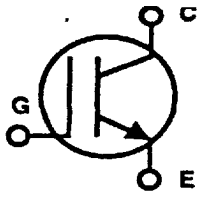

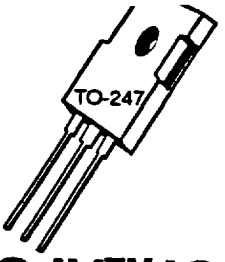

ADVANCED POWER TECHNOLOGY®

T-39-31

APT35G60BN 600V 35A
APT35G50BN 500V 35A

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	APT35G50BN	APT35G60BN	UNIT
V_{CES}	Collector-Emitter Voltage	500	600	Volts
V_{GE}	Gate-Emitter Voltage	±20		
I_{C1}	Continuous Collector Current	35		Amps
I_{C2}	Continuous Collector Current @ T_C = 100°C	20		
I_{CM}	Pulsed Collector Current ①	70		
I_{LM}	Clamped Inductive Load Current @ T_J = +125°C ②	40		
E_{ARV}	Reverse Voltage Avalanche Energy	100		mJ
P_D	Total Power Dissipation	162		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 = 250µA)	APT35G60BN	600			Volts
		APT35G50BN	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})			3.0	3.4	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V)				250	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			-5.8		mV/°C
gfe	Forward Transconductance (V_{CE} = 10V, I_C = I_{C2})			9		S

105 S.W. COLUMBIA STREET
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DYNAMIC CHARACTERISTICS

APT35G60/35G50BN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** V_{GE} = 0V, V_{CE} = 10V, f = 1 MHz		1160	1390	pF
C_{oes}	Output Capacitance			260	360	
C_{res}	Reverse Transfer Capacitance			90	130	
Q_g	Total Gate Charge ③	**Gate Charge** V_{GE} = 10V, V_{CC} = 0.5 V_{CES}, I_C = I_{C1}		45	65	nC
Q_{ge}	Gate-Emitter Charge			6	9	
Q_{gc}	Gate-Collector ("Miller") Charge			30	45	
$t_d(on)$	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			330		
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			15		
$t_d(off)$	Turn-off Delay Time			180		
t_f	Fall Time			350		
E_{on}	Turn-on Switching Energy			0.2		mJ
E_{off}	Turn-off Switching Energy			2.0		
E_{ts}	Total Switching Losses			2.2	2.9	
$t_d(on)$	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		15		ns
t_r	Rise Time			15		
$t_d(off)$	Turn-off Delay Time			75		
t_f	Fall Time			175		
E_{ts}	Total Switching Losses			1.1	1.5	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			0.77	°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

APT35G60/35G50BN

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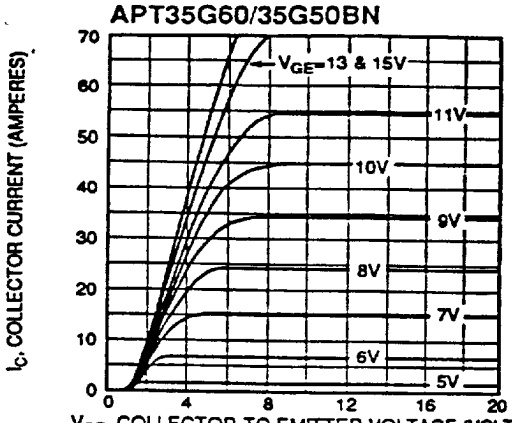

Figure 1, Typical Output Characteristics (T_J = 25°C)

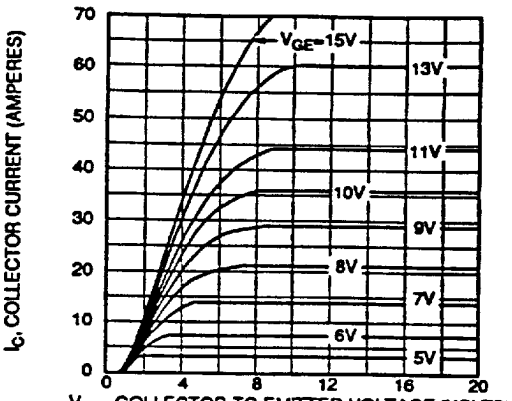

Figure 2, Typical Output Characteristics (T_J = 150°C)

