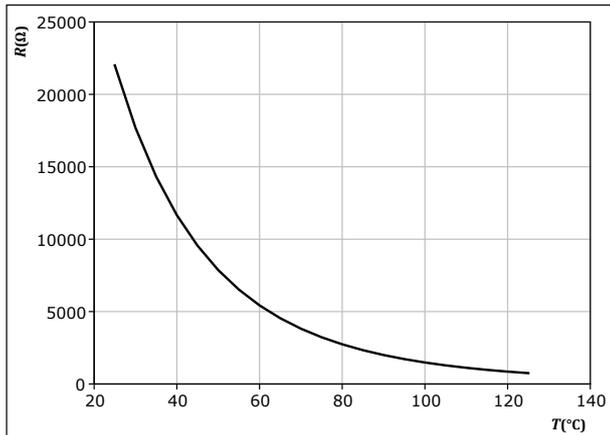


Thermistor Characteristics

figure 17. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

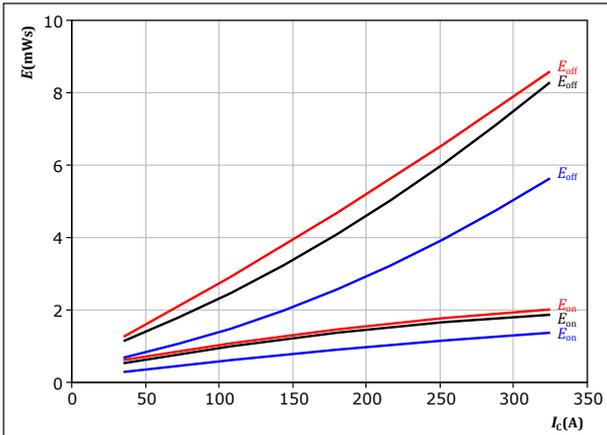




Buck Switching Characteristics

figure 18. IGBT

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

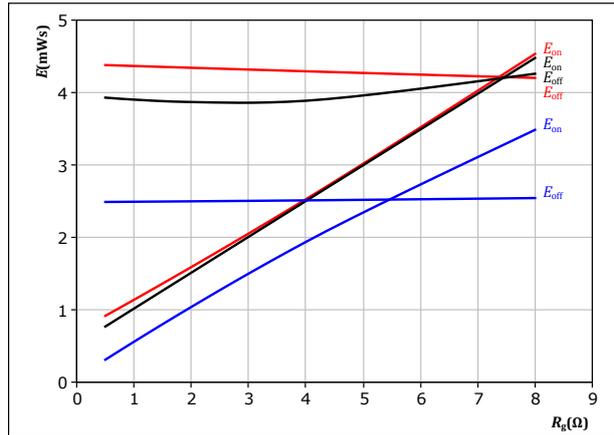


With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 19. IGBT

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

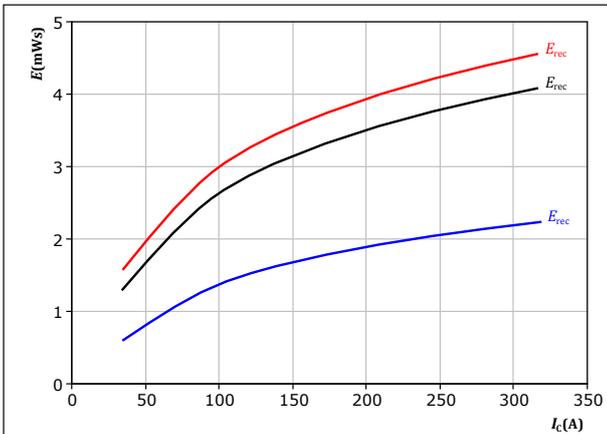


With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 180 \text{ A}$

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 20. FWD

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

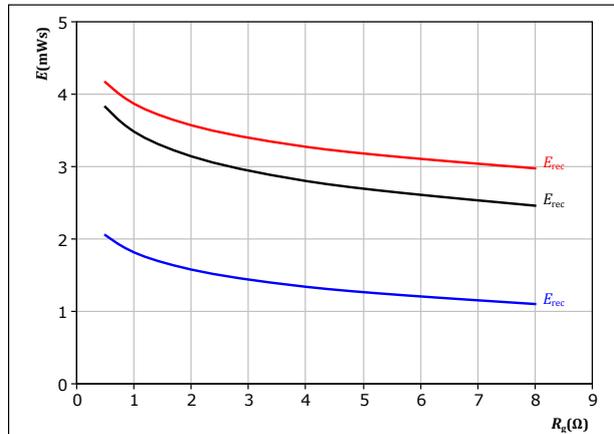


With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 21. FWD

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



With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 180 \text{ A}$

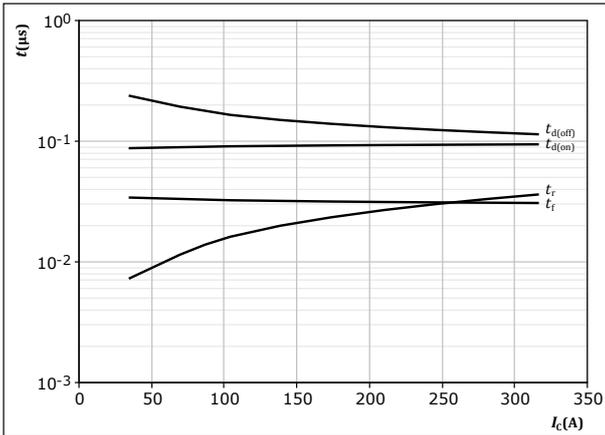
T_j : — 25 °C
 — 125 °C
 — 150 °C



Buck Switching Characteristics

figure 22. IGBT

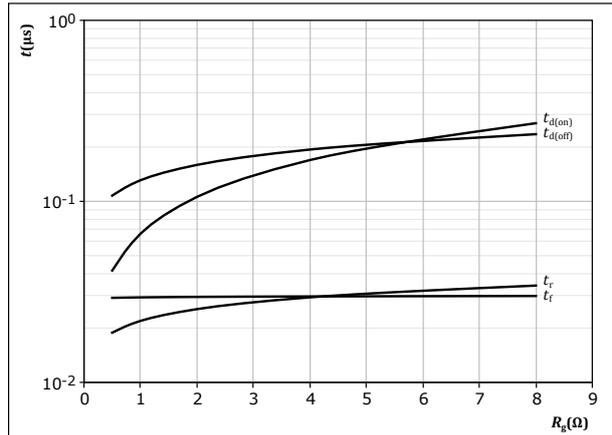
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 23. IGBT

