B0-SP10FSA600S7-LM69F98T
B0-SP10FSB600S7-LM79F98T
datasheet

***flow*FC S3 split** **950 V / 600 A**

Features

- Low inductive mid-power package
- High efficient Flying Capacitor topology
- Optimized for 1500 V applications
- Integrated DC capacitors

flow S3 12 mm housing

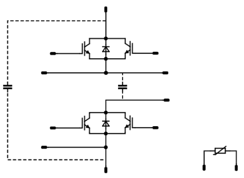
LM69F98T

LM79F98T

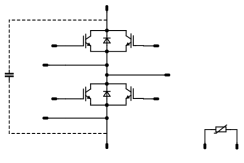
Target applications

- Solar Inverters

Schematic



LM69F98T



LM79F98T

Types

- B0-SP10FSA600S7-LM69F98T
- B0-SP10FSB600S7-LM79F98T

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
AC 1 Switch L					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	357	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	636	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
AC 1 Diode L					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	295	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	506	W
Maximum junction temperature	T_{jmax}			175	°C
AC 1 Switch H					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	357	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	636	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
AC 1 Diode H					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	295	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	506	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
AC 2 Switch L					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	357	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	636	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
AC 2 Diode L					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	295	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	506	W
Maximum junction temperature	T_{jmax}			175	°C
AC 2 Switch H					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	357	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	636	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
AC 2 Diode H					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	295	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	506	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Flying Capacitor					
Maximum DC voltage	V_{MAX}			1000	V
Operation Temperature	T_{op}			-55 ... 125	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			1500	V
Operation Temperature	T_{op}			-55 ... 125	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
Creepage distance		LM69F98T LM79F98T		9,77 9,6	mm
Clearance		LM69F98T LM79F98T		8,72 8,22	mm
Comparative Tracking Index	CTI			≥ 600	

*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
AC 1 Switch L										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,01002	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,79 2,05 2,09	2,35(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			12	µA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							0,25		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		39000		pF
Output capacitance	C_{oes}							834		pF
Reverse transfer capacitance	C_{res}							120		pF
Gate charge	Q_g		15		0	25		1380		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	600	25 125 150		197,76 198,72 199,36		ns
Rise time	t_r					25 125 150		25,92 28,16 28,48		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		148,16 170,88 176,64		ns
Fall time	t_f					25 125 150		23,26 41,21 46,35		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=17,07 µC Q_{rFWD}=36,66 µC Q_{rFWD}=42 µC				25 125 150		29,9 33,52 33,7		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		15,19 23,63 25,62		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	
AC 1 Diode L										
Static										
Forward voltage	V_F				600	25 125 150	2,1	2,58 2,41 2,35	2,8[1]	V
Reverse leakage current	I_R	V_r = 950 V				25			24	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,19		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=19055 A/µs d*i*/d*t*=19448 A/µs d*i*/d*t*=19304 A/µs	±15	600	600	25 125 150		361,81 540,11 587,56		A
Reverse recovery time	t_{rr}					25 125 150		142,07 173,11 182,02		ns
Recovered charge	Q_r					25 125 150		17,07 36,66 42		µC
Reverse recovered energy	E_{rec}					25 125 150		4,8 12,05 14,24		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		15319 13469 14003		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Values Min	Values Typ	Values Max	Unit
AC 1 Switch H										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,01002	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,79 2,05 2,09	2,35(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			12	μA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							0,25		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		39000		pF
Output capacitance	C_{oes}							834		pF
Reverse transfer capacitance	C_{res}							120		pF
Gate charge	Q_g		15		0	25		1380		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	600	25 125 150		197,76 198,72 199,36		ns
Rise time	t_r					25 125 150		25,92 28,16 28,48		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		148,16 170,88 176,64		ns
Fall time	t_f					25 125 150		23,26 41,21 46,35		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=17,07 μC Q_{rFWD}=36,66 μC Q_{rFWD}=42 μC				25 125 150		29,9 33,52 33,7		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		15,19 23,63 25,62		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	
AC 1 Diode H										
Static										
Forward voltage	V_F				600	25 125 150	2,1	2,58 2,41 2,35	2,8(1)	V
Reverse leakage current	I_R	V_r = 950 V				25			24	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,19		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=19055 A/µs di/dt=19448 A/µs di/dt=19304 A/µs	±15	600	600	25 125 150		361,81 540,11 587,56		A
Reverse recovery time	t_{rr}					25 125 150		142,07 173,11 182,02		ns
Recovered charge	Q_r					25 125 150		17,07 36,66 42		µC
Reverse recovered energy	E_{rec}					25 125 150		4,8 12,05 14,24		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		15319 13469 14003		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
AC 2 Switch L										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,01002	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,79 2,05 2,09	2,35(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			12	µA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							0,25		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		39000		pF
Output capacitance	C_{oes}							834		pF
Reverse transfer capacitance	C_{res}							120		pF
Gate charge	Q_g		15		0	25		1380		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	600	25 125 150		199,04 200,32 200,64		ns
Rise time	t_r					25 125 150		24,32 26,56 27,52		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		151,04 175,36 181,76		ns
Fall time	t_f					25 125 150		22,91 42,32 49,49		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=17,05 µC Q_{rFWD}=38,32 µC Q_{rFWD}=44,72 µC				25 125 150		29,33 33,29 34,4		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		15,06 23,9 26,74		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	
AC 2 Diode L										
Static										
Forward voltage	V_F				600	25 125 150	2,1	2,58 2,41 2,35	2,8(1)	V
Reverse leakage current	I_R	V_r = 950 V				25			24	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,19		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=20877 A/µs d*i*/d*t*=20334 A/µs d*i*/d*t*=20767 A/µs	±15	600	600	25 125 150		377,72 572,15 625,39		A
Reverse recovery time	t_{rr}					25 125 150		138,55 173,65 187,29		ns
Recovered charge	Q_r					25 125 150		17,05 38,32 44,72		µC
Reverse recovered energy	E_{rec}					25 125 150		4,65 12,41 15,01		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		16716 15210 15877		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_j [°C]	Min	Typ	Max	Unit
AC 2 Switch H										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}			0,01002	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,79 2,05 2,09	2,35(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			12	µA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							0,25		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		39000		pF
Output capacitance	C_{oes}							834		pF
Reverse transfer capacitance	C_{res}							120		pF
Gate charge	Q_g		15		0	25		1380		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	600	25 125 150		199,04 200,32 200,64		ns
Rise time	t_r					25 125 150		24,32 26,56 27,52		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		151,04 175,36 181,76		ns
Fall time	t_f					25 125 150		22,91 42,32 49,49		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=17,05 µC Q_{rFWD}=38,32 µC Q_{rFWD}=44,72 µC				25 125 150		29,33 33,29 34,4		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		15,06 23,9 26,74		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	
AC 2 Diode H										
Static										
Forward voltage	V_F				600	25 125 150	2,1	2,58 2,41 2,35	2,8(1)	V
Reverse leakage current	I_R	V_r = 950 V				25			24	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 4,4 W/mK (PTM)						0,19		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=20877 A/µs d*i*/d*t*=20334 A/µs d*i*/d*t*=20767 A/µs	±15	600	600	25 125 150		377,72 572,15 625,39		A
Reverse recovery time	t_{rr}					25 125 150		138,55 173,65 187,29		ns
Recovered charge	Q_r					25 125 150		17,05 38,32 44,72		µC
Reverse recovered energy	E_{rec}					25 125 150		4,65 12,41 15,01		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		16716 15210 15877		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	
Flying Capacitor										
Static										
Capacitance	C	DC bias voltage = 0 V				25		400		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		112		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	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	

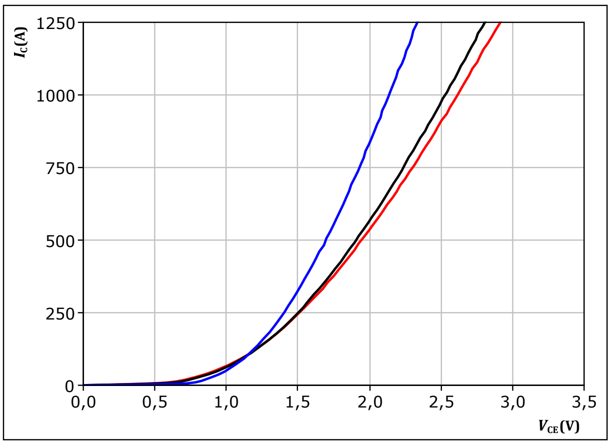
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

AC 1, AC 2 Switch L Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



t_p = 250 µs

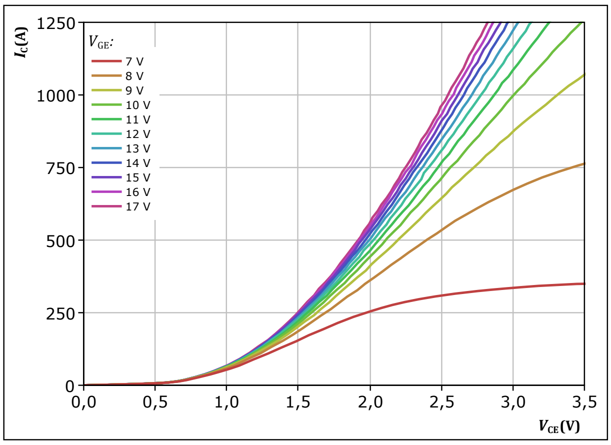
V_{GE} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



t_p = 250 µs

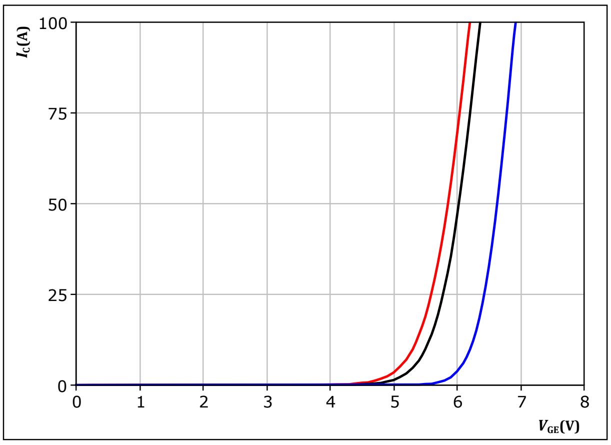
T_j = 150 °C

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

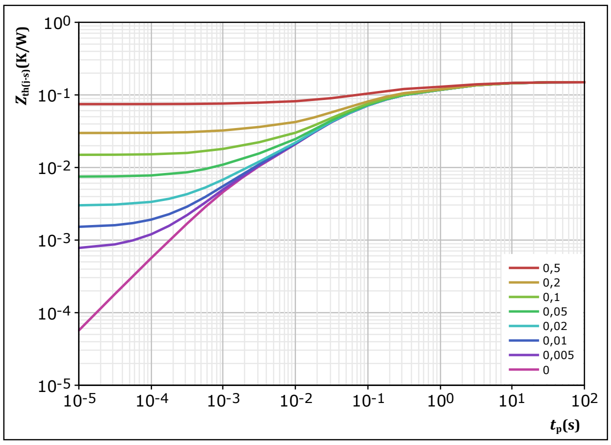
V_{CE} = 14 V

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

$R_{th(j-s)}$ = 0,149 K/W

IGBT thermal model values

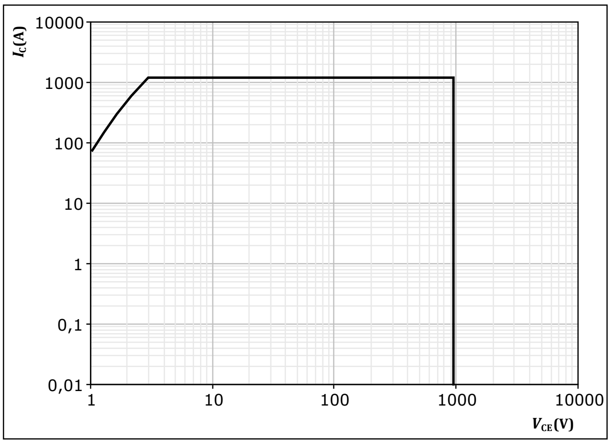
R (K/W)	τ (s)
1,26E-02	8,85E+00
4,17E-02	1,44E+00
6,06E-02	1,19E-01
2,86E-02	2,31E-02
5,81E-03	1,46E-03

