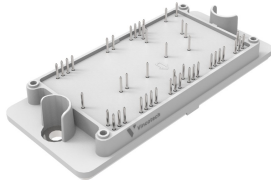
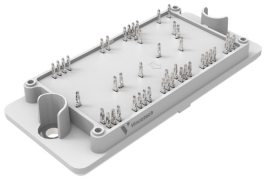
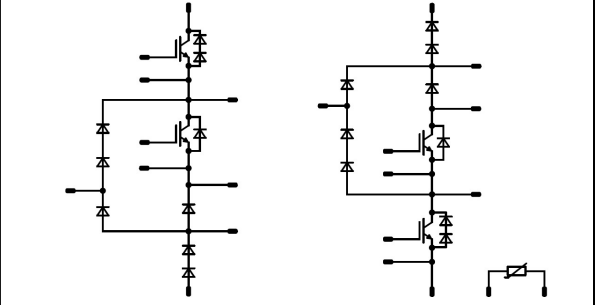




<i>flowNPC 2</i>	1500 V / 150 A
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> 1200 V components for 1500 V_{DC} systems Four quadrant operation 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">flow 2 13 mm housing</div> <div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around; font-size: small;"> Solder pin Press-fit pin </div>
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Solar Inverters Special Application 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 30-FT12NIA150SH-LG09F08 30-PT12NIA150SH-LG09F08Y 	

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ }^\circ\text{C}$	137	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ }^\circ\text{C}$	345	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CE} = 800\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$	10	µs
Maximum junction temperature	T_{jmax}		175	°C



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Buck Diode				
Peak repetitive reverse voltage	V_{RRM}		1300	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	94	A
Repetitive peak forward current	I_{FRM}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	233	W
Maximum junction temperature	T_{jmax}		175	°C
Buck Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1300	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	28	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	97	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	137	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	345	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CE} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	µs
Maximum junction temperature	T_{jmax}		175	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1300	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	94	A
Repetitive peak forward current	I_{FRM}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	233	W
Maximum junction temperature	T_{jmax}		175	°C



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Boost Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	30	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	100	A
Surge current capability	I^2t		50	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	74	W
Maximum junction temperature	T_{jmax}		175	°C

Boost D. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	30	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	100	A
Surge current capability	I^2t		50	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	74	W
Maximum junction temperature	T_{jmax}		175	°C

Boost Sw.Inv.Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	121	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	860	A
Surge current capability	I^2t		3700	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	234	W
Maximum junction temperature	T_{jmax}		175	°C



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
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Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{top}		-40...(T _{max} - 25)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		= 525	

*100 % tested in production



Characteristic Values

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

Buck Switch

Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$				0,0052	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15			150	25 125 150	1,78	2,16 2,48 2,56	2,42	V
Collector-emitter cut-off current	I_{CES}		0	1200			25			2	µA
Gate-emitter leakage current	I_{GES}		20	0			25			240	nA
Internal gate resistance	r_g								none		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25			25		8800		pF
Reverse transfer capacitance	C_{res}								470		
Gate charge	Q_g		15				25		1140		nC

Thermal

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)							0,28		K/W

Dynamic

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	±15	600	150		25		116		ns
								125	120		
								150	120		
Rise time	t_r							25	20		
								125	23		
								150	24		
Turn-off delay time	$t_{d(off)}$							25	213		
		125	267								
		150	279								
Fall time	t_f	25	20								
		125	66								
		150	75								
Turn-on energy (per pulse)	E_{on}	$Q_{t-FWD} = 4,4 \mu\text{C}$ $Q_{t-FWD} = 8,4 \mu\text{C}$ $Q_{t-FWD} = 9,7 \mu\text{C}$					25		6,23		mWs
			125	8,57							
			150	9,33							
Turn-off energy (per pulse)	E_{off}						25		5,36		mWs
			125	9,58							
			150	10,74							



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Buck Diode

Static

Forward voltage	V_F				150	25 125		3,35 3,10	3,84	V
Reverse leakage current	I_R			1300		25			7,6	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,41		K/W
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Dynamic

Peak recovery current	I_{RRM}					25 125 150		110 139 151		A
Reverse recovery time	t_{rr}					25 125 150		79 111 124		ns
Recovered charge	Q_r	$di/dt = 8628$ A/ μ s $di/dt = 8113$ A/ μ s $di/dt = 8006$ A/ μ s	± 15	600	150	25 125 150		4,42 8,38 9,74		μ C
Reverse recovered energy	E_{rec}					25 125 150		1,50 3,08 3,62		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		7069 1003 1214		A/ μ s

Buck Sw. Protection Diode

Static

Forward voltage	V_F				30	25 125		3,56 3,62	4,44	V
Reverse leakage current	I_R			1300		25			1,6	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,97		K/W
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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		

Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0052	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150	1,78	2,16 2,48 2,56	2,42	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			2	μA
Gate-emitter leakage current	I_{GES}		20	0		25			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		8800		pF
Reverse transfer capacitance	C_{res}							470		
Gate charge	Q_g		15			25		1140		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,28		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	± 15	600	150	25		111		ns
						125		118		
						150		118		
Rise time	t_r					25		21		
						125		23		
						150		23		
Turn-off delay time	$t_{d(off)}$					25		209		
		125		266						
		150		285						
Fall time	t_f	25		25						
		125		65						
		150		84						
Turn-on energy (per pulse)	E_{on}	$Q_{t-FWD} = 4,2 \mu\text{C}$ $Q_{t-FWD} = 8,7 \mu\text{C}$ $Q_{t-FWD} = 10,3 \mu\text{C}$				25		5,76	mWs	
						125		8,31		
						150		9,10		
						25		5,12		
Turn-off energy (per pulse)	E_{off}					125		8,86		
						150		10,49		



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Boost Diode

Static

Forward voltage	V_F			150	25 125		3,35 3,10	3,84	V
Reverse leakage current	I_R		1300		25			7,6	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,41		K/W
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Dynamic

Peak recovery current	I_{RRM}				25 125 150		87 127 139		A
Reverse recovery time	t_{rr}				25 125 150		88 126 149		ns
Recovered charge	Q_r	$di/dt = 7944$ A/ μ s $di/dt = 7602$ A/ μ s $di/dt = 7467$ A/ μ s	± 15	600	150	25 125 150	4,20 8,68 10,27		μ C
Reverse recovered energy	E_{rec}				25 125 150		1,48 2,90 3,55		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 125 150		2530 874 1472		A/ μ s

Boost Sw. Protection Diode

Static

Forward voltage	V_F			25	25 125 150		2,27 2,44 2,36	2,74	V
Reverse leakage current	I_R		1200		25 150			60 3300	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,29		K/W
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Characteristic Values

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

Boost D. Protection Diode

Static

Forward voltage	V_F			25	25 125 150		2,27 2,44 2,36	2,74		V
Reverse leakage current	I_R		1200		25 150			60 3300		μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,29			K/W
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Boost Sw.Inv.Diode

Static

Forward voltage	V_F			150	25 125 150		2,22 2,30 2,23	2,49		V
Reverse leakage current	I_R		1200		25 150			240 28000		μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,41			K/W
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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	

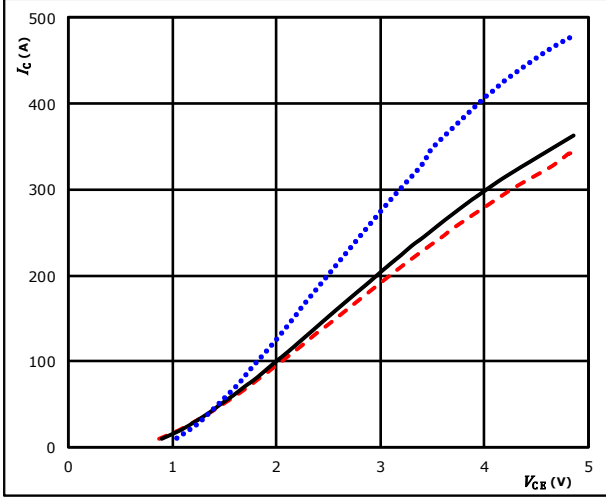


Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

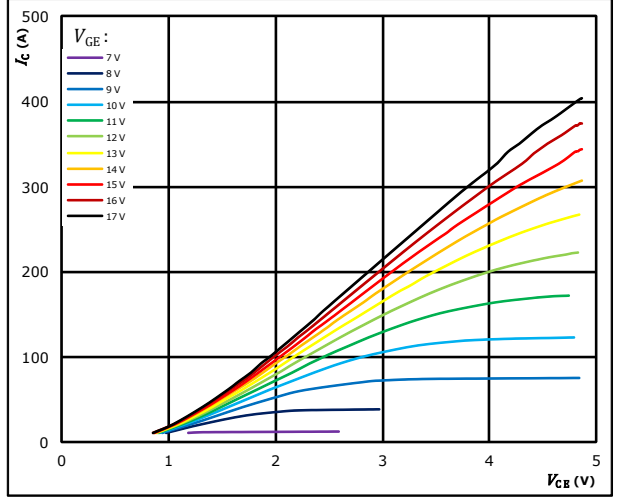


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$ (blue dotted)
 $V_{GE} = 15 V$ $T_j: 125 \text{ }^\circ C$ (black solid)
 $T_j: 150 \text{ }^\circ C$ (red dashed)

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

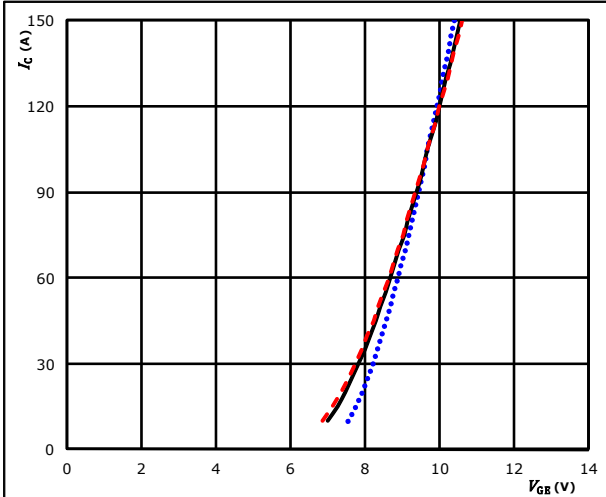


$t_p = 250 \mu s$
 $T_j = 125 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

