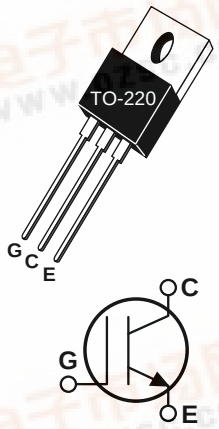
APT20GF120KR

1200V 32A

Fast IGBT



The Fast IGBT is a new generation of high voltage power IGBTs. Using Non-Punch Through Technology the Fast IGBT offers superior ruggedness, fast switching speed and low Collector-Emitter On voltage.

- **Low Forward Voltage Drop**
- **High Freq. Switching to 20KHz**
- **Low Tail Current**
- **Ultra Low Leakage Current**
- **Avalanche Rated**
- **RBSOA and SCSOA Rated**

MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT20GF120KR	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{CGR}	Collector-Gate Voltage (R_{GE} = 20KΩ)	1200	
V_{EC}	Emitter-Collector Voltage	15	
V_{GE}	Gate-Emitter Voltage	±20	
I_{C1}	Continuous Collector Current @ T_C = 25°C	32	Amps
I_{C2}	Continuous Collector Current @ T_C = 90°C	20	
I_{CM1}	Pulsed Collector Current ① @ T_C = 25°C	64	
I_{CM2}	Pulsed Collector Current ① @ T_C = 90°C	40	
E_{AS}	Single Pulse Avalanche Energy ②	22	mJ
P_D	Total Power Dissipation	200	Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C
T_L	Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec.	300	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 0.8mA)	1200			Volts
RBV_{CES}	Collector-Emitter Reverse Breakdown Voltage (V_{GE} = 0V, I_C = 50mA)	-15			
$V_{GE}(TH)$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 350µA, T_j = 25°C)	4.5	5.5	6.5	
$V_{CE}(ON)$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 15A, T_j = 25°C)		2.7	3.2	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 15A, T_j = 125°C)		3.3	3.9	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25°C)			0.8	mA
	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 125°C)			5.0	
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)			±100	nA

⚠ **CAUTION:** These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

APT Website - http://www.advancedpower.com

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EUROPE

052-6205 Rev C

DYNAMIC CHARACTERISTICS

APT20GF120KR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** V_{GE} = 0V, V_{CE} = 25V, f = 1 MHz		1100	1500	pF
C_{oes}	Output Capacitance			110	165	
C_{res}	Reverse Transfer Capacitance			70	105	
Q_g	Total Gate Charge ③	**Gate Charge** V_{GE} = 15V, V_{CC} = 0.50V_{CES}, I_C = I_{C2}		95	150	nC
Q_{ge}	Gate-Emitter Charge			13	20	
Q_{gc}	Gate-Collector ("Miller") Charge			55	85	
$t_d(on)$	Turn-on Delay Time	**Resistive Switching (25°C)** V_{GE} = 15V, V_{CC} = 0.8V_{CES}, I_C = I_{C2}, R_G = 10Ω		17		ns
t_r	Rise Time			75		
$t_d(off)$	Turn-off Delay Time			95		
t_f	Fall Time			170		
$t_d(on)$	Turn-on Delay Time	**Inductive Switching (150°C)** V_{CLAMP}(Peak) = 0.66V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 10Ω, T_J = +150°C		20	30	ns
t_r	Rise Time			35	70	
$t_d(off)$	Turn-off Delay Time			175	260	
t_f	Fall Time			90	135	
E_{on}	Turn-on Switching Energy			1.2		mJ
E_{off}	Turn-off Switching Energy			1.3		
E_{ts}	Total Switching Losses			2.5		
$t_d(on)$	Turn-on Delay Time	**Inductive Switching (25°C)** V_{CLAMP}(Peak) = 0.66V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 10Ω, T_J = +25°C		20		ns
t_r	Rise Time			35		
$t_d(off)$	Turn-off Delay Time			150		
t_f	Fall Time			90		
E_{ts}	Total Switching Losses			2.3		mJ
gfe	Forward Transconductance	V_{CE} = 20V, I_C = 15A		12		S

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case			0.63	°C/W
$R_{\Theta JA}$	Junction to Ambient			80	
Torque	Mounting Torque using a 6-32 or 3mm Binding Head Machine Screw		10		lb•in

