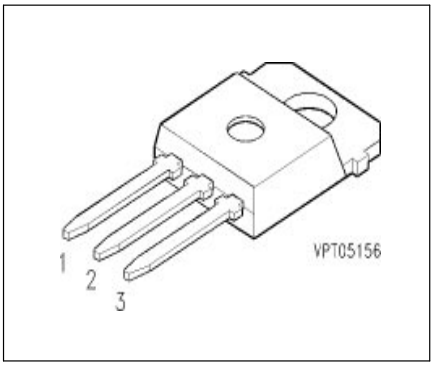
IGBT With Antiparallel Diode

Preliminary data

- Low forward voltage drop
- High switching speed
- Low tail current
- Latch-up free
- Including fast free-wheel diode



Pin 1	Pin 2	Pin 3
G	C	E

Type	V_{CE}	I_C	Package	Ordering Code
BUP 307D	1200V	35A	TO-218 AB	Q67040-A4221-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1200	V
Collector-gate voltage R_{GE} = 20 kΩ	V_{CGR}	1200	
Gate-emitter voltage	V_{GE}	± 20	
DC collector current T_C = 25 °C T_C = 90 °C	I_C	35 23	A
Pulsed collector current, t_p = 1 ms T_C = 25 °C T_C = 90 °C	I_{Cpuls}	70 46	
Diode forward current T_C = 90 °C	I_F	18	
Pulsed diode current, t_p = 1 ms T_C = 25 °C	I_{Fpuls}	108	
Power dissipation T_C = 25 °C	P_{tot}	300	W
Chip or operating temperature	T_j	-55 ... + 150	°C
Storage temperature	T_{stg}	-55 ... + 150	

Maximum Ratings

Parameter	Symbol	Values	Unit
DIN humidity category, DIN 40 040	-	E	-
IEC climatic category, DIN IEC 68-1	-	55 / 150 / 56	

Thermal Resistance

Thermal resistance, chip case	R_{thJC}	≤ 0.42	K/W
Diode thermal resistance, chip case	R_{thJCD}	≤ 1.25	

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Gate threshold voltage V_{GE} = V_{CE}, I_C = 0.35 mA, T_j = 25 °C	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$				
V_{GE} = 15 V, I_C = 25 A, T_j = 25 °C		-	2.7	3.2	
V_{GE} = 15 V, I_C = 25 A, T_j = 125 °C		-	3.3	3.9	
V_{GE} = 15 V, I_C = 42 A, T_j = 25 °C		-	3.4	-	
V_{GE} = 15 V, I_C = 42 A, T_j = 125 °C		-	4.3	-	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 V, T_j = 25 °C	I_{CES}	-	-	0.5	mA
Gate-emitter leakage current V_{GE} = 25 V, V_{CE} = 0 V	I_{GES}	-	-	100	nA
AC Characteristics					
Transconductance V_{CE} = 20 V, I_C = 15 A	g_{fs}	5.5	8	-	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	C_{iss}	-	2000	2700	pF
Output capacitance V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	C_{oss}	-	160	240	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	C_{rss}	-	65	100	