AC 1, AC 2 Switch L Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



D = single pulse

T_s = 80 °C

V_{GE} = 15 V

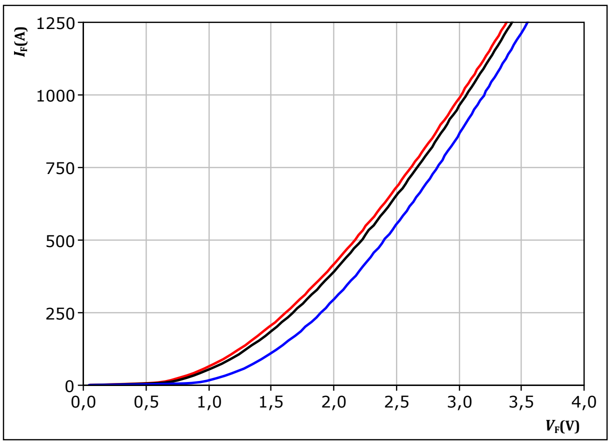
T_j = T_{jmax}

AC 1, AC 2 Diode L Characteristics

figure 6. FWD

Typical forward characteristics

I_F = f(V_F)



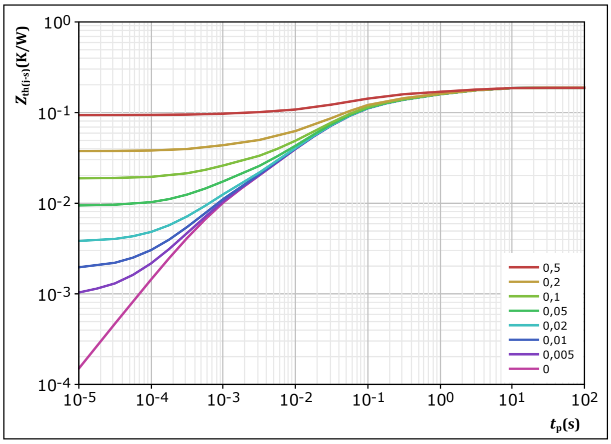
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,188 K/W

FWD thermal model values

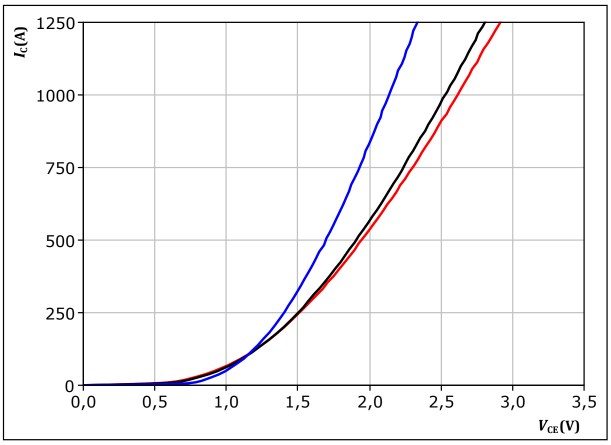
R (K/W)	τ (s)
2,89E-02	3,31E+00
3,81E-02	5,82E-01
8,22E-02	6,14E-02
3,00E-02	1,08E-02
8,47E-03	7,78E-04

AC 1, AC 2 Switch H Characteristics

figure 8. IGBT

Typical output characteristics

I_C = f(V_{CE})



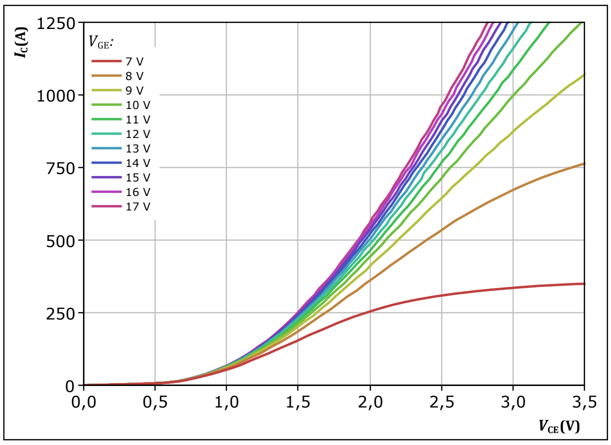
t_p =	250	µs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 9. IGBT

Typical output characteristics

I_C = f(V_{CE})



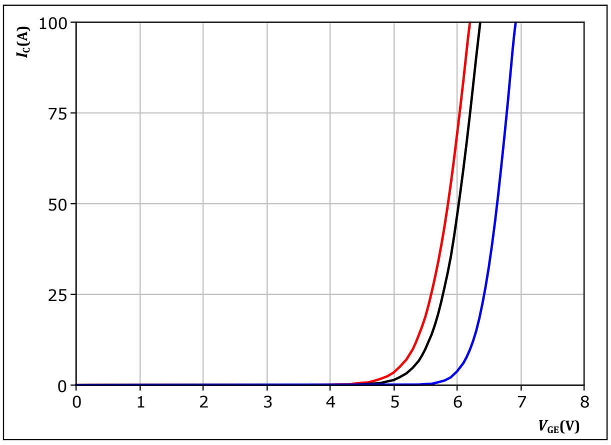
t_p =	250	µs
T_j =	150	°C

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

figure 10. IGBT

Typical transfer characteristics

I_C = f(V_{GE})



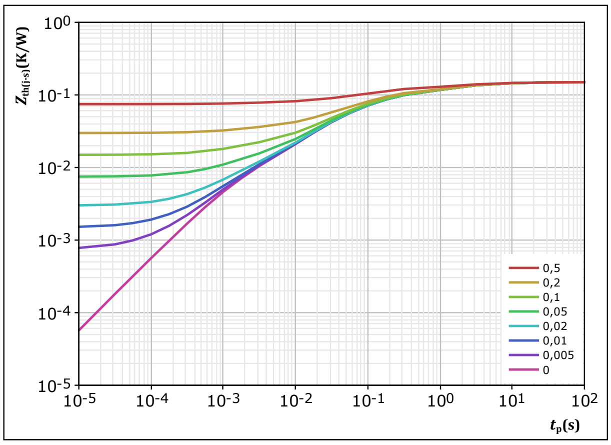
t_p =	250	µs
V_{CE} =	14	V

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	
$R_{th(j-s)}$ =	0,149	K/W

IGBT thermal model values

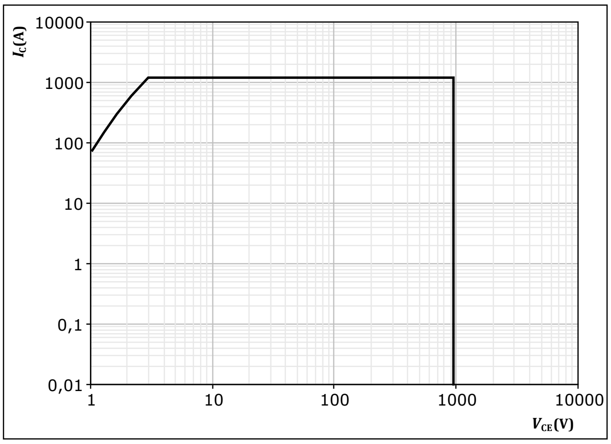
R (K/W)	τ (s)
1,26E-02	8,85E+00
4,17E-02	1,44E+00
6,06E-02	1,19E-01
2,86E-02	2,31E-02
5,81E-03	1,46E-03

AC 1, AC 2 Switch H Characteristics

figure 12.	IGBT

Safe operating area

I_C = f(V_{CE})



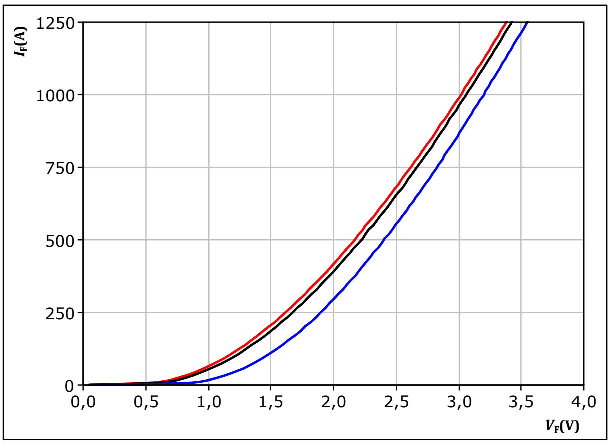
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

AC 1, AC 2 Diode H Characteristics

figure 13. **FWD**

Typical forward characteristics

I_F = f(V_F)



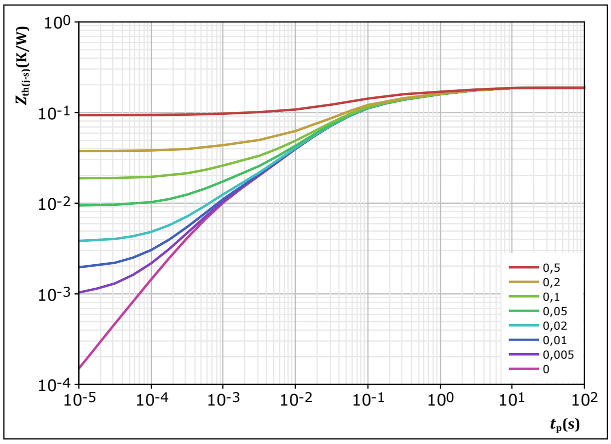
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 14. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,188 K/W

FWD thermal model values

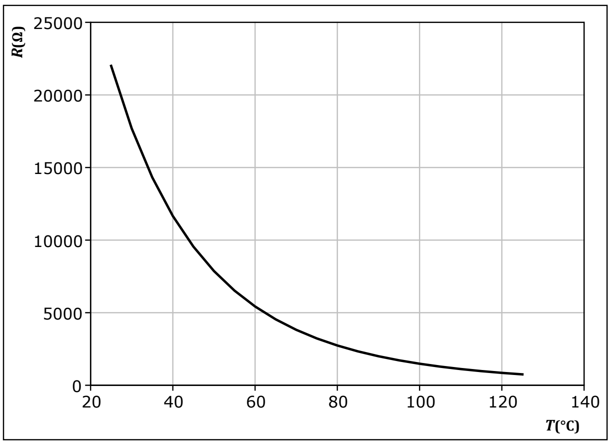
R (K/W)	τ (s)
2,89E-02	3,31E+00
3,81E-02	5,82E-01
8,22E-02	6,14E-02
3,00E-02	1,08E-02
8,47E-03	7,78E-04

