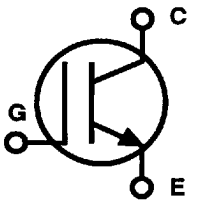

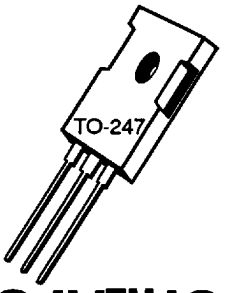

ADVANCED POWER TECHNOLOGY®

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°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°C	35		
I_{CM}	Pulsed Collector Current ①	100		
I_{LM}	Clamped Inductive Load Current @ T_J = +125°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		°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°C)				2.0	mA
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)				±100	nA
$V_{GE}/\Delta T_J$	Gate-Emitter Threshold Voltage Temperature Coefficient			-7.5		mV/°C
gfe	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 = 2Ω.

③ See MIL-STD-750 Method 3471

* This product when used in very fast switching circuits (turn-off $^{dv}/_{dt}$ > 15 volts per ns) and under operating conditions of T_c = +150°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.

APT50GF100BN

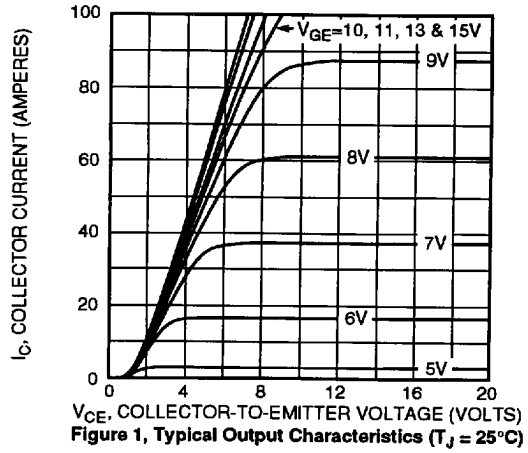

Figure 1, Typical Output Characteristics (T_J = 25°C)

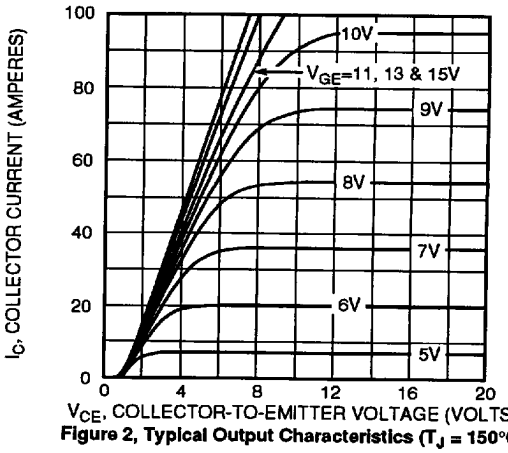

Figure 2, Typical Output Characteristics (T_J = 150°C)

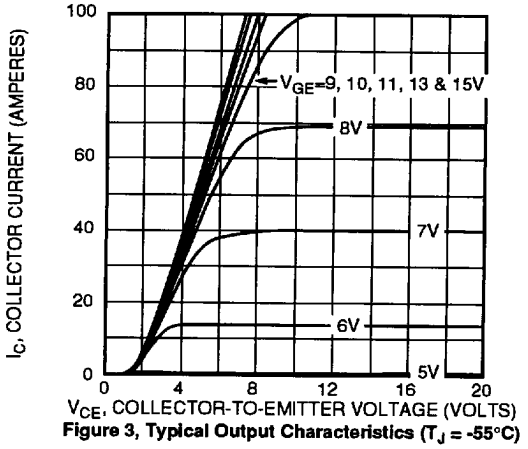

Figure 3, Typical Output Characteristics (T_J = -55°C)