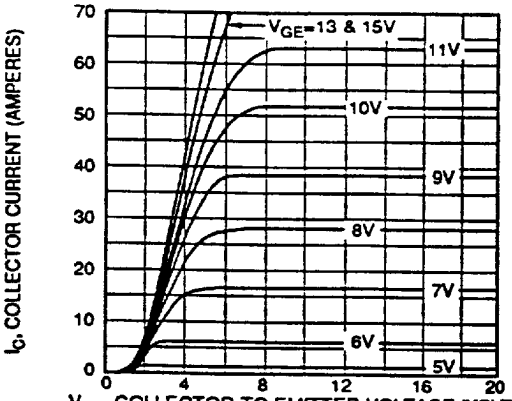

Figure 3, Typical Output Characteristics (T_J = -55°C)

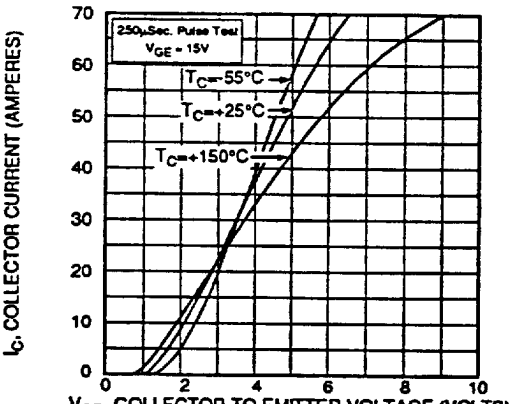

Figure 4, Typical Output Characteristics @ V_{GE} = 15V

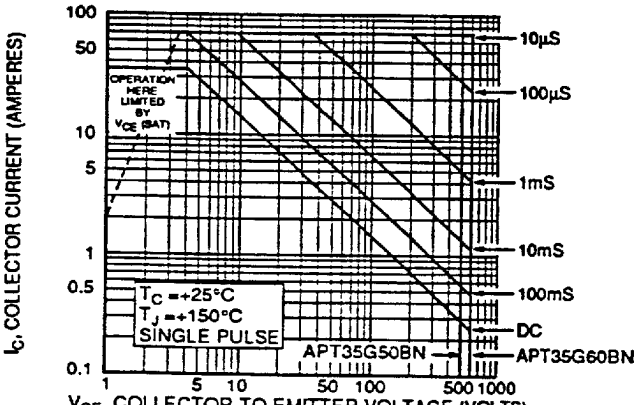

Figure 5, Maximum Forward Bias Safe Operating Area

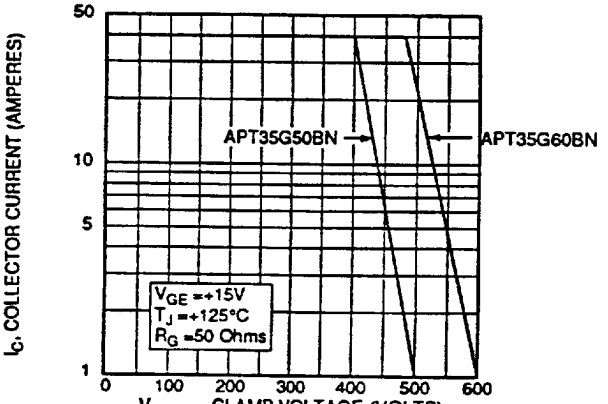

Figure 6, Maximum Reverse Bias Safe Operating Area

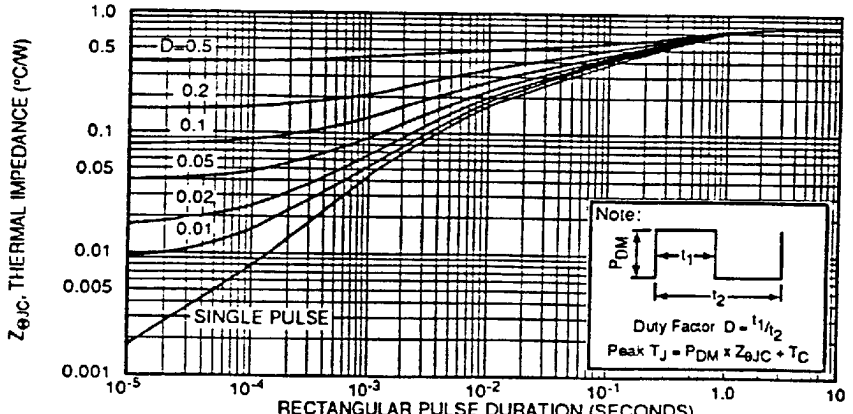

Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

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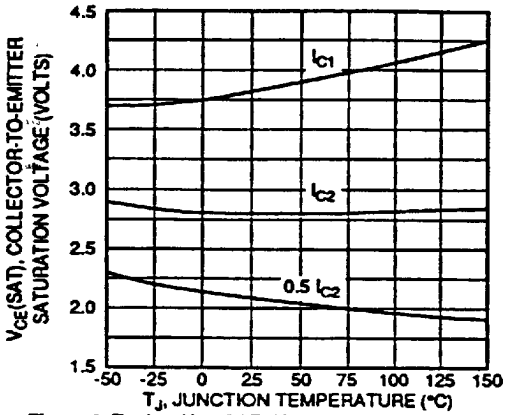