Thermistor Characteristics

figure 15. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

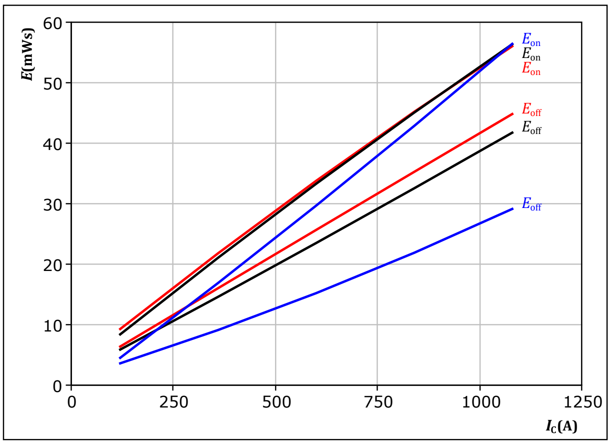


AC 1 Switching Characteristics L

figure 16. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



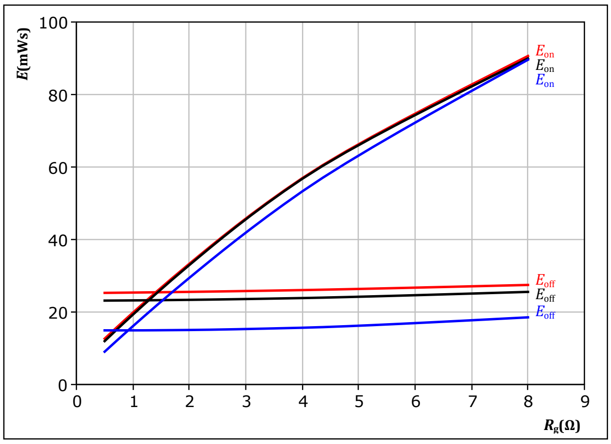
With an inductive load at

			T_j:
V_{CE} =	600	V	25 °C
V_{GE} =	±15	V	125 °C
R_{gon} =	2	Ω	150 °C
R_{goff} =	2	Ω	

figure 17. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



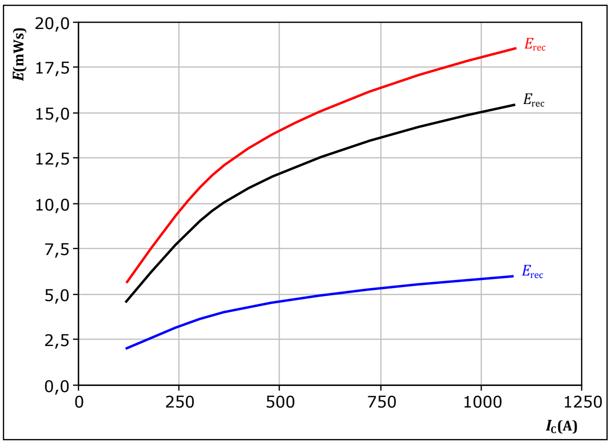
With an inductive load at

			T_j:
V_{CE} =	600	V	25 °C
V_{GE} =	±15	V	125 °C
I_C =	600	A	150 °C

figure 18. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



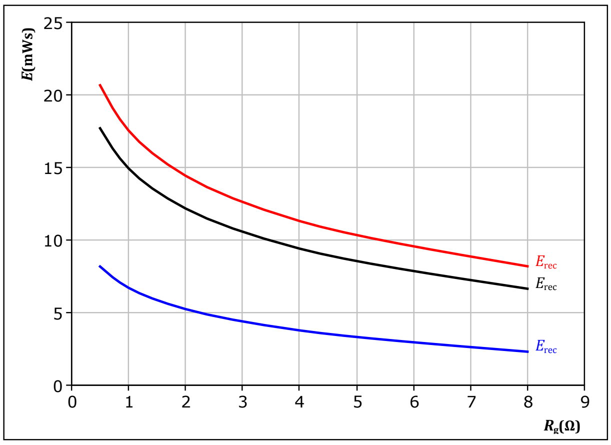
With an inductive load at

			T_j:
V_{CE} =	600	V	25 °C
V_{GE} =	±15	V	125 °C
R_{gon} =	2	Ω	150 °C

figure 19. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

			T_j:
V_{CE} =	600	V	25 °C
V_{GE} =	±15	V	125 °C
I_C =	600	A	150 °C

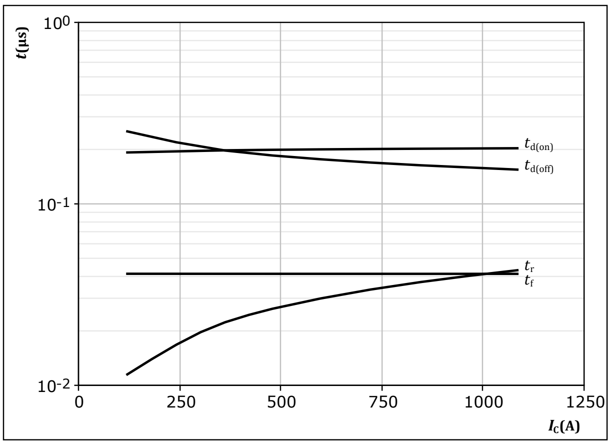
Vincotech

AC 1 Switching Characteristics L

figure 20. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



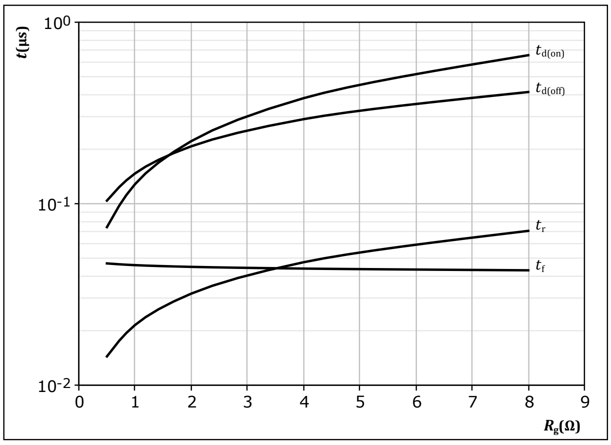
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 21. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



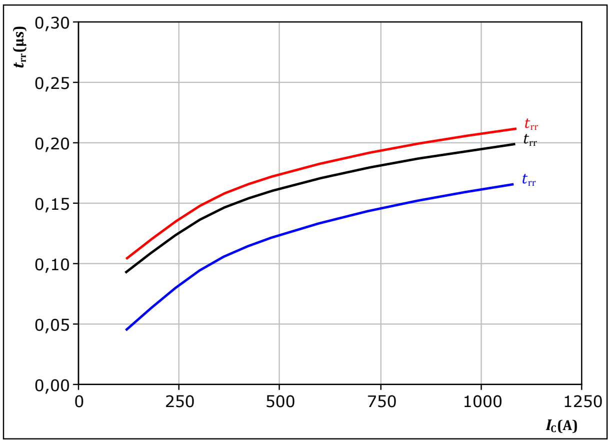
With an inductive load at

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

figure 22. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

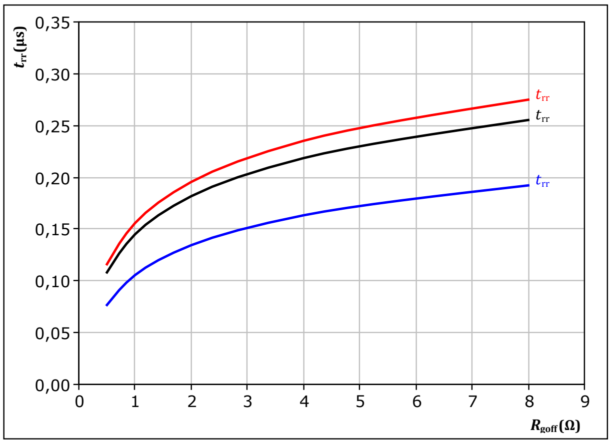
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 23. **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} =	600	V
V_{GE} =	±15	V
I_C =	600	A

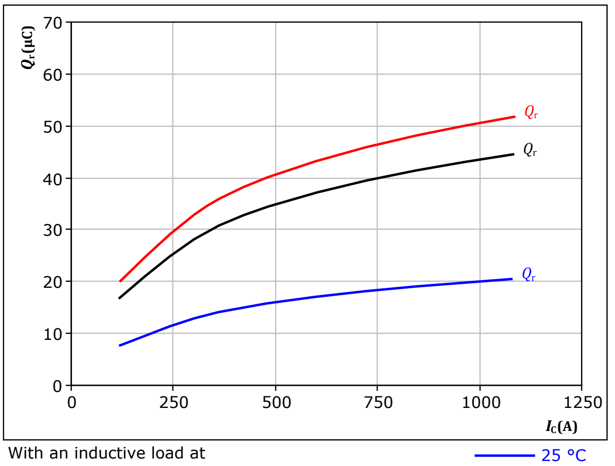
T_j: 25 °C, 125 °C, 150 °C

AC 1 Switching Characteristics L

figure 24. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



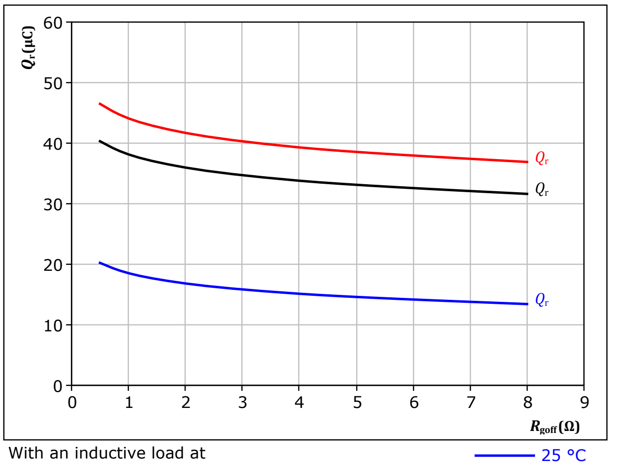
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 25. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



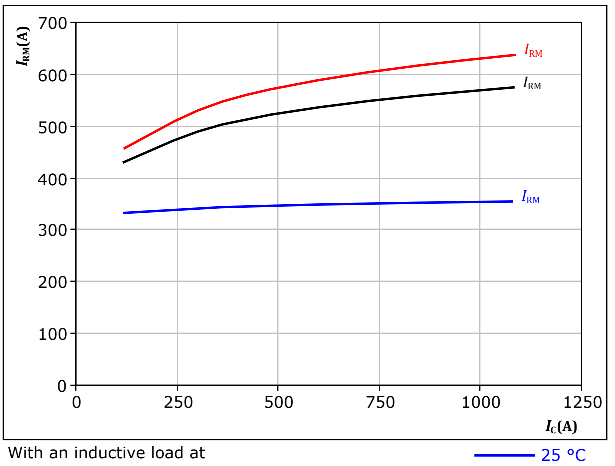
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 26. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



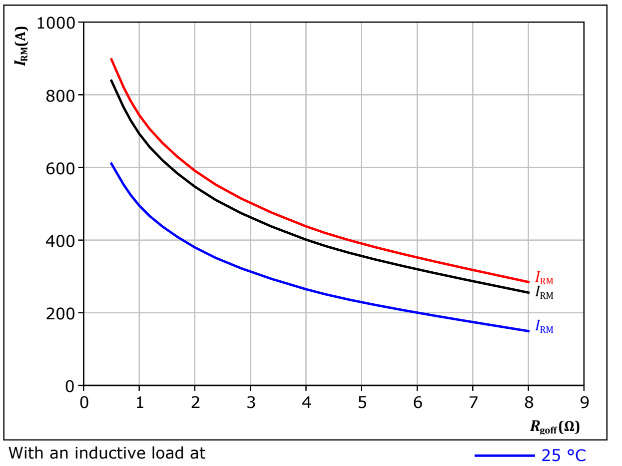
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 27. FWD

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

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



With an inductive load at

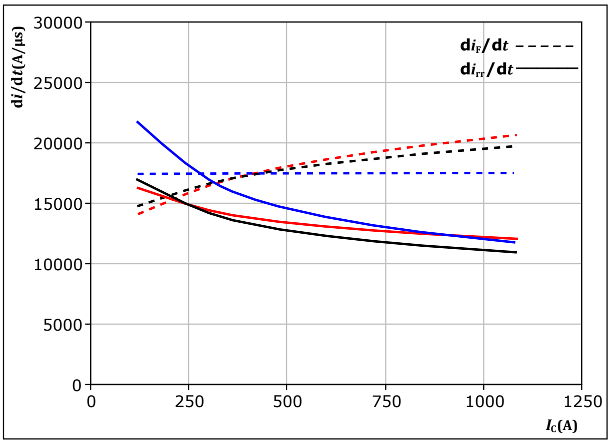
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

