30-PT12NMA160SH04-M669F48Y

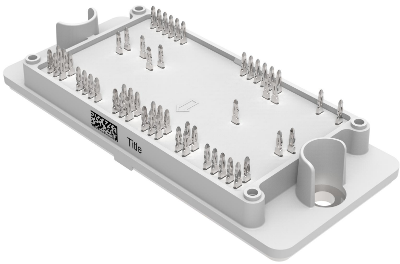
datasheet

***flow*MNPC 2** | **1200 V / 160 A**

Features

- Mixed voltage NPC topology
- Enhanced reactive power capability
- Low inductance layout
- Split output
- Common collector neutral connection

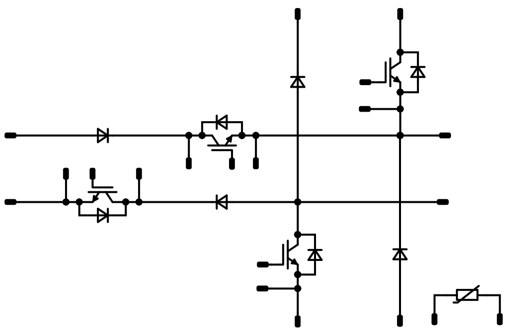
***flow* 2 13 mm housing**



Target applications

- Solar Inverters

Schematic



Types

- 30-PT12NMA160SH04-M669F48Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Buck Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	174	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		480	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	447	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	10	µs
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 °C	111	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	142	W
Maximum junction temperature	T_{jmax}			175	°C
Buck Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	22	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	56	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	114	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		640	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	180	W
Gate-emitter voltage	V_{GES}			±30	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 360 V	T_j = 25 °C	2	µs
Maximum junction temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	90	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	540	A
Surge current capability	I^2t			0	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	181	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	36	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		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	4000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	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
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,006	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		160	25 125 150	1,78	1,94 2,23 2,32	2,42(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			20	µA
Gate-emitter leakage current	I_{GES}		20	0		25			480	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		9320		pF
Output capacitance	C_{oes}							600		pF
Reverse transfer capacitance	C_{res}							520		pF
Gate charge	Q_g	V_{CC} = 960 V	15		160	25		740		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,21		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	±15	350	80	25 125 150		132,48 132,48 131,52		ns
Rise time	t_r					25 125 150		22,72 26,24 27,2		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		215,04 293,44 311,36		ns
Fall time	t_f					25 125 150		41,69 97,55 114,57		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=2,54 µC Q_{rFWD}=5,51 µC Q_{rFWD}=6,46 µC				25 125 150		1,37 2,15 2,4		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,44 4,65 5,33		mWs

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
Buck Diode										
Static										
Forward voltage	V_F				150	25 125 150		1,53 1,49 1,47	1,92(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			7,6	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,67		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=4251 A/µs d*i*/d*t*=3763 A/µs d*i*/d*t*=3925 A/µs	±15	350	80	25 125 150		61,93 88,59 94,22		A
Reverse recovery time	t_{rr}					25 125 150		61,9 94,72 106,85		ns
Recovered charge	Q_r					25 125 150		2,54 5,51 6,46		µC
Reverse recovered energy	E_{rec}					25 125 150		0,478 1,05 1,2		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1800 1442 1087		A/µs

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 Sw. Protection Diode										
Static										
Forward voltage	V_F				10	25 125 150	1,35	1,79 1,77 1,73	2,05(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			2,7	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,68		K/W

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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			5	0,1142	25	5	6	7	V
Collector-emitter saturation voltage	V_{CEsat}		15		160	25 125 150		1,64 1,69 1,75	1,9(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			20	μA
Gate-emitter leakage current	I_{GES}		30	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	30		25		9620		pF
Output capacitance	C_{oes}							368		pF
Reverse transfer capacitance	C_{res}							158		pF
Gate charge	Q_g		15	400	160	25		342		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,53		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	350	80	25 125 150		142,72 140,8 139,84		ns
Rise time	t_r					25 125 150		15,68 16,96 17,28		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		118,4 136,32 143,04		ns
Fall time	t_f					25 125 150		36,92 57,78 67,88		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=3,44 μC Q_{rFWD}=8,62 μC Q_{rFWD}=10,46 μC				25 125 150		0,909 1,34 1,47		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,6 2,37 2,68		mWs

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				100	25 125 150		2,21 2,31 2,22	2,54(1) 2,5(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		 8800	120 17600	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,52		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=6053 A/µs di/dt=5451 A/µs di/dt=5300 A/µs	±15	350	80	25 125 150		137,23 165,59 176,18		A
Reverse recovery time	t_{rr}					25 125 150		43,24 134,94 154,88		ns
Recovered charge	Q_r					25 125 150		3,44 8,62 10,46		µC
Reverse recovered energy	E_{rec}					25 125 150		0,771 2,21 2,69		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8803 7078 6667		A/µs

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. Protection Diode										
Static										
Forward voltage	V_F				30	25 125	1,23	1,7 1,59	1,87 (1)	V
Reverse leakage current	I_R	V_r = 650 V				25			0,36	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,61		K/W
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		14	%
Power dissipation	P							200		mW
Power dissipation constant	d					25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3 %						3950		K
B-value	$B_{(25/100)}$	Tol. ±3 %						3998		K
Vincotech Thermistor Reference									B	

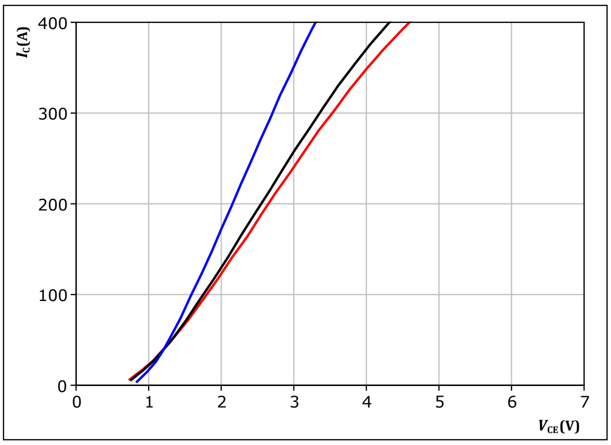
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



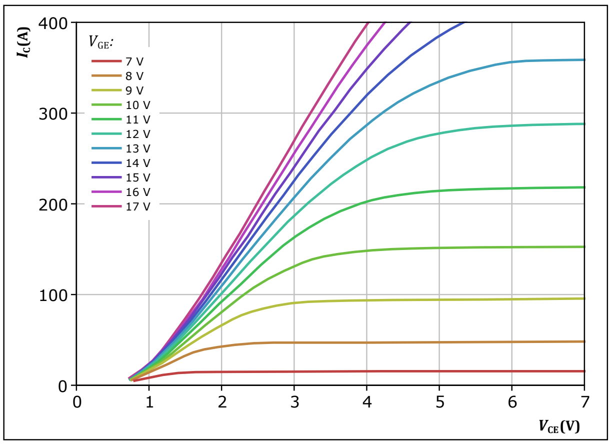
t_p =	250	μs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



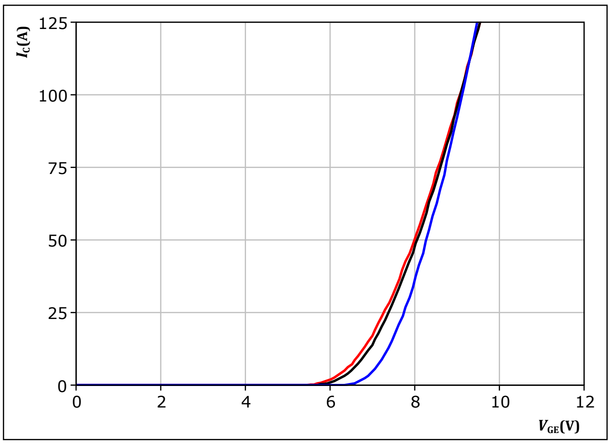
t_p =	250	μs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})