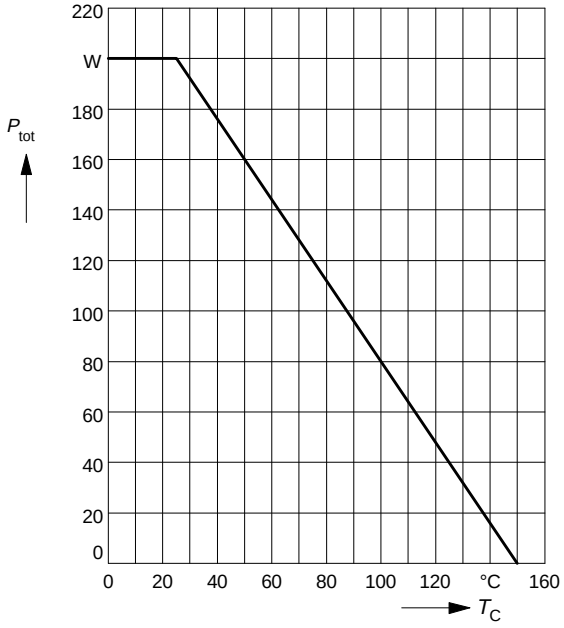
① Repetitive Rating: Pulse width limited by maximum junction temperature.