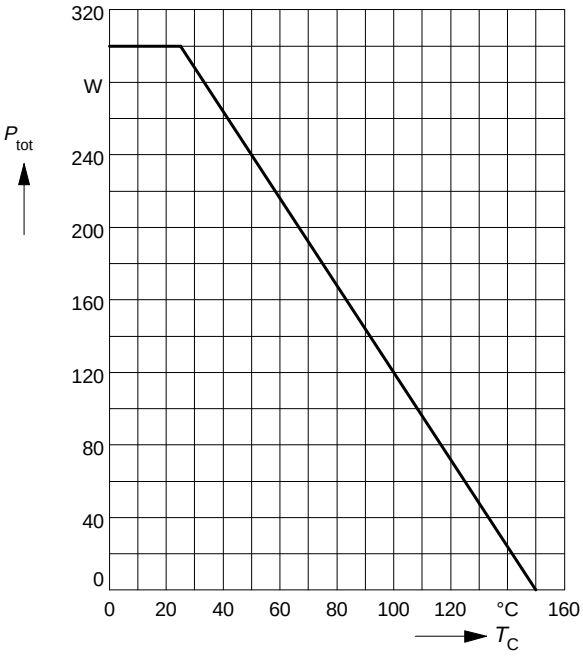
Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Switching Characteristics, Inductive Load at T_j = 125 °C					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A R_{Gon} = 33 Ω	$t_{d(on)}$	- -	 30	 45	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A R_{Gon} = 33 Ω	t_r	 -	 22	 35	
Turn-off delay time V_{CC} = 600 V, V_{GE} = -15 V, I_C = 15 A R_{Goff} = 33 Ω	$t_{d(off)}$	 -	 230	 310	
Fall time V_{CC} = 600 V, V_{GE} = -15 V, I_C = 15 A R_{Goff} = 33 Ω	t_f	 -	 20	 28	
Total turn-off loss energy V_{CC} = 600 V, V_{GE} = -15 V, I_C = 15 A R_{Goff} = 33 Ω, T_j = 25 °C	E_{off}	 -	 1.7	 -	mWs
Free-Wheel Diode					
Diode forward voltage I_F = 15 A, V_{GE} = 0 V, T_j = 25 °C I_F = 15 A, V_{GE} = 0 V, T_j = 125 °C	V_F	 - -	 2.4 1.9	 2.95 -	V
Reverse recovery time I_F = 15 A, V_R = -600 V, V_{GE} = 0 V di_F/dt = -800 A/µs T_j = 25 °C T_j = 125 °C	t_{rr}	 - -	 - 100	 - 150	ns
Reverse recovery charge I_F = 15 A, V_R = -600 V, V_{GE} = 0 V di_F/dt = -800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 - -	 1 3	 1.8 5.4	µC

Power dissipation

$P_{tot} = f(T_C)$

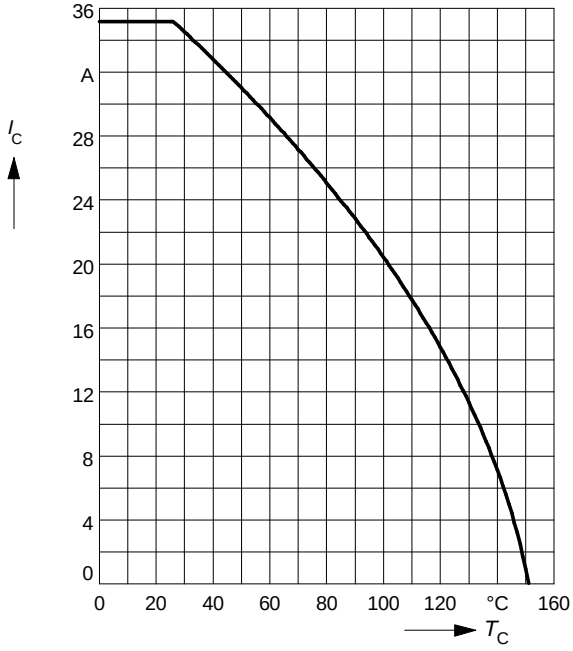
parameter: $T_j \leq 150$ °C



Collector current

$I_C = f(T_C)$

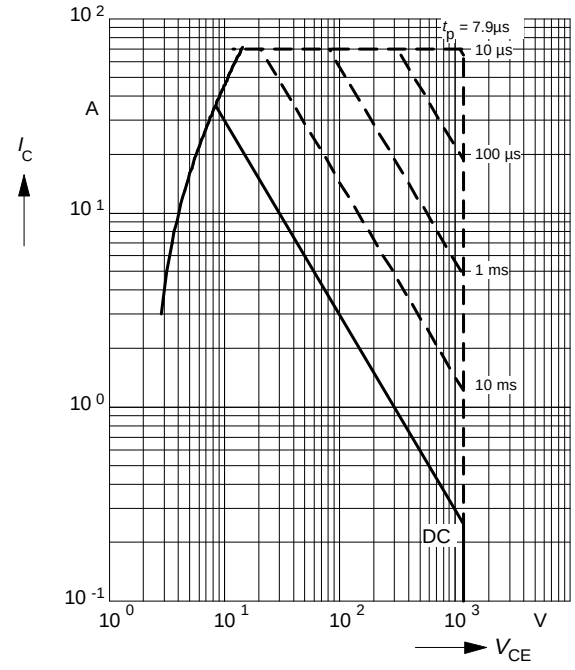
parameter: $V_{GE} \geq 15$ V , $T_j \leq 150$ °C