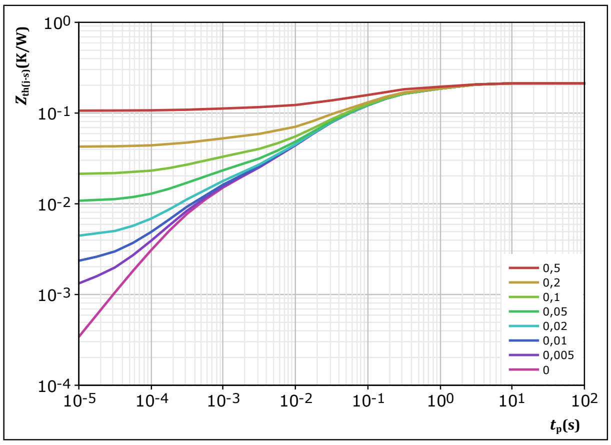
t_p =	250	μs
V_{CE} =	10	V

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	
$R_{th(j-s)}$ =	0,213	K/W

IGBT thermal model values

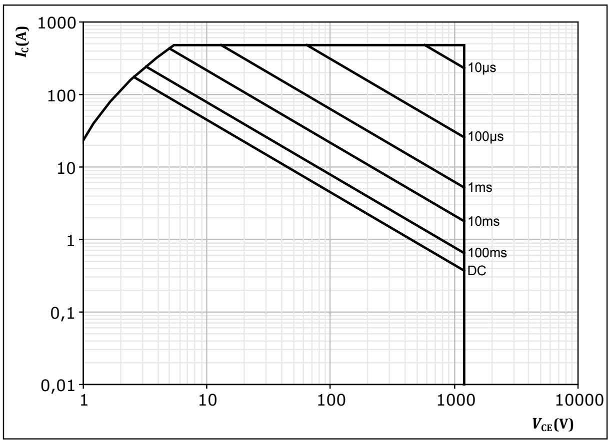
R (K/W)	τ (s)
5,20E-02	1,51E+00
9,57E-02	1,22E-01
4,99E-02	1,80E-02
8,04E-03	1,08E-03
7,07E-03	2,99E-04

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



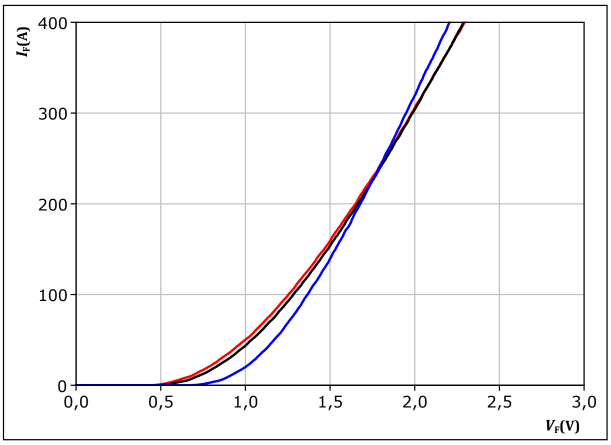
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



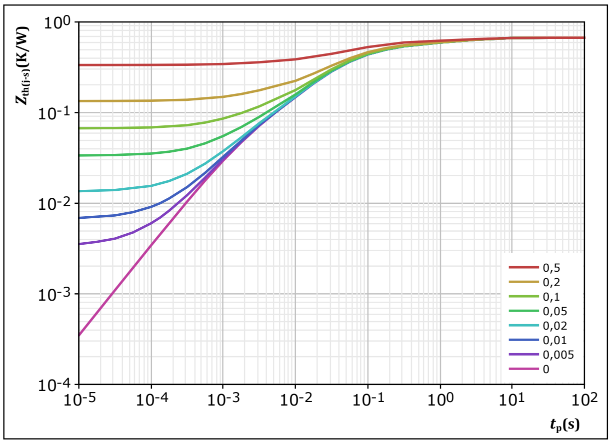
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

FWD thermal model values

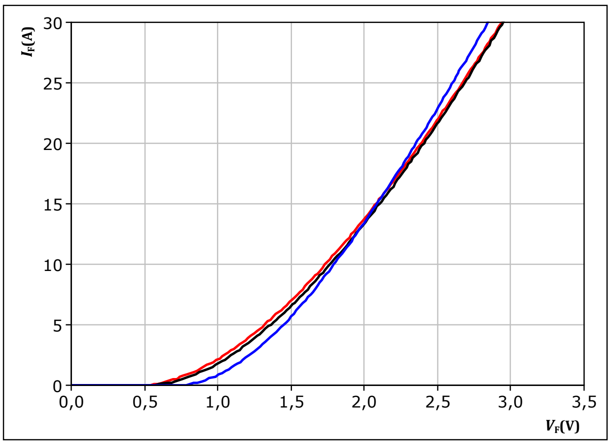
R (K/W)	τ (s)
8,21E-02	3,29E+00
8,71E-02	5,92E-01
2,69E-01	7,96E-02
1,91E-01	2,03E-02
4,05E-02	1,85E-03

Buck Sw. Protection Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



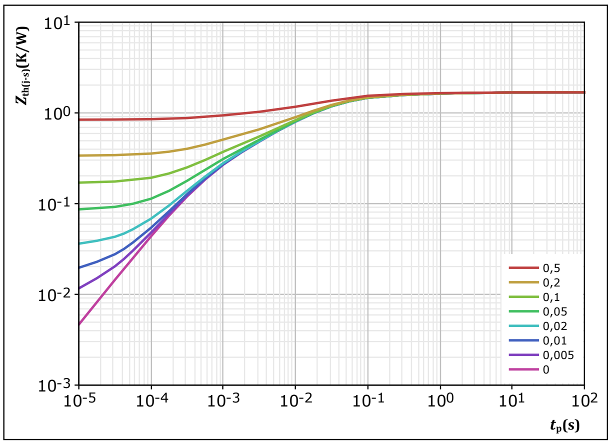
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 9. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,683 K/W

FWD thermal model values

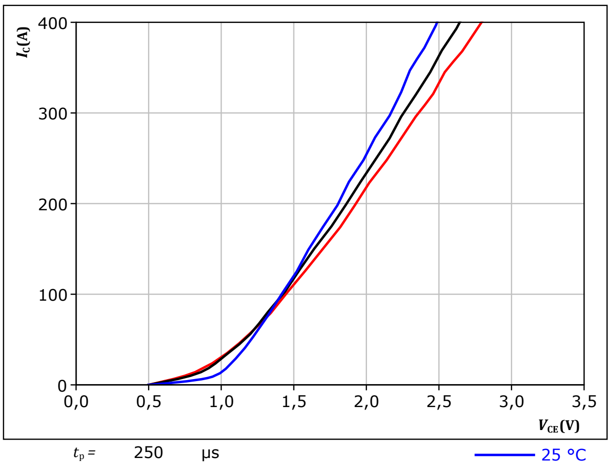
R (K/W)	τ (s)
6,27E-02	2,99E+00
1,53E-01	2,72E-01
5,57E-01	4,10E-02
4,90E-01	1,29E-02
2,45E-01	3,00E-03
1,75E-01	5,24E-04

Boost Switch Characteristics

figure 10. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



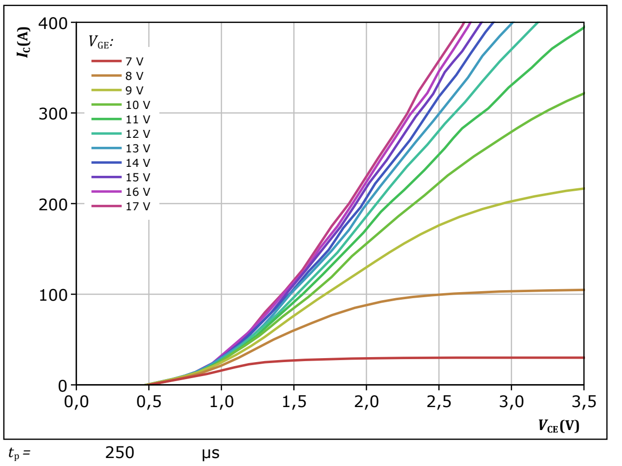
t_p =	250	μs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 11. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



