

**ADVANCED
POWER
TECHNOLOGY®**
APT50GF100BN 1000V 50A

POWER MOS IV™ IGBT

N - CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER INSULATED GATE BIPOLAR TRANSISTOR

MAXIMUM RATINGS

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

Symbol	Parameter		APT50GF100BN	UNIT
V_{CES}	Collector-Emitter Voltage		1000	Volts
V_{GE}	Gate-Emitter Voltage		± 20	
I_{C1}^*	Continuous Collector Current		50	Amps
I_{C2}	Continuous Collector Current @ $T_C = 90^\circ\text{C}$		35	
I_{CM}	Pulsed Collector Current ①		100	
I_{LM}	Clamped Inductive Load Current @ $T_J = +125^\circ\text{C}$ ②		70	
E_{ARV}	Reverse Voltage Avalanche Energy		100	mJ
P_D	Total Power Dissipation		260	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 / Part Number	MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage ($V_{GE} = 0V, I_C = 3.0mA$)	APT50GF100BN	1000		Volts
RBV_{CES}	Collector-Emitter Reverse Breakdown Voltage ($V_{GE} = 0V, I_C = 1.0A$)	-15	-25		
$V_{GE(TH)}$	Gate Threshold Voltage ($V_{CE} = V_{GE}, I_C = 1.0mA$)	3		6	
$V_{CE(ON)}$	Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = I_{C2}$)		3.2	3.7	
I_{CES}	Collector Cut-off Current ($V_{CE} = 0.8 V_{CES}, V_{GE} = 0V$)			1.0	mA
	Collector Cut-off Current ($V_{CE} = 0.8 V_{CES}, V_{GE} = 0V, T_C = 125^\circ\text{C}$)			2.0	mA
I_{GES}	Gate-Emitter Leakage Current ($V_{GE} = \pm 20V, V_{CE} = 0V$)			± 100	nA
$V_{GE}/\Delta T_J$	Gate-Emitter Threshold Voltage Temperature Coefficient		-7.5		mV/ $^\circ\text{C}$
g_{fe}	Forward Transconductance ($V_{CE} = 10V, I_C = I_{C2}$)		18.5		S

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

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DYNAMIC CHARACTERISTICS

APT50GF100BN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C _{ies}	Input Capacitance	Capacitance V _{GE} = 0V V _{CE} = 10V f = 1 MHz		3500	4300	pF
C _{oes}	Output Capacitance			500	625	
C _{res}	Reverse Transfer Capacitance			150	200	
Q _g	Total Gate Charge ^③	Gate Charge V _{GE} = 10V V _{CC} = 0.5 V _{CES} I _C = I _{C1}		125	180	nC
Q _{ge}	Gate-Emitter Charge			20	30	
Q _{gc}	Gate-Collector ("Miller") Charge			75	110	
t _{d(on)}	Turn-on Delay Time	Resistive Switching (25°C) V _{GE} = 15V V _{CC} = 0.5 V _{CES} I _C = I _{C2} R _G = 2Ω		20	40	ns
t _r	Rise Time			65	130	
t _{d(off)}	Turn-off Delay Time			75	115	
t _f	Fall Time			400	800	
t _{d(on)}	Turn-on Delay Time	Inductive Switching (125°C) V _{CLAMP(Peak)} = 0.8V _{CES} V _{GE} = 15V I _C = I _{C2} R _G = 2Ω T _J = +125°C		15	30	ns
t _r	Rise Time			15	40	
t _{d(off)}	Turn-off Delay Time			300	450	
t _f	Fall Time			400	800	
E _{on}	Turn-on Switching Energy			1	2	mJ
E _{off}	Turn-off Switching Energy			6.7	13.4	
E _{ts}	Total Switching Losses			7.7	15.4	
t _{d(on)}	Turn-on Delay Time	Inductive Switching (25°C) V _{CLAMP(Peak)} = 0.8V _{CES} V _{GE} = 15V I _C = I _{C2} R _G = 2Ω T _J = +25°C		20	40	ns
t _r	Rise Time			15	30	
t _{d(off)}	Turn-off Delay Time			150	300	
t _f	Fall Time			225	450	
E _{ts}	Total Switching Losses			3.8	7.6	mJ
L _E	Internal Emitter Inductance Measured 5mm/0.197in. From Package			5		nH

