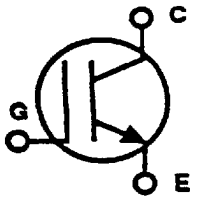

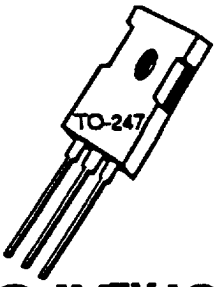

ADVANCED POWER TECHNOLOGY®

APT50G60BN 600V 50A
APT50G50BN 500V 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	APT50G50BN	APT50G60BN	UNIT
V_{CES}	Collector-Emitter Voltage	500	600	Volts
V_{GE}	Gate-Emitter Voltage	±20		
I_{C1}	Continuous Collector Current	50		Amps
I_{C2}	Continuous Collector Current @ T_C = 100°C	29		
I_{CM}	Pulsed Collector Current ①	100		
I_{LM}	Clamped Inductive Load Current @ T_J = +125°C ②	58		
E_{ARV}	Reverse Voltage Avalanche Energy	200		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 / Part Number		MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 500µA)	APT50G60BN	600			Volts
		APT50G50BN	500			
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)		2.5		5	
$V_{CE(ON)}$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = I_{C2})			2.8	3.2	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V)				500	µA
	Collector Cut-off Current (V_{CE} = 0.8 V_{CES}, V_{GE} = 0V, T_C = 125°C)				1.0	mA
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)				±100	nA
$V_{GE}/\Delta T_J$	Gate-Emitter Threshold Voltage Termperature Coefficient			-6.9		mV/°C
gfe	Forward Transconductance (V_{CE} = 10V, I_C = I_{C2})			13.5		S

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DYNAMIC CHARACTERISTICS

APT50G60/50G50BN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	Capacitance V_{GE} = 0V V_{CE} = 10V f = 1 MHz		2100	2550	pF
C_{oes}	Output Capacitance			435	600	
C_{res}	Reverse Transfer Capacitance			130	200	
Q_g	Total Gate Charge ③	Gate Charge V_{GE} = 10V V_{CC} = 0.5 V_{CES} I_C = I_{C1}		75	110	nC
Q_{ge}	Gate-Emitter Charge			10	15	
Q_{gc}	Gate-Collector ("Miller") Charge			40	60	
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		15		ns
t_r	Rise Time			45		
t_{d}(off)	Turn-off Delay Time			55		
t_f	Fall Time			350		
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		ns
t_r	Rise Time			30	60	
t_{d}(off)	Turn-off Delay Time			200		
t_f	Fall Time			350	400	
E_{on}	Turn-on Switching Energy			0.3		mJ
E_{off}	Turn-off Switching Energy			3.1		
E_{ts}	Total Switching Losses			3.4	3.9	
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		10		ns
t_r	Rise Time			20	40	
t_{d}(off)	Turn-off Delay Time			120		
t_f	Fall Time			220	300	
E_{ts}	Total Switching Losses			1.7	2.2	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			0.625	°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

APT50G60/50G50BN

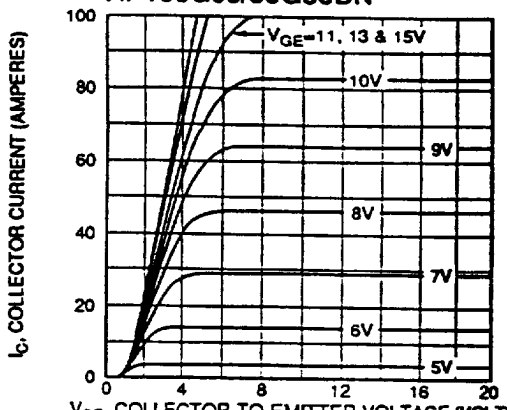

Figure 1, Typical Output Characteristics (T_J = 25°C)

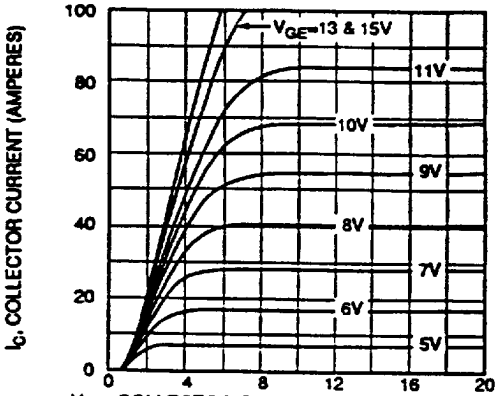

Figure 2, Typical Output Characteristics (T_J = 150°C)