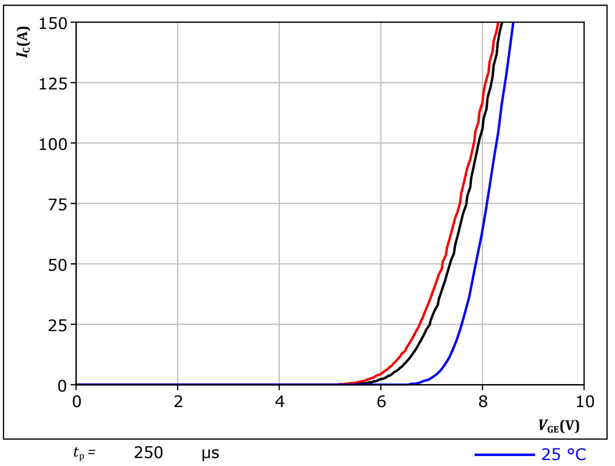
t_p =	250	μs
T_j =	150	°C

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

figure 12. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



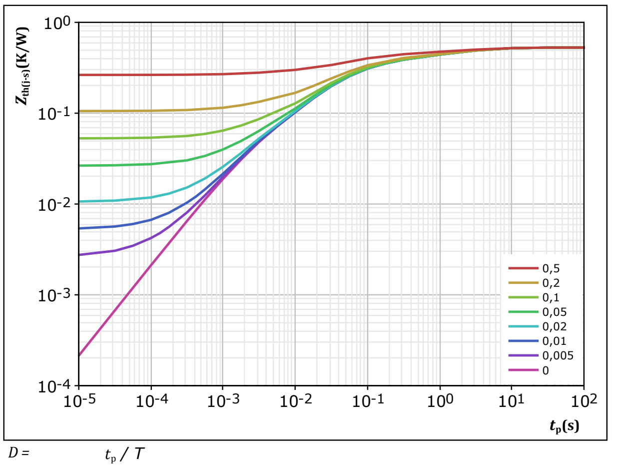
t_p =	250	μs
V_{CE} =	10	V

T_j: 25 °C, 125 °C, 150 °C

figure 13. IGBT

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,527	K/W

IGBT thermal model values

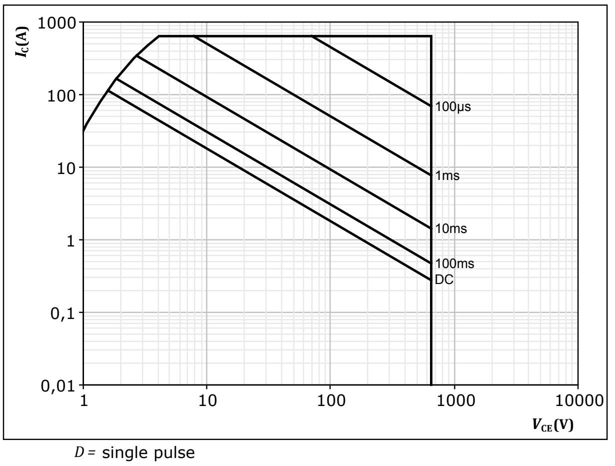
R (K/W)	τ (s)
5,68E-02	5,04E+00
8,65E-02	1,27E+00
1,43E-01	1,55E-01
2,07E-01	2,97E-02
3,42E-02	2,55E-03

Boost Switch Characteristics

figure 14.	IGBT

Safe operating area

$I_C = f(V_{CE})$



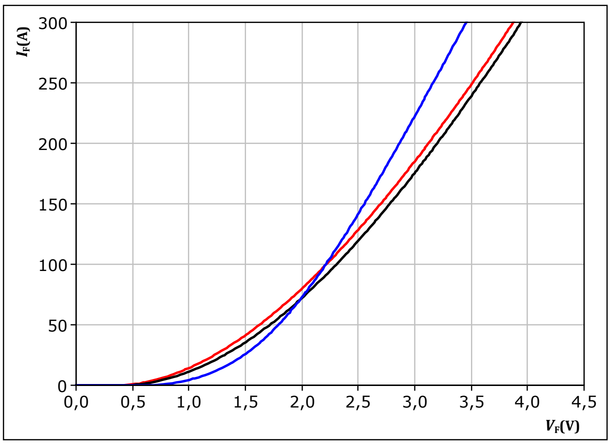
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

I_F = f(V_F)



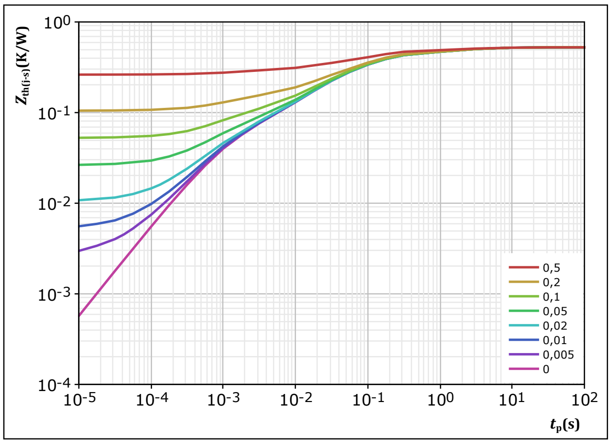
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 16. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,524 K/W

FWD thermal model values

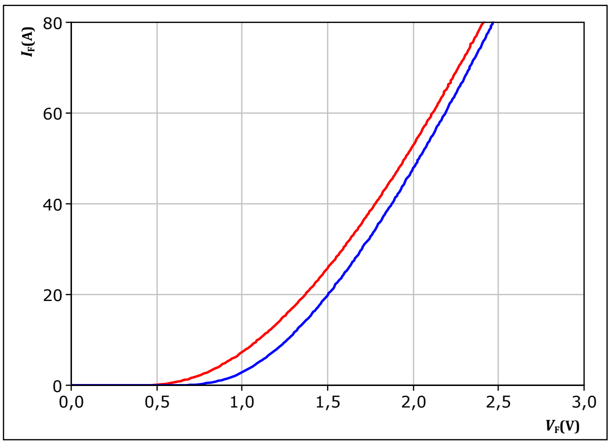
R (K/W)	τ (s)
3,78E-02	4,57E+00
6,87E-02	1,00E+00
2,55E-01	9,32E-02
1,15E-01	1,51E-02
4,80E-02	1,02E-03

Boost Sw. Protection Diode Characteristics

figure 17. FWD

Typical forward characteristics

I_F = f(V_F)



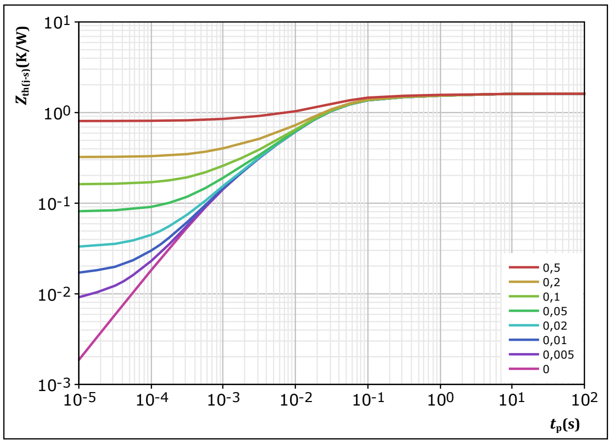
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 18. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,614 K/W

FWD thermal model values

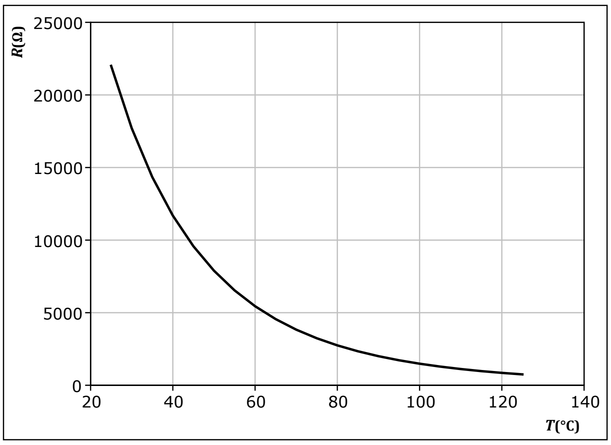
R (K/W)	τ (s)
1,05E-01	3,05E+00
1,86E-01	2,04E-01
8,60E-01	3,00E-02
3,40E-01	8,15E-03
1,24E-01	1,07E-03