Figure 8, Typical V_{CE}(SAT) Voltage vs Junction Temperature

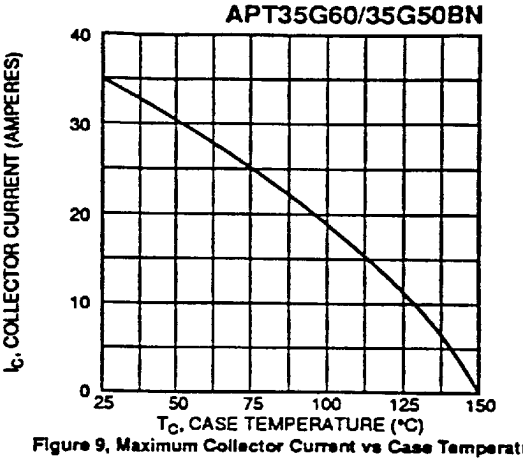


Figure 9, Maximum Collector Current vs Case Temperature

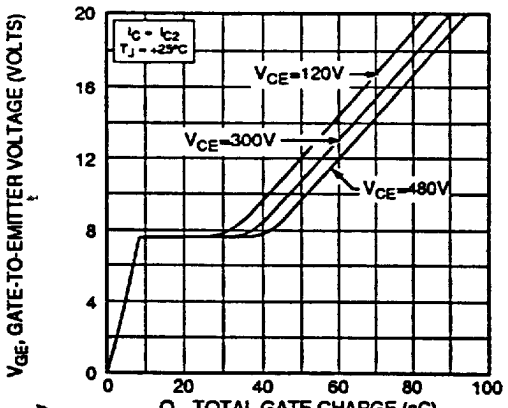


Figure 10, Gate Charges vs Gate-To-Emitter Voltage

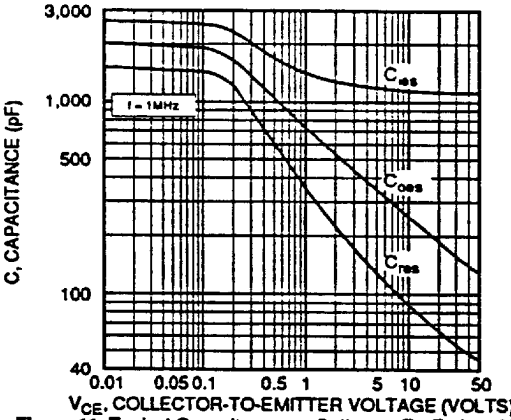


Figure 11, Typical Capacitance vs Collector-To-Emitter Voltage