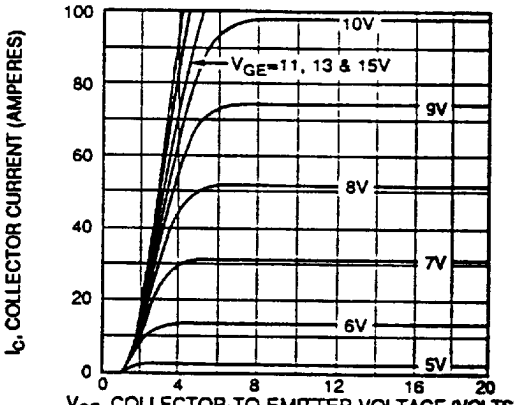

Figure 3, Typical Output Characteristics (T_J = -55°C)

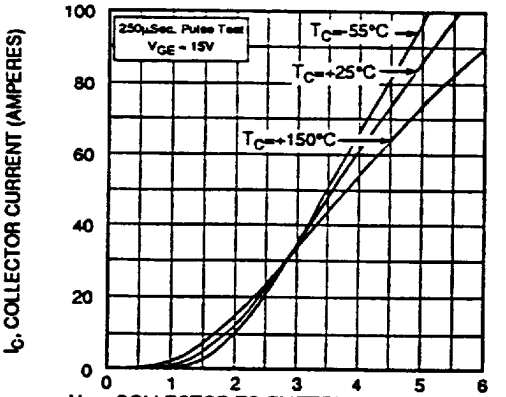

Figure 4, Typical Output Characteristics @ V_{GE} = 15V

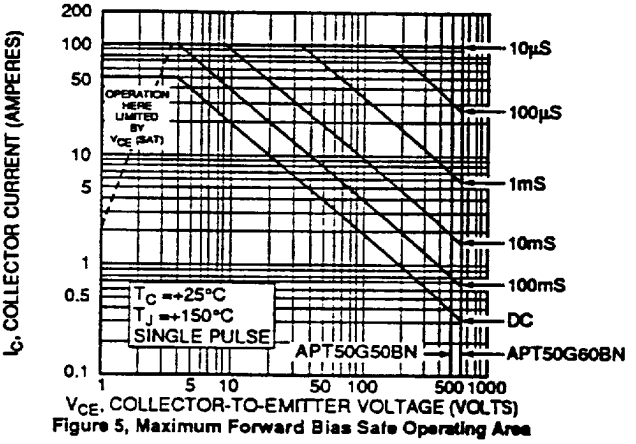

Figure 5, Maximum Forward Bias Safe Operating Area

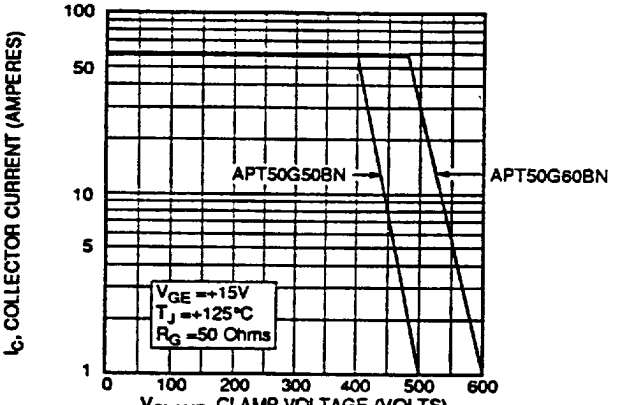

Figure 6, Maximum Reverse Bias Safe Operating Area

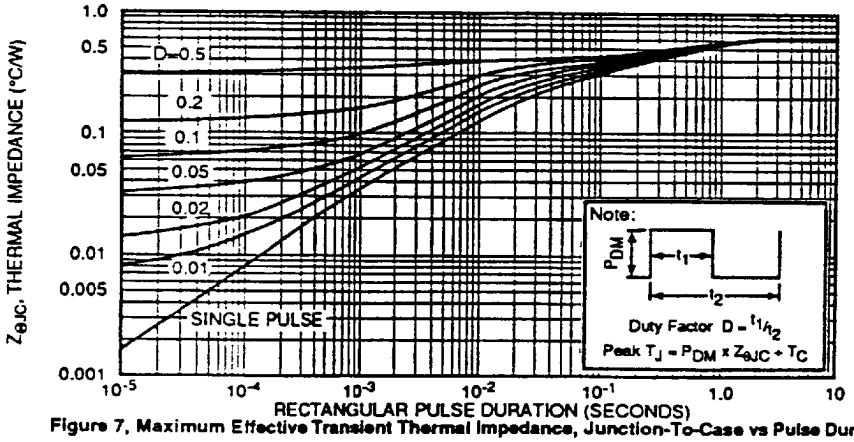

Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

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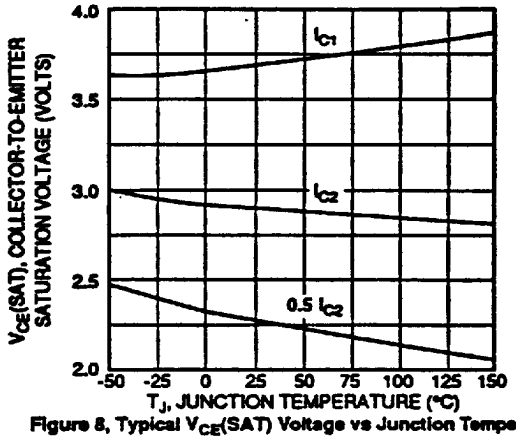