Thermistor Characteristics

figure 19.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

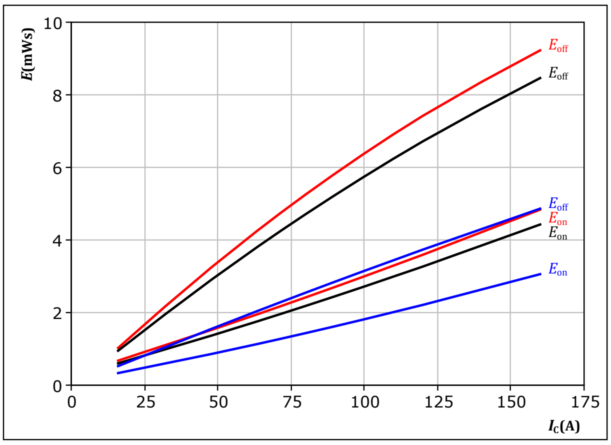


Buck Switching Characteristics

figure 20. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



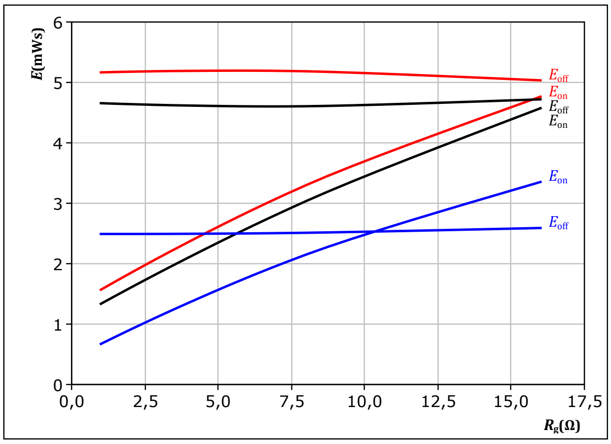
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C
V_{GE} =	±15	V	125 °C
R_{gon} =	4	Ω	150 °C
R_{goff} =	4	Ω	

figure 21. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



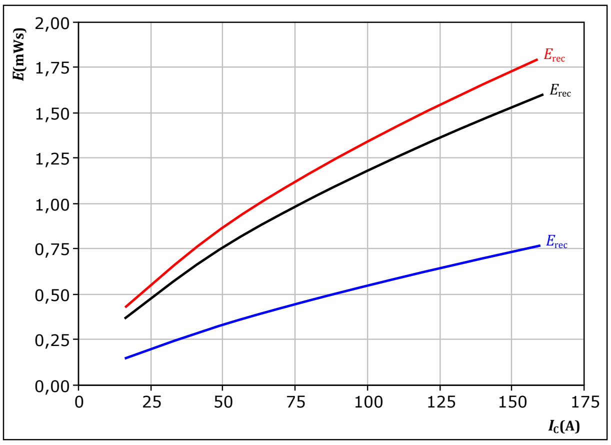
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C
V_{GE} =	±15	V	125 °C
I_C =	80	A	150 °C

figure 22. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



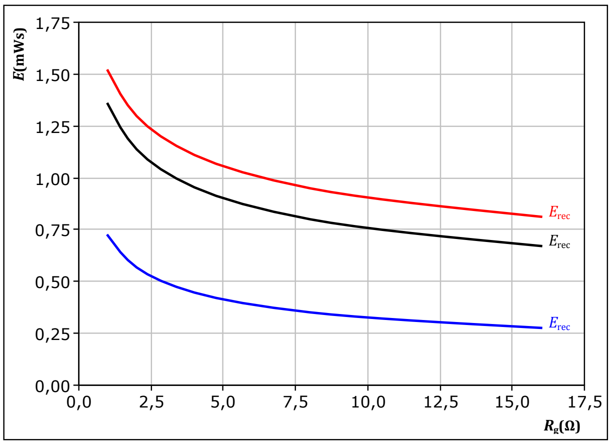
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C
V_{GE} =	±15	V	125 °C
R_{gon} =	4	Ω	150 °C

figure 23. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

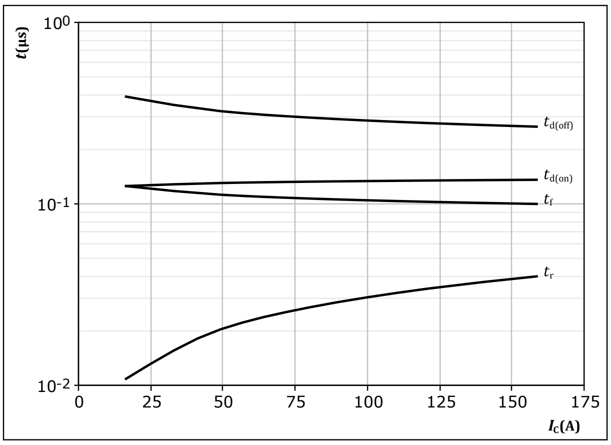
V_{CE} =	350	V	T_j: 25 °C
V_{GE} =	±15	V	125 °C
I_C =	80	A	150 °C

Buck Switching Characteristics

figure 24. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



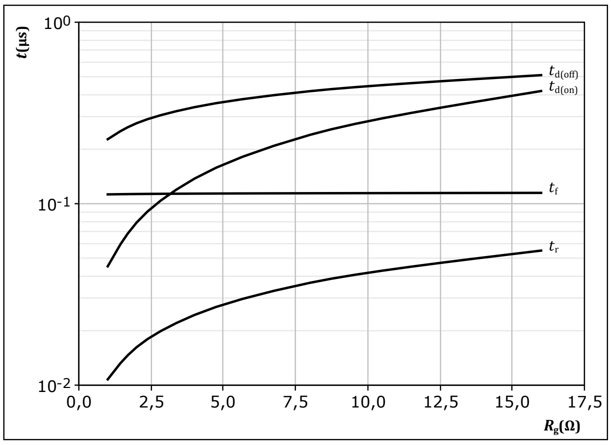
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 25. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



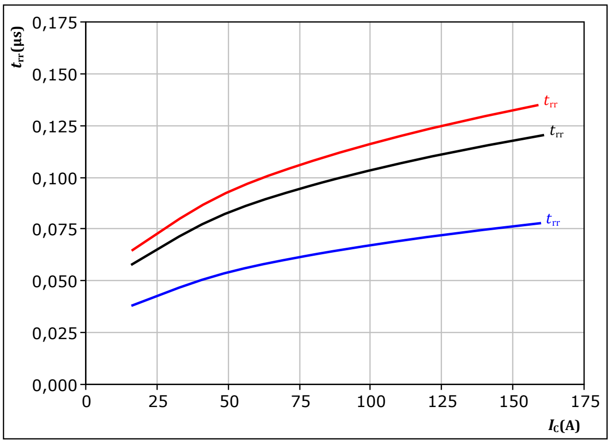
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	80	A

figure 26. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

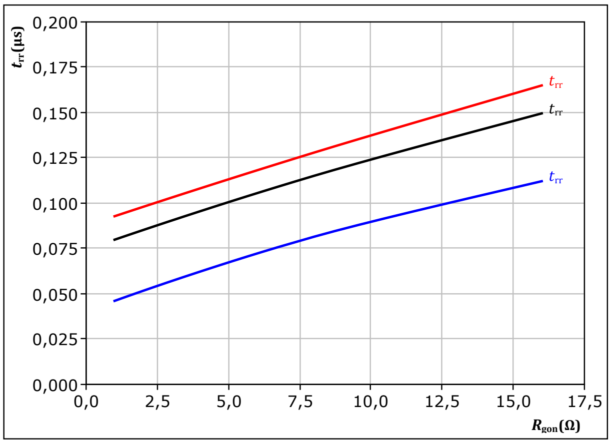
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 27. **FWD**