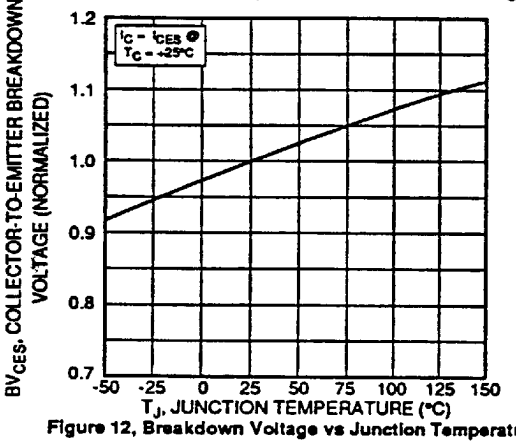


Figure 12, Breakdown Voltage vs Junction Temperature

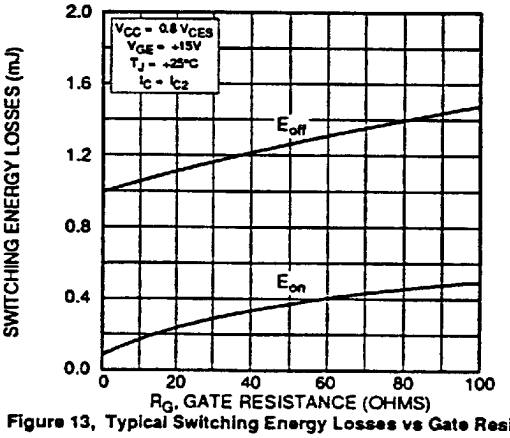


Figure 13, Typical Switching Energy Losses vs Gate Resistance

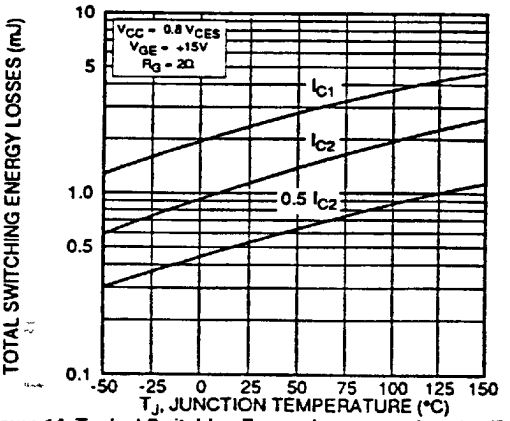


Figure 14, Typical Switching Energy Losses vs. Junction Temperature

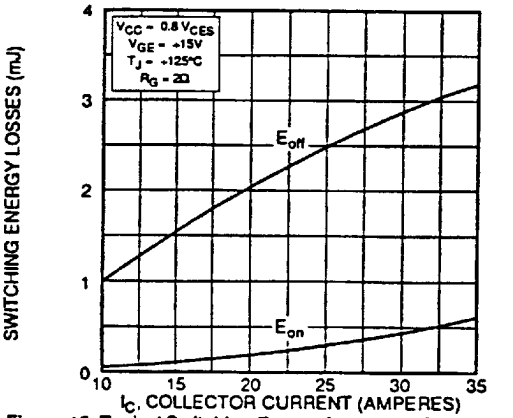