Safe operating area

$I_C = f(V_{CE})$

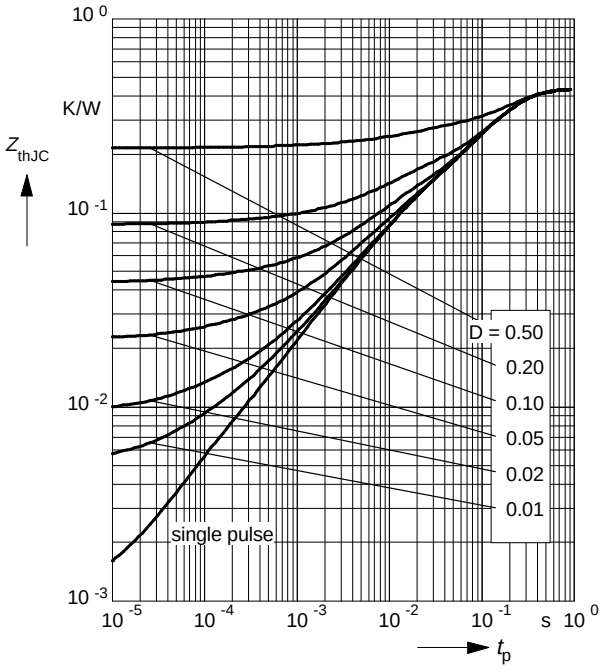
parameter: $D = 0$, $T_C = 25$°C , $T_j \leq 150$ °C