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

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



With an inductive load at

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	80	A

T_j: 25 °C, 125 °C, 150 °C

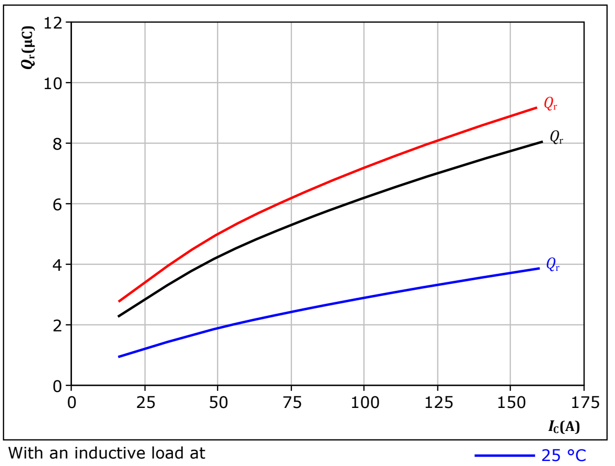
Copyright Vincotech

Buck Switching Characteristics

figure 28. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



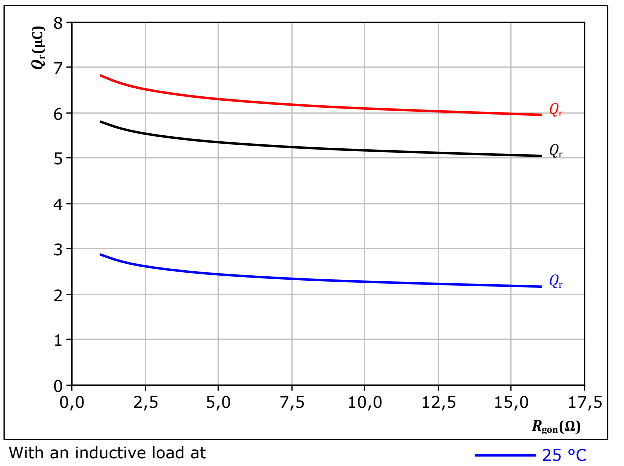
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 29. FWD

Typical recovered charge as a function of turn on gate resistor

Q_r = f(R_{gon})



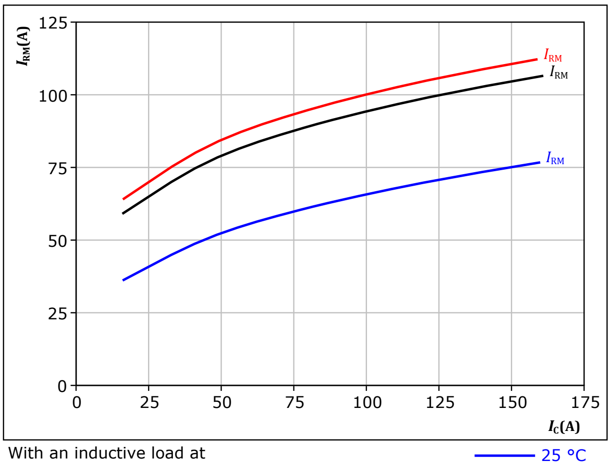
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

figure 30. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



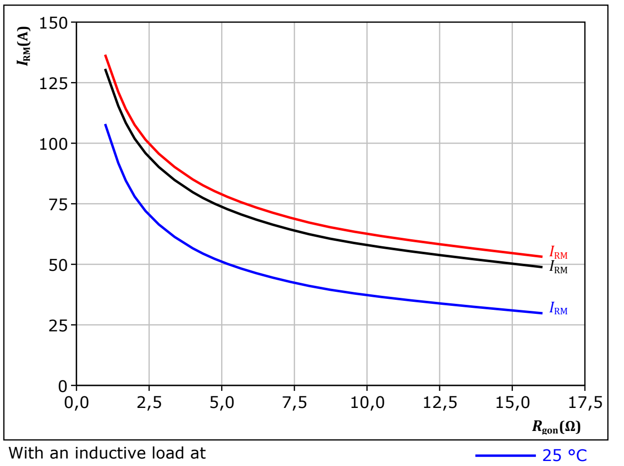
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 31. FWD

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

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



With an inductive load at

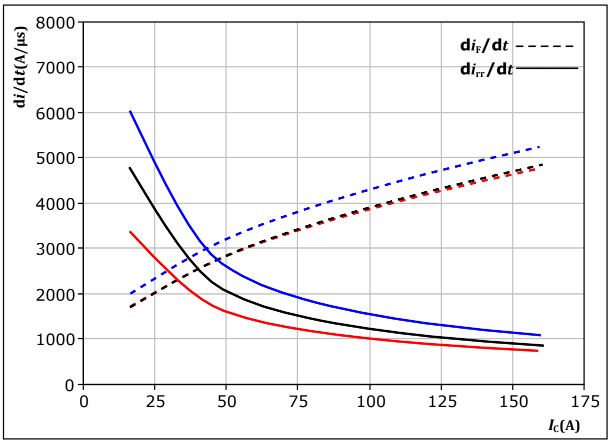
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

Buck Switching Characteristics

figure 32. **FWD**

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

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



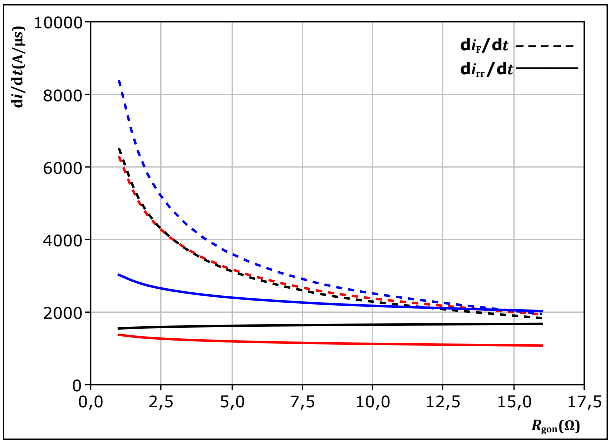
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 33. **FWD**

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

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



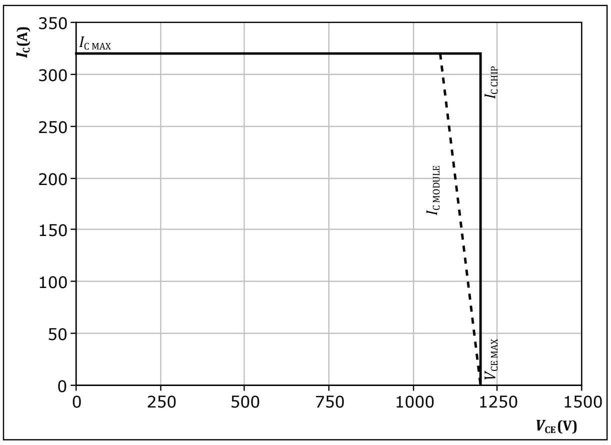
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

figure 34. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



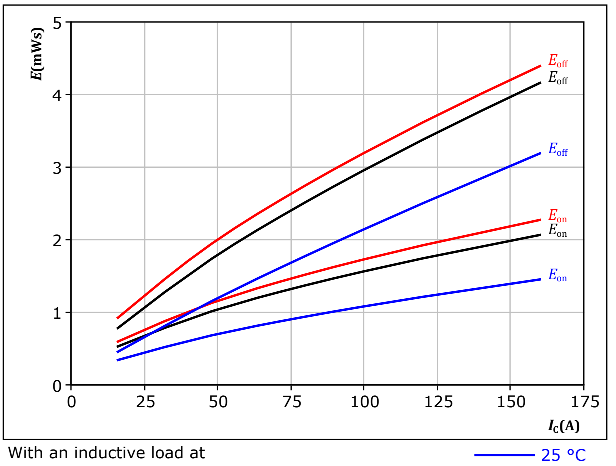
At			
	T_j =	150	°C
	R_{gon} =	4	Ω
	R_{goff} =	4	Ω