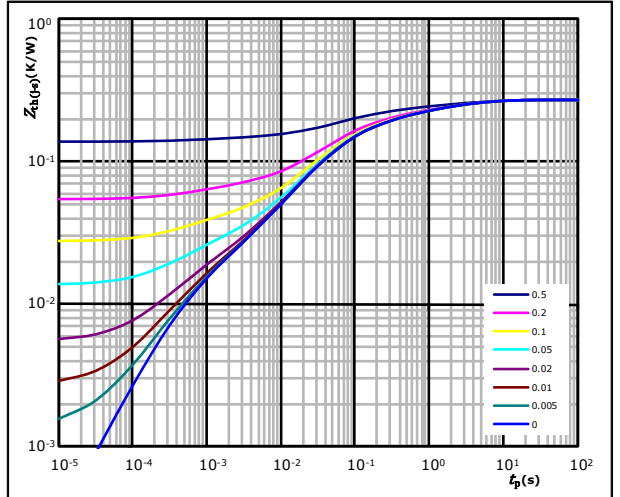


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$ (blue dotted)
 $V_{CE} = 10 V$ $T_j: 125 \text{ }^\circ C$ (black solid)
 $T_j: 150 \text{ }^\circ C$ (red dashed)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,28 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
2,55E-02	5,27E+00
4,70E-02	1,31E+00
6,23E-02	2,29E-01
9,01E-02	5,22E-02
3,16E-02	1,71E-02
9,83E-03	2,13E-03
8,64E-03	4,08E-04

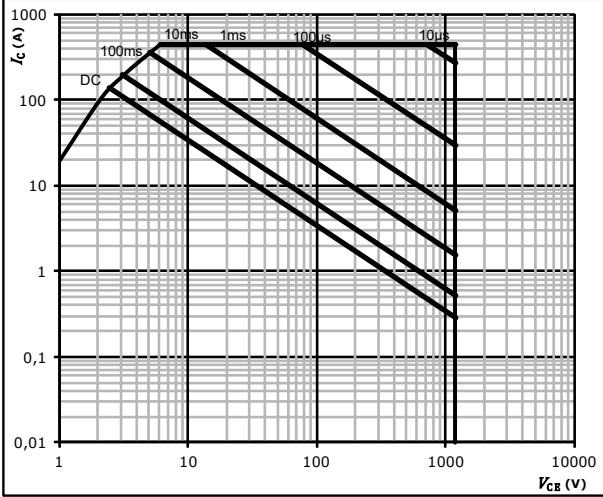


Buck Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$



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

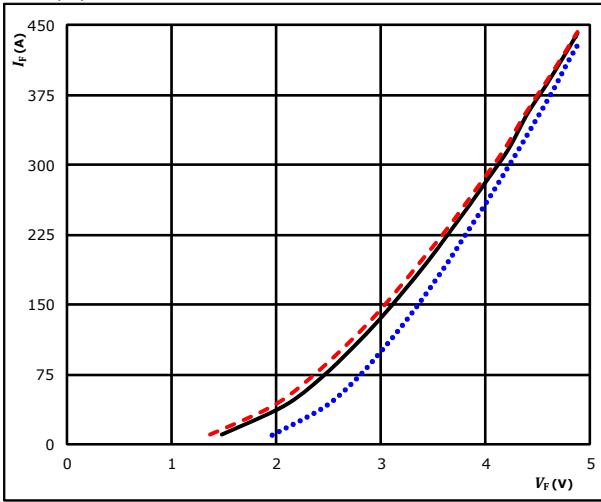


Buck Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

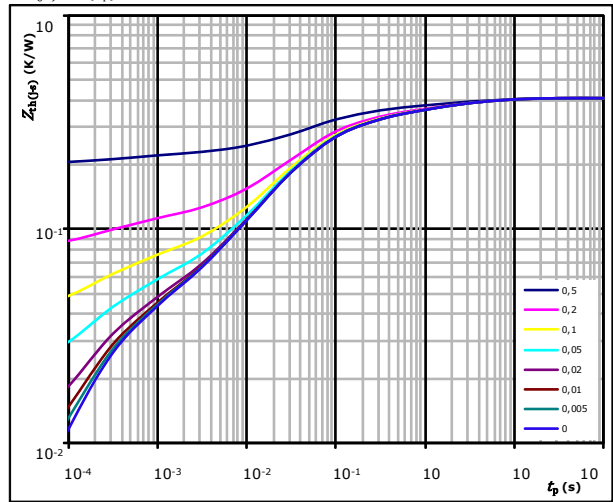


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,41 \text{ K/W}$

FWD thermal model values

R (K/W)	τ (s)
3,46E-02	5,29E+00
5,25E-02	9,84E-01
8,36E-02	1,62E-01
1,54E-01	3,91E-02
4,14E-02	9,22E-03
1,35E-02	1,28E-03
2,79E-02	2,39E-04

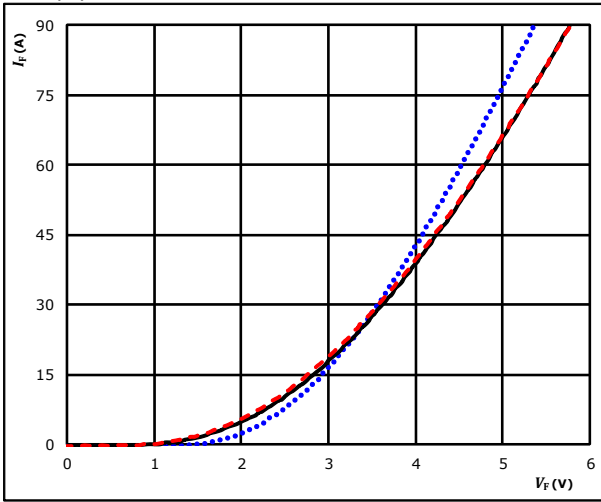


Buck Sw. Protection Diode Characteristics

figure 1. Prot. Diode

Typical forward characteristics

$$I_F = f(V_F)$$

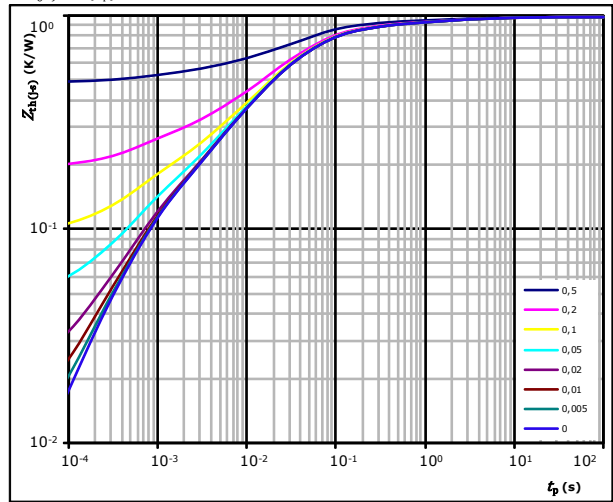


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. Prot. Diode

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,97 \text{ K/W}$
 Prot. Diode thermal model values

R (K/W)	τ (s)
3,38E-02	6,50E+00
7,05E-02	9,48E-01
1,87E-01	1,18E-01
4,58E-01	2,73E-02
1,41E-01	4,93E-03
8,48E-02	6,22E-04

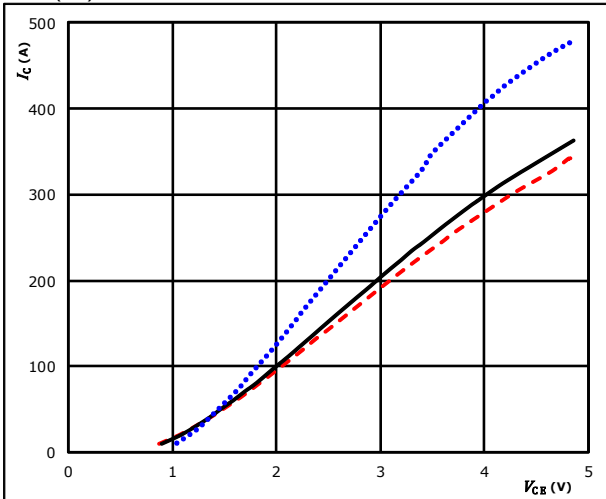


Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

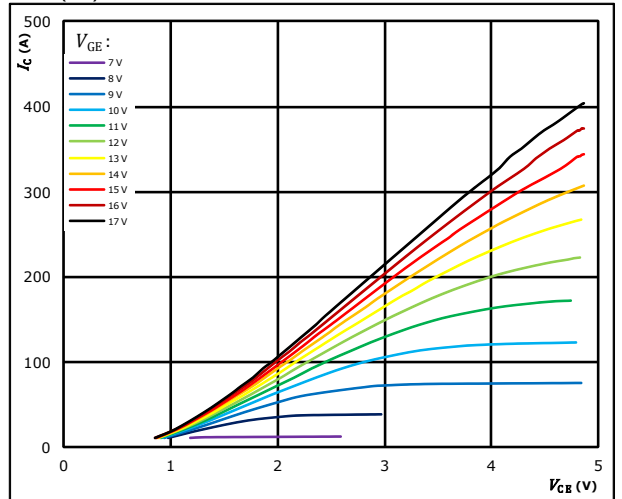


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - -

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

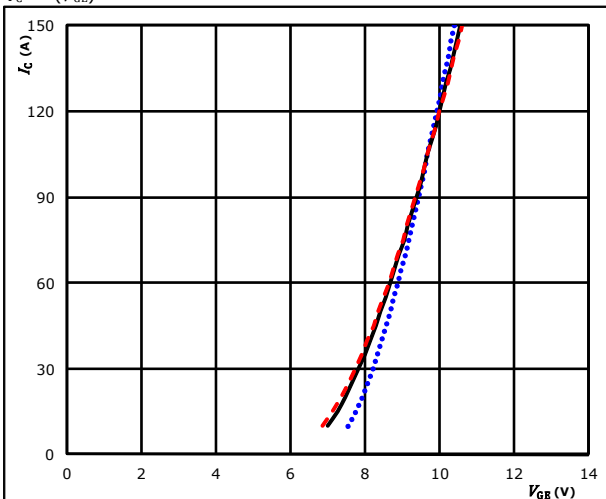


$t_p = 250 \mu s$ $T_j = 125 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