② I_C = 15A, V_{CC} = 50V, R_{GE} = 25Ω, L = 200µH, T_j = 25°C

③ See MIL-STD-750 Method 3471

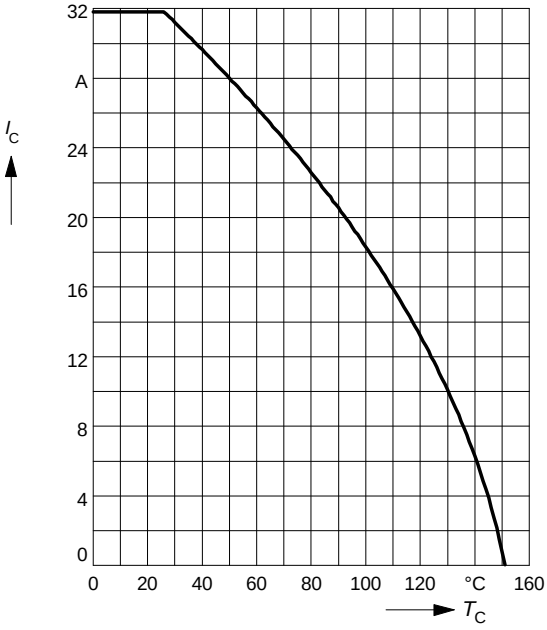
Power dissipation

$P_{tot} = f(T_C)$
parameter: $T_j \leq 150$ °C



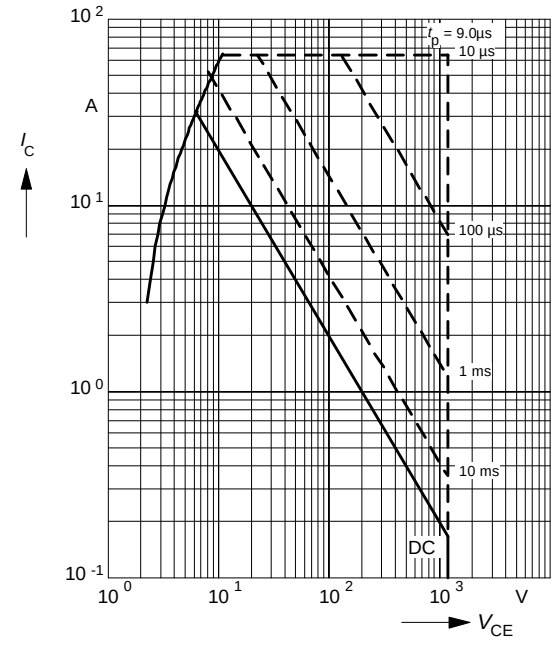
Collector current

$I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V , $T_j \leq 150$ °C



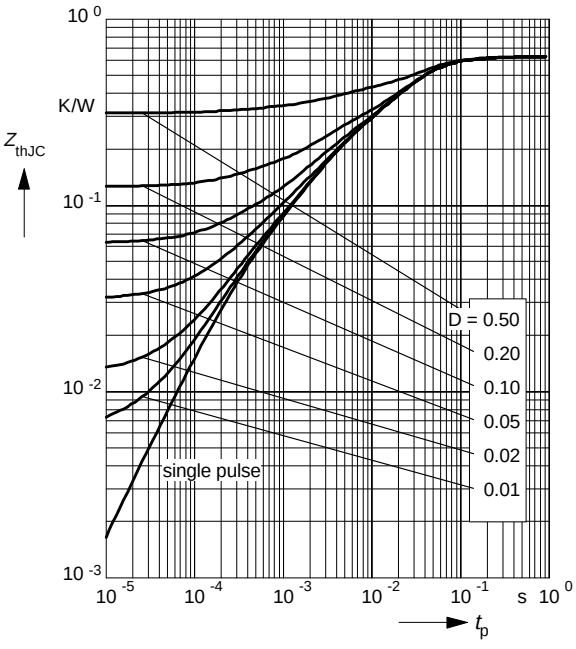
Safe operating area

$I_C = f(V_{CE})$
parameter: $D = 0$, $T_C = 25$°C , $T_j \leq 150$ °C



Transient thermal impedance IGBT

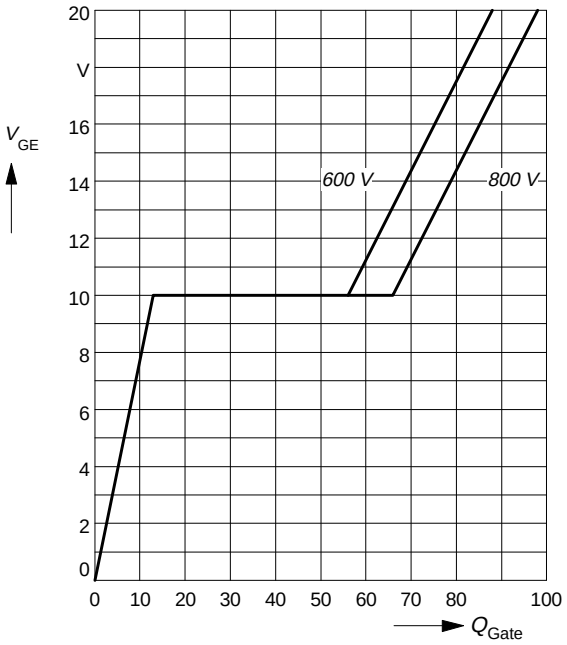
$Z_{th\,JC} = f(t_p)$
parameter: $D = t_p / T$