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.48	°C/W
$R_{\theta JA}$	Junction to Ambient			40	
Torque	Mounting Torque using a 6-32 or 3mm Binding Head Machine Screw		10		in-Lbs.

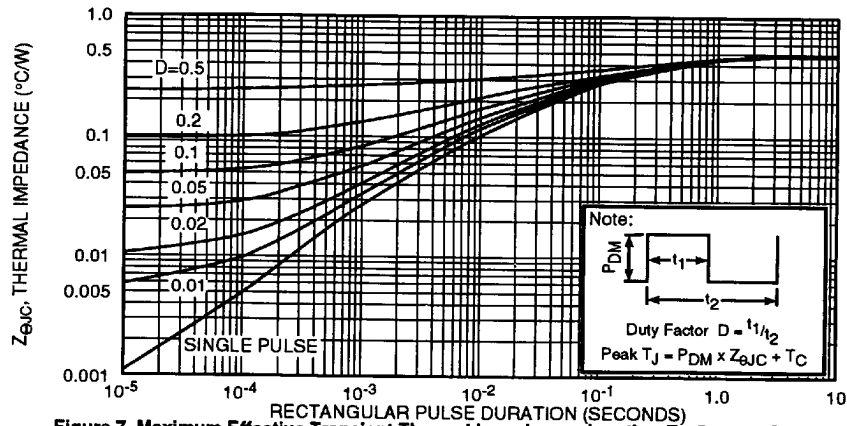
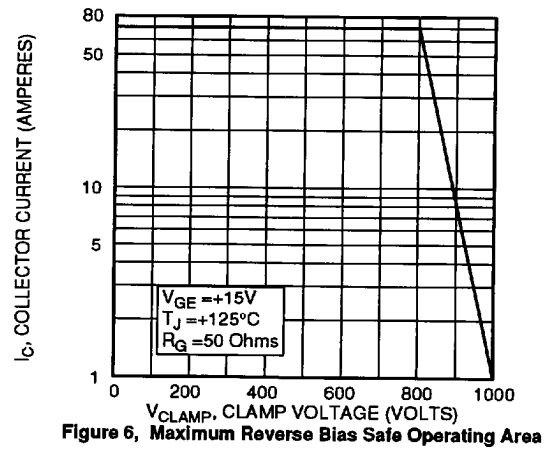