AC 1 Switching Characteristics L

figure 28. **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)



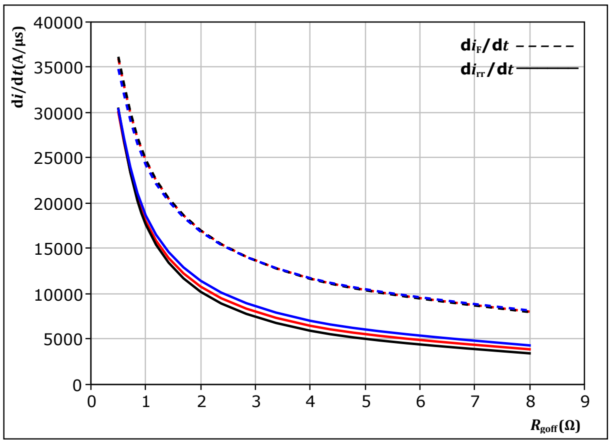
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 29. **FWD**

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

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



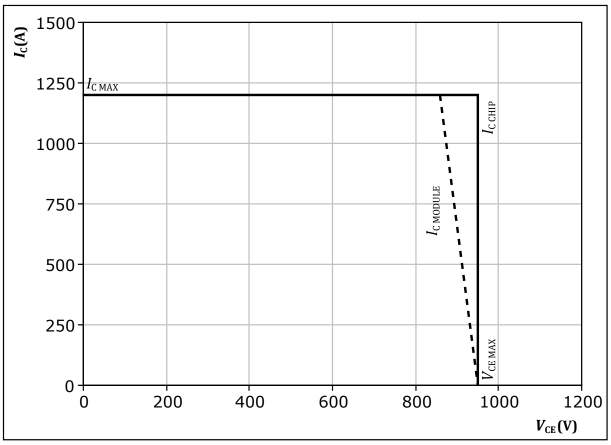
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 30. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



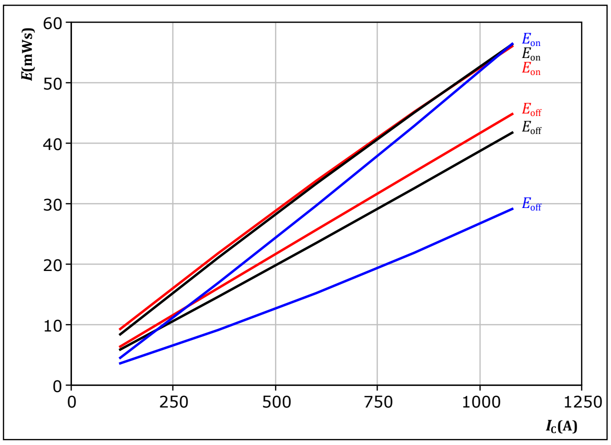
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

AC 1 Switching Characteristics H

figure 31. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



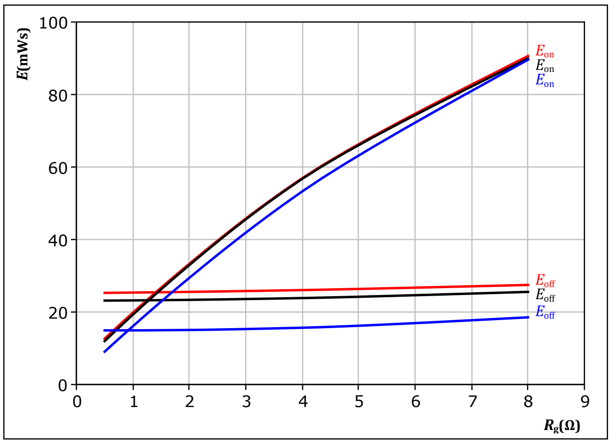
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 32. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



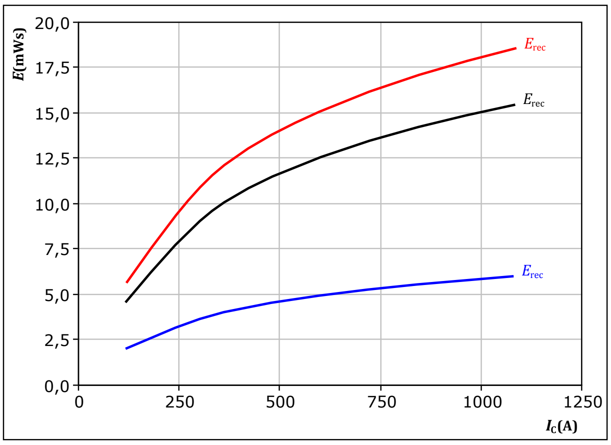
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 33. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



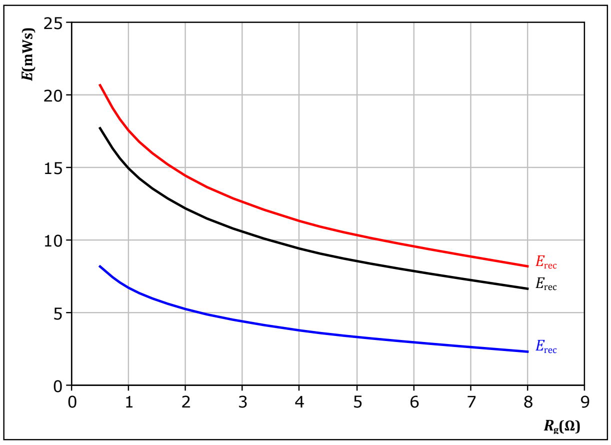
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 34. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

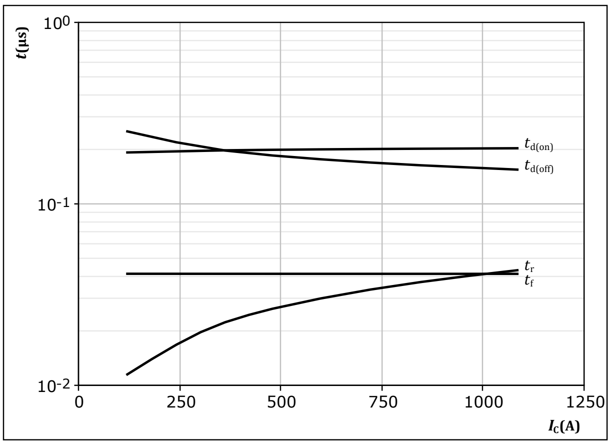
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

AC 1 Switching Characteristics H

figure 35. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



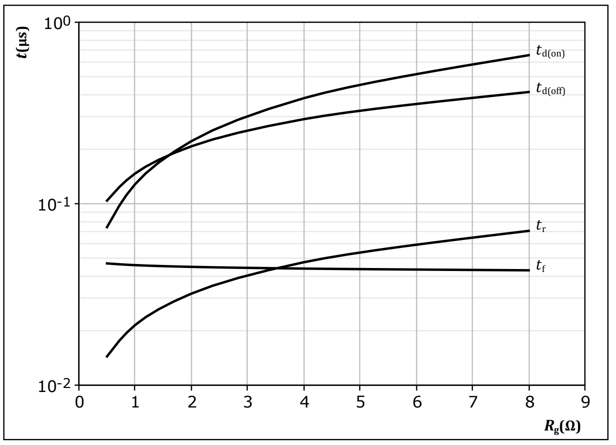
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 36. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



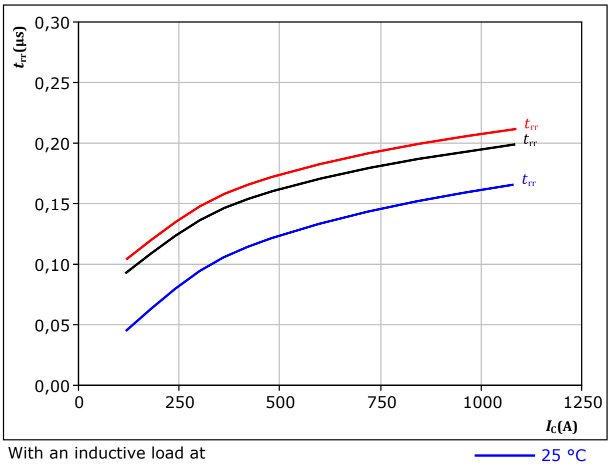
With an inductive load at

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

figure 37. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

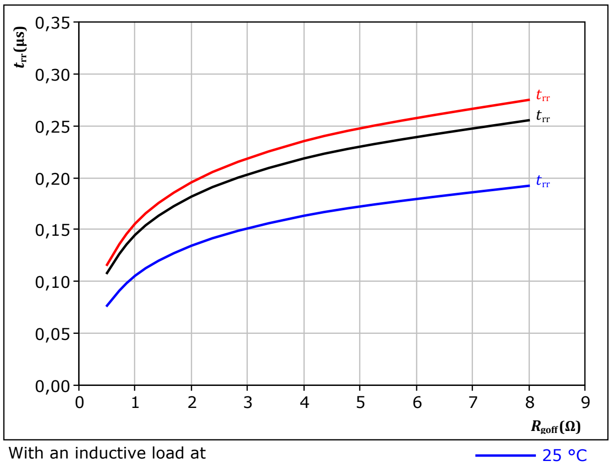
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 38. **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} =	600	V
V_{GE} =	±15	V
I_C =	600	A

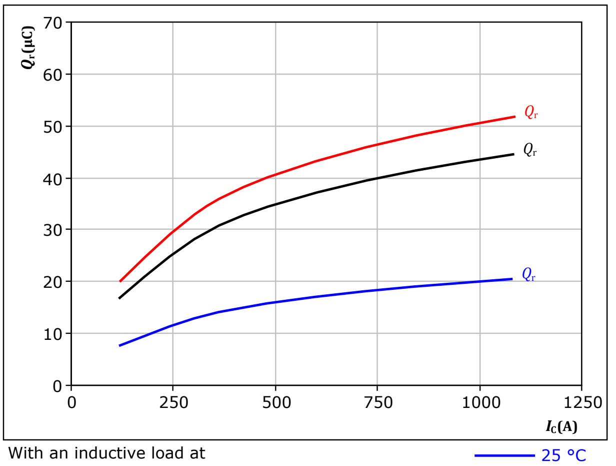
T_j: 25 °C, 125 °C, 150 °C

AC 1 Switching Characteristics H

figure 39. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



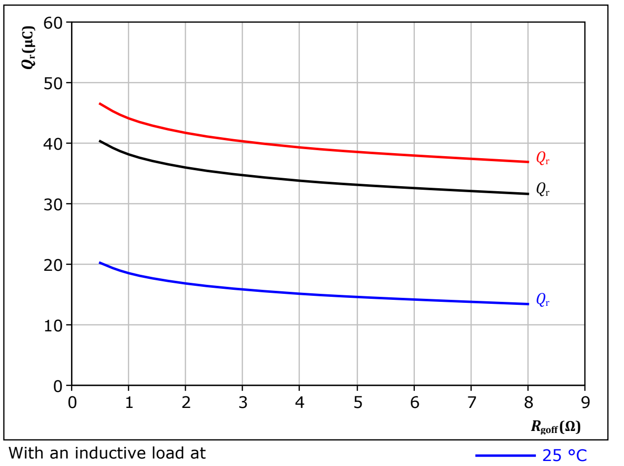
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 40. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