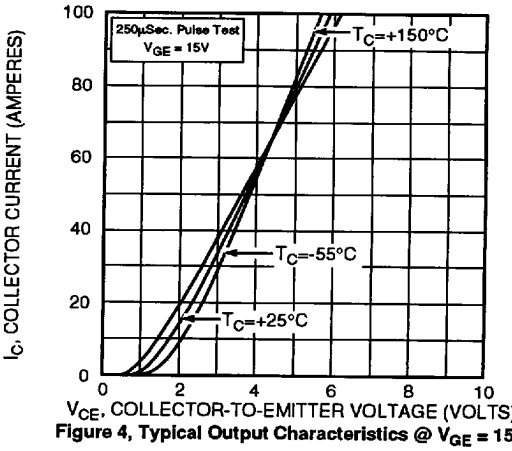

Figure 4, Typical Output Characteristics @ V_{GE} = 15V

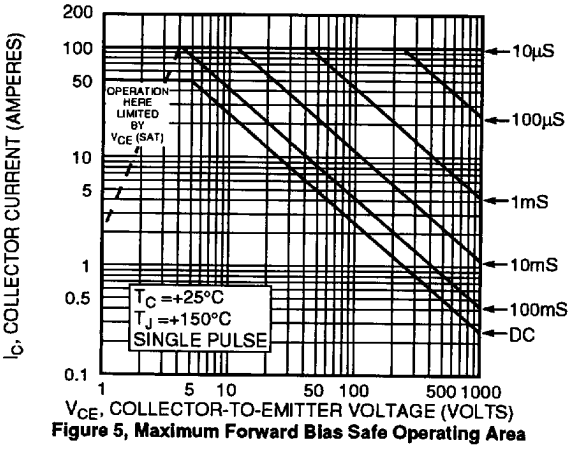

Figure 5, Maximum Forward Bias Safe Operating Area

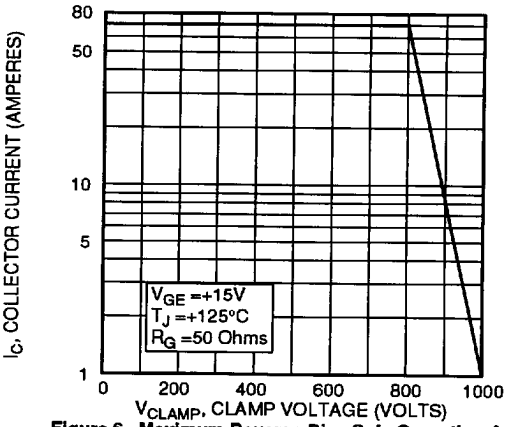

Figure 6, Maximum Reverse Bias Safe Operating Area

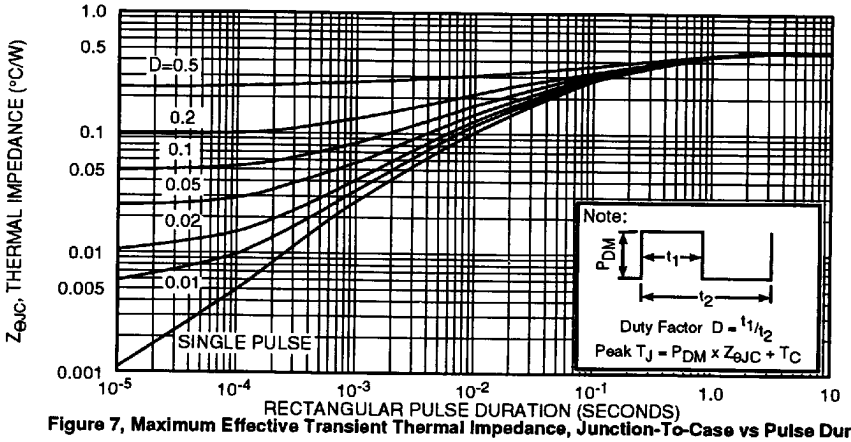

Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