Figure 8, Typical V_{CE}(SAT) Voltage vs Junction Temperature

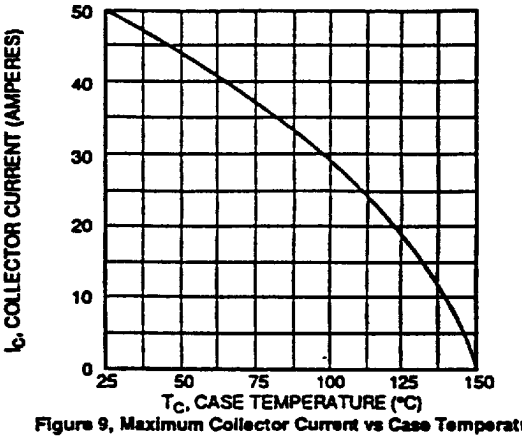


Figure 9, Maximum Collector Current vs Case Temperature

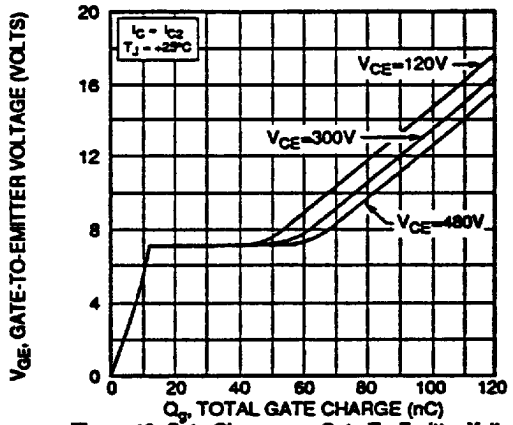


Figure 10, Gate Charges vs Gate-To-Emitter Voltage

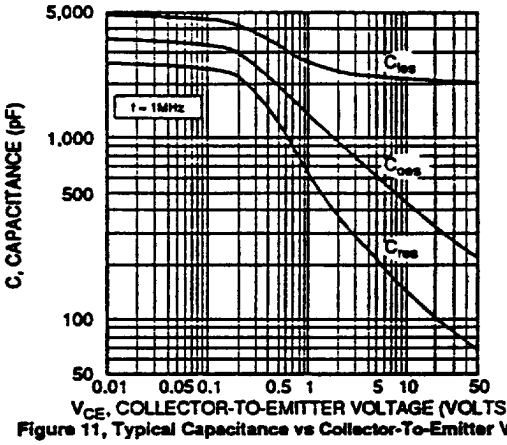


Figure 11, Typical Capacitance vs Collector-To-Emitter Voltage