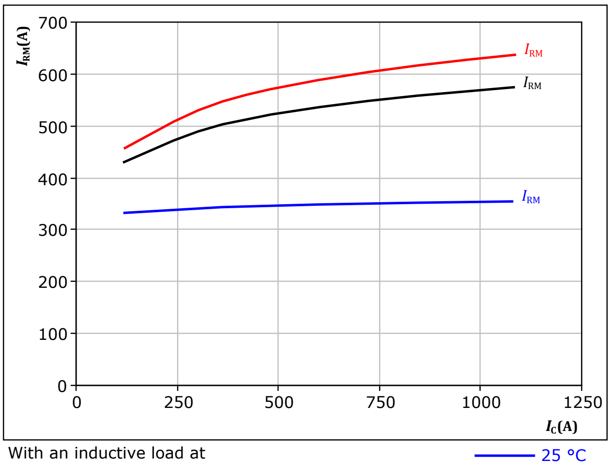
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 41. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



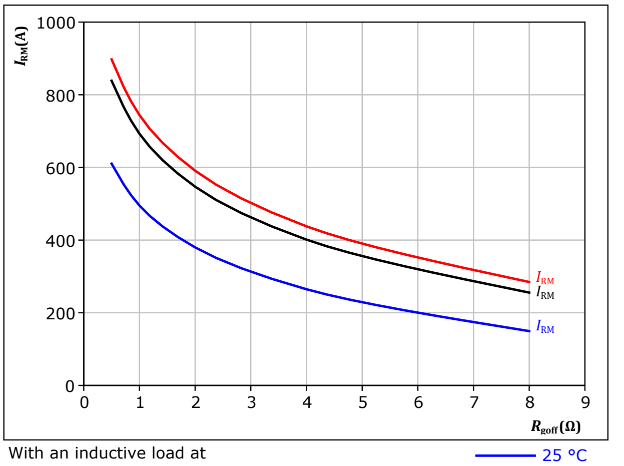
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 42. FWD

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

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



With an inductive load at

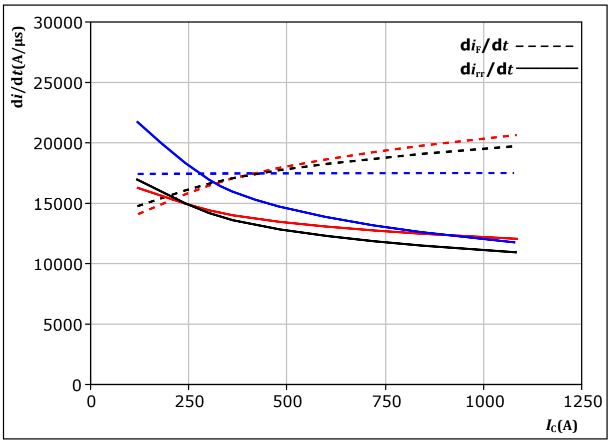
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

AC 1 Switching Characteristics H

figure 43. **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)



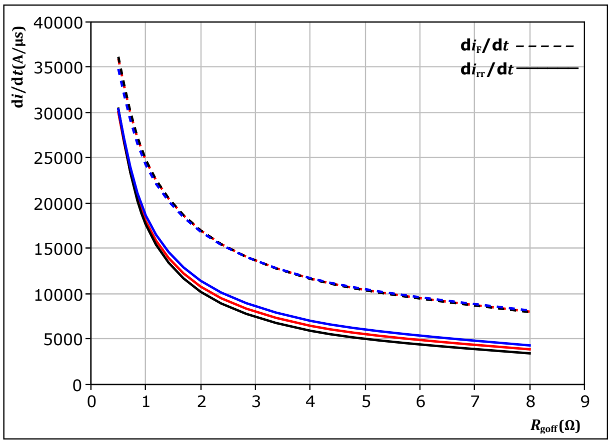
With an inductive load at

V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

figure 44. **FWD**

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

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



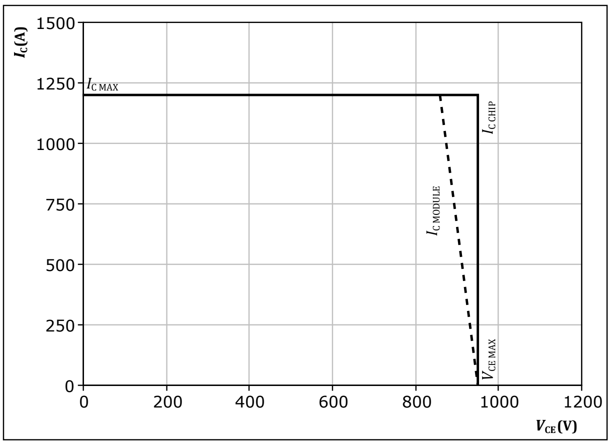
With an inductive load at

V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	600	A	

figure 45. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



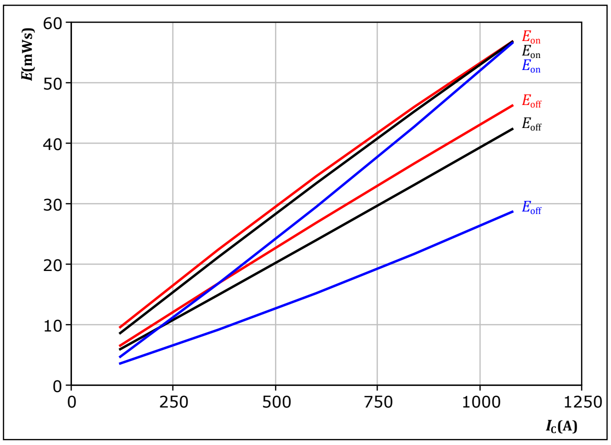
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

AC 2 Switching Characteristics L

figure 16. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

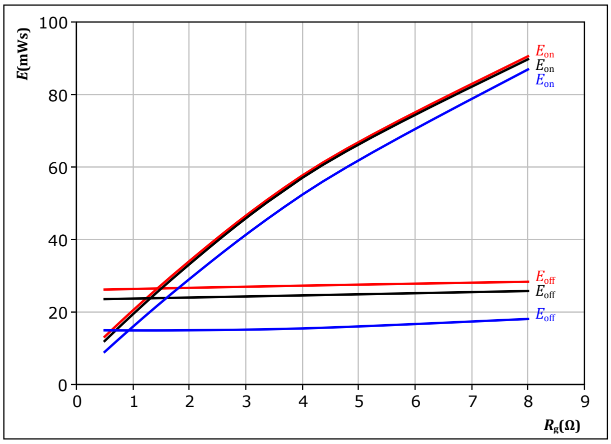
V_{CE} =	600	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	
R_{goff} =	2	Ω	

T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

figure 17. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



With an inductive load at

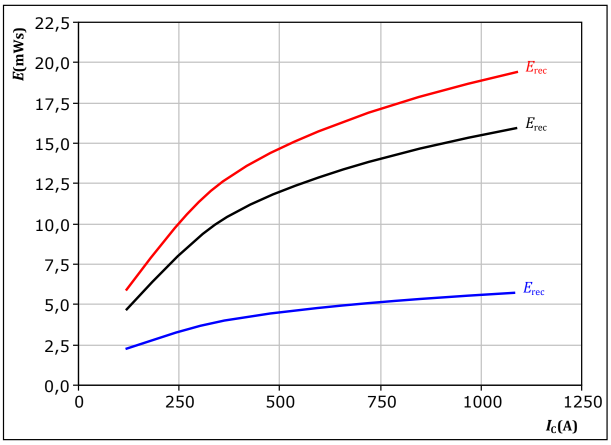
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	600	A

T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

figure 18. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

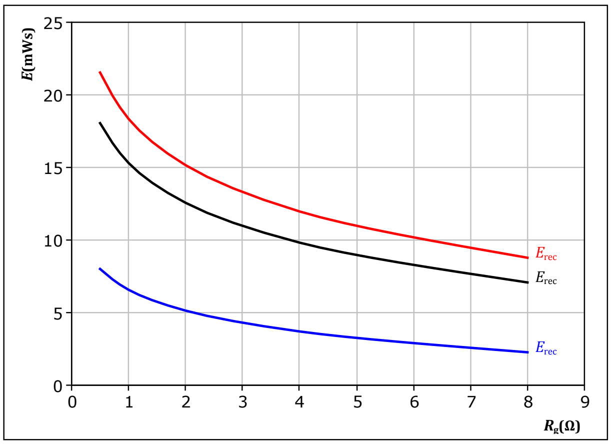
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

figure 19. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	600	A

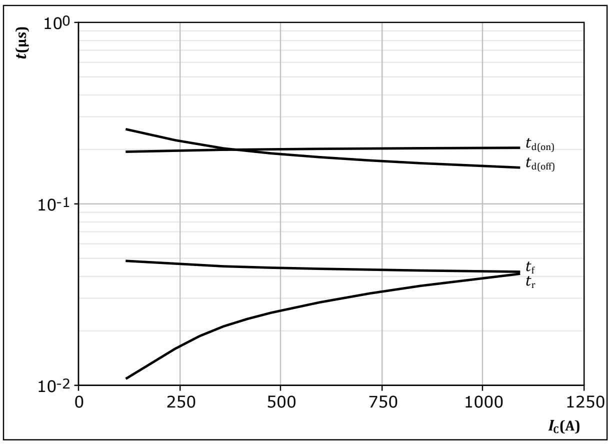
T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

AC 2 Switching Characteristics L

figure 20. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



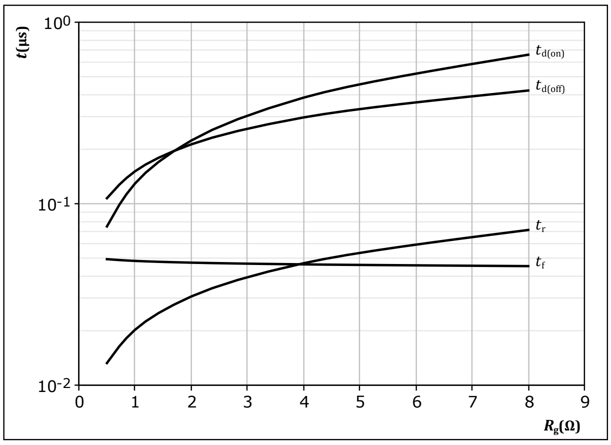
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 21. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



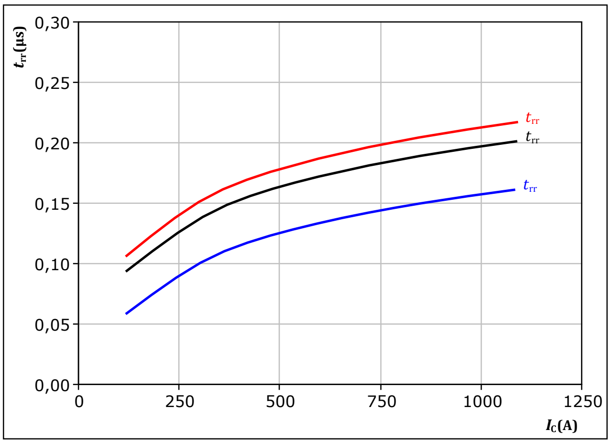
With an inductive load at

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

figure 22. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

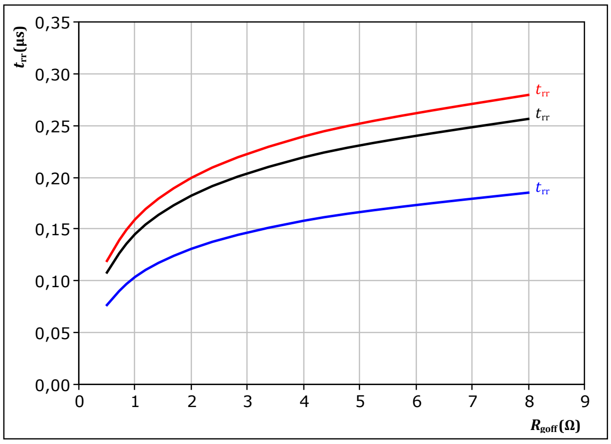
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 23. **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} =	600	V
V_{GE} =	±15	V
I_C =	600	A