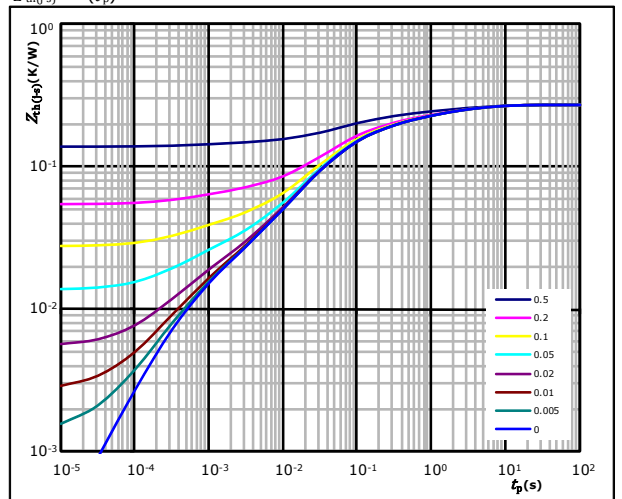


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - -

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,28 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
2,55E-02	5,27E+00
4,70E-02	1,31E+00
6,23E-02	2,29E-01
9,01E-02	5,22E-02
3,16E-02	1,71E-02
9,83E-03	2,13E-03
8,64E-03	4,08E-04

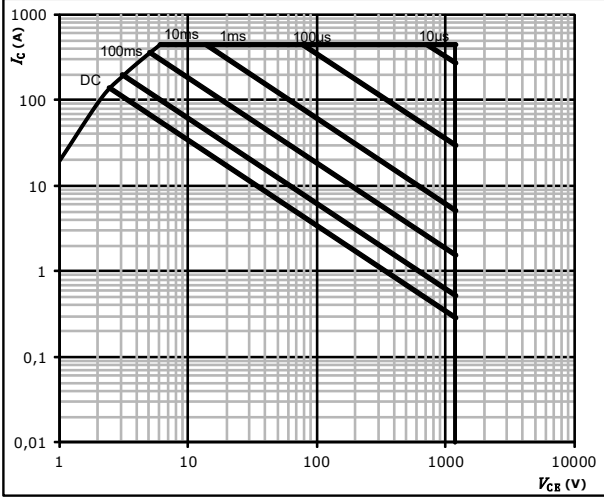


Boost Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$



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

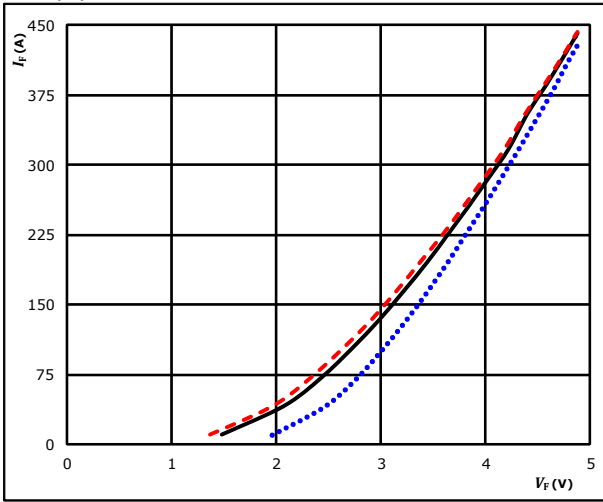


Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$$I_F = f(V_F)$$

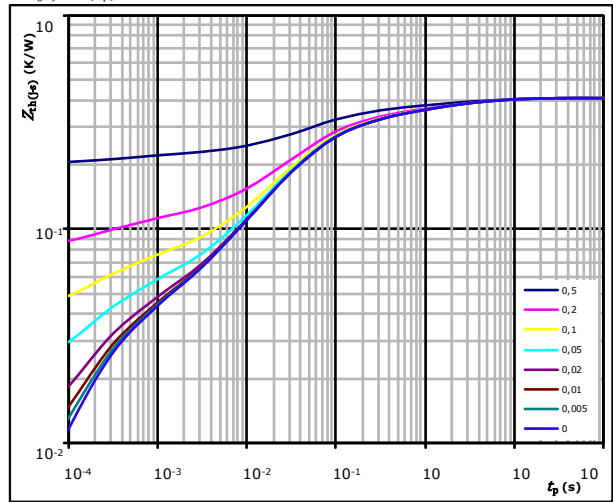


$t_p =$ 250 μ s T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D =$ t_p / T
 $R_{th(j-s)} =$ 0,41 K/W

FWD thermal model values

R (K/W)	τ (s)
3,46E-02	5,29E+00
5,25E-02	9,84E-01
8,36E-02	1,62E-01
1,54E-01	3,91E-02
4,14E-02	9,22E-03
1,35E-02	1,28E-03
2,79E-02	2,39E-04

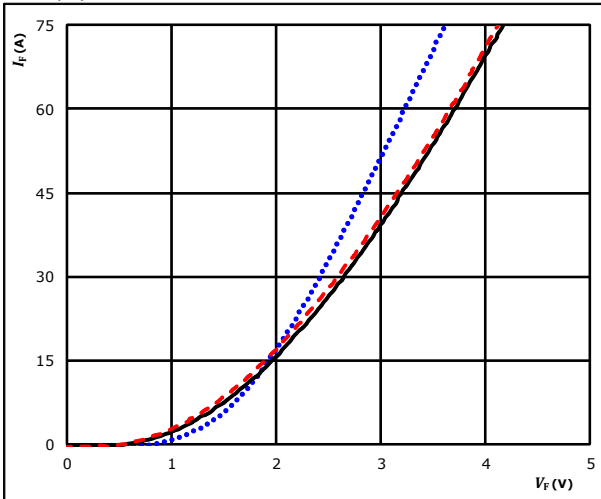


Boost Sw. Protection Diode Characteristics

figure 1. Prot. Diode

Typical forward characteristics

$$I_F = f(V_F)$$

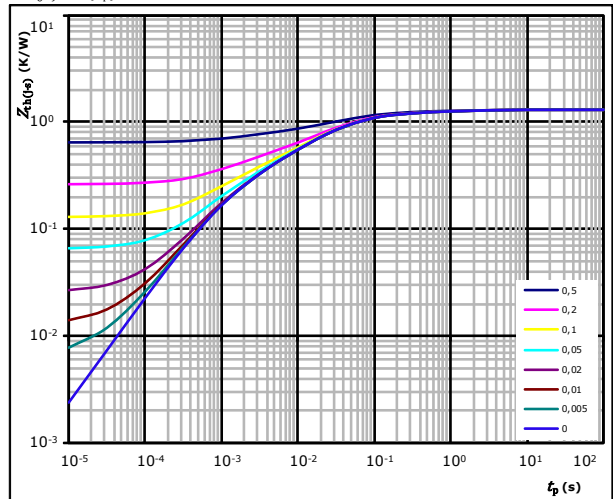


$t_p = 250 \mu s$
 T_j : 25 °C (blue dotted line)
 125 °C (black solid line)
 150 °C (red dashed line)

figure 2. Prot. Diode

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

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

Prot. Diode thermal model values

R (K/W)	τ (s)
6,16E-02	2,03E+00
1,25E-01	2,79E-01
4,82E-01	4,69E-02
3,44E-01	1,34E-02
1,35E-01	3,30E-03
1,42E-01	8,91E-04



Boost D. Protection Diode Characteristics

figure 1. Prot. Diode

Typical forward characteristics

$$I_F = f(V_F)$$

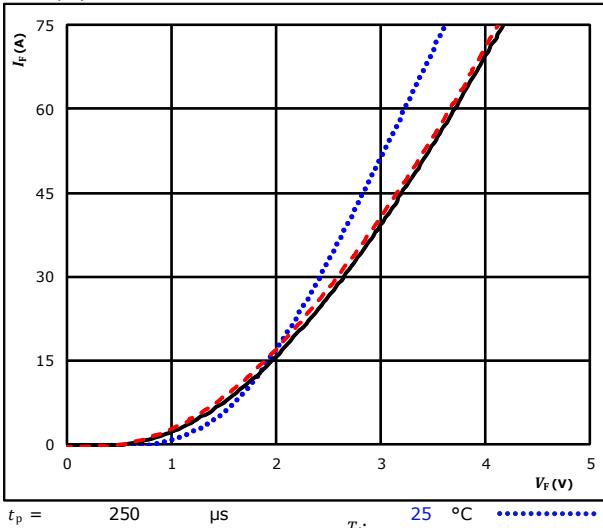
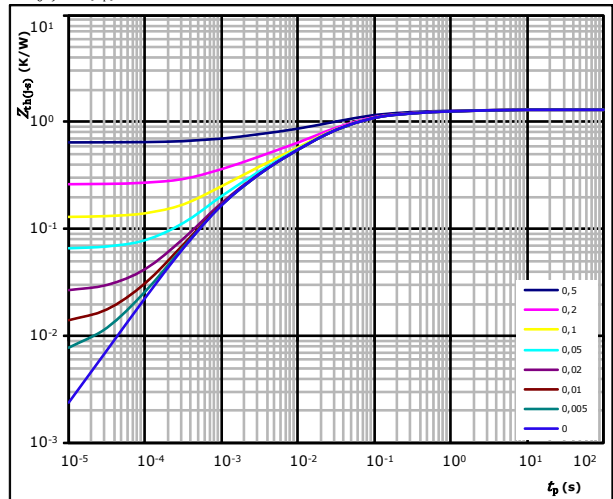


figure 2. Prot. Diode

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

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

Prot. Diode thermal model values

R (K/W)	τ (s)
6,16E-02	2,03E+00
1,25E-01	2,79E-01
4,82E-01	4,69E-02
3,44E-01	1,34E-02
1,35E-01	3,30E-03
1,42E-01	8,91E-04