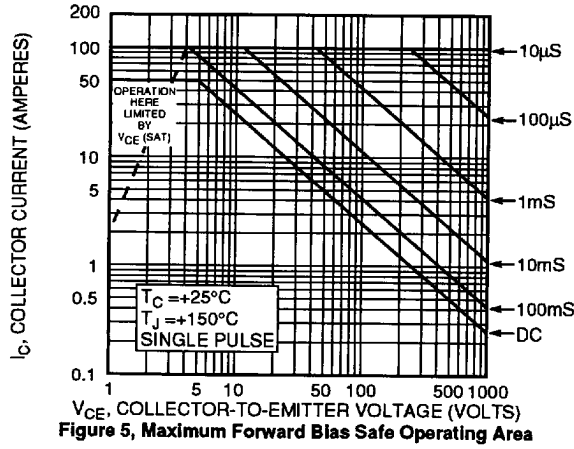
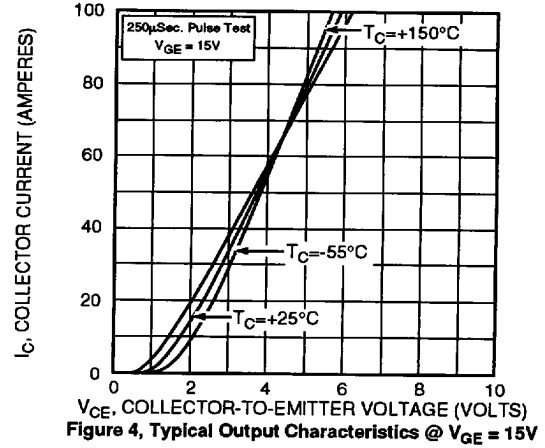
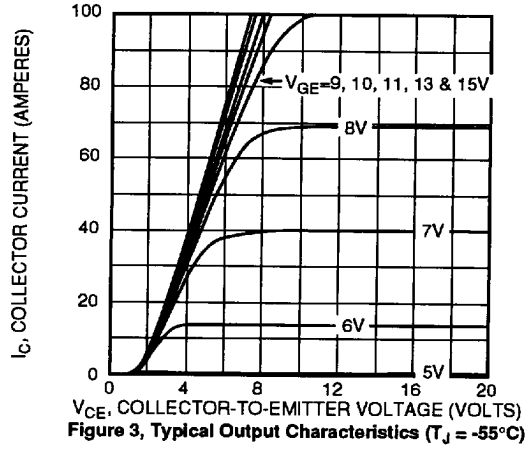
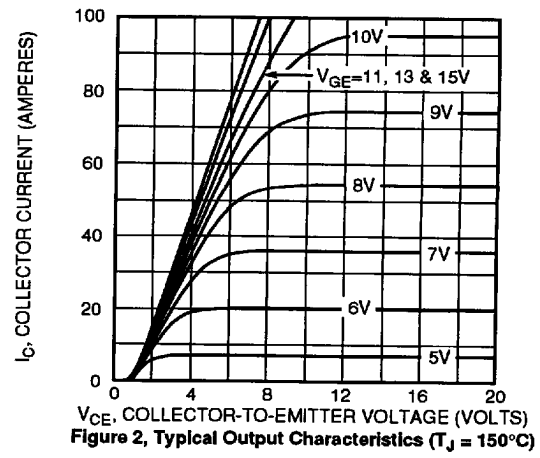
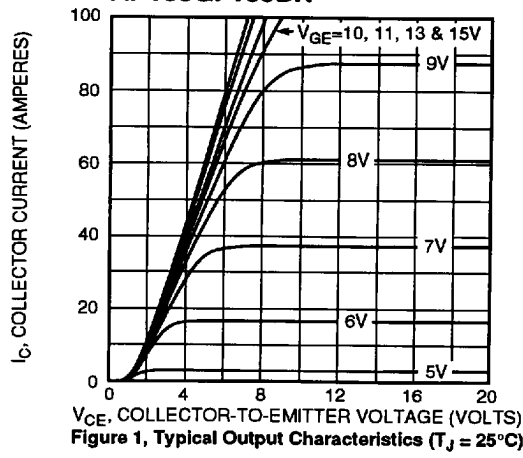
① Repetitive Rating: Pulse width limited by maximum junction temperature.