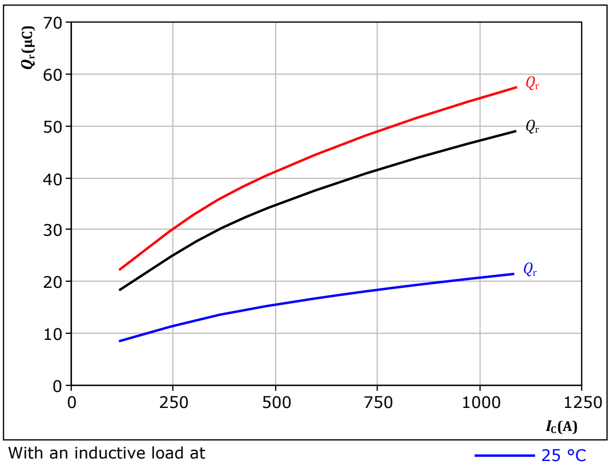
T_j: 25 °C, 125 °C, 150 °C

AC 2 Switching Characteristics L

figure 24. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



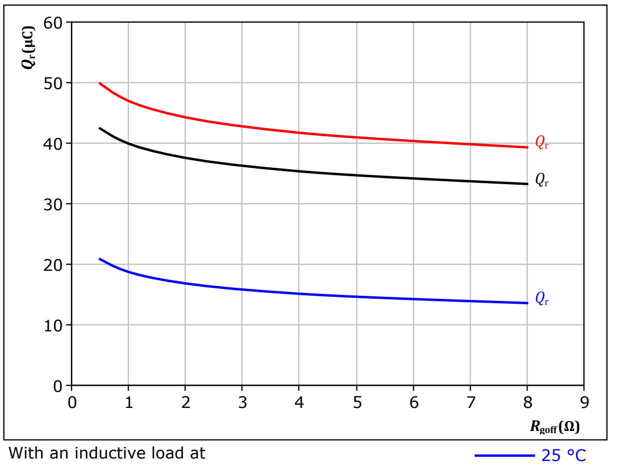
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 25. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



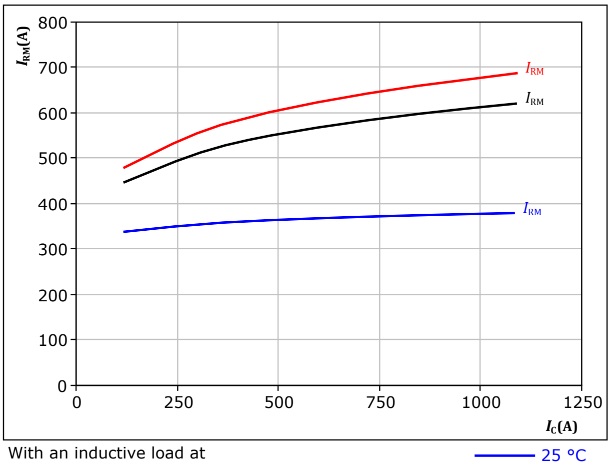
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 26. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



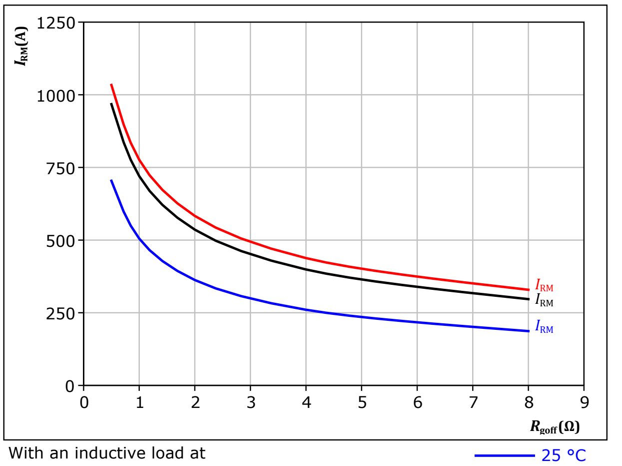
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 27. FWD

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

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



With an inductive load at

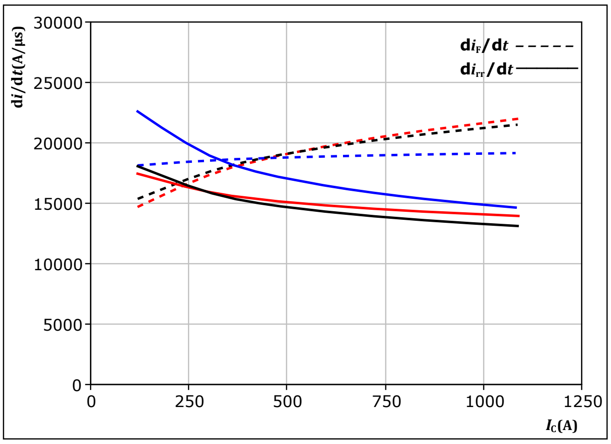
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

AC 2 Switching Characteristics L

figure 28. **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)



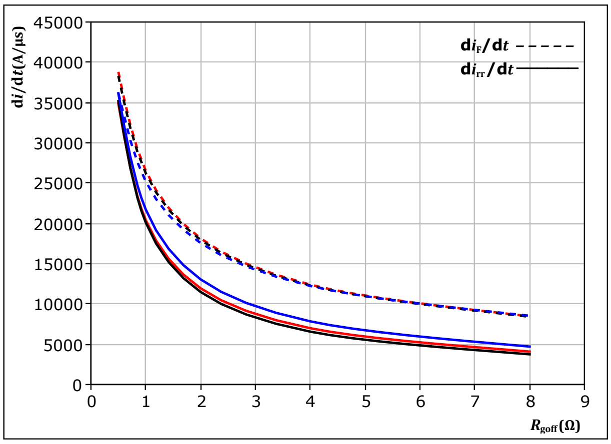
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 29. **FWD**

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

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



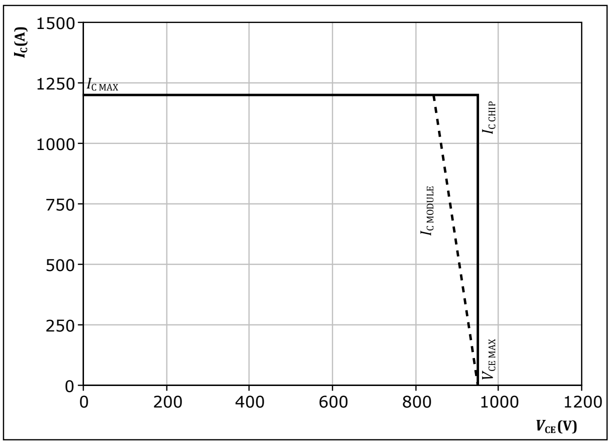
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 30. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



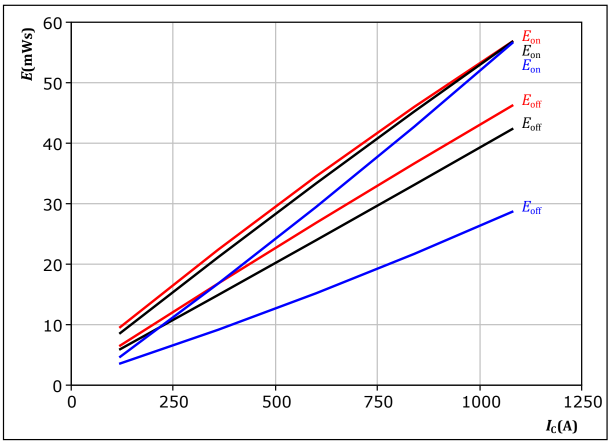
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

AC 2 Switching Characteristics H

figure 31. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



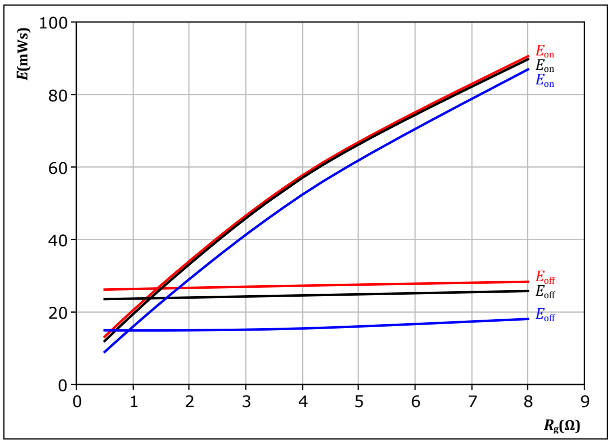
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 32. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



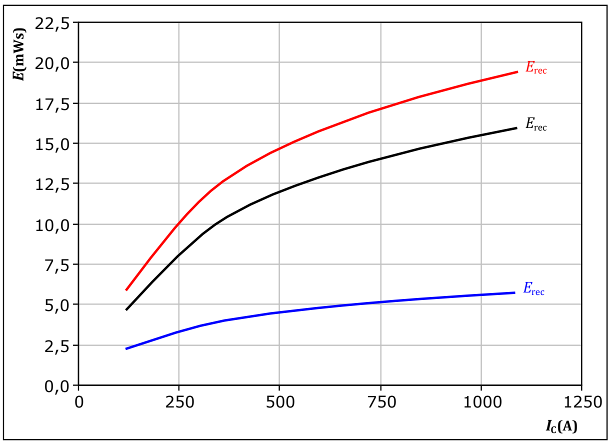
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 33. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



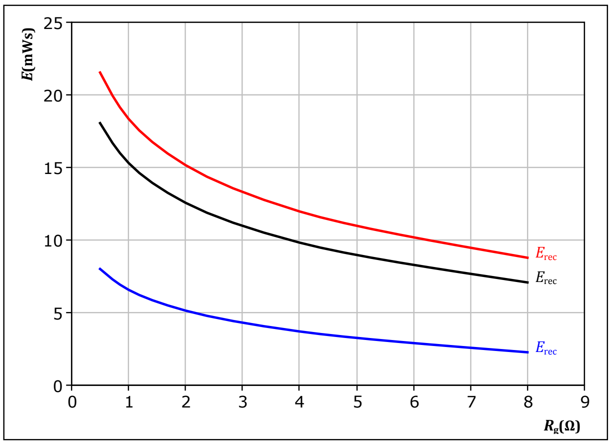
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 34. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

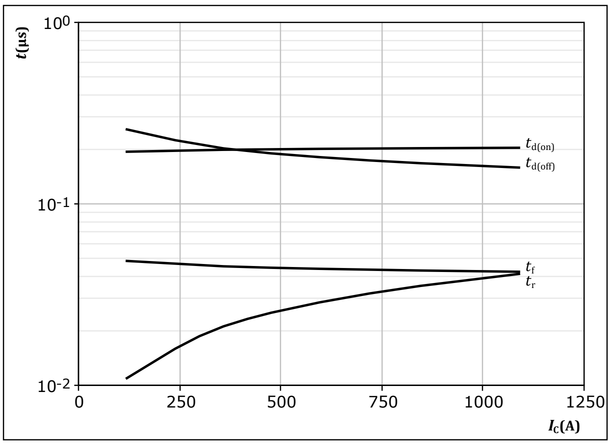
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

AC 2 Switching Characteristics H

figure 35. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



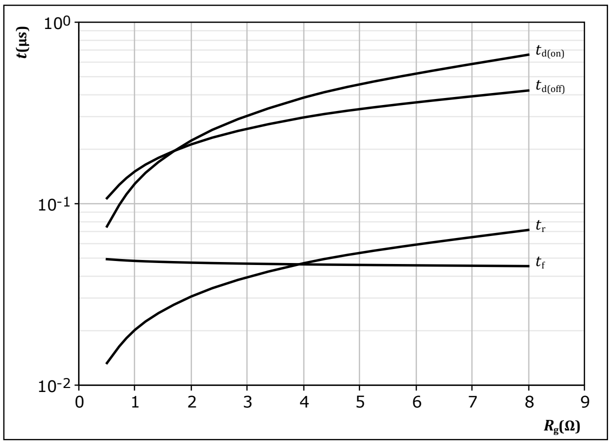
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 36. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