Boost Switching Characteristics

figure 35. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



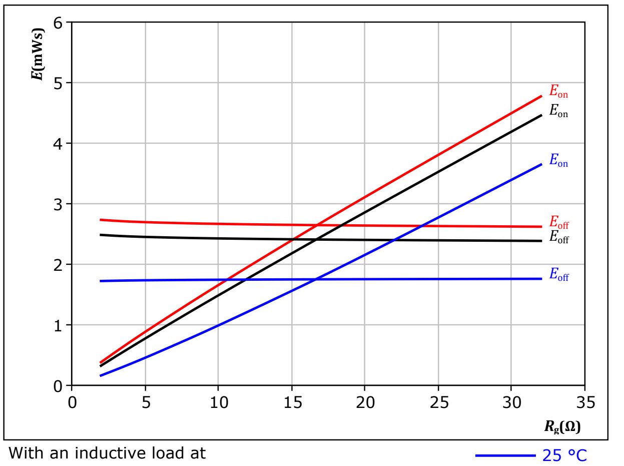
With an inductive load at

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

figure 36. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



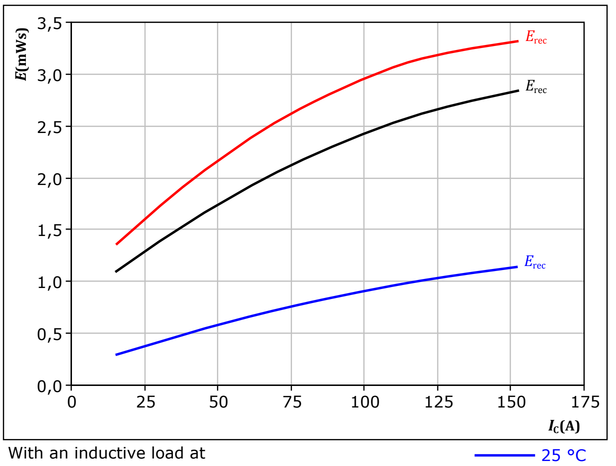
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

figure 37. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



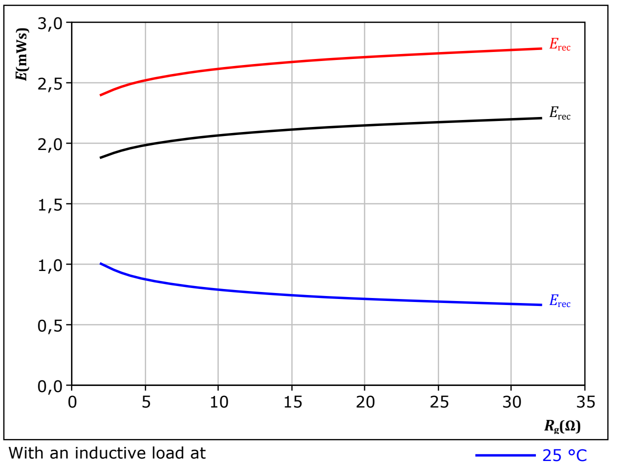
With an inductive load at

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

figure 38. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

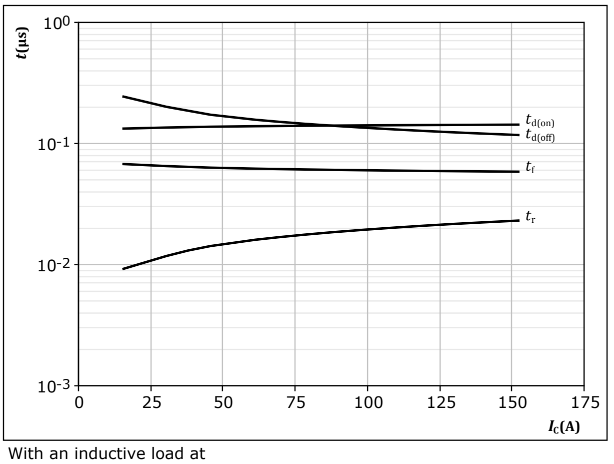
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

Boost Switching Characteristics

figure 39. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



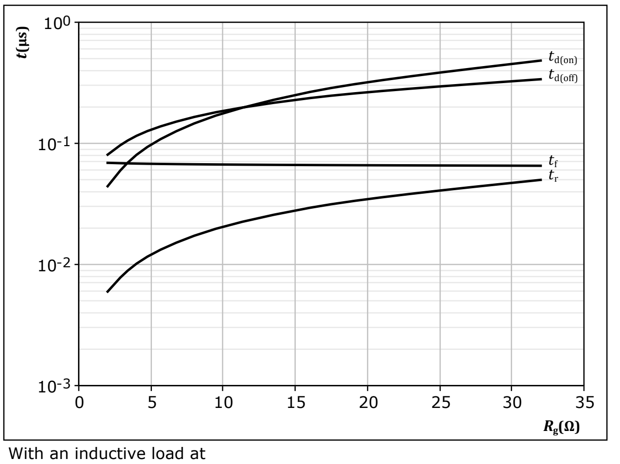
With an inductive load at

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

figure 40. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



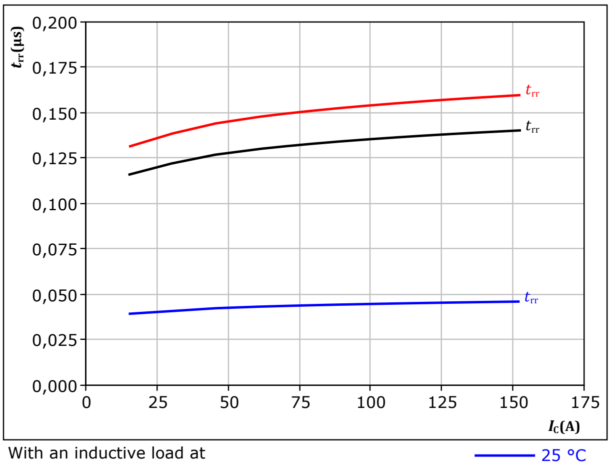
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	80	A

figure 41. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

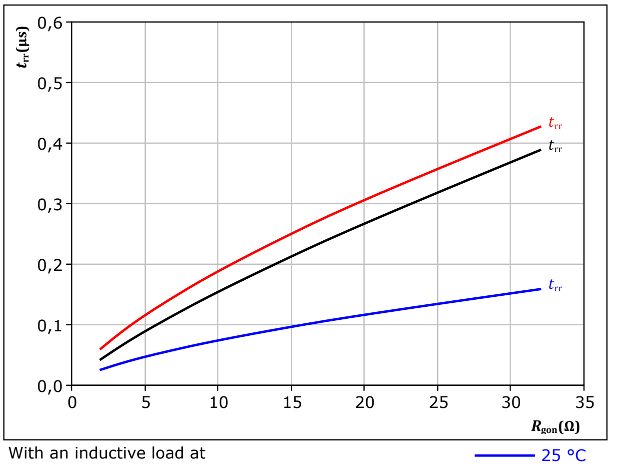
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 42. **FWD**

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

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



With an inductive load at

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	80	A

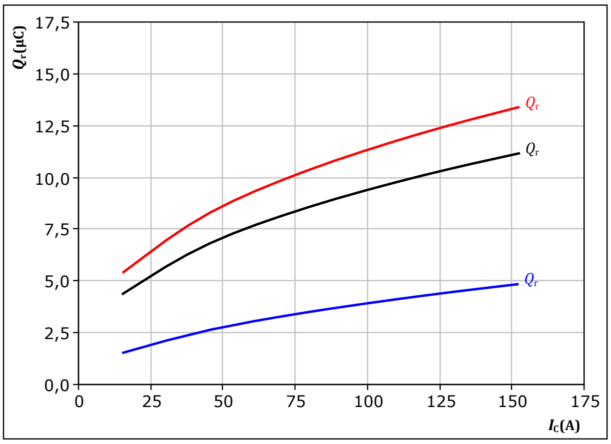
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 43. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



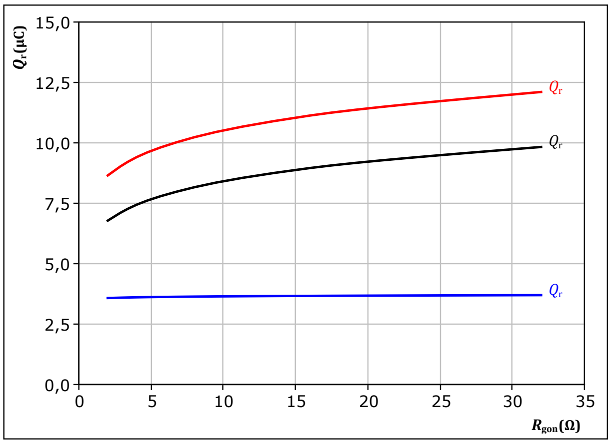
With an inductive load at

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

figure 44. **FWD**

Typical recovered charge as a function of turn on gate resistor

Q_r = f(R_{gon})