Transient thermal impedance IGBT

$Z_{th\,JC} = f(t_p)$

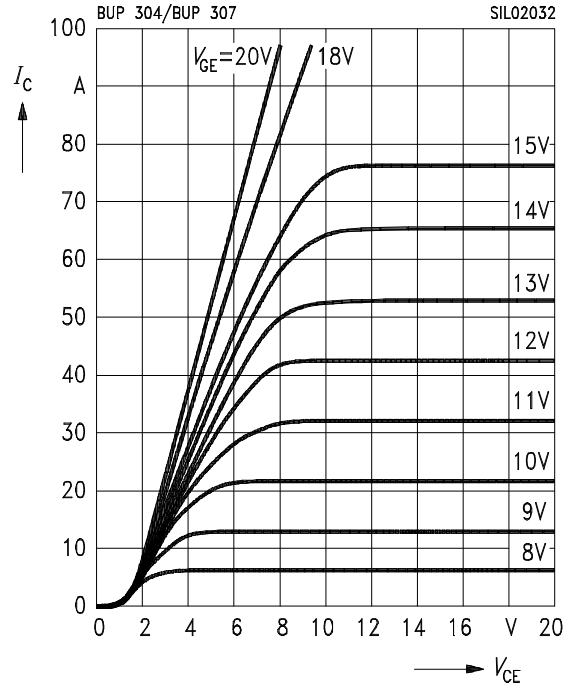
parameter: $D = t_p / T$



Typ. output characteristics

$I_C = f(V_{CE})$

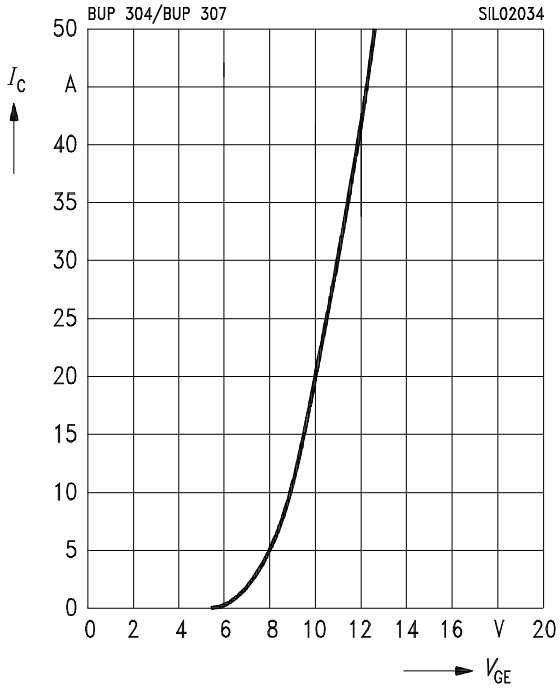
parameter: t_p = 80 µs, T_j = 125 °C



Typ. transfer characteristics

$I_C = f(V_{GE})$

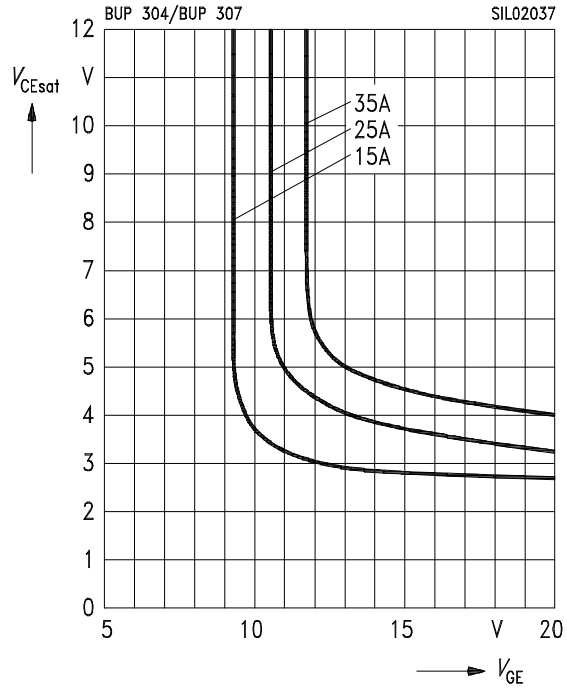
parameter: t_P = 80 µs, V_{CE} = 20 V, T_j = 25 °C



