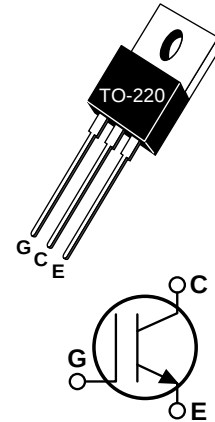


Fast IGBT

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



MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT20GF120KR	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{CGR}	Collector-Gate Voltage ($R_{GE} = 20K\Omega$)	1200	
V_{EC}	Emitter-Collector Voltage	15	
V_{GE}	Gate-Emitter Voltage	± 20	
I_{C1}	Continuous Collector Current @ $T_C = 25^\circ\text{C}$	32	Amps
I_{C2}	Continuous Collector Current @ $T_C = 90^\circ\text{C}$	20	
I_{CM1}	Pulsed Collector Current ^① @ $T_C = 25^\circ\text{C}$	64	
I_{CM2}	Pulsed Collector Current ^① @ $T_C = 90^\circ\text{C}$	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	$^\circ\text{C}$
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 ($V_{CE} = V_{GE}, I_C = 350\mu A, T_J = 25^\circ\text{C}$)	4.5	5.5	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = 15A, T_J = 25^\circ\text{C}$)		2.7	3.2	
	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = 15A, T_J = 125^\circ\text{C}$)		3.3	3.9	
I_{CES}	Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_J = 25^\circ\text{C}$)			0.8	mA
	Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_J = 125^\circ\text{C}$)			5.0	
I_{GES}	Gate-Emitter Leakage Current ($V_{GE} = \pm 20V, V_{CE} = 0V$)			± 100	nA



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

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DYNAMIC CHARACTERISTICS

APT20GF120KR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance $V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1\text{ MHz}$		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) $V_{GE} = 15V$ $V_{CC} = 0.8V_{CES}$ $I_C = I_{C2}$ $R_G = 10\Omega$		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) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +150^\circ C$		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) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +25^\circ C$		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 $I_C = 15A, V_{CC} = 50V, R_{GE} = 25\Omega, L = 200\mu H, T_J = 25^\circ C$

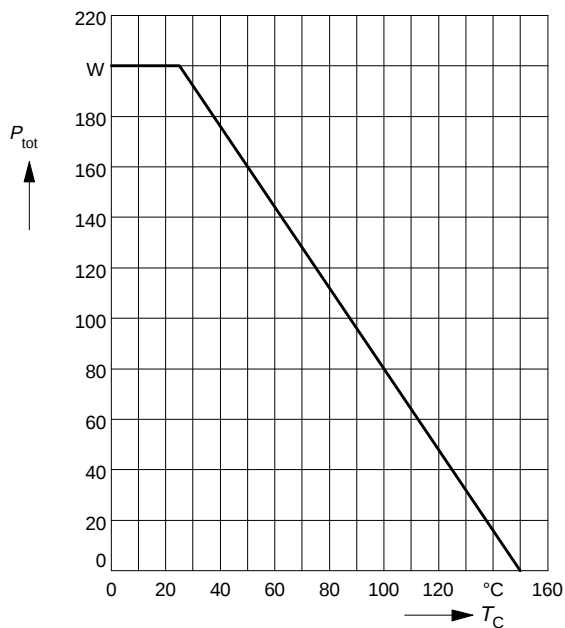
③ See MIL-STD-750 Method 3471

APT Reserves the right to change, without notice, the specifications and information contained herein.