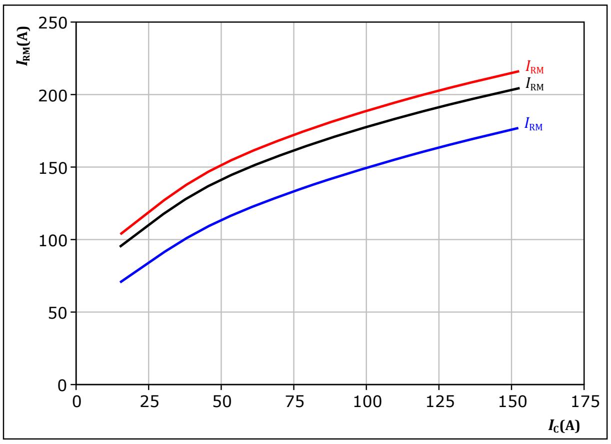
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

figure 45. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



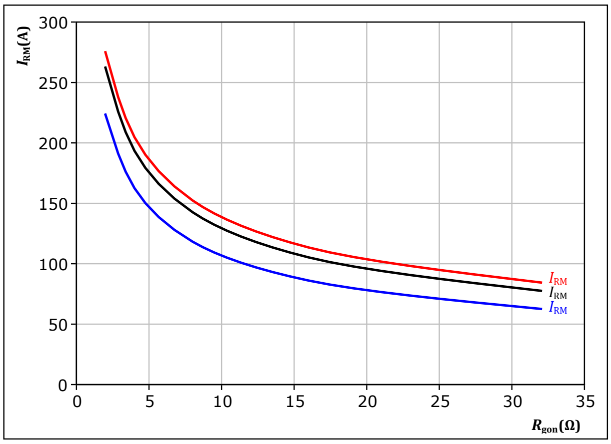
With an inductive load at

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

figure 46. **FWD**

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

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



With an inductive load at

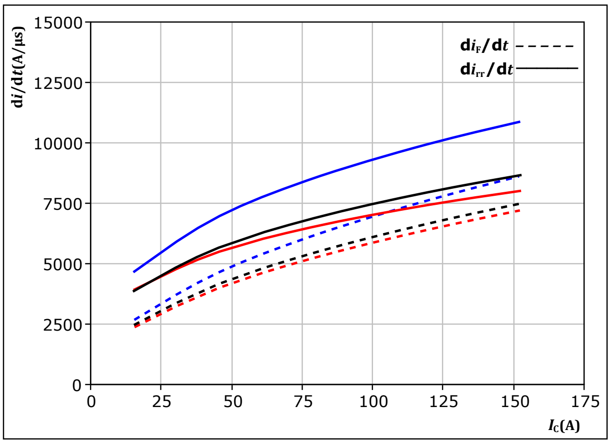
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

Boost Switching Characteristics

figure 47. **FWD**

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

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



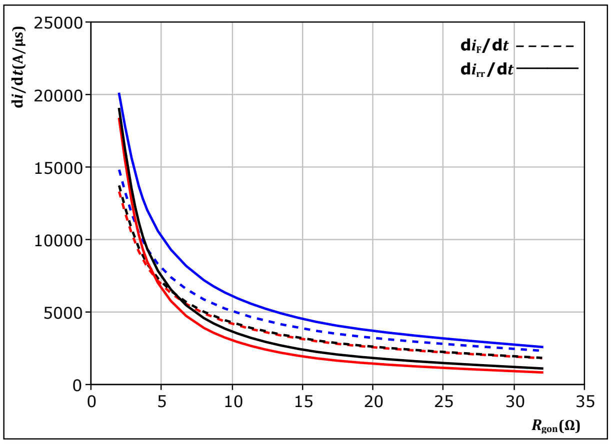
With an inductive load at

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

figure 48. **FWD**

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

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



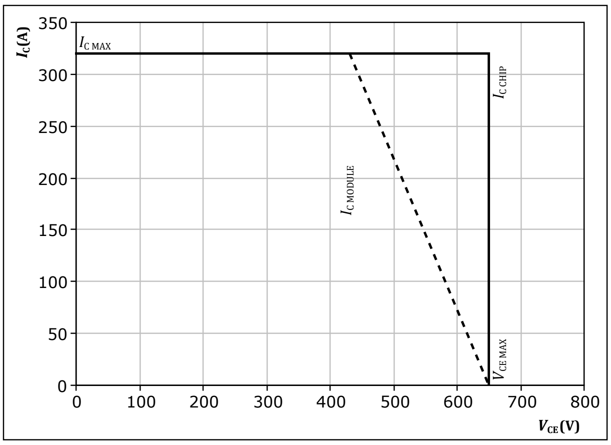
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	80	A		150 °C

figure 49. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Switching Definitions

figure 50. **IGBT**

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

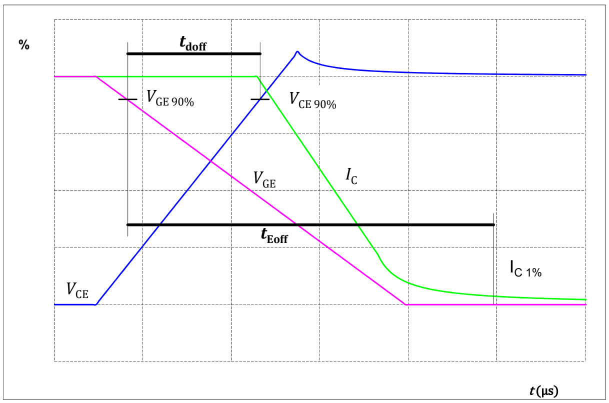


figure 51. **IGBT**

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

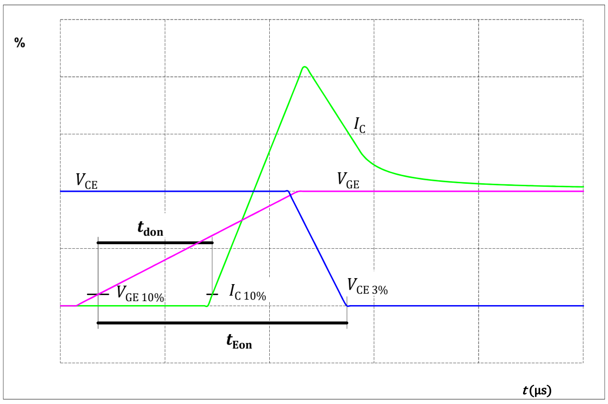


figure 52. **IGBT**

Turn-off Switching Waveforms & definition of t_f

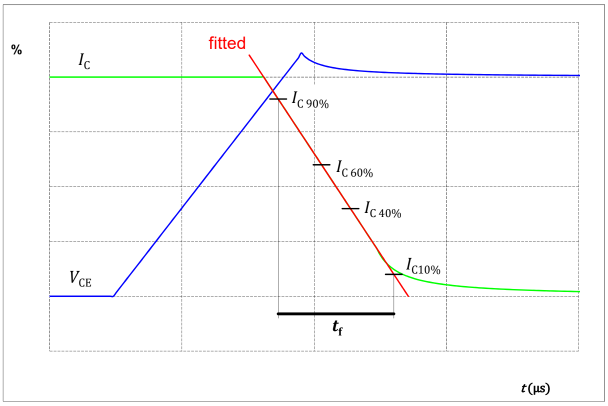
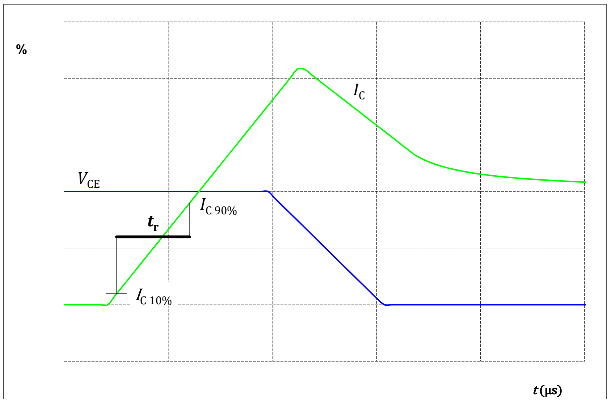