Typ. gate charge

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

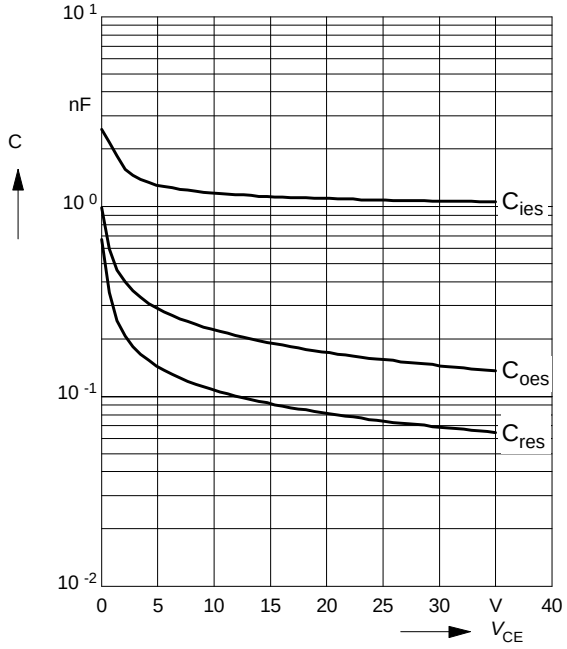
parameter: $I_{C\ puls}$ = 16A



Typ. capacitances

$C = f(V_{CE})$

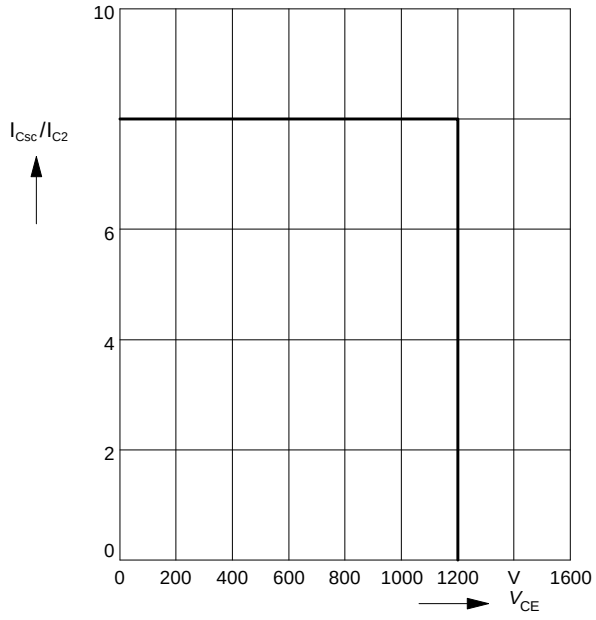
parameter: V_{GE} = 0 V, f = 1 MHz



Short circuit safe operating area

$I_{Csc} = f(V_{CE})$, T_j = 150°C

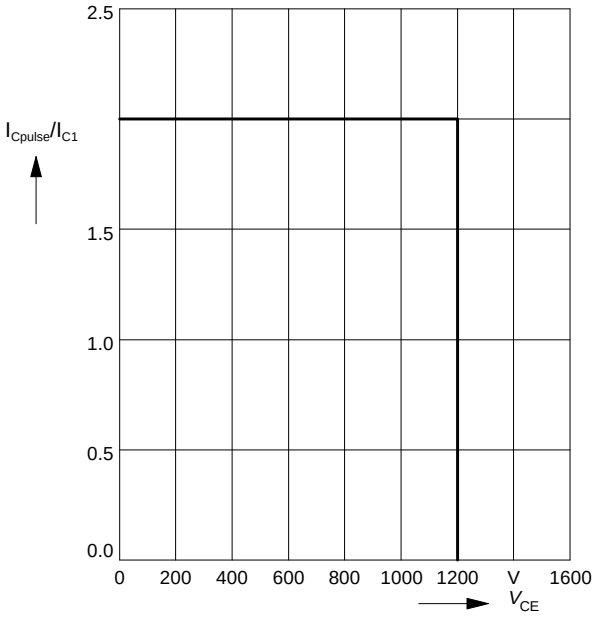
parameter: V_{GE} = ± 15 V, $t_{sc} \leq$ 10 µs, L < 25 nH



Reverse biased safe operating area

$I_{Cpuls} = f(V_{CE})$, T_j = 150°C

parameter: V_{GE} = 15 V



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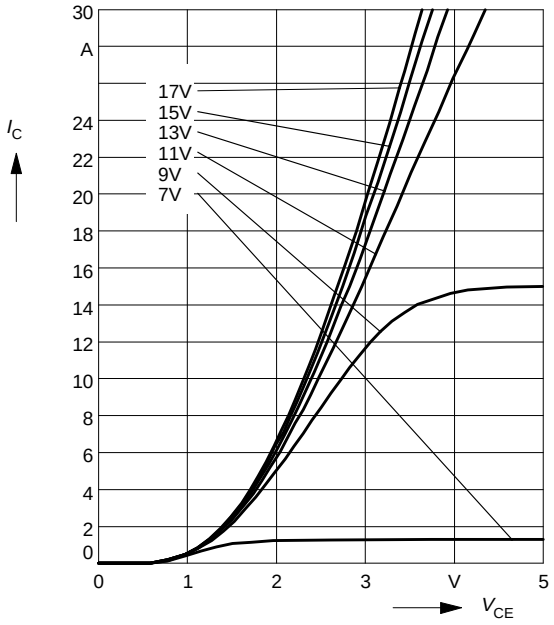
USA

Typ. output characteristics

$I_C = f(V_{CE})$

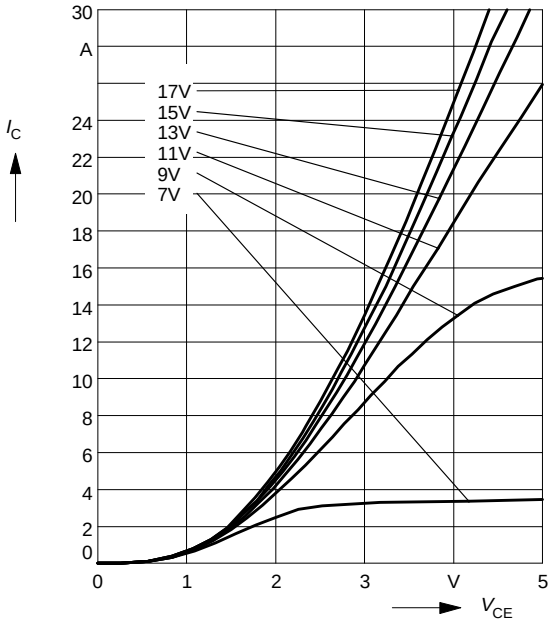
parameter: t_p = 80 µs, T_j = 25 °C



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