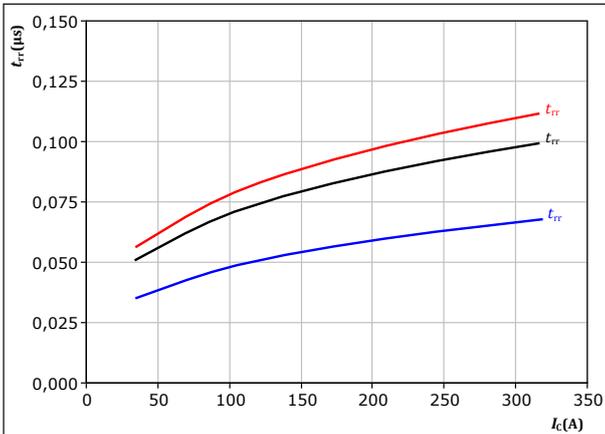
Typical switching times as a function of gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A

figure 24. FWD

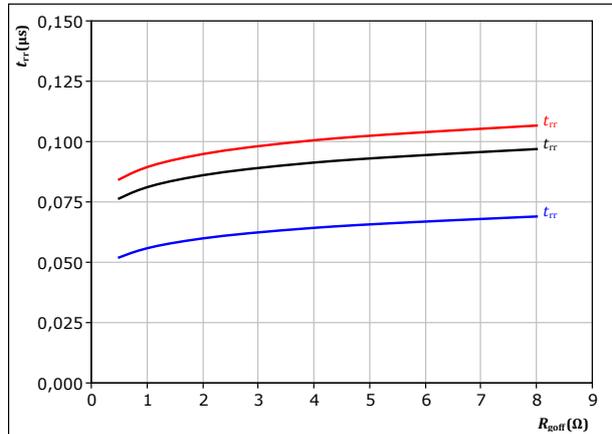
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 T_j : — 25 °C
— 125 °C
— 150 °C

figure 25. FWD

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



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A
 T_j : — 25 °C
— 125 °C
— 150 °C

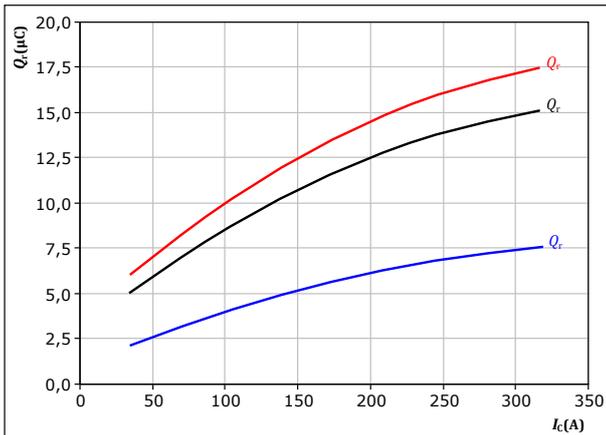


Buck Switching Characteristics

figure 26. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



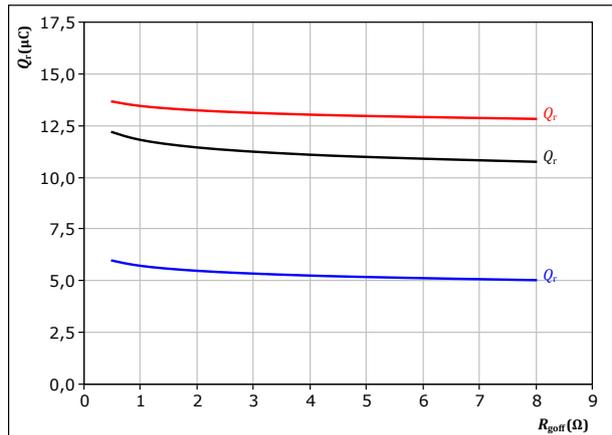
With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{goff} = 2$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 27. FWD

Typical recovered charge as a function of turn off gate resistor

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



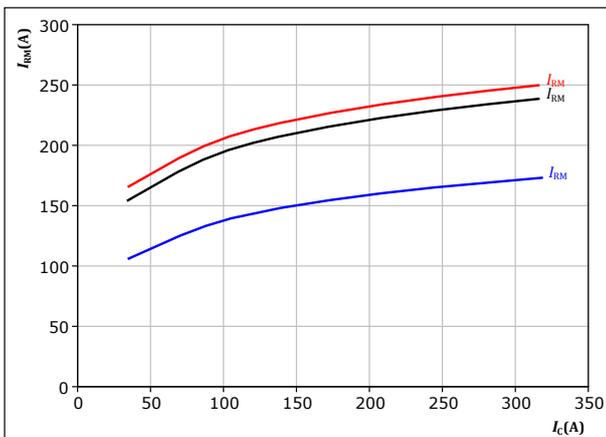
With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 28. FWD

Typical peak reverse recovery current as a function of collector current

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



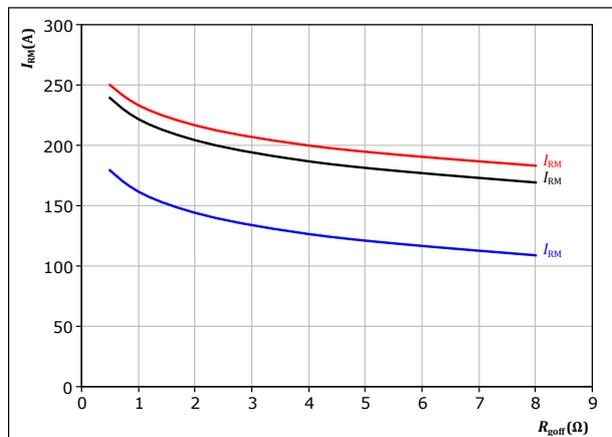
With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{goff} = 2$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 29. FWD