figure 53. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 54. **FWD**

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

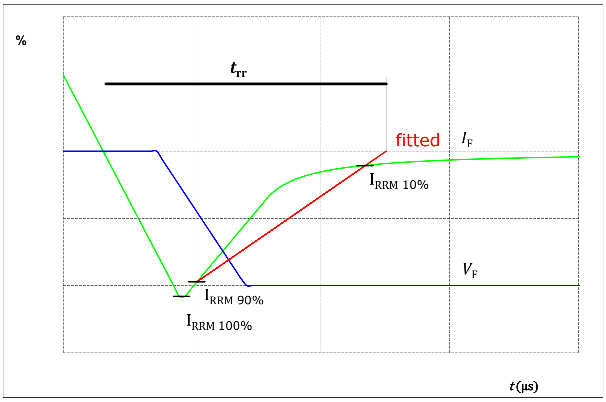
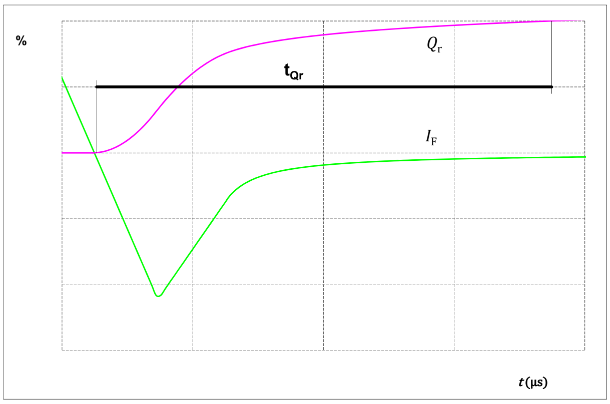


figure 55. **FWD**

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



Ordering Code	
Version	**Ordering Code**
Without thermal paste	30-PT12NMA160SH04-M669F48Y
With thermal paste	30-PT12NMA160SH04-M669F48Y-/3/

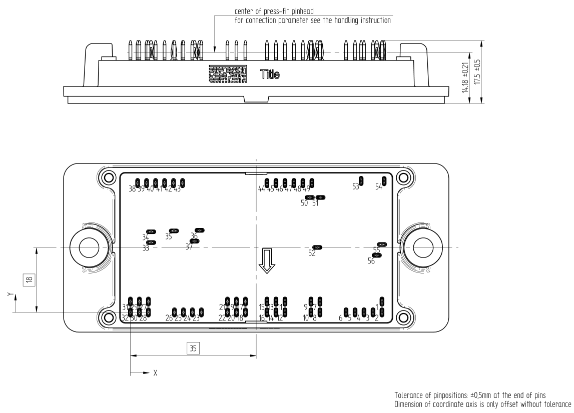
Marking

	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		

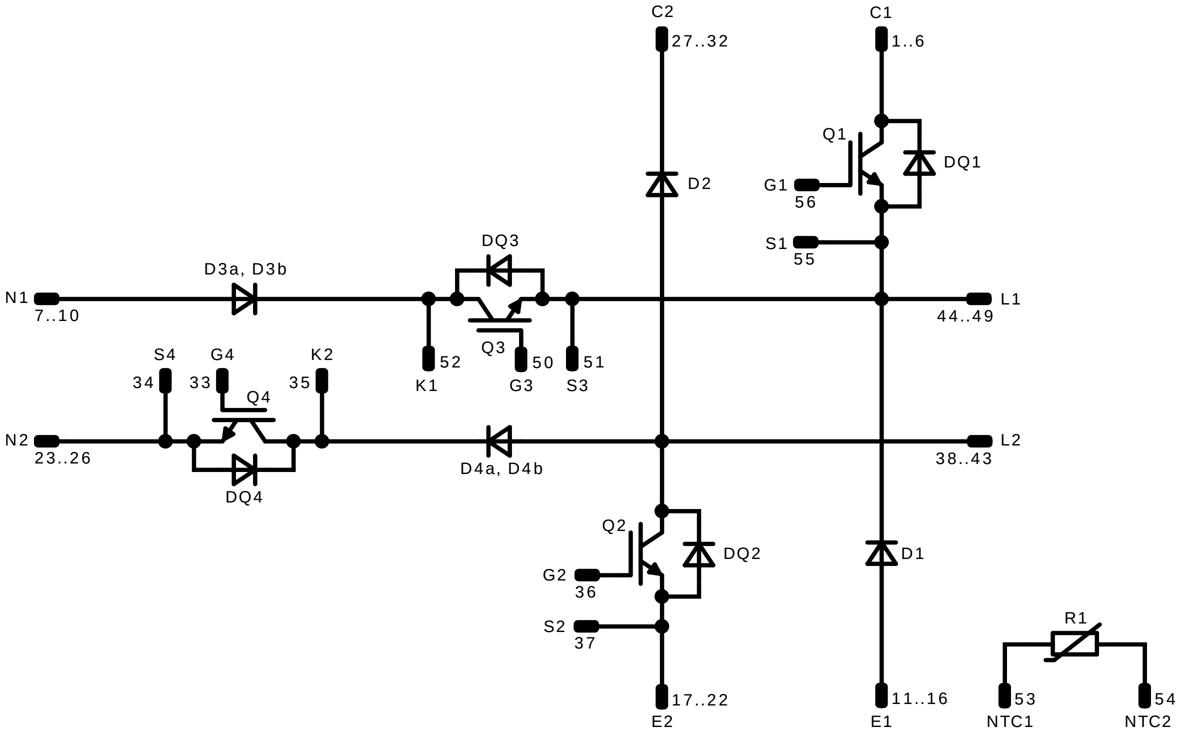
Outline

Pin table [mm]

Pin	X	Y	Function	29	2,5	3	C2
1	70	3	C1	30	2,5	0	C2
2	70	0	C1	31	0	3	C2
3	67,5	0	C1	32	0	0	C2
4	65	0	C1	33	5,75	19,45	G4
5	62,5	0	C1	34	5,75	22,45	S4
6	60	0	C1	35	12,1	22,7	K2
7	52,75	3	N1	36	19,25	22,85	G2
8	52,75	0	N1	37	17,85	19,85	S2
9	50,25	3	N1	38	2	36	L2
10	50,25	0	N1	39	4,5	36	L2
11	43	3	E1	40	7	36	L2
12	43	0	E1	41	9,5	36	L2
13	40,5	3	E1	42	12	36	L2
14	40,5	0	E1	43	14,5	36	L2
15	38	3	E1	44	38	36	L1
16	38	0	E1	45	40,5	36	L1
17	32	3	E2	46	43	36	L1
18	32	0	E2	47	45,5	36	L1
19	29,5	3	E2	48	48	36	L1
20	29,5	0	E2	49	50,5	36	L1
21	27	3	E2	50	49,9	32	G3
22	27	0	E2	51	52,9	32	S3
23	19,75	0	N2	52	52	18,1	K1
24	17,25	0	N2	53	64,2	36,6	NTC
25	14,75	0	N2	54	70,6	36,55	NTC
26	12,25	0	N2	55	70	18,9	S1
27	5	3	C2	56	68,55	15,9	G1
28	5	0	C2				



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
Q1, Q2	IGBT	1200 V	160 A	Buck Switch	
D3, D4	FWD	650 V	150 A	Buck Diode	
DQ1, DQ2	FWD	1200 V	10 A	Buck Sw. Protection Diode	
Q4, Q3	IGBT	650 V	160 A	Boost Switch	
D2, D1	FWD	1200 V	100 A	Boost Diode	
DQ4, DQ3	FWD	650 V	30 A	Boost Sw. Protection Diode	
NTC	NTC			Thermistor	

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

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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.

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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.