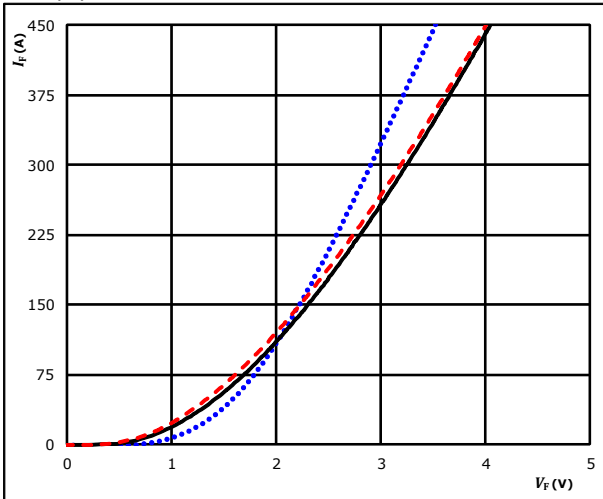


Boost Sw.Inv.Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

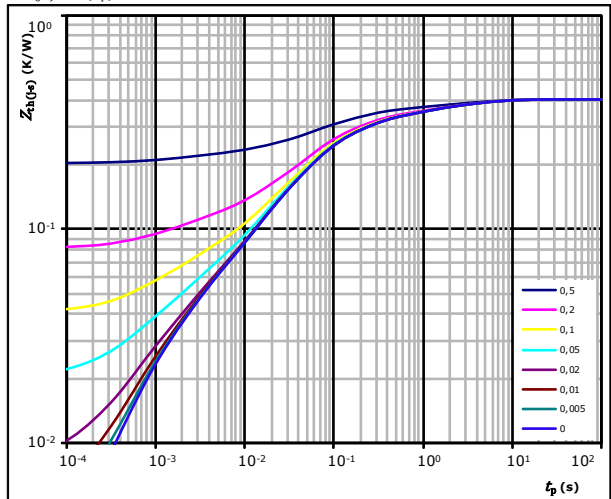


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,41 \text{ K/W}$
 FWD thermal model values

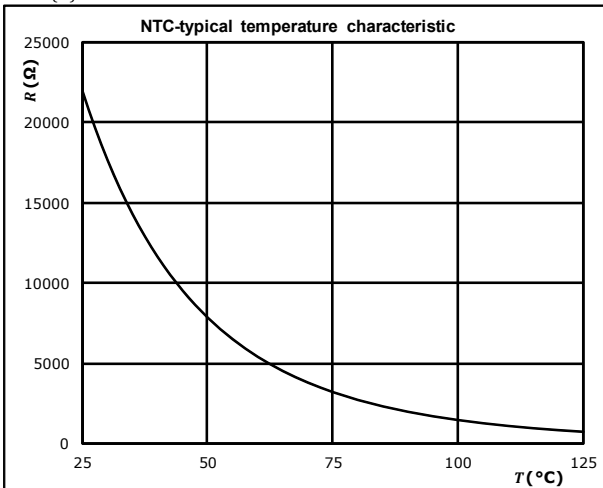
R (K/W)	τ (s)
4,46E-02	3,97E+00
5,69E-02	7,74E-01
1,16E-01	1,33E-01
1,34E-01	3,91E-02
2,84E-02	7,16E-03
2,55E-02	1,10E-03

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

$$R = f(T)$$

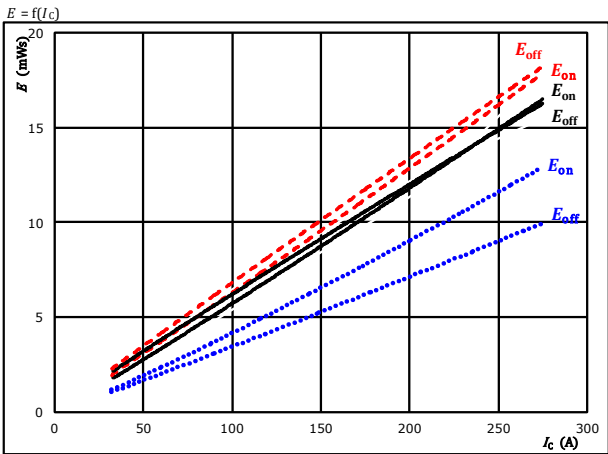




Buck Switching Characteristics

figure 1. IGBT

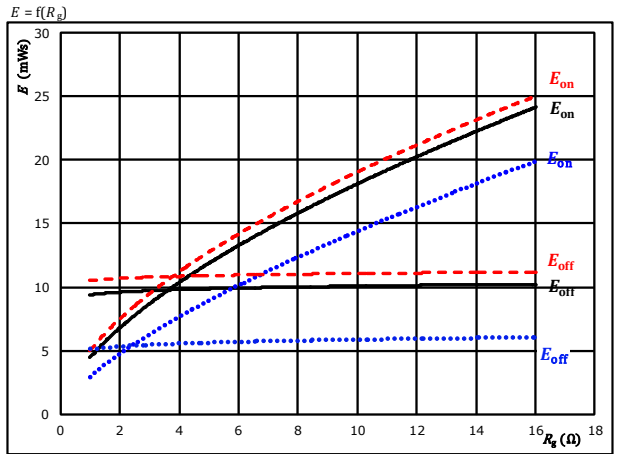
Typical switching energy losses as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 2. IGBT

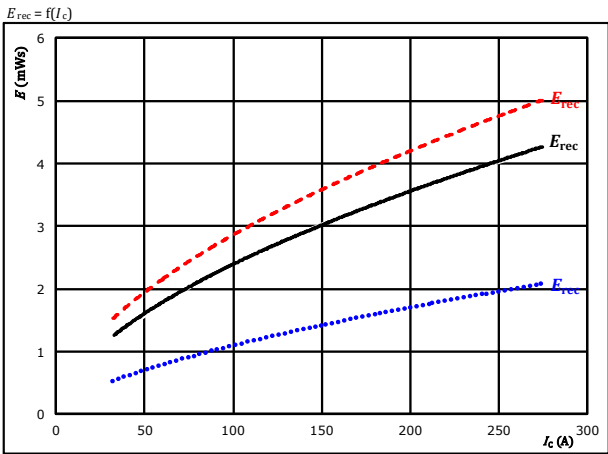
Typical switching energy losses as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 150$ A
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 3. FWD

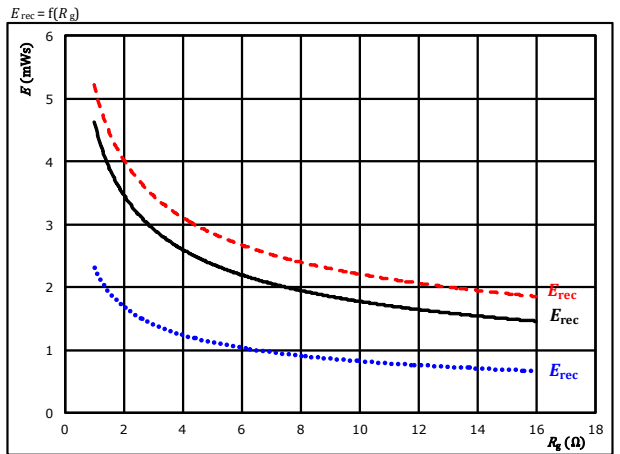
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 150$ A
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

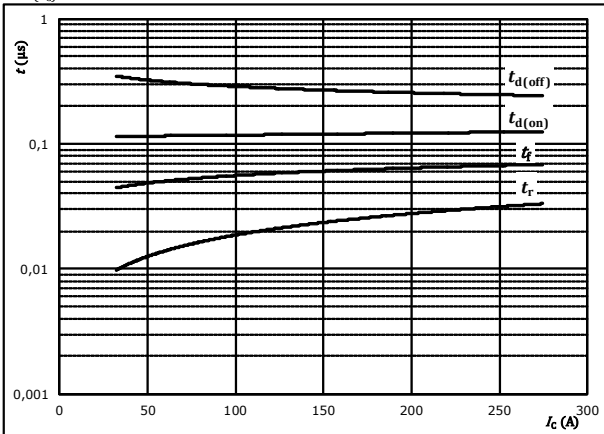


Buck Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



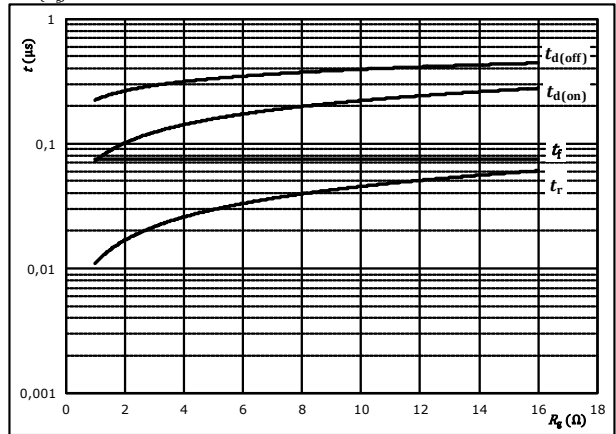
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



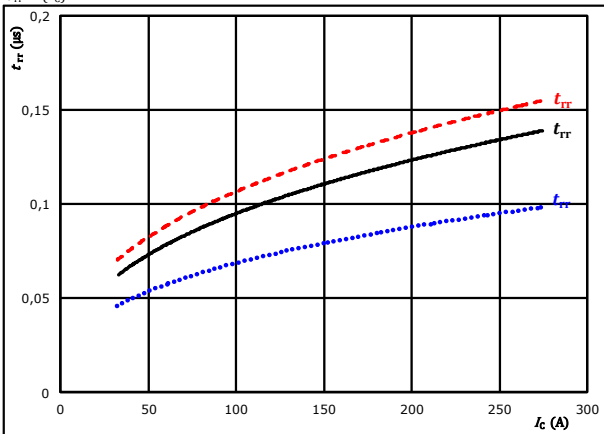
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_c =$	150	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

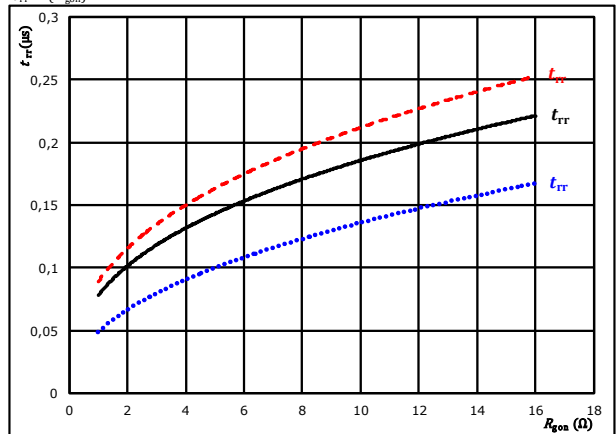


At	$V_{CE} =$	600	V	$T_j =$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	4	Ω		150 °C	-----

figure 8. FWD

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

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



At	$V_{CE} =$	600	V	$T_j =$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_c =$	150	A		150 °C	-----