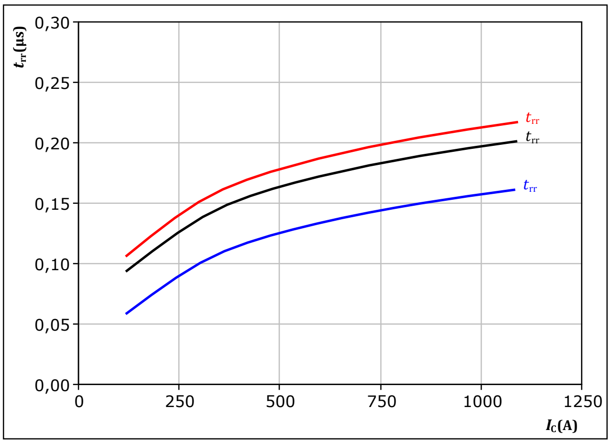
With an inductive load at

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

figure 37. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

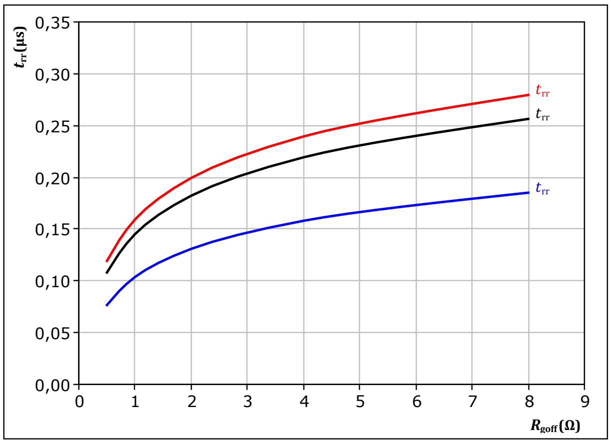
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 38. **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} =	600	V
V_{GE} =	±15	V
I_C =	600	A

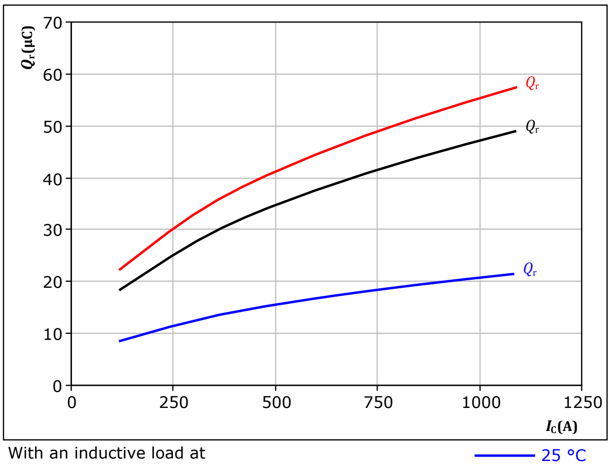
T_j: 25 °C, 125 °C, 150 °C

AC 2 Switching Characteristics H

figure 39. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



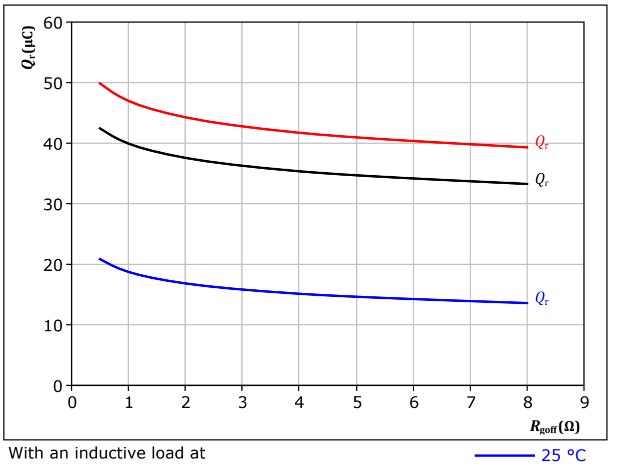
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 40. FWD

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$



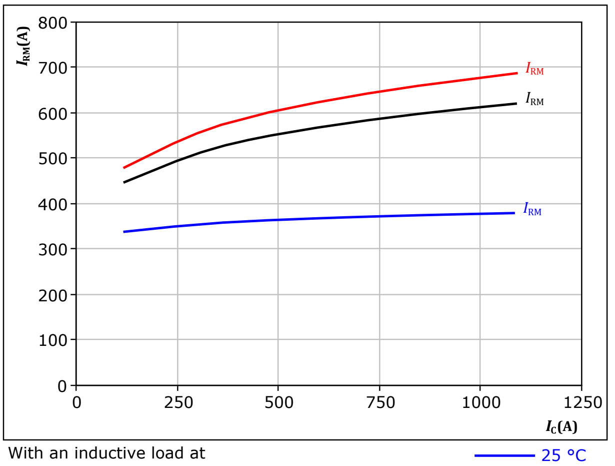
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 41. FWD

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



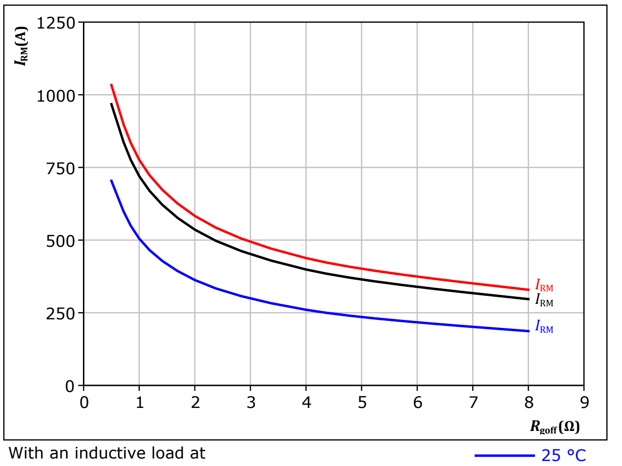
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 42. FWD

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

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



With an inductive load at

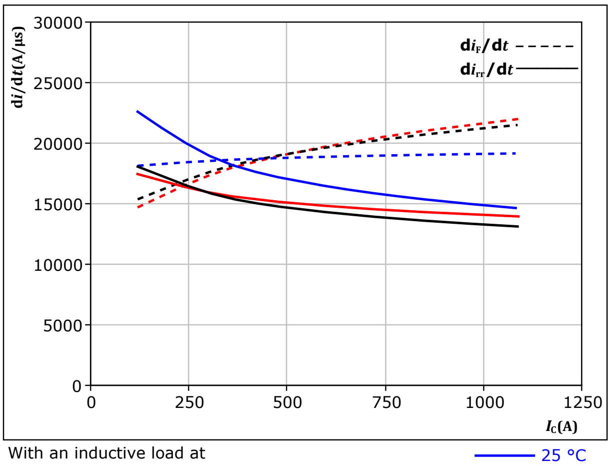
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

AC 2 Switching Characteristics H

figure 43. FWD

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

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



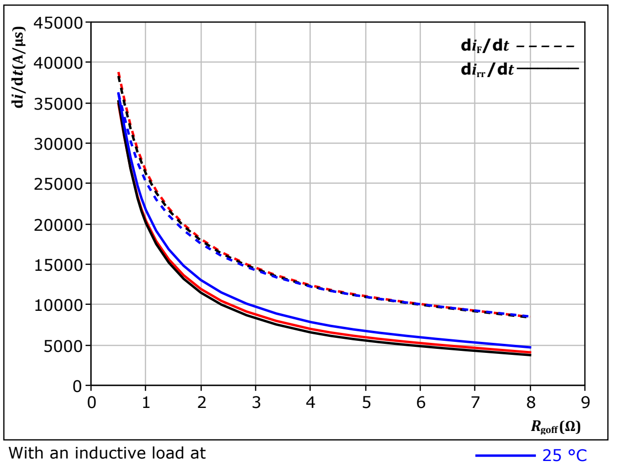
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 44. FWD

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

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



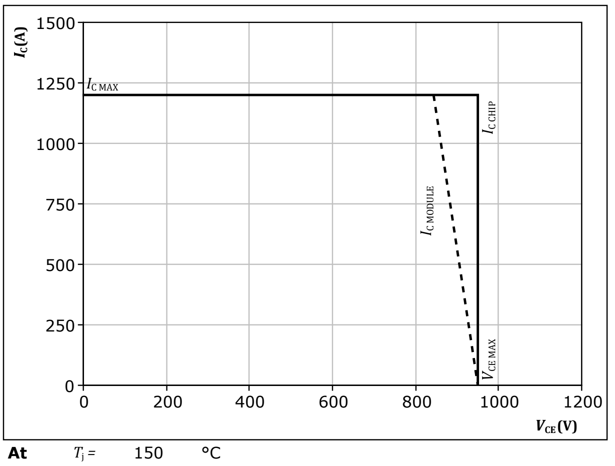
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	600	A		150 °C

figure 45. IGBT

Reverse bias safe operating area

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



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

Switching Definitions

figure 46. **IGBT**

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

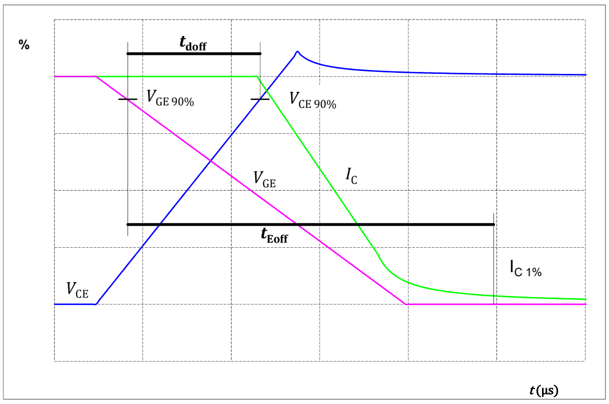


figure 47. **IGBT**

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

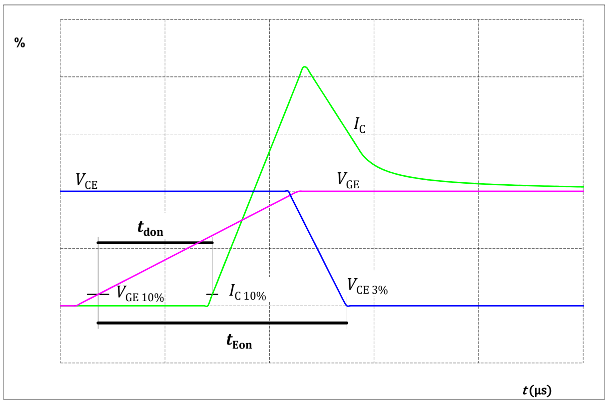


figure 48. **IGBT**

Turn-off Switching Waveforms & definition of t_f

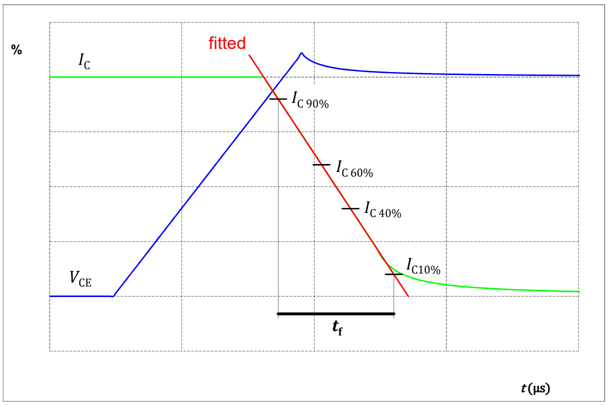
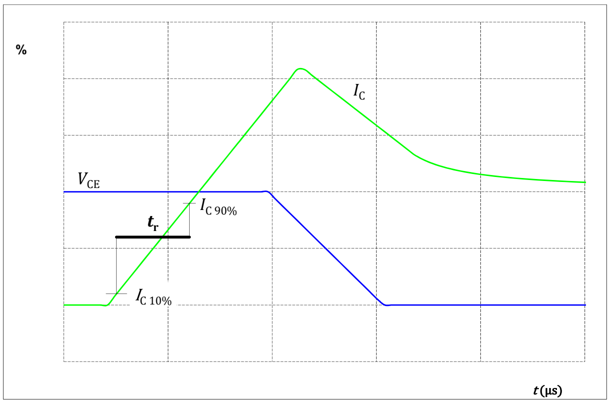