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

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



With an inductive load at

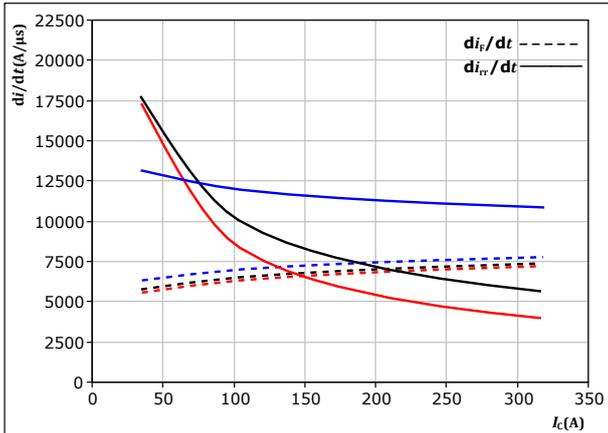
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



Buck Switching Characteristics

figure 30. FWD

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

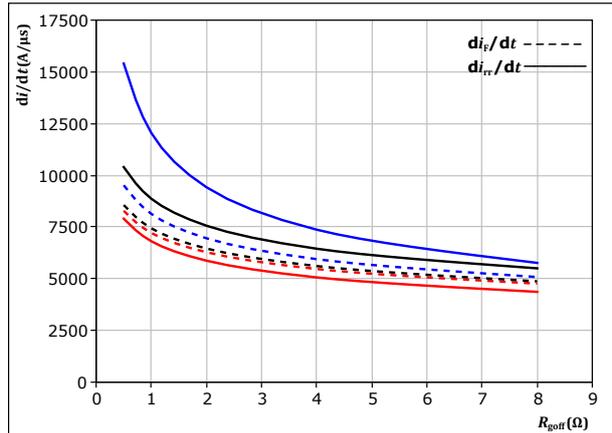


With an inductive load at

$V_{CE} =$	350	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{goff} =$	2	Ω		150 °C

figure 31. FWD

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

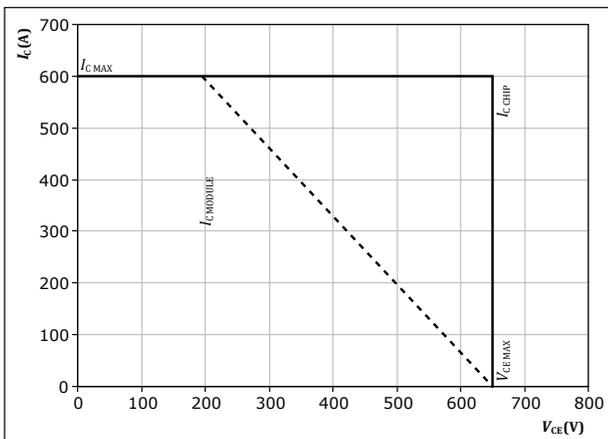


With an inductive load at

$V_{CE} =$	350	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	180	A		150 °C

figure 32. IGBT

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



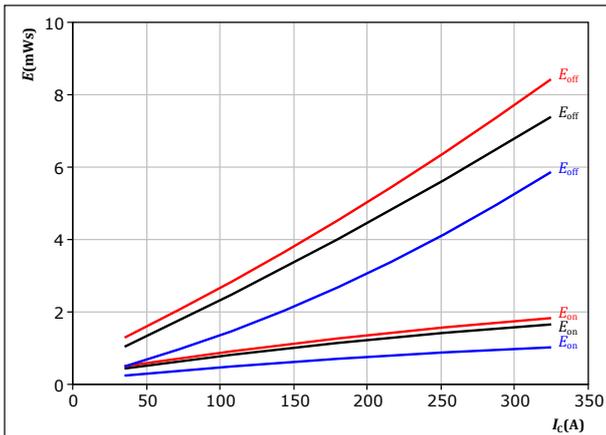
At $T_j = 150$ °C
 $R_{goff} = 2$ Ω
 $R_{goff} = 2$ Ω