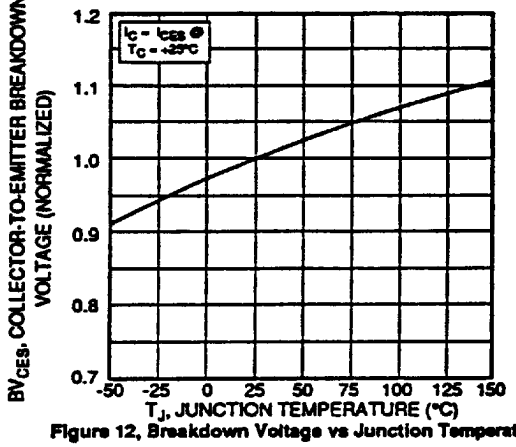


Figure 12, Breakdown Voltage vs Junction Temperature

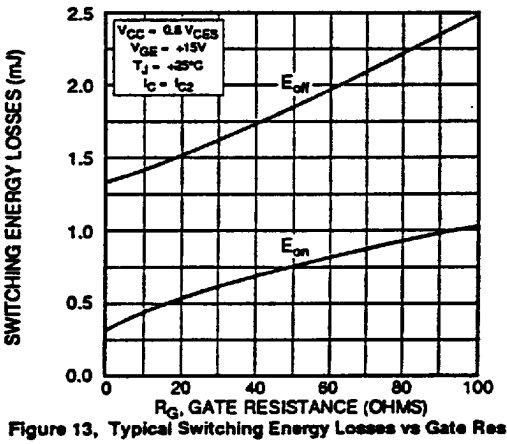


Figure 13, Typical Switching Energy Losses vs Gate Resistance

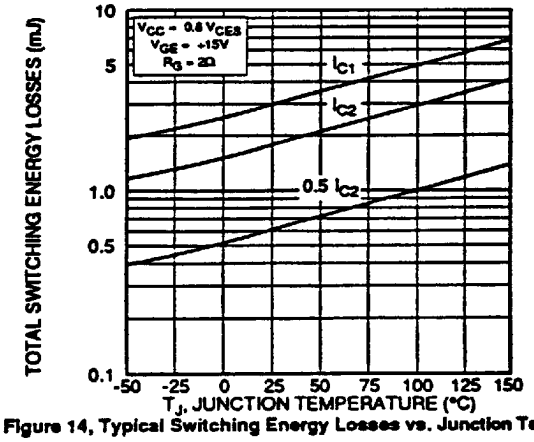


Figure 14, Typical Switching Energy Losses vs. Junction Temperature

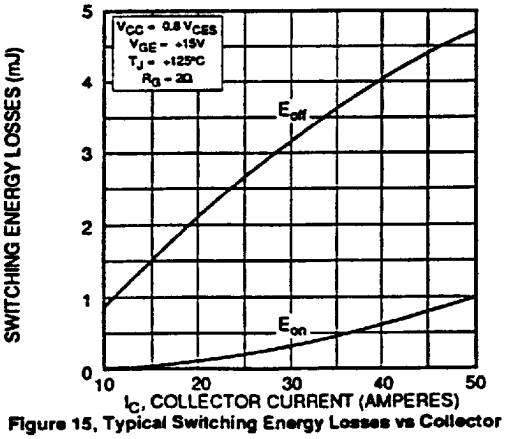