Figure 15, Typical Switching Energy Losses vs Collector Current

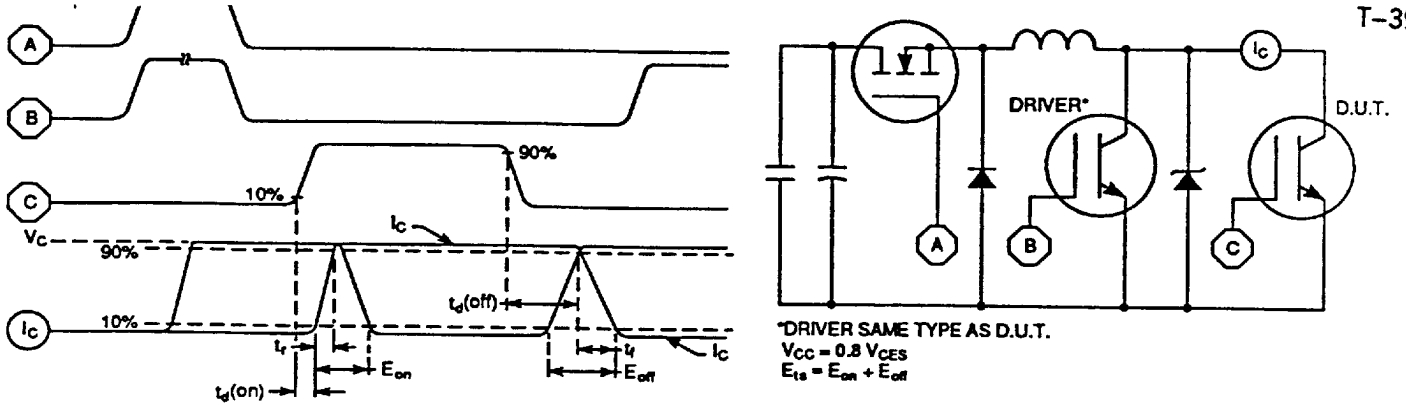


Figure 16, Switching Loss Test Circuit and Waveforms

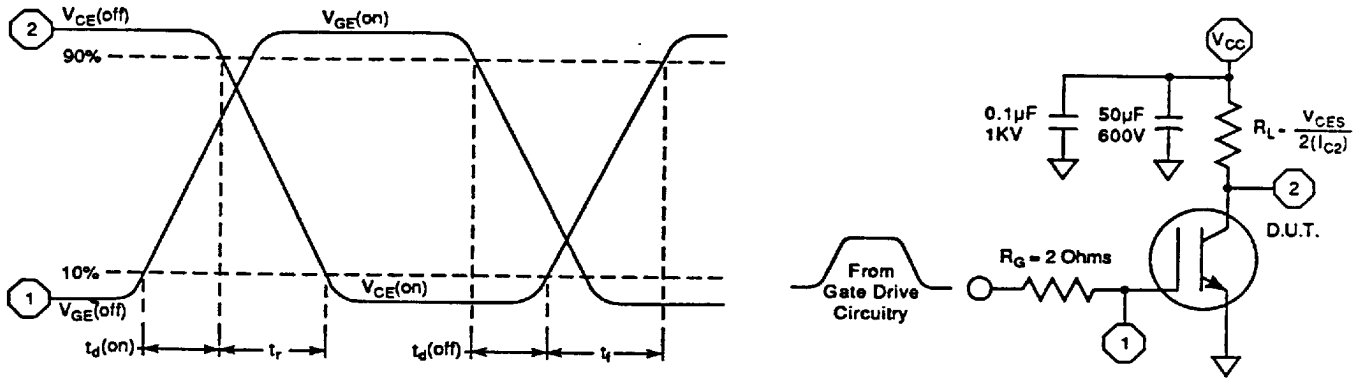
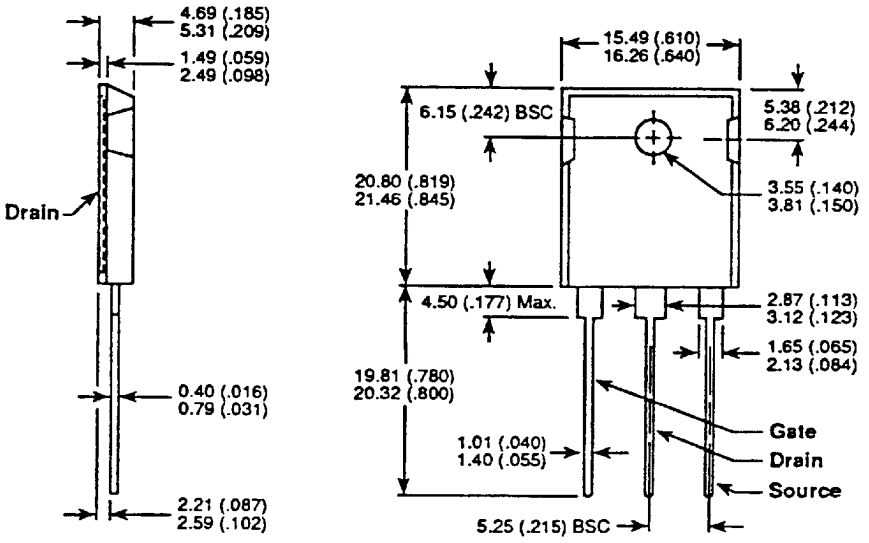


Figure 17, Resistive Switching Time Test Circuit and Waveforms

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)