Power dissipation

$$P_{\text{tot}} = f(T_C)$$

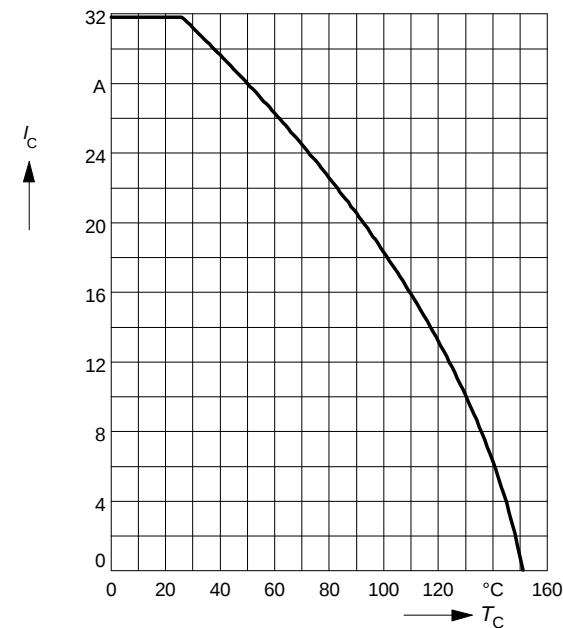
parameter: $T_j \leq 150^\circ\text{C}$



Collector current

$$I_C = f(T_C)$$

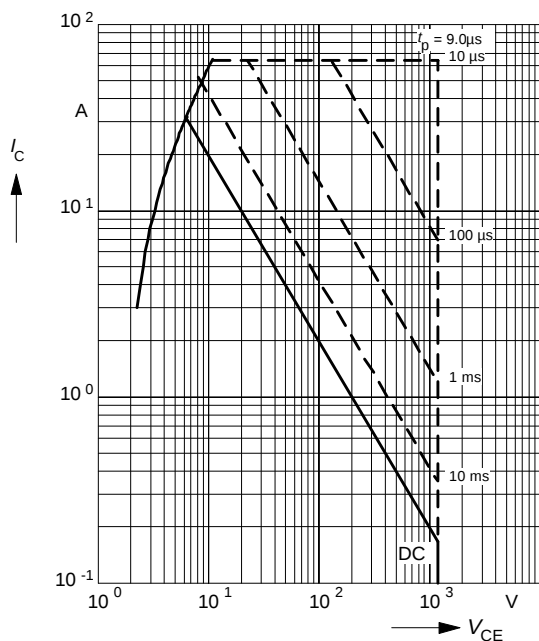
parameter: $V_{GE} \geq 15\text{ V}$, $T_j \leq 150^\circ\text{C}$



Safe operating area

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

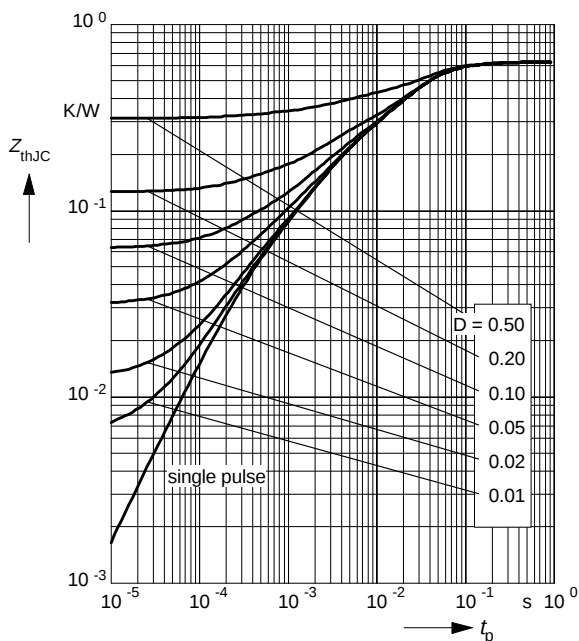
parameter: $D = 0$, $T_C = 25^\circ\text{C}$, $T_j \leq 150^\circ\text{C}$



Transient thermal impedance IGBT

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

parameter: $D = t_p / T$



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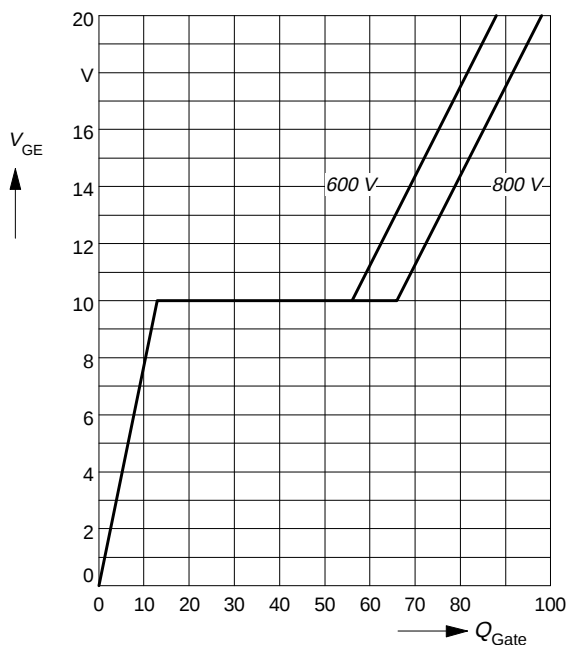
FAX: (33) 5 56 47 97 61