Boost Switching Characteristics

figure 33. IGBT

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

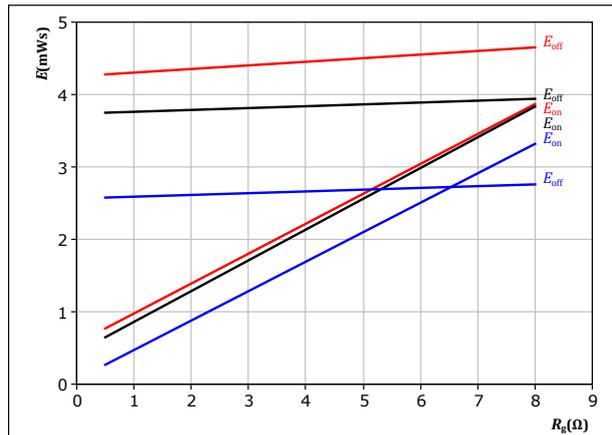


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 34. IGBT

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

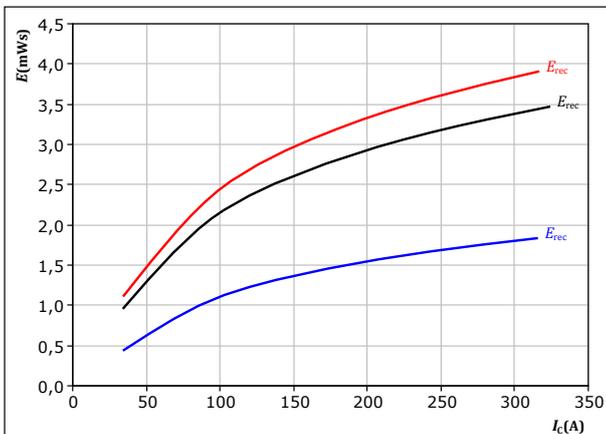


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 35. FWD

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

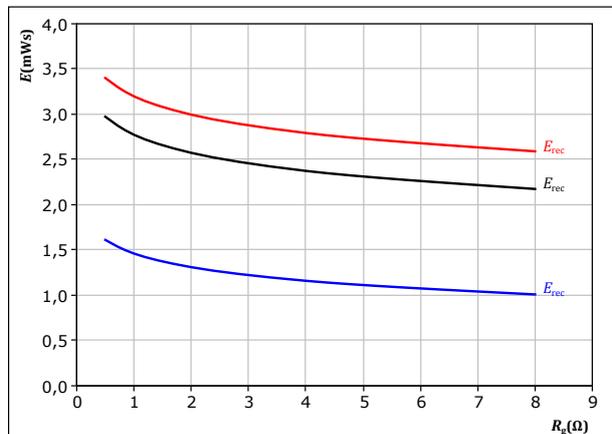


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 36. 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
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A

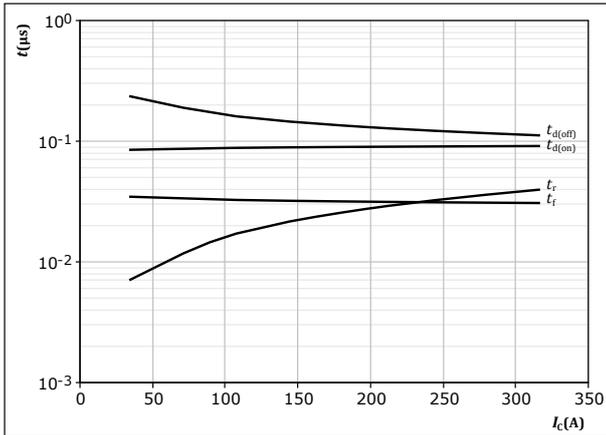
T_j : — 25 °C
 — 125 °C
 — 150 °C



Boost Switching Characteristics

figure 37. IGBT

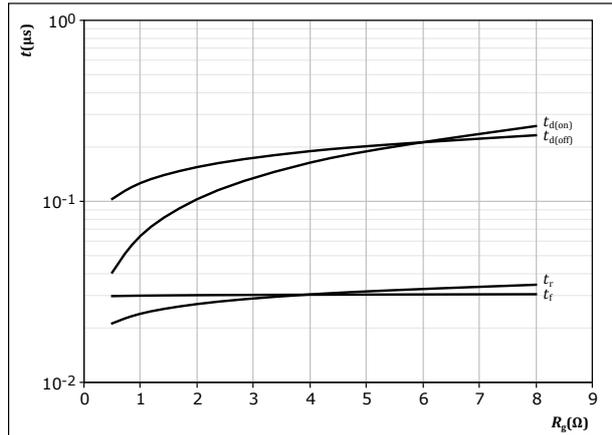
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 38. IGBT

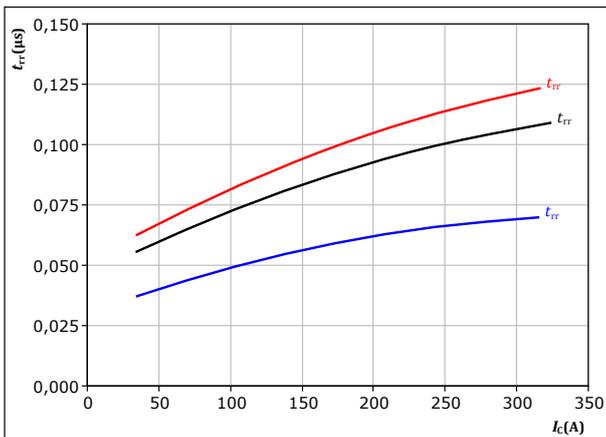
Typical switching times as a function of gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A

figure 39. FWD

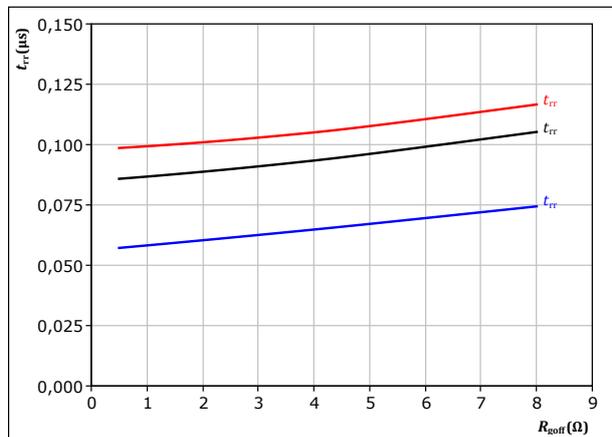
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 T_j : — 25 °C
— 125 °C
— 150 °C

figure 40. FWD

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



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A
 T_j : — 25 °C
— 125 °C
— 150 °C