② $V_{CLAMP} = 0.8V_{CES}$ Volts, $R_G = 2\Omega$.

③ See MIL-STD-750 Method 3471

* This product when used in very fast switching circuits (turn-off $\frac{dv}{dt} > 15$ volts per ns) and under operating conditions of $T_c = +150^\circ\text{C}$ and $I_c > I_{C1}$ will latch in a thyristor mode of operation. When device latches, it must be commutated with minimum energy to prevent damage.

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



APT50GF100BN

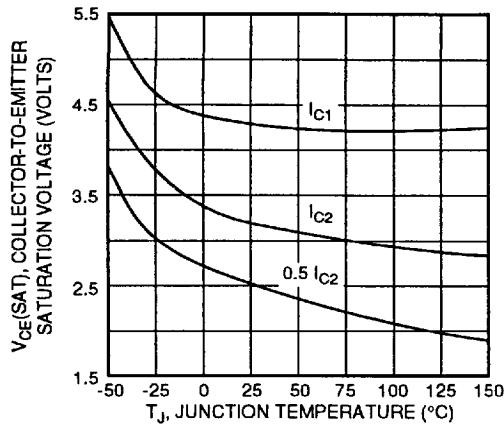


Figure 8, Typical $V_{CE(SAT)}$ Voltage vs Junction Temperature

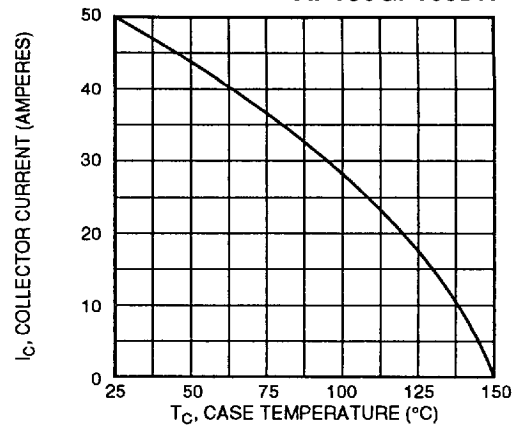


Figure 9, Maximum Collector Current vs Case Temperature

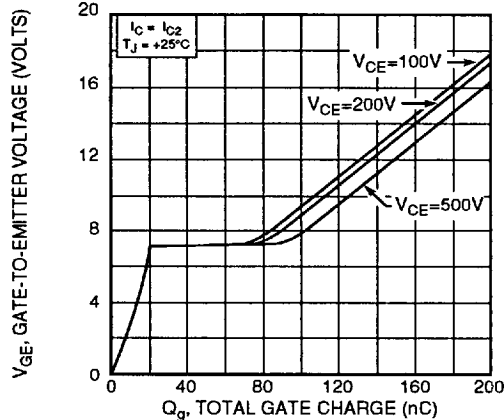


Figure 10, Gate Charges vs Gate-To-Emitter Voltage

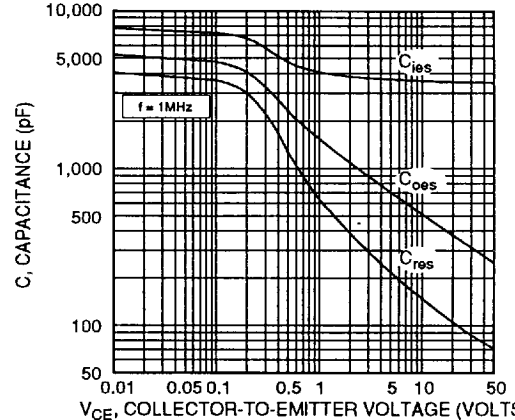


Figure 11, Typical Capacitance vs Collector-To-Emitter Voltage

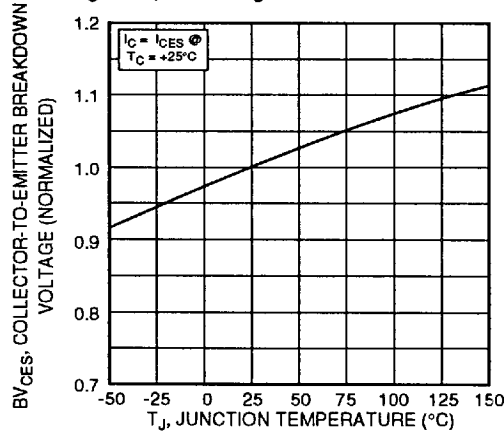


Figure 12, Breakdown Voltage vs Junction Temperature

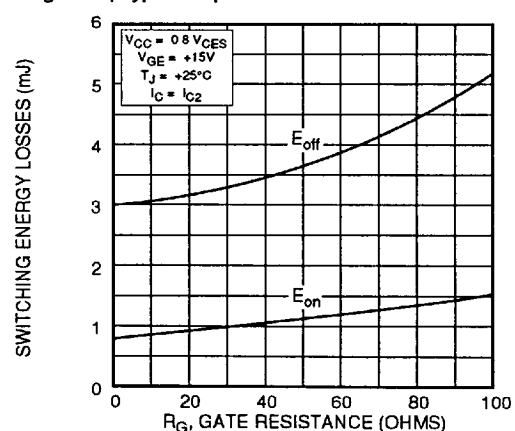


Figure 13, Typical Switching Energy Losses vs Gate Resistance