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Rev A

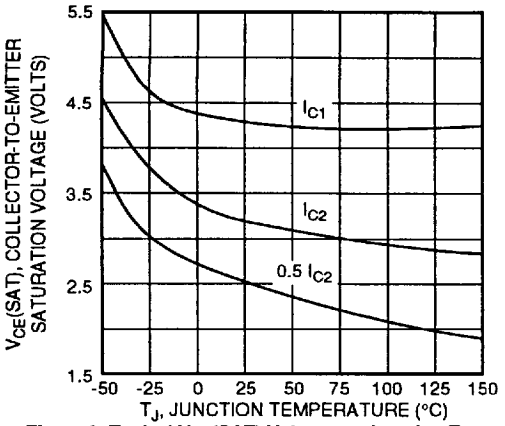


Figure 8, Typical V_{CE}(SAT) Voltage vs Junction Temperature

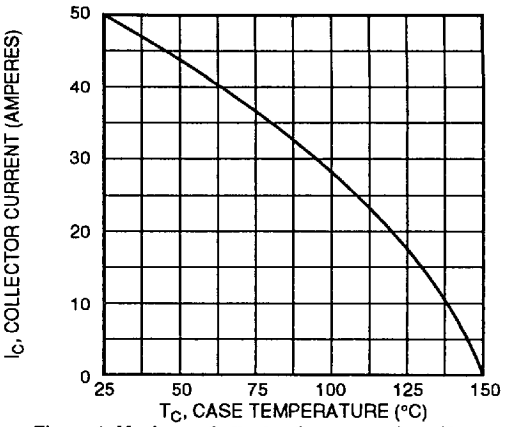


Figure 9, Maximum Collector Current vs Case Temperature

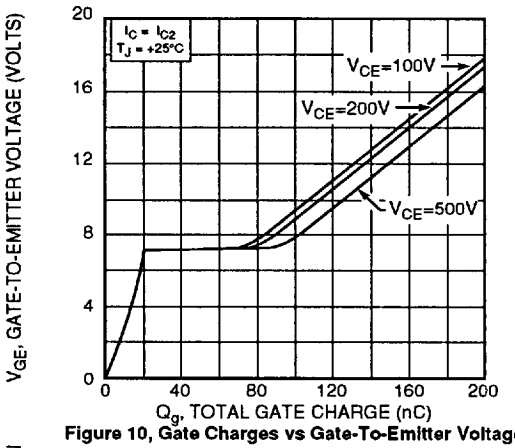


Figure 10, Gate Charges vs Gate-To-Emitter Voltage

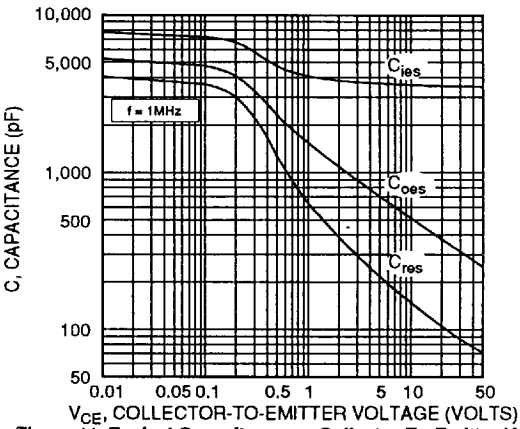