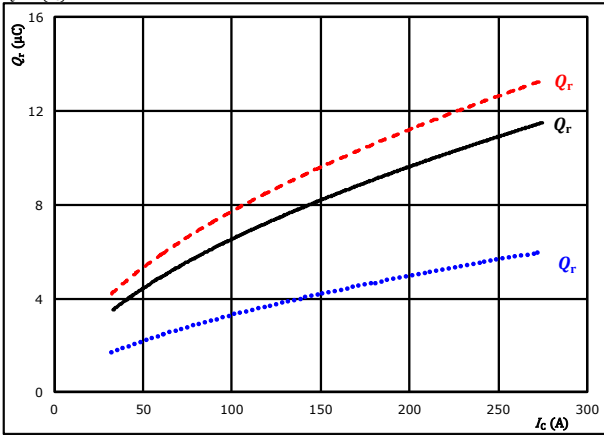


Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

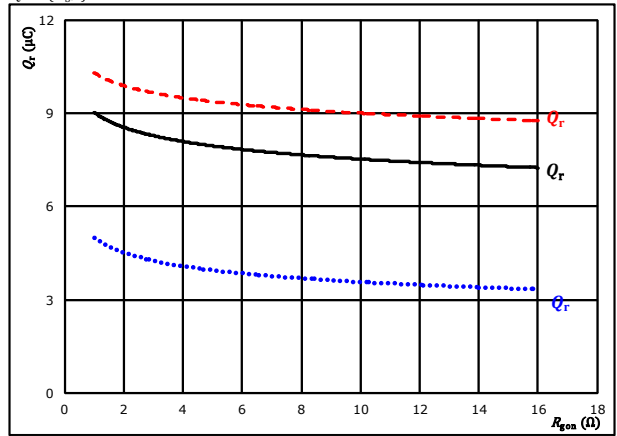


At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $R_{gdn} = 4$ Ω $T_j = 150$ °C

figure 10. FWD

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

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

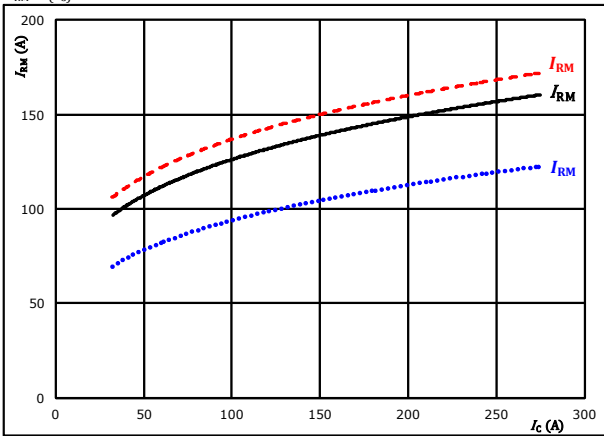


At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $I_c = 150$ A $T_j = 150$ °C

figure 11. FWD

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

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

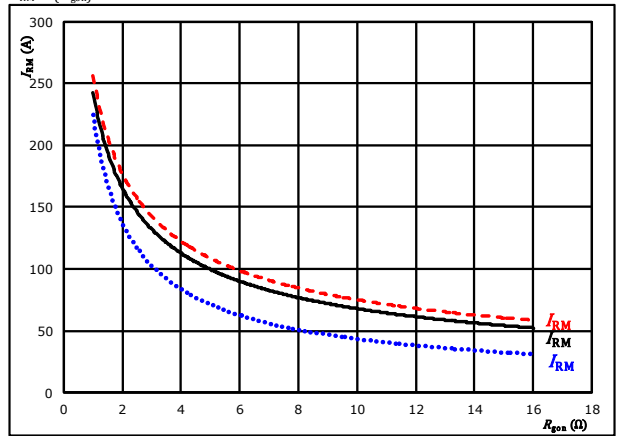


At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $R_{gdn} = 4$ Ω $T_j = 150$ °C

figure 12. FWD

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

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



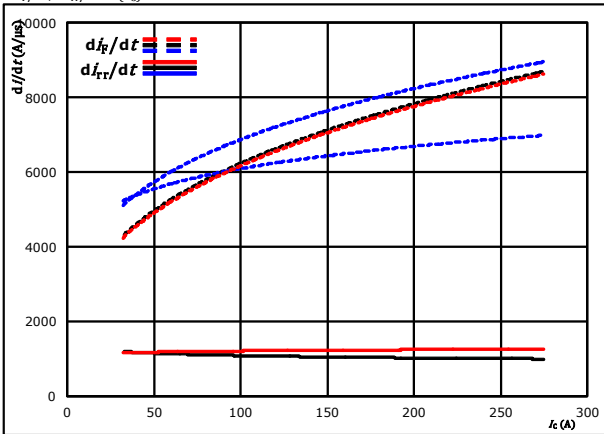
At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $I_c = 150$ A $T_j = 150$ °C



Buck Switching Characteristics

figure 13. FWD

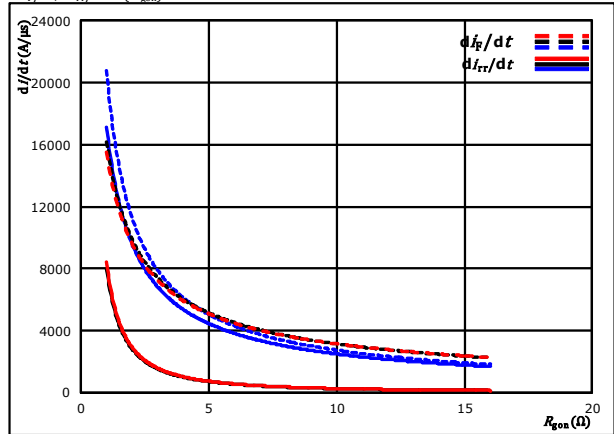
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $R_{g(on)} = 4$ Ω $T_j = 150$ °C

figure 14. FWD

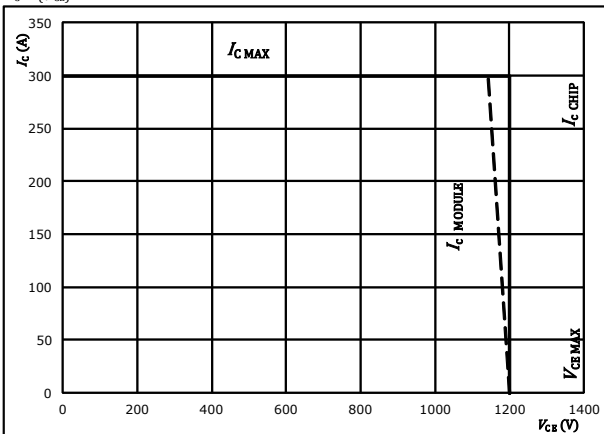
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $I_c = 150$ A $T_j = 150$ °C

figure 15. IGBT

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



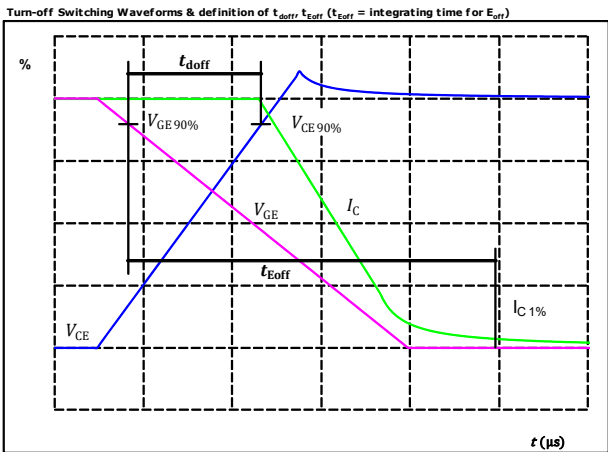
At $T_j = 125$ °C
 $R_{g(on)} = 4$ Ω
 $R_{g(off)} = 4$ Ω



Buck Switching Definitions

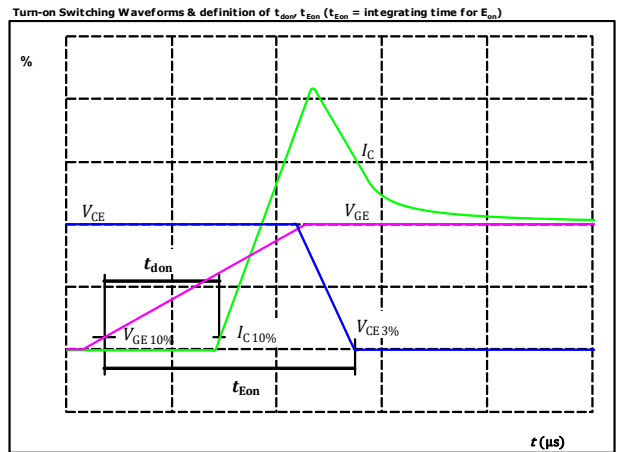
General conditions		
T_j	=	125 °C
$R_{g\text{on}}$	=	4 Ω
$R_{g\text{off}}$	=	4 Ω

figure 1. IGBT



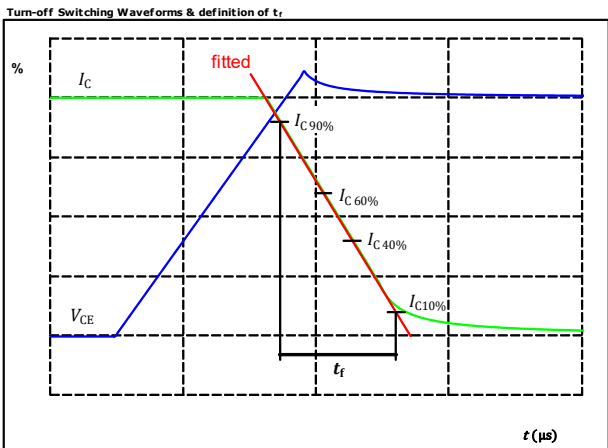
$V_{\text{CE}}(0\%) =$	-15	V
$V_{\text{GE}}(100\%) =$	15	V
$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_{\text{doff}} =$	267	ns