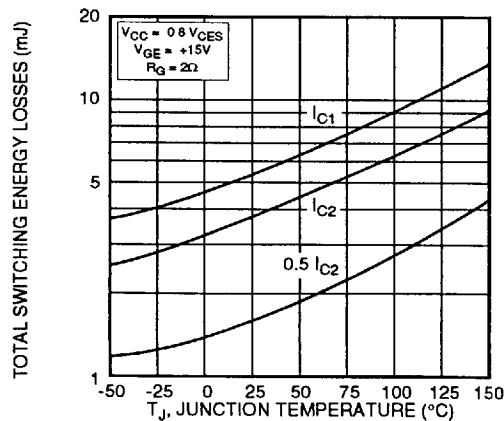


Figure 14, Typical Switching Energy Losses vs. Junction Temperature

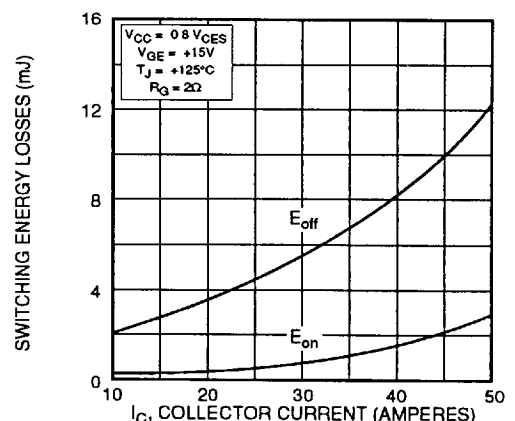


Figure 15, Typical Switching Energy Losses vs Collector Current

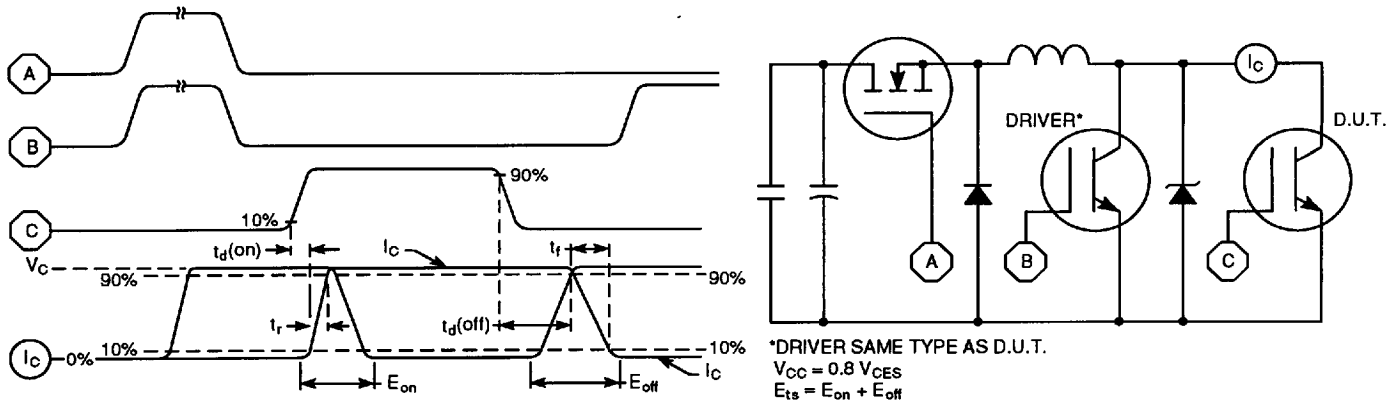


Figure 16, Switching Loss Test Circuit and Waveforms

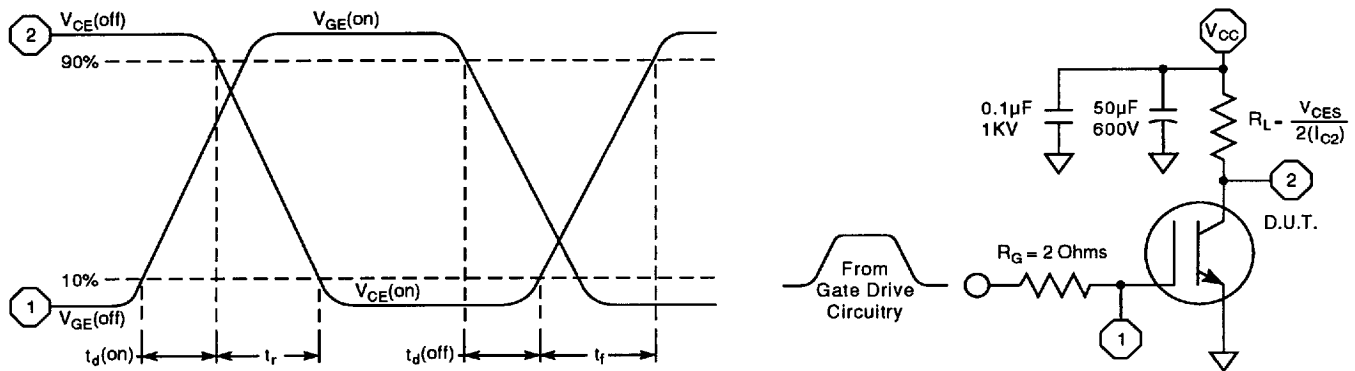
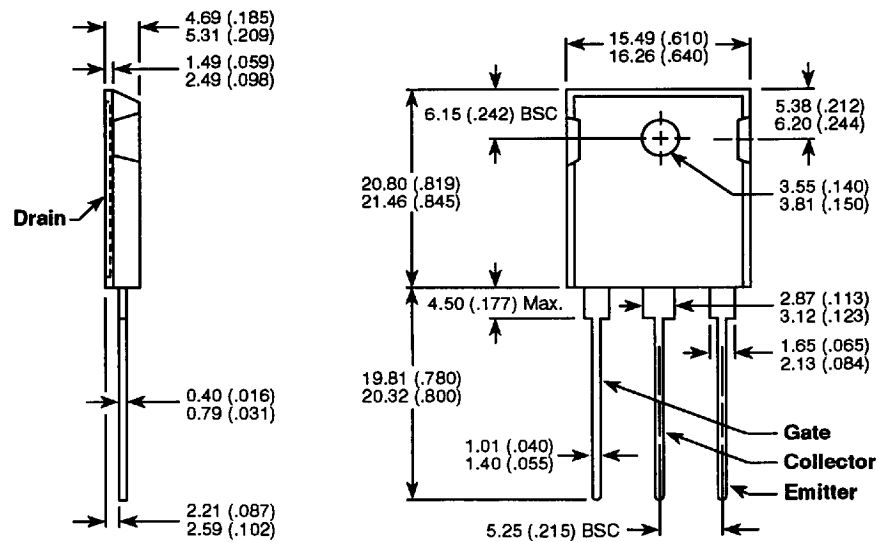


Figure 17, Resistive Switching Time Test Circuit and Waveforms

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)