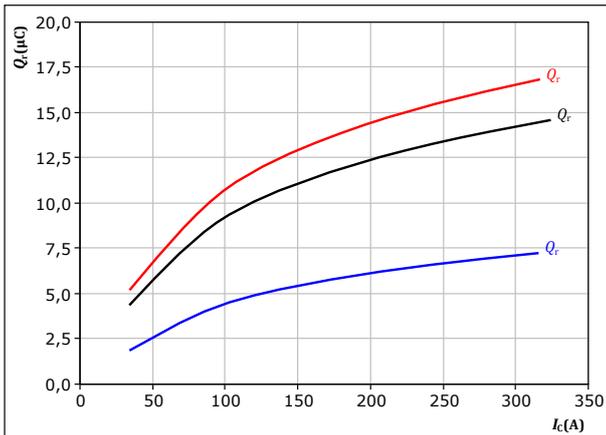


Boost Switching Characteristics

figure 41. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

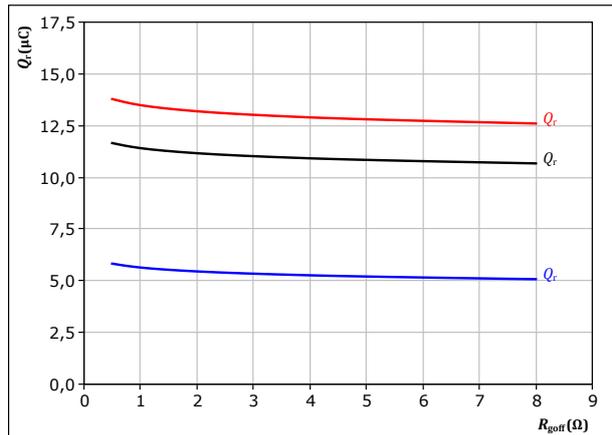
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{goff} = 2$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 42. FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

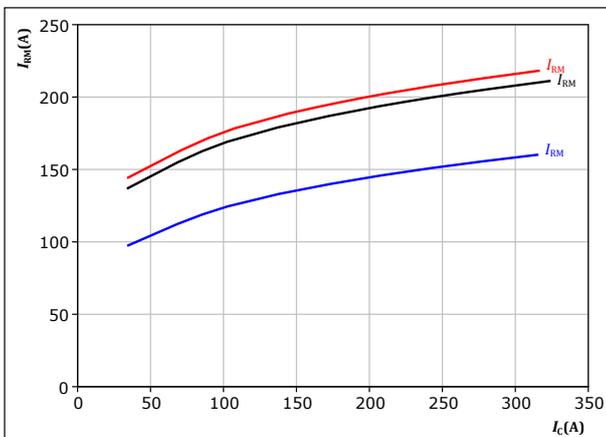
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 43. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

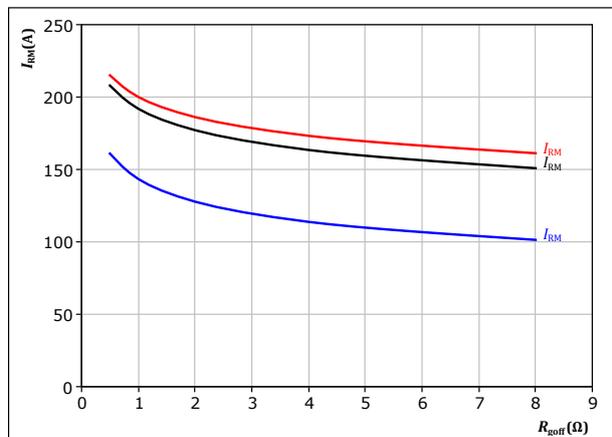
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{goff} = 2$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 44. FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 180$ A

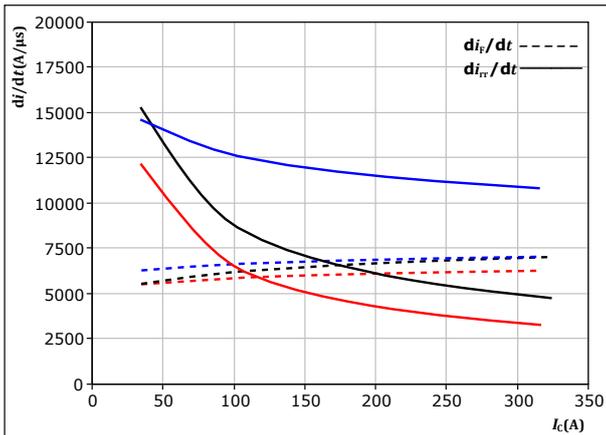
T_j : — 25 °C
 — 125 °C
 — 150 °C



Boost Switching Characteristics

figure 45. FWD

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

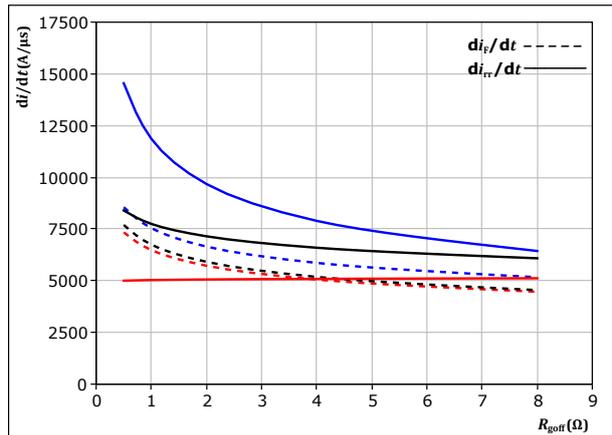


With an inductive load at

$V_{CE} =$	350	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{goff} =$	2	Ω		150 °C

figure 46. FWD

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



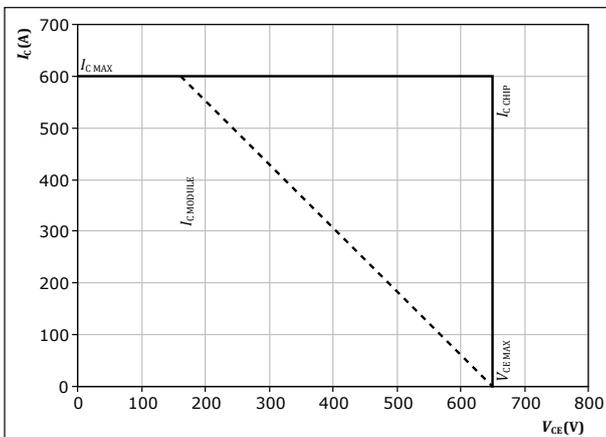
With an inductive load at

$V_{CE} =$	350	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	180	A		150 °C

figure 47. IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At $T_j = 150$ °C
 $R_{goff} = 2$ Ω
 $R_{goff} = 2$ Ω