Figure 15, Typical Switching Energy Losses vs Collector Current

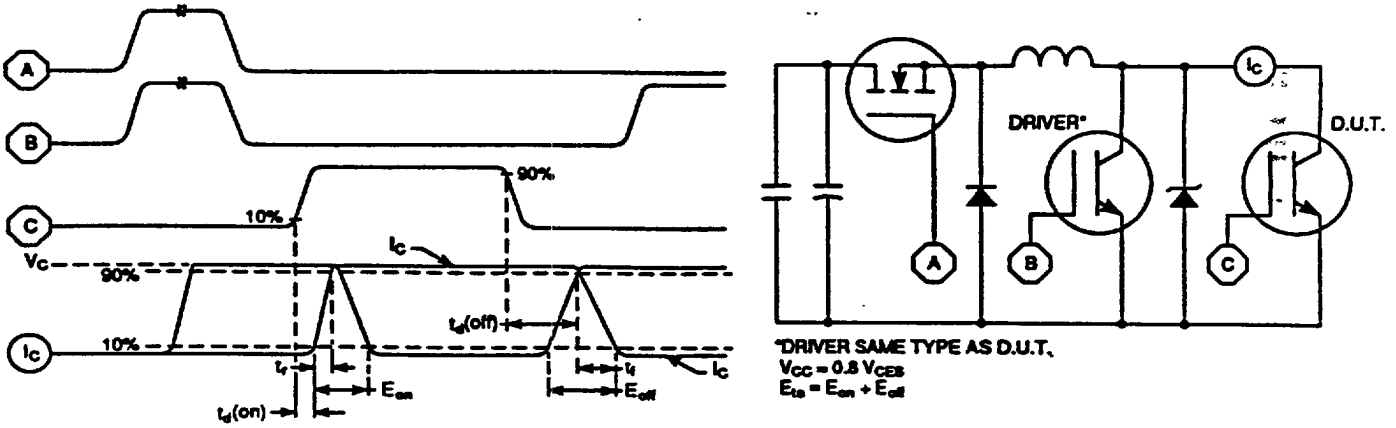


Figure 16, Switching Loss Test Circuit and Waveforms

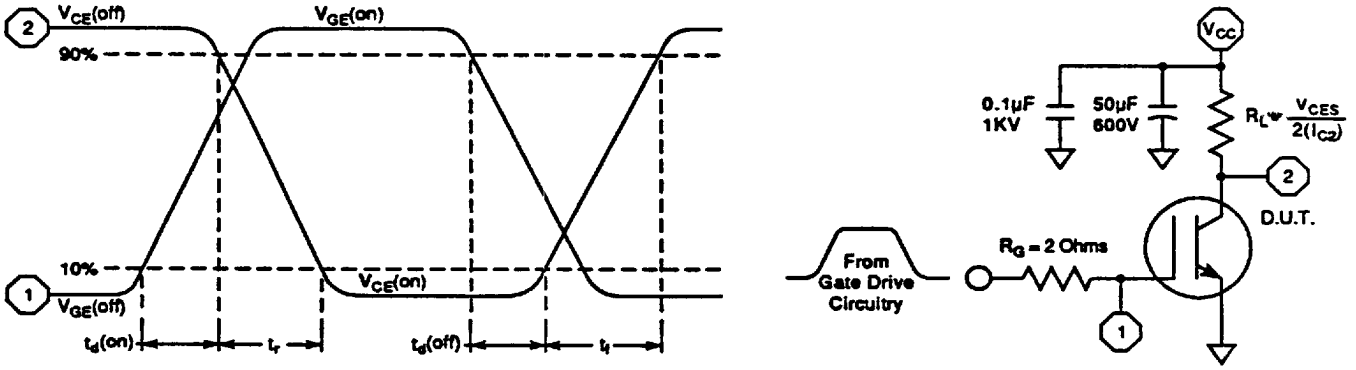
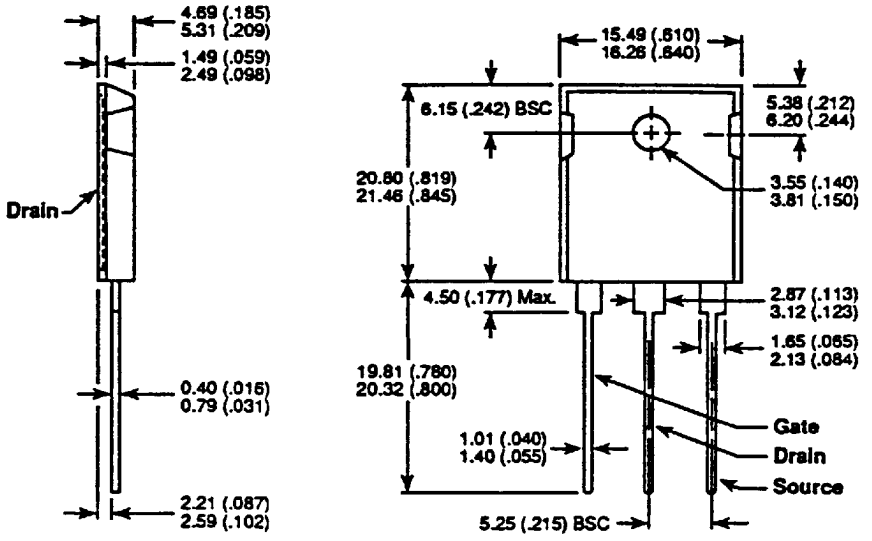


Figure 17, Resistive Switching Time Test Circuit and Waveforms

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)