figure 2. IGBT



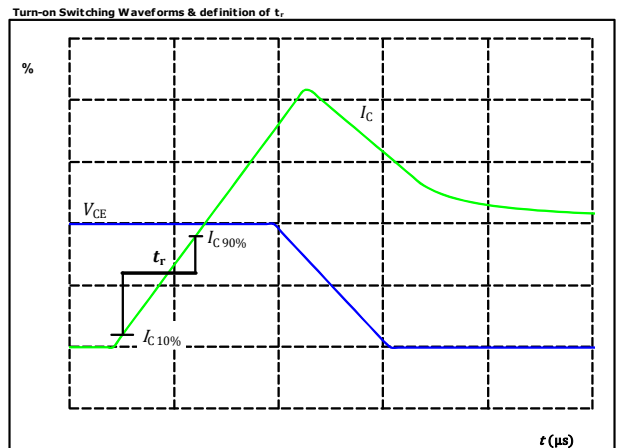
$V_{\text{CE}}(0\%) =$	-15	V
$V_{\text{GE}}(100\%) =$	15	V
$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_{\text{don}} =$	120	ns

figure 3. IGBT



$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_r =$	66	ns

figure 4. IGBT

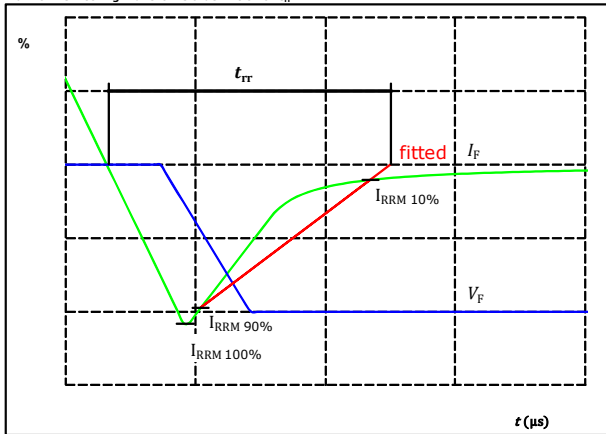


$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_r =$	23	ns



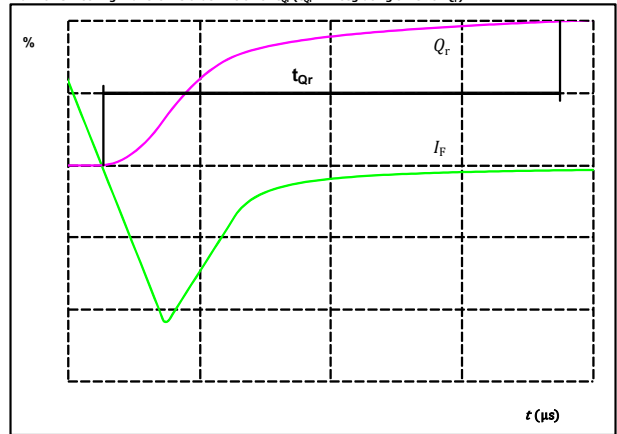
Buck Switching Characteristics

figure 5. FWD
 Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	600	V
$I_F(100\%) =$	150	A
$I_{RRM}(100\%) =$	139	A
$t_{rr} =$	111	ns

figure 6. FWD
 Turn-on Switching Waveforms & definition of t_{qr} (t_{qr} = integrating time for Q_r)



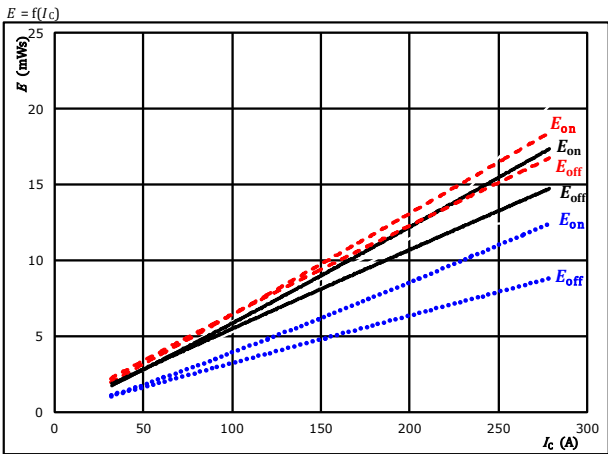
$I_F(100\%) =$	150	A
$Q_r(100\%) =$	8,38	μC



Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

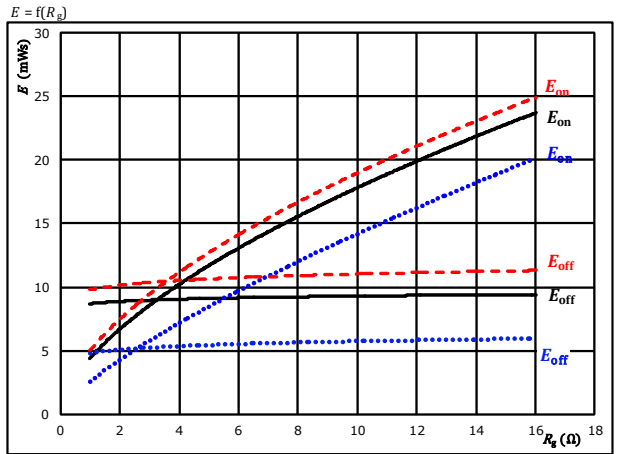


With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$R_{g\text{on}} = 4$ Ω	$T_j = 150$ °C	-----
$R_{g\text{off}} = 4$ Ω		

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

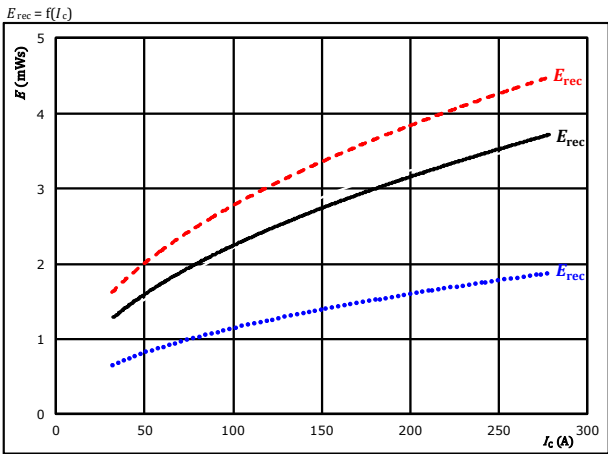


With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$I_C = 150$ A	$T_j = 150$ °C	-----

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

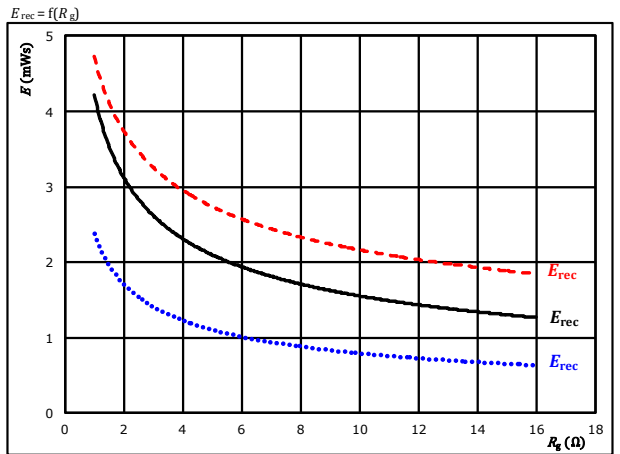


With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$R_{g\text{on}} = 4$ Ω	$T_j = 150$ °C	-----

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$I_C = 150$ A	$T_j = 150$ °C	-----

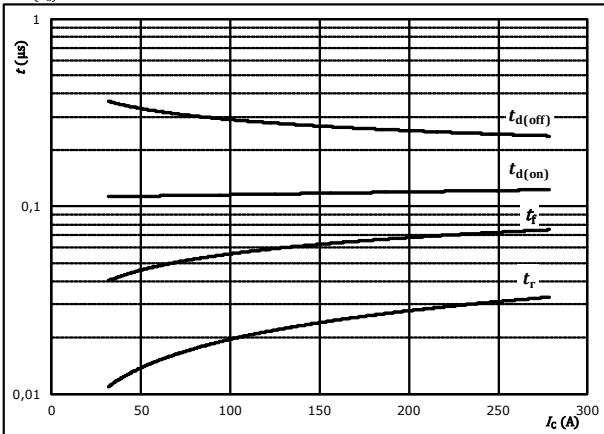


Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



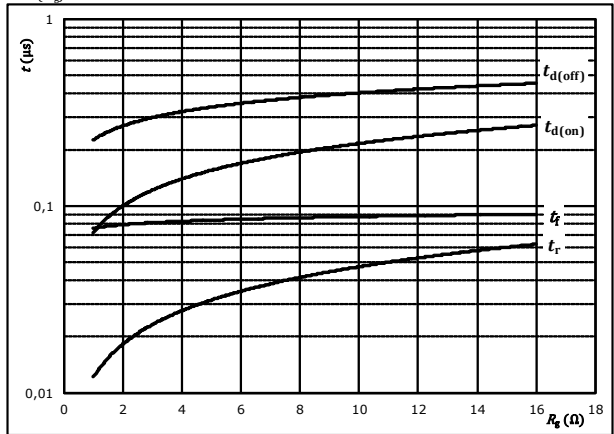
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



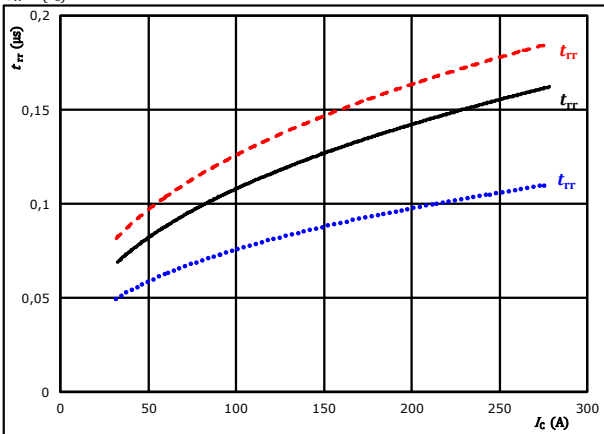
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	150	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$