Figure 11, Typical Capacitance vs Collector-To-Emitter Voltage

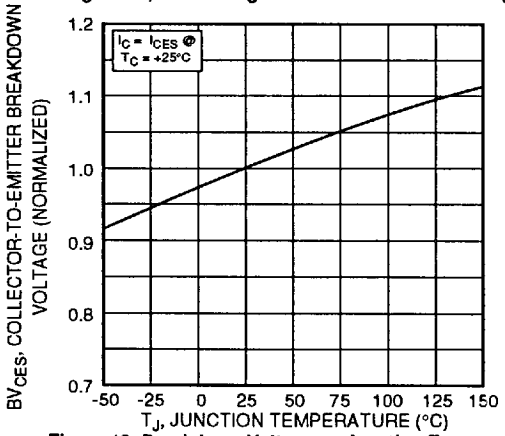


Figure 12, Breakdown Voltage vs Junction Temperature

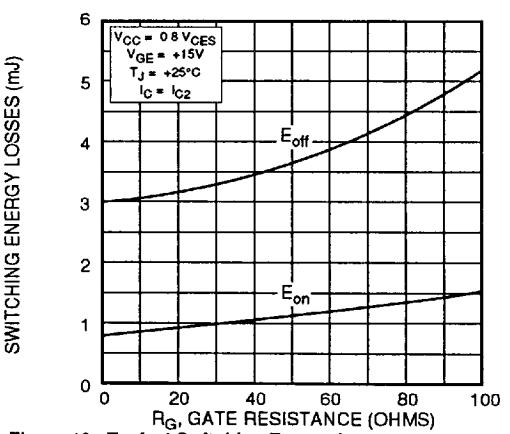


Figure 13, Typical Switching Energy Losses vs Gate Resistance

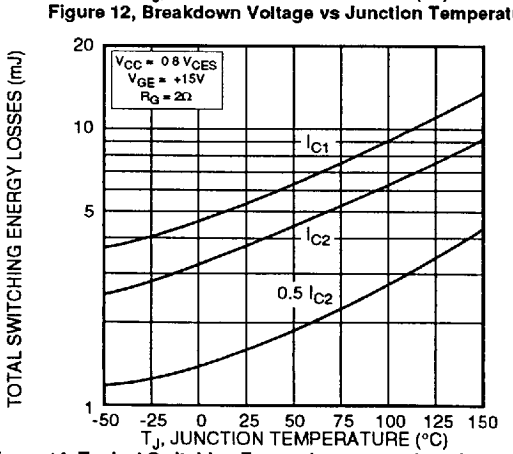


Figure 14, Typical Switching Energy Losses vs. Junction Temperature

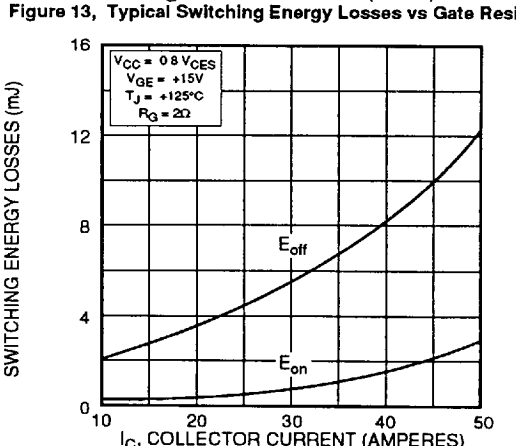