FAX: (541) 388-0364

Typ. gate charge

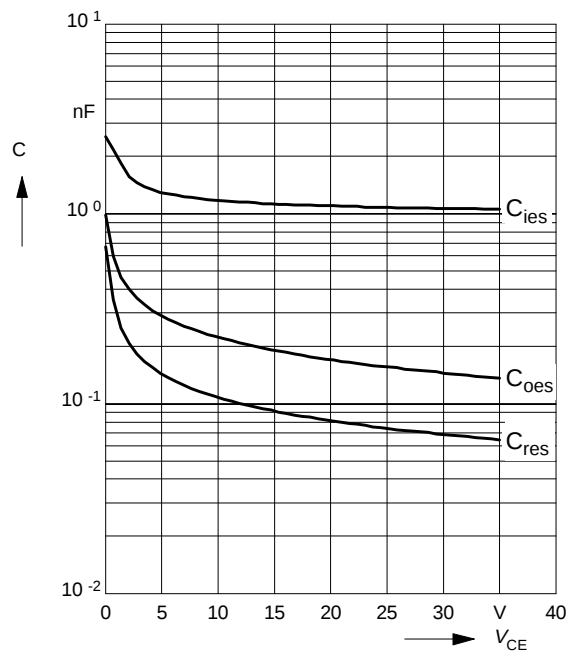
$$V_{GE} = f(Q_{Gate})$$

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


Typ. capacitances

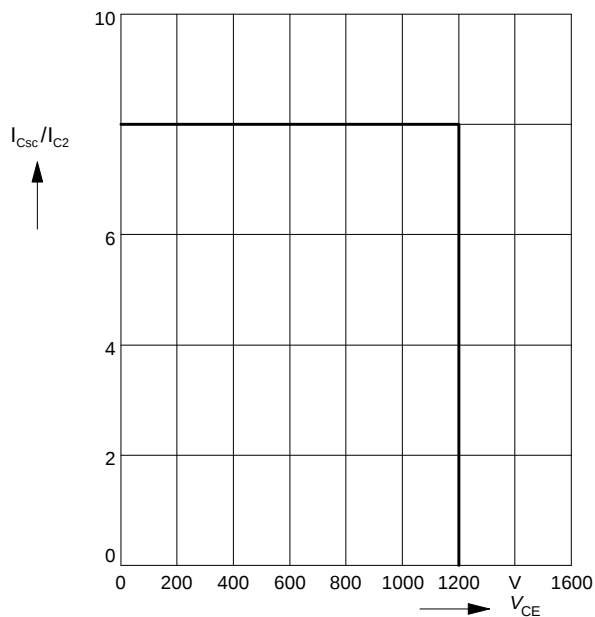
$$C = f(V_{CE})$$

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


Short circuit safe operating area

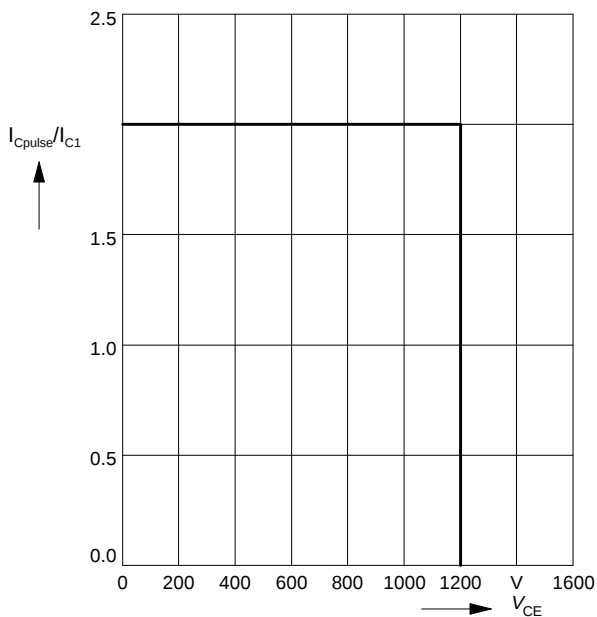
$$I_{Csc} = f(V_{CE}), T_j = 150^\circ\text{C}$$

parameter: $V_{GE} = \pm 15\text{V}$, $t_{sc} \leq 10\ \mu\text{s}$, $L < 25\text{nH}$