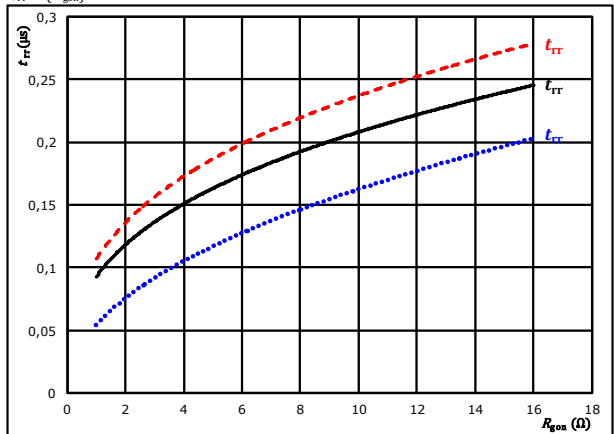


At	$V_{CE} =$	600	V	$T_j =$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	4	Ω		150 °C	-----

figure 8. FWD

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

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



At	$V_{CE} =$	600	V	$T_j =$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	150	A		150 °C	-----

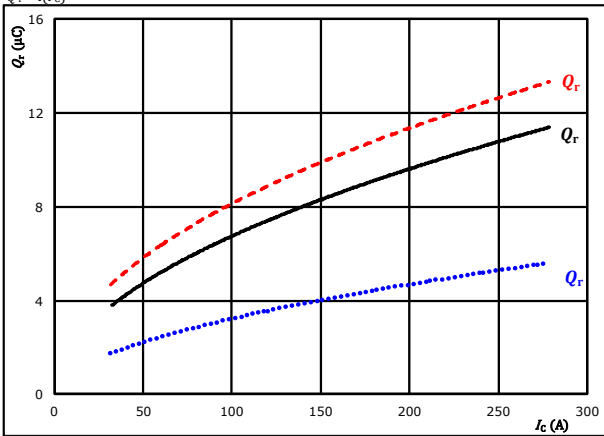


Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

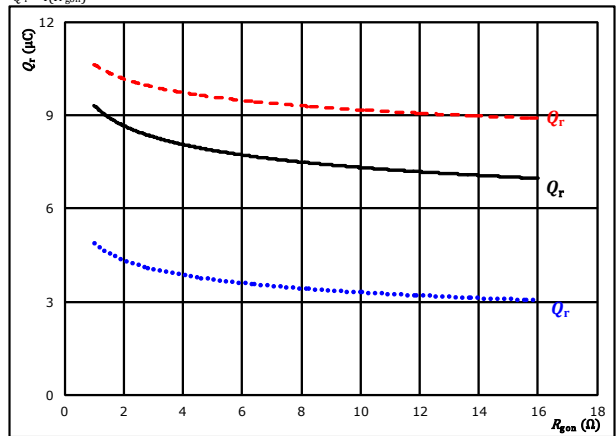


At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $R_{gpn} = 4$ Ω $T_j = 150$ °C

figure 10. FWD

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

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

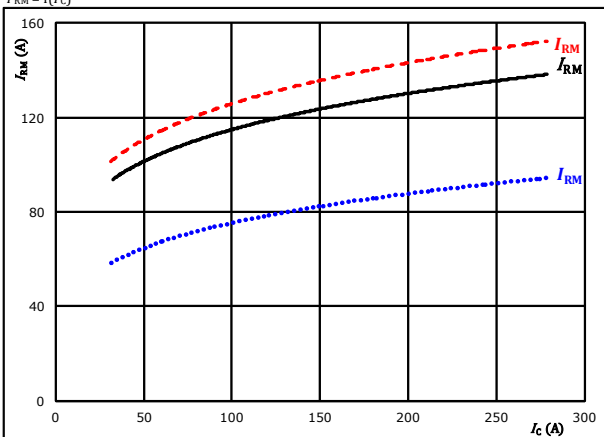


At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $I_c = 150$ A $T_j = 150$ °C

figure 11. FWD

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

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

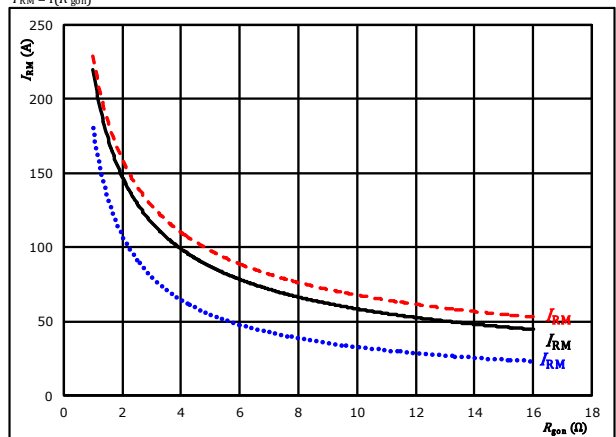


At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $R_{gpn} = 4$ Ω $T_j = 150$ °C

figure 12. FWD

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

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



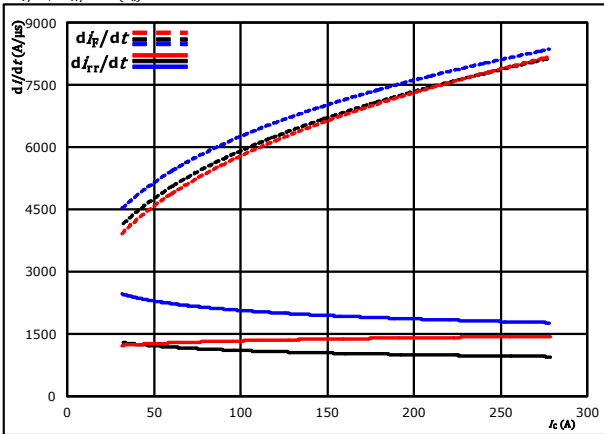
At $V_{CE} = 600$ V $T_j = 25$ °C $V_{GE} = \pm 15$ V $T_j = 125$ °C $I_c = 150$ A $T_j = 150$ °C



Boost Switching Characteristics

figure 13. FWD

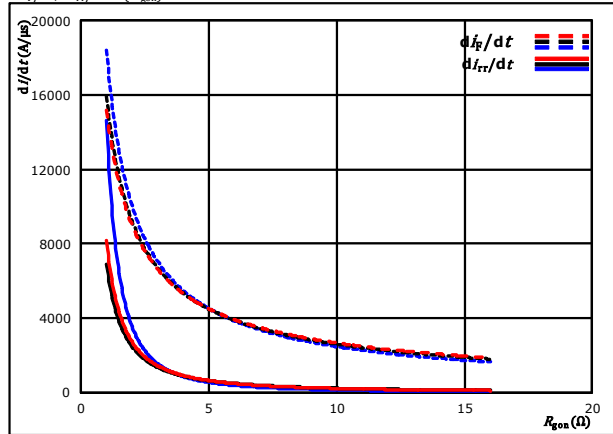
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $R_{g(on)} = 4$ Ω $T_j = 150$ °C

figure 14. FWD

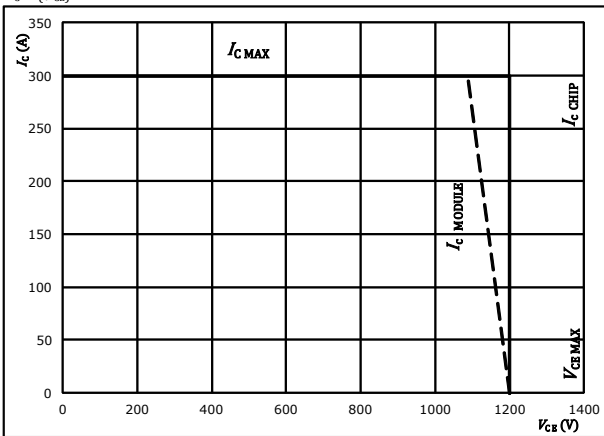
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $I_c = 150$ A $T_j = 150$ °C

figure 15. IGBT

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



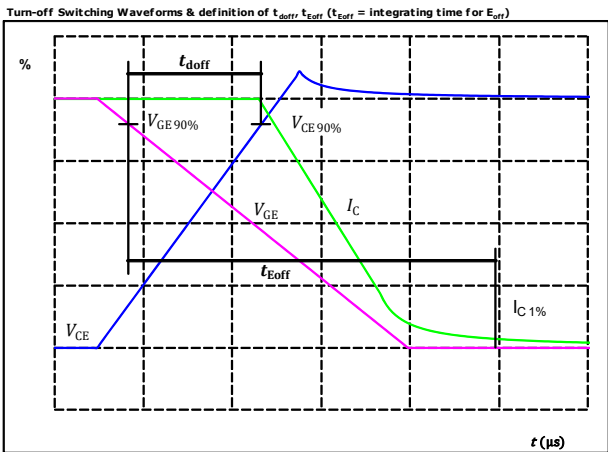
At $T_j = 125$ °C
 $R_{g(on)} = 4$ Ω
 $R_{g(off)} = 4$ Ω



Boost Switching Definitions

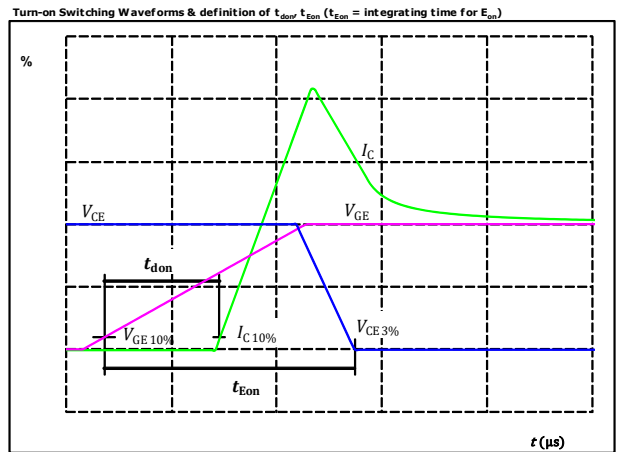
General conditions		
T_j	=	125 °C
$R_{g\text{on}}$	=	4 Ω
$R_{g\text{off}}$	=	4 Ω

figure 1. IGBT



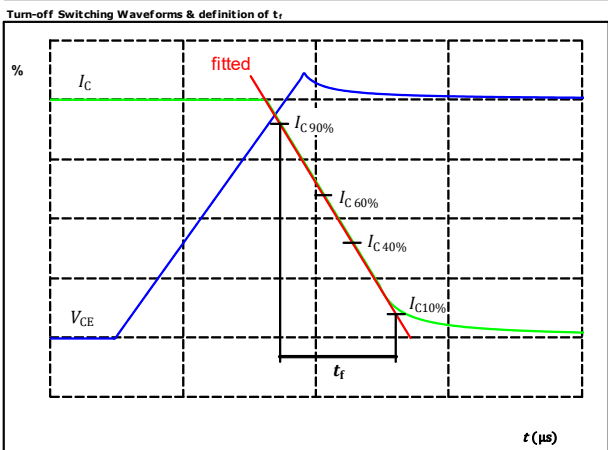
$V_{\text{CE}}(0\%) =$	-15	V
$V_{\text{GE}}(100\%) =$	15	V
$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_{\text{doff}} =$	266	ns