Switching Definitions

figure 48. IGBT
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})

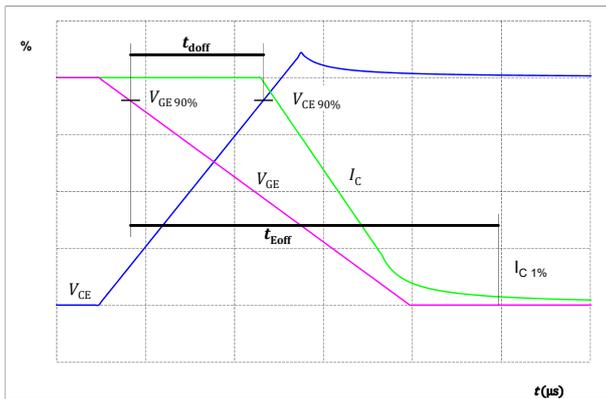


figure 49. IGBT
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})

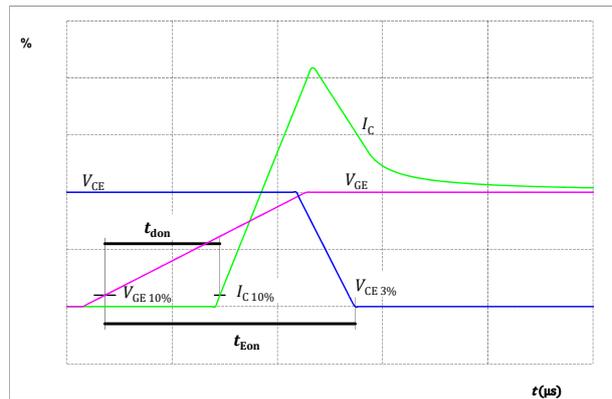


figure 50. IGBT
Turn-off Switching Waveforms & definition of t_f

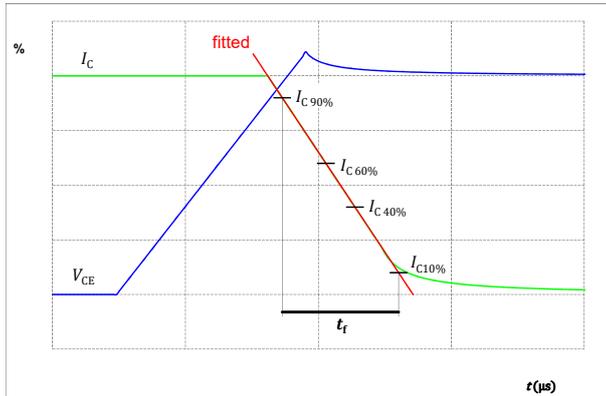
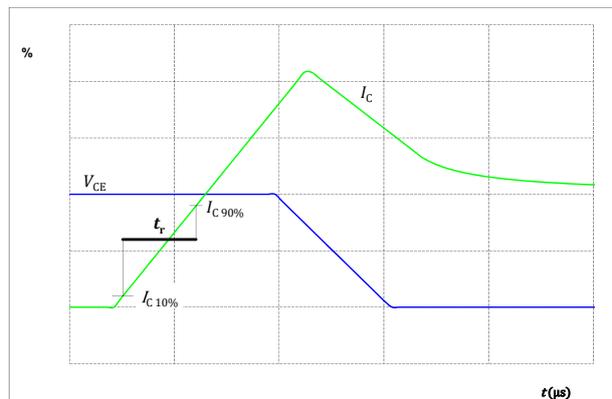


figure 51. IGBT
Turn-on Switching Waveforms & definition of t_r





Switching Definitions

figure 52. FWD

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

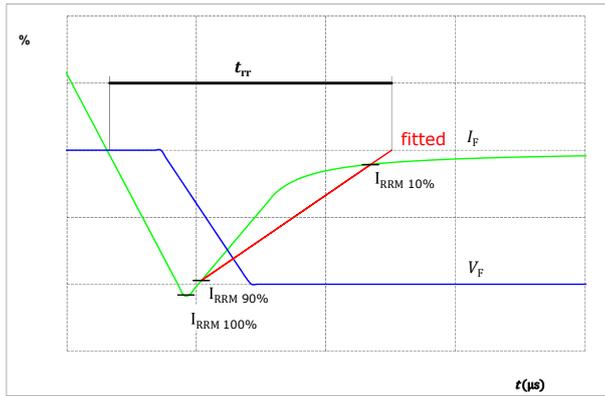
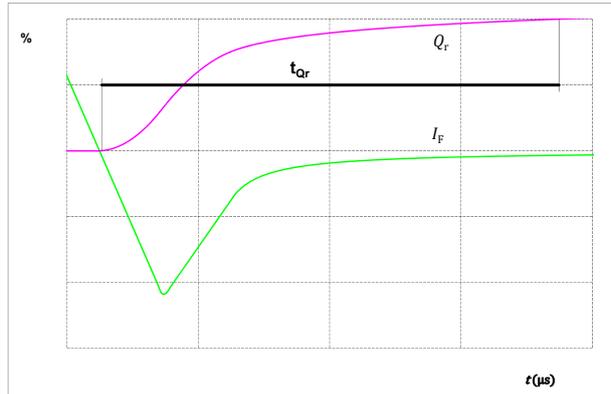