Reverse biased safe operating area

$$I_{Cpuls} = f(V_{CE}), T_j = 150^\circ\text{C}$$

parameter: $V_{GE} = 15\text{V}$


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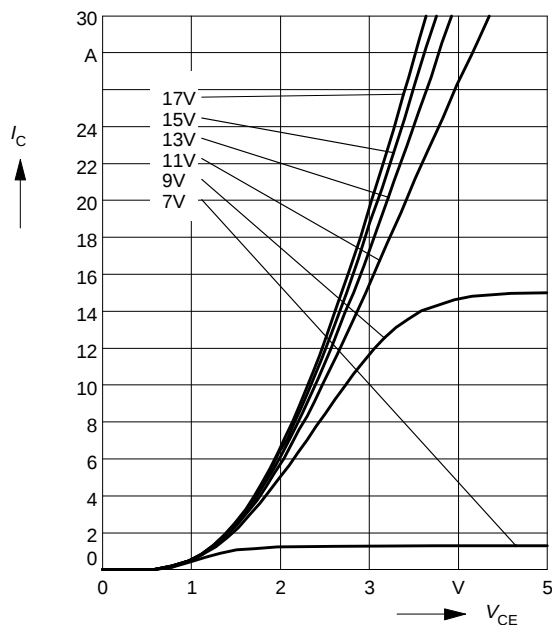
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Typ. output characteristics

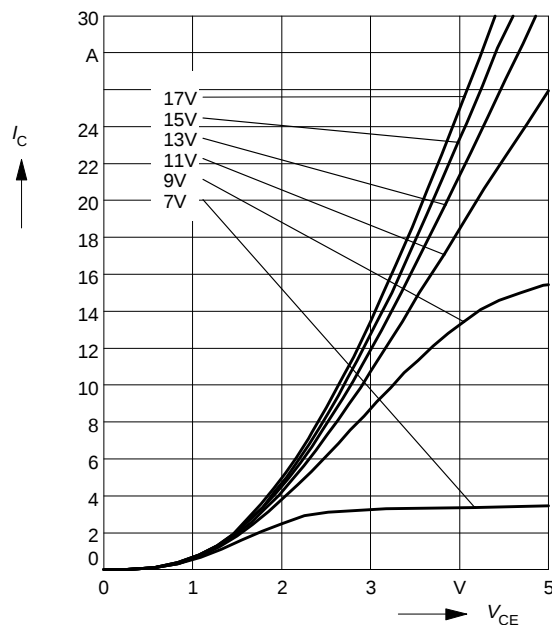
$$I_C = f(V_{CE})$$

parameter: $t_p = 80 \mu s$, $T_j = 25^\circ C$


Typ. output characteristics

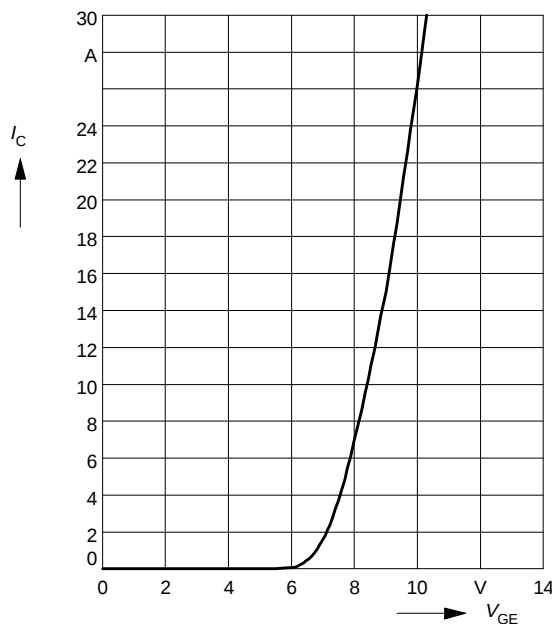
$$I_C = f(V_{CE})$$

parameter: $t_p = 80 \mu s$, $T_j = 125^\circ C$


Typ. transfer characteristics

$$I_C = f(V_{GE})$$

parameter: $t_p = 80 \mu s$, $V_{CE} = 20 V$


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