Typ. saturation characteristics

$V_{CE(sat)} = f(V_{GE})$

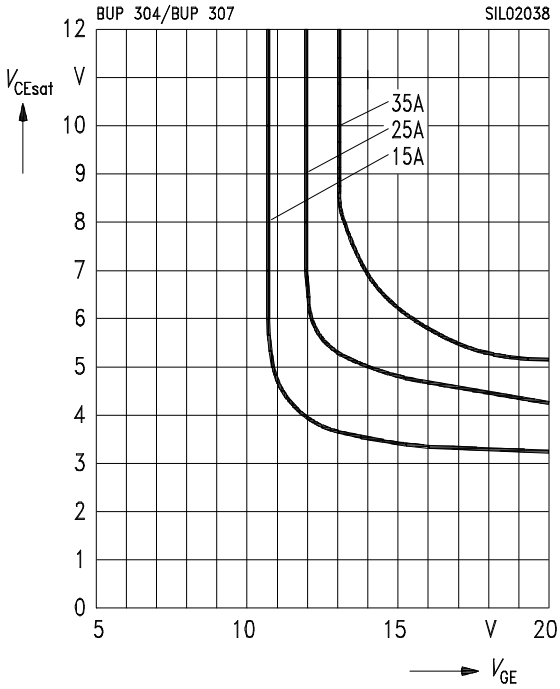
parameter: T_j = 25 °C



Typ. saturation characteristics

$V_{CE(sat)} = f(V_{GE})$

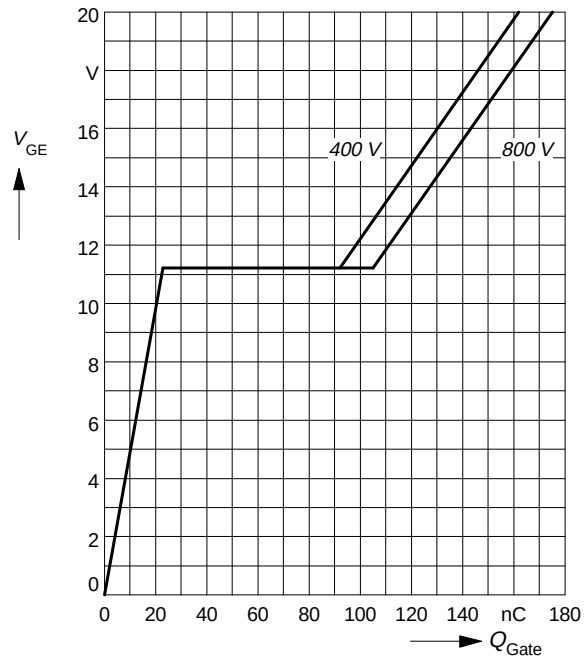
parameter: T_j = 125 °C



Typ. gate charge

$V_{GE} = f(Q_{Gate})$

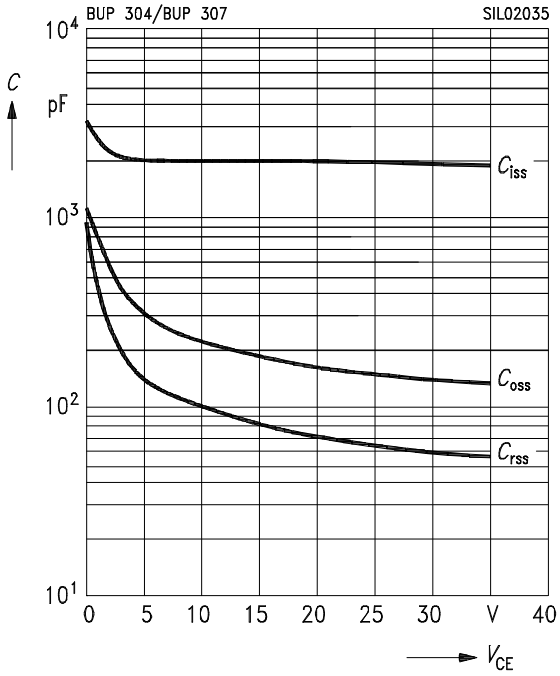
parameter: $I_{C\ puls}$ = 20 A



Typ. capacitances

$C = f(V_{CE})$

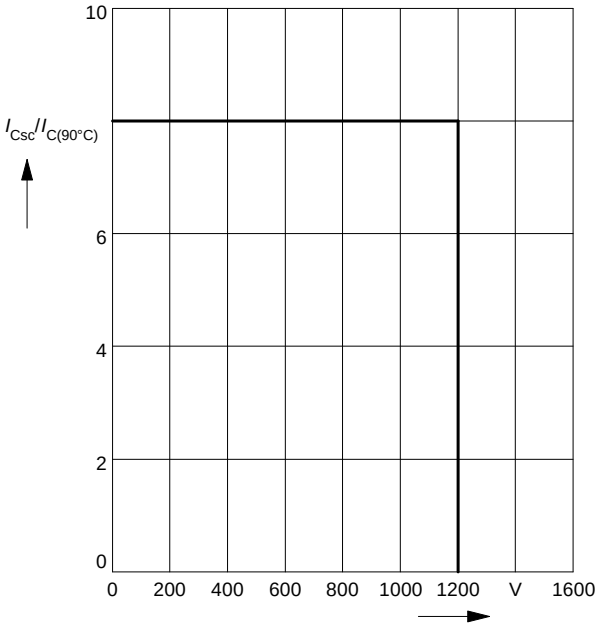
parameter: V_{GE} = 0 V, f = 1 MHz



Short circuit safe operating area

$I_{Csc} = f(V_{CE})$, T_j = 150°C