figure 53. FWD

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





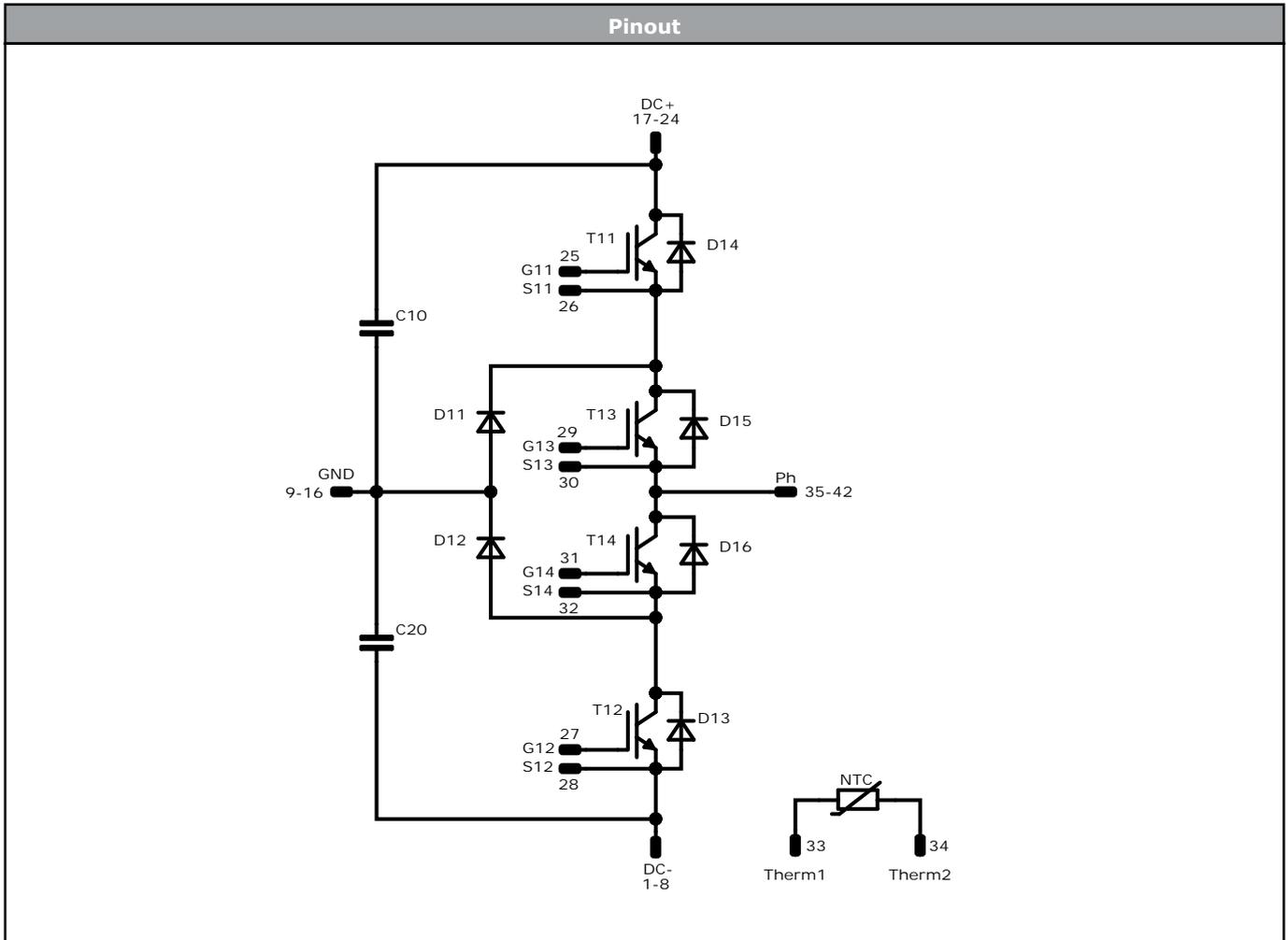
Vincotech

B0-SP07NIA300S5-LM38F58T
datasheet

Ordering Code	
Version	Ordering Code
With thermal paste (4,4 W/mK, PTM6000)	B0-SP07NIA300S5-LM38F58T-/7/