Figure 15, Typical Switching Energy Losses vs Collector Current

Switching Waveforms, Schematics, and Package Outline Drawing

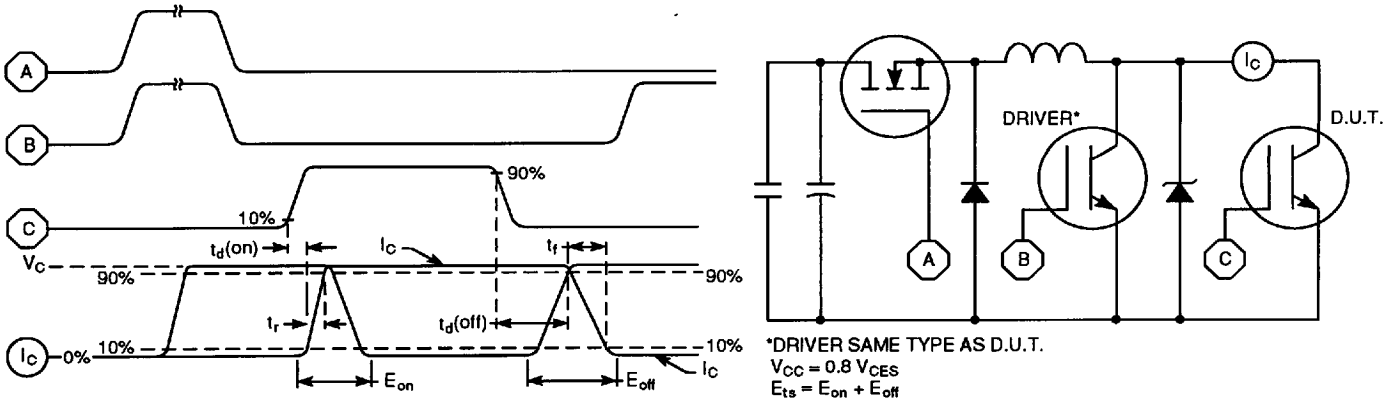


Figure 16, Switching Loss Test Circuit and Waveforms

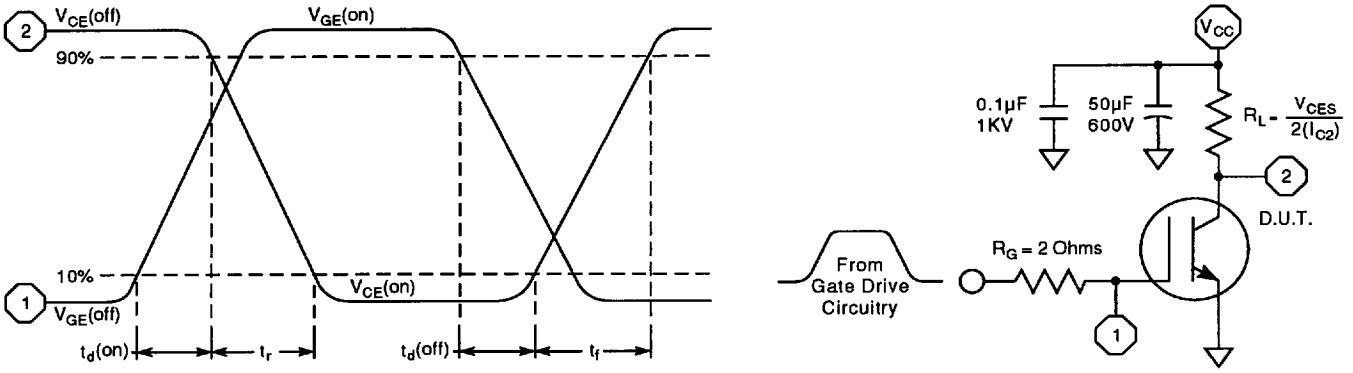
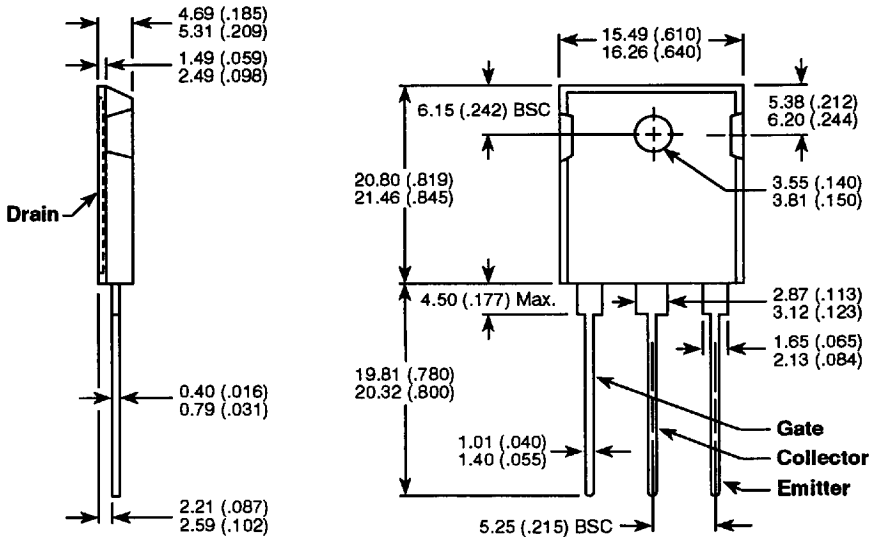


Figure 17, Resistive Switching Time Test Circuit and Waveforms

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)