figure 2. IGBT



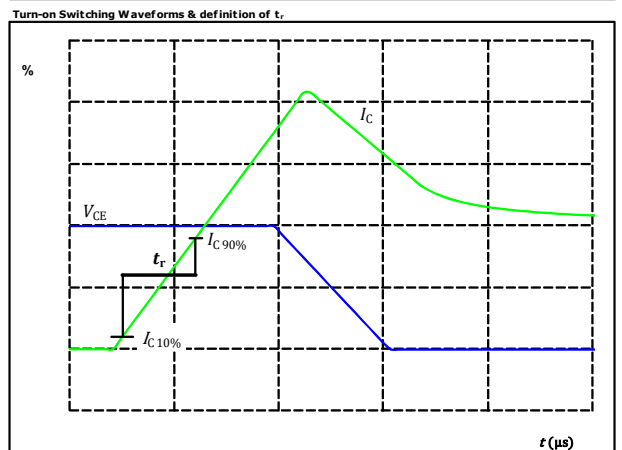
$V_{\text{CE}}(0\%) =$	-15	V
$V_{\text{GE}}(100\%) =$	15	V
$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_{\text{don}} =$	118	ns

figure 3. IGBT



$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_r =$	65	ns

figure 4. IGBT

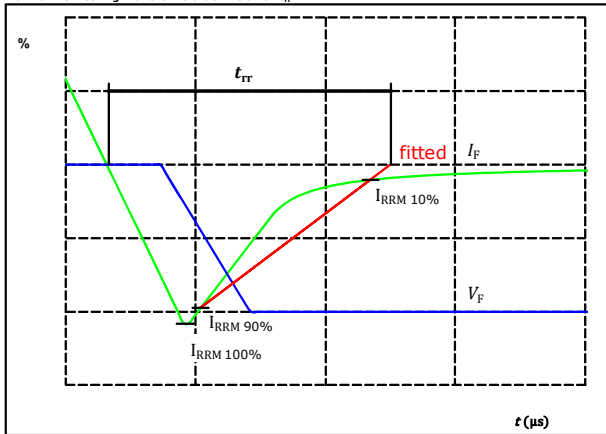


$V_{\text{C}}(100\%) =$	600	V
$I_{\text{C}}(100\%) =$	150	A
$t_r =$	23	ns



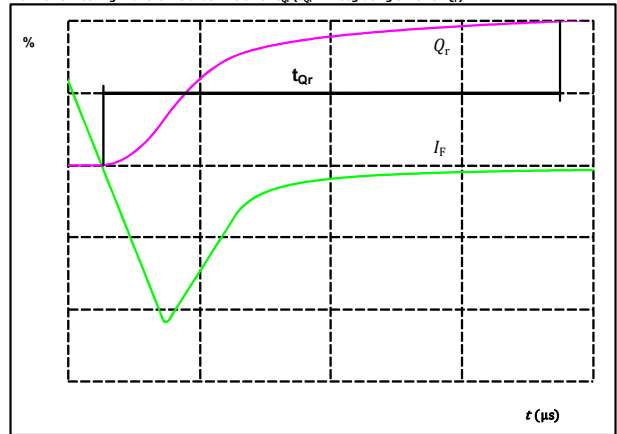
Boost Switching Characteristics

figure 5. FWD
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	600	V
$I_F(100\%) =$	150	A
$I_{RRM}(100\%) =$	127	A
$t_{rr} =$	126	ns

figure 6. FWD
Turn-on Switching Waveforms & definition of t_{qr} (t_{qr} = integrating time for Q_r)



$I_F(100\%) =$	150	A
$Q_r(100\%) =$	8,68	μC



30-FT12NIA150SH-LG09F08 30-PT12NIA150SH-LG09F08Y

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datasheet

Ordering Code & Marking								
Version			Ordering Code					
without thermal paste 13 mm housing with solder pins			30-FT12NIA150SH-LG09F08					
without thermal paste 13 mm housing with Press-fit pins			30-PT12NIA150SH-LG09F08Y					
with thermal paste 13 mm housing with solder pins			30-FT12NIA150SH-LG09F08-/3/					
with thermal paste 13 mm housing with Press-fit pins			30-PT12NIA150SH-LG09F08Y-/3/					
NN-NNNNNNNNNNNN TTTTIV WWYY UL VIN LLLL SSSS			Text	Name	Date code	UL & VIN	Lot	Serial
				NN-NNNNNNNNNNNN-TTTTIV	WWYY	UL VIN	LLLL	SSSS
			Datamatrix	Type&Ver	Lot number	Serial	Date code	
			TTTTIV	LLLL	SSSS	WWYY		

Pin table				Outline	
Pin	X	Y	Function		
1	70,9	3	DC+1	Solder pin	
2	70,9	0	DC+1		
3	68,4	0	DC+1	Press-fit pin	
4	65,9	0	DC+1		
5	58,2	0	GND1		
6	55,7	0	GND1		
7	53,2	0	GND1	Tolerance of pinpositions: $\pm 0,5\text{mm}$ at the end of pins Dimension of coordinate axis is only offset without tolerance	
8	50,7	0	GND1		
9	43	0	DC-1		
10	40,5	0	DC-1		
11	38	0	DC-1		
12	38	3	DC-1		
13	32,9	3	DC-2		
14	32,9	0	DC-2		
15	30,4	0	DC-2		
16	27,9	0	DC-2		
17	20,35	0	GND2		
18	17,85	0	GND2		
19	15,35	0	GND2		
20	12,85	0	GND2		
21	5	0	DC+2		
22	2,5	0	DC+2		
23	0	0	DC+2		
24	0	3	DC+2		
25	0	16,35	TM14		
26	4,6	36,9	Ph2		
27	7,1	36,9	Ph2		
28	9,6	36,9	Ph2		
29	12,1	36,9	Ph2		
30	29,9	36,9	G12		
31	33	36,8	S12		
32	43	36,9	Ph1		
33	45,5	36,9	Ph1		
34	48	36,9	Ph1		
35	50,5	36,9	Ph1		
36	64,1	36,9	Therm1		
37	70,9	36,9	Therm2		
38	61,65	25,05	G11		
39	60,65	22,05	S11		
40	54,35	14,6	TM11		
41	46,2	30,9	S13		
42	47,2	33,9	G13		
43	44,15	17,7	TM15		
44	29,2	13,3	TM12		
45	18,95	13,7	S14		
46	15,95	13,7	G14		

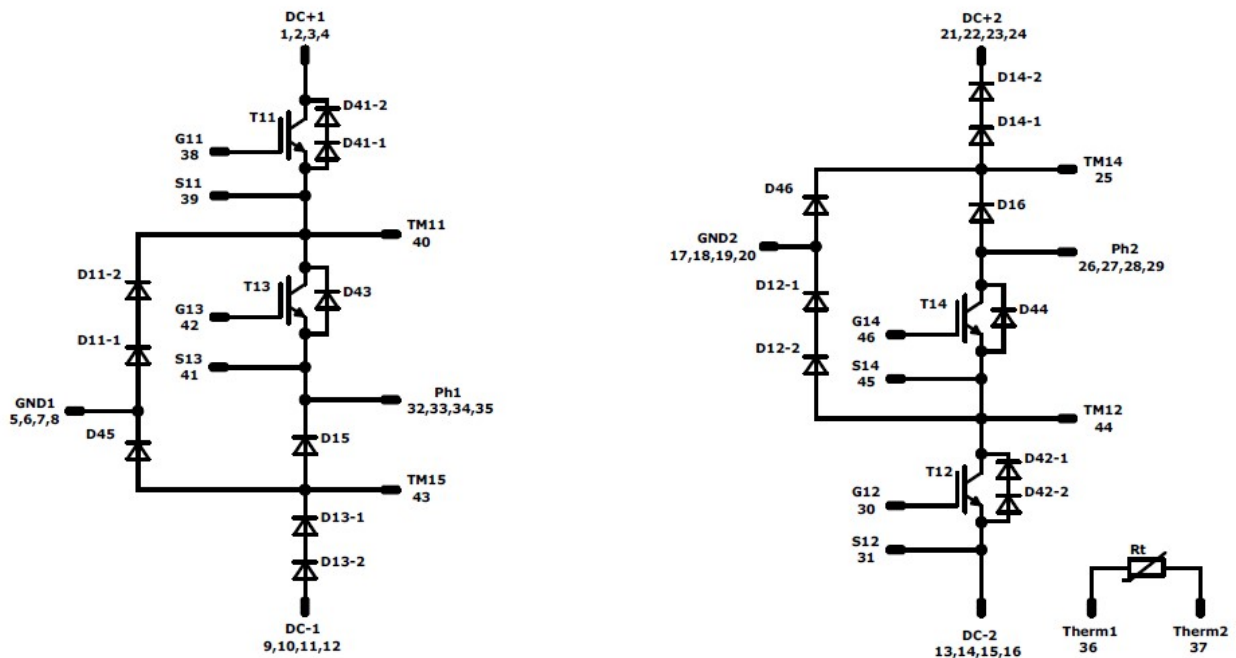


30-FT12NIA150SH-LG09F08 30-PT12NIA150SH-LG09F08Y

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datasheet

Pinout



Identification


ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	150 A	Buck Switch	
D11, D12	FWD	1300 V	150 A	Buck Diode	
D41, D42	FWD	1300 V	30 A	Buck Sw. Protection Diode	
T14, T13	IGBT	1200 V	150 A	Boost Switch	
D13, D14	FWD	1300 V	150 A	Boost Diode	
D43, D44	FWD	1200 V	25 A	Boost Sw. Protection Diode	
D45, D46	FWD	1200 V	25 A	Boost D. Protection Diode	
D15, D16	FWD	1200 V	150 A	Boost Sw.Inv.Diode	
Rt	NTC			Thermistor	



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

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

Package data
Package data for <i>flow 2</i> packages see vincotech.com website.

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

Document No.:	Date:	Modification:	Pages
30-xT12NIA150SH-LG09F08x-D3-14	09 Jul. 2019	Marketing application voltage modified	1

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