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

Outline																																																																																																																																																																																			
<table border="1"> <thead> <tr> <th colspan="4">Pin table [mm]</th> </tr> <tr> <th>Pin</th> <th>X</th> <th>Y</th> <th>Function</th> </tr> </thead> <tbody> <tr><td>1</td><td>0</td><td>0</td><td>DC-</td></tr> <tr><td>2</td><td>0</td><td>3,3</td><td>DC-</td></tr> <tr><td>3</td><td>0</td><td>6,6</td><td>DC-</td></tr> <tr><td>4</td><td>0</td><td>9,9</td><td>DC-</td></tr> <tr><td>5</td><td>0</td><td>13,2</td><td>DC-</td></tr> <tr><td>6</td><td>2,7</td><td>13,2</td><td>DC-</td></tr> <tr><td>7</td><td>0</td><td>15,9</td><td>DC-</td></tr> <tr><td>8</td><td>2,7</td><td>15,9</td><td>DC-</td></tr> <tr><td>9</td><td>0</td><td>20,9</td><td>GND</td></tr> <tr><td>10</td><td>2,7</td><td>20,9</td><td>GND</td></tr> <tr><td>11</td><td>0</td><td>23,6</td><td>GND</td></tr> <tr><td>12</td><td>2,7</td><td>23,6</td><td>GND</td></tr> <tr><td>13</td><td>0</td><td>26,3</td><td>GND</td></tr> <tr><td>14</td><td>2,7</td><td>26,3</td><td>GND</td></tr> <tr><td>15</td><td>0</td><td>29</td><td>GND</td></tr> <tr><td>16</td><td>2,7</td><td>29</td><td>GND</td></tr> <tr><td>17</td><td>0</td><td>34</td><td>DC+</td></tr> <tr><td>18</td><td>2,7</td><td>34</td><td>DC+</td></tr> <tr><td>19</td><td>0</td><td>36,7</td><td>DC+</td></tr> <tr><td>20</td><td>2,7</td><td>36,7</td><td>DC+</td></tr> <tr><td>21</td><td>0</td><td>40</td><td>DC+</td></tr> <tr><td>22</td><td>0</td><td>43,3</td><td>DC+</td></tr> <tr><td>23</td><td>0</td><td>46,6</td><td>DC+</td></tr> <tr><td>24</td><td>0</td><td>49,9</td><td>DC+</td></tr> <tr><td>25</td><td>16,35</td><td>43,55</td><td>G11</td></tr> <tr><td>26</td><td>16,35</td><td>40,55</td><td>S11</td></tr> <tr><td>27</td><td>17,1</td><td>3,3</td><td>G12</td></tr> <tr><td>28</td><td>17,1</td><td>0,3</td><td>S12</td></tr> <tr><td>29</td><td>35,1</td><td>28,2</td><td>G13</td></tr> <tr><td>30</td><td>35,1</td><td>25,2</td><td>S13</td></tr> <tr><td>31</td><td>36,6</td><td>11,7</td><td>G14</td></tr> <tr><td>32</td><td>36,6</td><td>8,7</td><td>S14</td></tr> <tr><td>33</td><td>52,4</td><td>42,9</td><td>Therm1</td></tr> <tr><td>34</td><td>52,4</td><td>36,1</td><td>Therm2</td></tr> <tr><td>35</td><td>52,4</td><td>28,35</td><td>Ph</td></tr> <tr><td>36</td><td>52,4</td><td>25,65</td><td>Ph</td></tr> <tr><td>37</td><td>52,4</td><td>22,95</td><td>Ph</td></tr> <tr><td>38</td><td>52,4</td><td>20,25</td><td>Ph</td></tr> <tr><td>39</td><td>52,4</td><td>17,55</td><td>Ph</td></tr> <tr><td>40</td><td>52,4</td><td>14,85</td><td>Ph</td></tr> <tr><td>41</td><td>52,4</td><td>12,15</td><td>Ph</td></tr> <tr><td>42</td><td>52,4</td><td>9,45</td><td>Ph</td></tr> </tbody> </table>				Pin table [mm]				Pin	X	Y	Function	1	0	0	DC-	2	0	3,3	DC-	3	0	6,6	DC-	4	0	9,9	DC-	5	0	13,2	DC-	6	2,7	13,2	DC-	7	0	15,9	DC-	8	2,7	15,9	DC-	9	0	20,9	GND	10	2,7	20,9	GND	11	0	23,6	GND	12	2,7	23,6	GND	13	0	26,3	GND	14	2,7	26,3	GND	15	0	29	GND	16	2,7	29	GND	17	0	34	DC+	18	2,7	34	DC+	19	0	36,7	DC+	20	2,7	36,7	DC+	21	0	40	DC+	22	0	43,3	DC+	23	0	46,6	DC+	24	0	49,9	DC+	25	16,35	43,55	G11	26	16,35	40,55	S11	27	17,1	3,3	G12	28	17,1	0,3	S12	29	35,1	28,2	G13	30	35,1	25,2	S13	31	36,6	11,7	G14	32	36,6	8,7	S14	33	52,4	42,9	Therm1	34	52,4	36,1	Therm2	35	52,4	28,35	Ph	36	52,4	25,65	Ph	37	52,4	22,95	Ph	38	52,4	20,25	Ph	39	52,4	17,55	Ph	40	52,4	14,85	Ph	41	52,4	12,15	Ph	42	52,4	9,45	Ph
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11	0	23,6	GND																																																																																																																																																																																
12	2,7	23,6	GND																																																																																																																																																																																
13	0	26,3	GND																																																																																																																																																																																
14	2,7	26,3	GND																																																																																																																																																																																
15	0	29	GND																																																																																																																																																																																
16	2,7	29	GND																																																																																																																																																																																
17	0	34	DC+																																																																																																																																																																																
18	2,7	34	DC+																																																																																																																																																																																
19	0	36,7	DC+																																																																																																																																																																																
20	2,7	36,7	DC+																																																																																																																																																																																
21	0	40	DC+																																																																																																																																																																																
22	0	43,3	DC+																																																																																																																																																																																
23	0	46,6	DC+																																																																																																																																																																																
24	0	49,9	DC+																																																																																																																																																																																
25	16,35	43,55	G11																																																																																																																																																																																
26	16,35	40,55	S11																																																																																																																																																																																
27	17,1	3,3	G12																																																																																																																																																																																
28	17,1	0,3	S12																																																																																																																																																																																
29	35,1	28,2	G13																																																																																																																																																																																
30	35,1	25,2	S13																																																																																																																																																																																
31	36,6	11,7	G14																																																																																																																																																																																
32	36,6	8,7	S14																																																																																																																																																																																
33	52,4	42,9	Therm1																																																																																																																																																																																
34	52,4	36,1	Therm2																																																																																																																																																																																
35	52,4	28,35	Ph																																																																																																																																																																																
36	52,4	25,65	Ph																																																																																																																																																																																
37	52,4	22,95	Ph																																																																																																																																																																																
38	52,4	20,25	Ph																																																																																																																																																																																
39	52,4	17,55	Ph																																																																																																																																																																																
40	52,4	14,85	Ph																																																																																																																																																																																
41	52,4	12,15	Ph																																																																																																																																																																																
42	52,4	9,45	Ph																																																																																																																																																																																
<p>center of press-fit pin head pin head type: T; PCB plated through-hole $\phi 1\text{mm} \pm 0,09 / -0,06$ for further PCB design rules refer to the latest handling instruction</p> <p>Tolerance of positions: $\pm 0,05\text{mm}$ of the end of pin. Tolerance of coordinates: only of pin without tolerance</p>																																																																																																																																																																																			



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	650 V	300 A	Buck Switch	
D11, D12	FWD	650 V	300 A	Buck Diode	
T13, T14	IGBT	650 V	300 A	Boost Switch	
D13, D14	FWD	650 V	300 A	Boost Diode	
D15, D16	FWD	650 V	300 A	Boost Sw. Inv. Diode	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	



Packaging instruction				
Standard packaging quantity (SPQ) 45	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow</i> S3 packages see vincotech.com website.

Package data
Package data for <i>flow</i> S3 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

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

Document No.:	Date:	Modification:	Pages
B0-SP07NIA300S5-LM38F58T-D1-14	19 Nov. 2020		
B0-SP07NIA300S5-LM38F58T-D2-14	7 Jul. 2021	Module marking is updated with UL logo, product is unchanged	

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As used herein:

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