figure 49. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 50. **FWD**

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

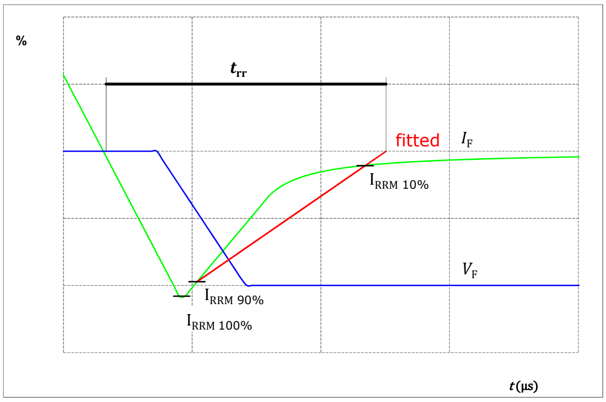
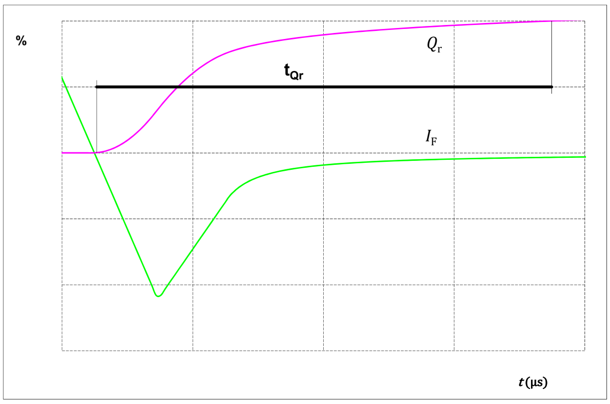


figure 51. **FWD**

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



Ordering Code

Version	Ordering Code
With thermal paste (4,4 W/mK, PTM6000)	B0-SP10FSA600S7-LM69F98T-/7/

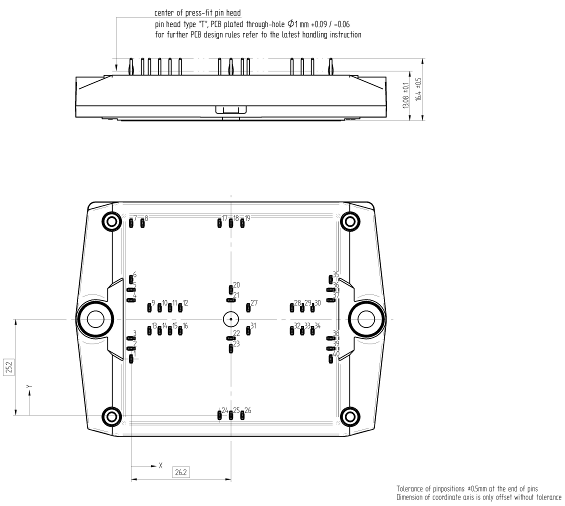
Marking

		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		

B0-SP10FSA600S7-LM69F98T

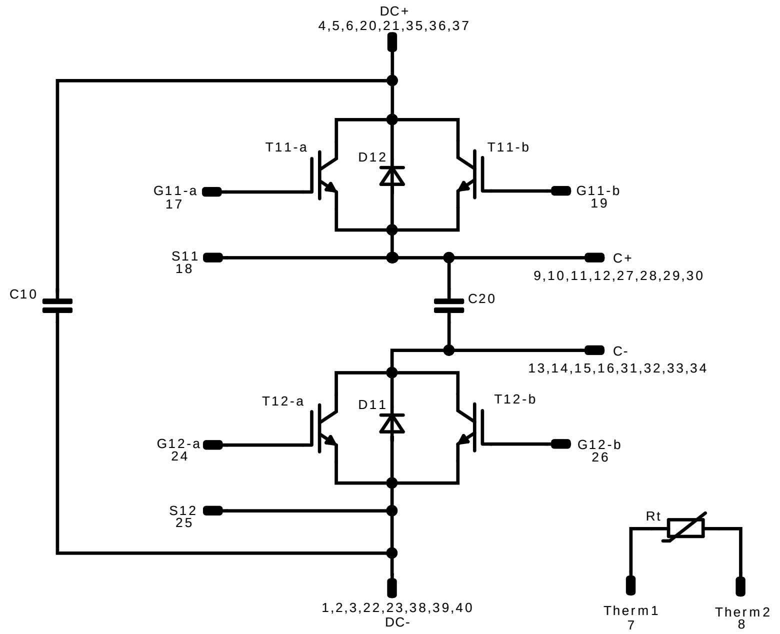
Outline

Pin table [mm]			
Pin	X	Y	Function
1	0	14,8	DC-
2	0	17,5	DC-
3	0	20,2	DC-
4	0	30,2	DC+
5	0	32,9	DC+
6	0	35,6	DC+
7	0	50,4	Therm1
8	3	50,4	Therm2
9	4,8	28,2	C+
10	7,5	28,2	C+
11	10,2	28,2	C+
12	12,9	28,2	C+
13	4,8	22,2	C-
14	7,5	22,2	C-
15	10,2	22,2	C-
16	12,9	22,2	C-
17	23,2	50,4	G11-a
18	26,2	50,4	S11
19	29,2	50,4	G11-b
20	26,2	32,9	DC+
21	26,2	30,2	DC+
22	26,2	20,2	DC-
23	26,2	17,5	DC-
24	23,2	0	G12-a
25	26,2	0	S12
26	29,2	0	G12-b
27	30,75	28,2	C+
28	42,2	28,2	C+
29	44,9	28,2	C+
30	47,6	28,2	C+
31	30,75	22,2	C-
32	42,2	22,2	C-
33	44,9	22,2	C-
34	47,6	22,2	C-
35	52,4	35,6	DC+
36	52,4	32,9	DC+
37	52,4	30,2	DC+
38	52,4	20,2	DC-
39	52,4	17,5	DC-
40	52,4	14,8	DC-



B0-SP10FSA600S7-LM69F98T

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T12	IGBT	950 V	600 A	AC 1 Switch L	Parallel devices with separate control. Values apply to complete device.
D11	FWD	950 V	600 A	AC 1 Diode L	
T11	IGBT	950 V	600 A	AC 1 Switch H	Parallel devices with separate control. Values apply to complete device.
D12	FWD	950 V	600 A	AC 1 Diode H	
C20	Capacitor	1000 V		Flying Capacitor	
C10	Capacitor	1500 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

Ordering Code

Version	Ordering Code
With thermal paste (4,4 W/mK, PTM6000)	B0-SP10FSB600S7-LM79F98T-/7/

Marking

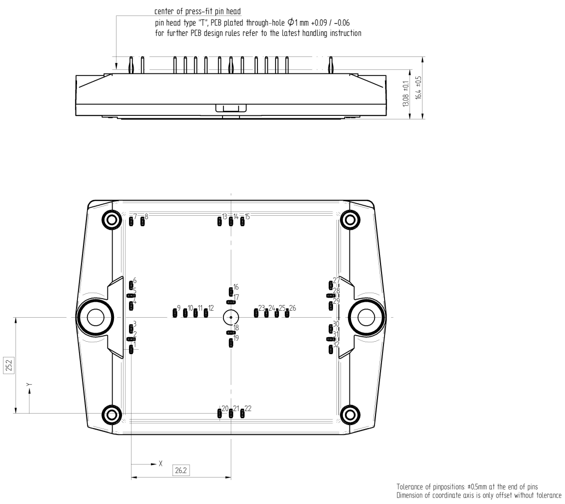
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
		TTTTTTTVV	LLLLL	SSSS	WWYY		

B0-SP10FSB600S7-LM79F98T

Outline

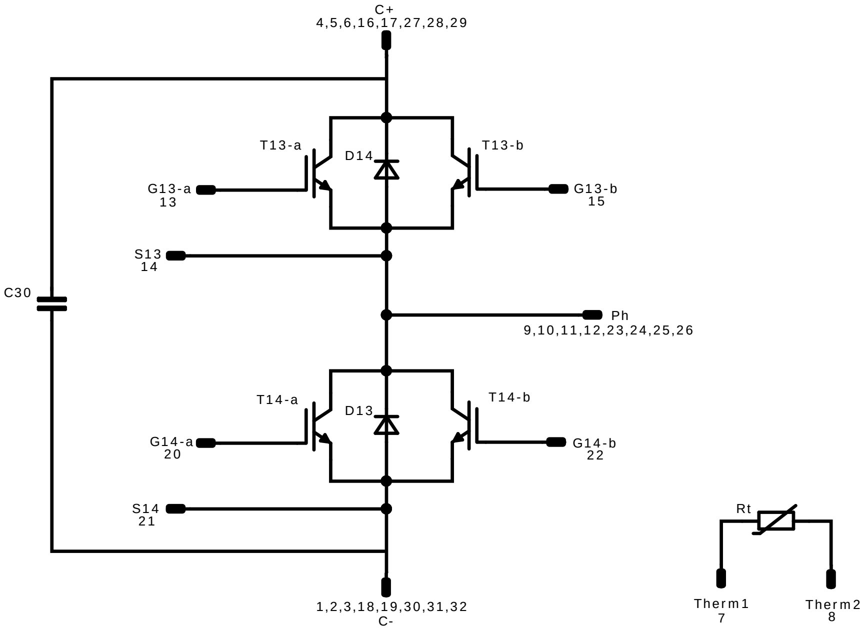
Pin table [mm]

Pin	X	Y	Function
1	0	16,8	C-
2	0	19,5	C-
3	0	22,2	C-
4	0	28,2	C+
5	0	30,9	C+
6	0	33,6	C+
7	0	50,4	Therm1
8	3	50,4	Therm2
9	11,5	26,35	Ph
10	14,22	26,35	Ph
11	16,9	26,35	Ph
12	19,62	26,35	Ph
13	23,2	50,4	G13-a
14	26,2	50,4	S13
15	29,2	50,4	G13-b
16	26,2	31,9	C+
17	26,2	29,2	C+
18	26,2	21,2	C-
19	26,2	18,5	C-
20	23,2	0	G14-a
21	26,2	0	S14
22	29,2	0	G14-b
23	32,8	26,35	Ph
24	35,5	26,35	Ph
25	38,2	26,35	Ph
26	40,9	26,35	Ph
27	52,4	33,6	C+
28	52,4	30,9	C+
29	52,4	28,2	C+
30	52,4	22,2	C-
31	52,4	19,5	C-
32	52,4	16,8	C-



B0-SP10FSB600S7-LM79F98T

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T14	IGBT	950 V	600 A	AC 2 Switch L	Parallel devices with separate control. Values apply to complete device.
D13	FWD	950 V	600 A	AC 2 Diode L	
T13	IGBT	950 V	600 A	AC 2 Switch H	Parallel devices with separate control. Values apply to complete device.
D14	FWD	950 V	600 A	AC 2 Diode H	
C30	Capacitor	1000 V		Flying Capacitor	
Rt	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* S3 packages see vincotech.com website.

Package data
Package data for *flow* 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-SP10FSx600S7-LMx9F98T-D1-14	29 Jan. 2021		
B0-SP10FSx600S7-LMx9F98T-D2-14	9 Jul. 2021	Module marking is updated with UL logo, product is unchanged	