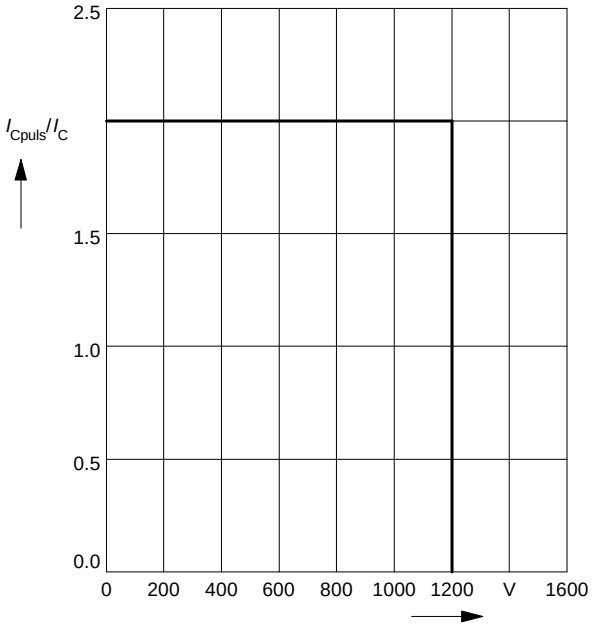
parameter: V_{GE} = ± 15 V, $t_{sc} \leq$ 10 µs, L < 25 nH



Reverse biased safe operating area

$I_{Cpuls} = f(V_{CE})$, T_j = 150°C

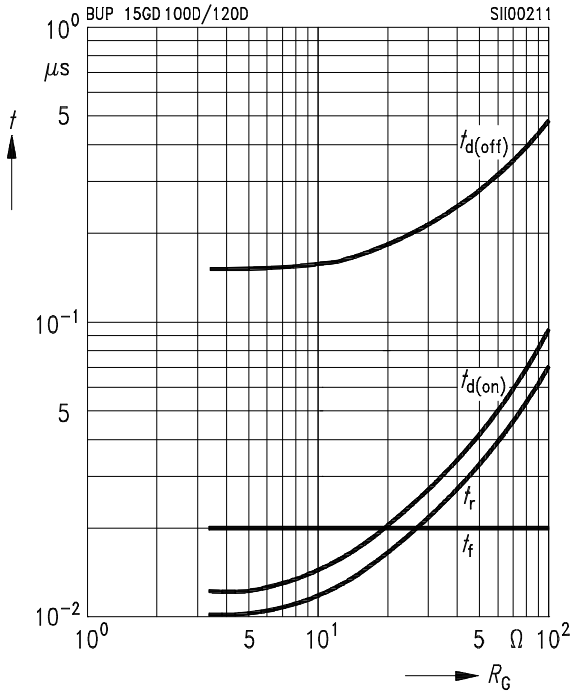
parameter: V_{GE} = 15 V



Typ. switching time

$t = f(R_G)$, inductive load, T_j = 125 °C

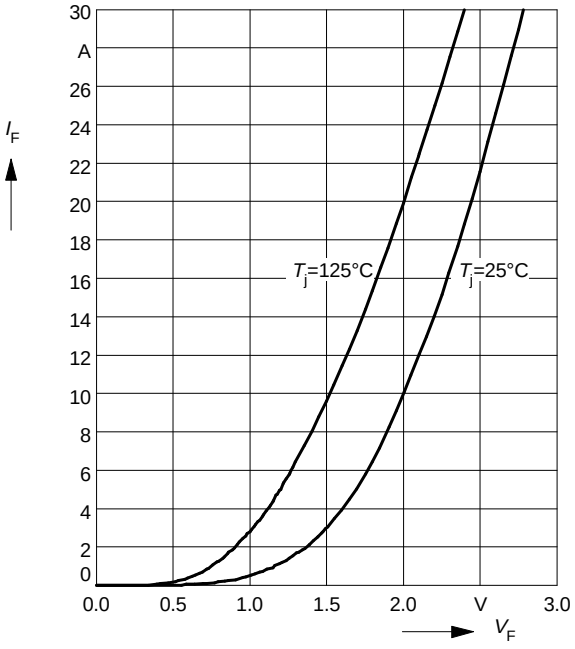
parameter: V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 15 A



Typ. forward characteristics

$I_F = f(V_F)$

parameter: T_j



Transient thermal impedance Diode

$Z_{th\ JC} = f(t_p)$

parameter: $D = t_p / T$