

**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: $T_C = 25^\circ\text{C}$ 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 ($V_{GE} = 0V, I_C = 500\mu A$)	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 ($V_{CE} = 0.8 V_{CES}, V_{GE} = 0V, T_C = 125^\circ\text{C}$)			1.0	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		-6.9		mV/ $^\circ\text{C}$
g_{fe}	Forward Transconductance ($V_{CE} = 10V, I_C = I_{C2}$)		13.5		S

405 S.W. COLUMBIA STREET
BEND, OREGON 97702-1035
U.S.A.

LINDBERG COMPANY
6140 E. Evans Avenue
Denver, CO 80222

PHONE . . . (503) 382-8028
FAX (503) 388-0364

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	
E _{off}	Turn-off Switching Energy			3.1		
E _{is}	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 _{is}	Total Switching Losses				1.7	2.2
L _E	Internal Emitter Inductance Measured 5mm/0.197in. From Package			5		nH

THERMAL CHARACTERISTICS

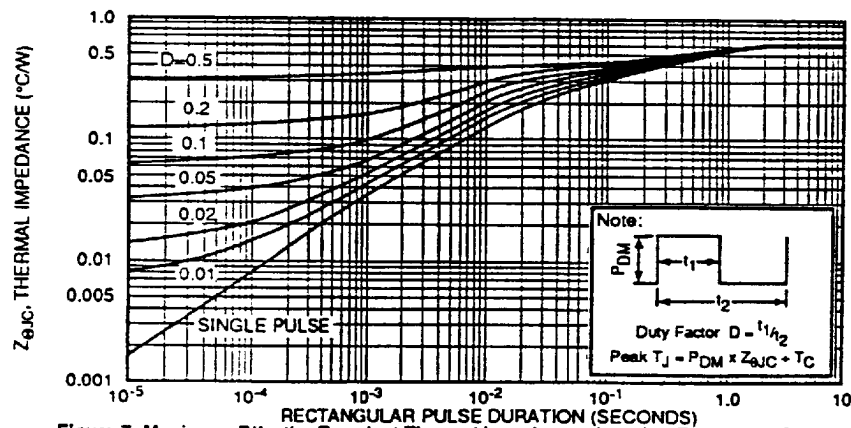
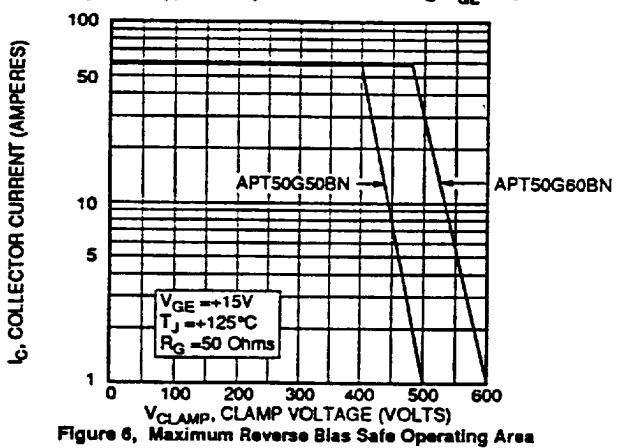
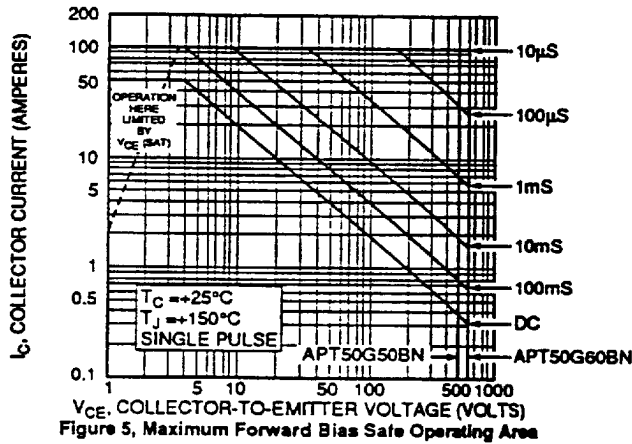
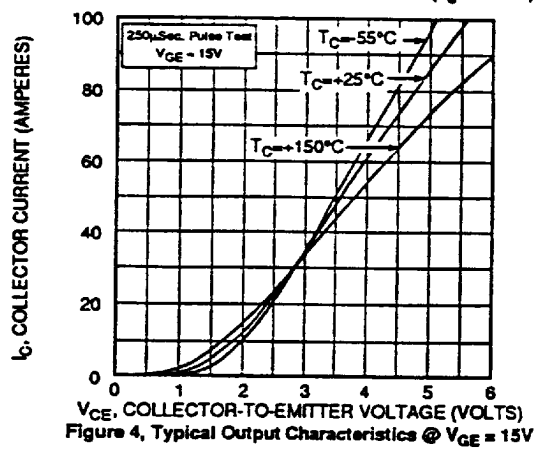
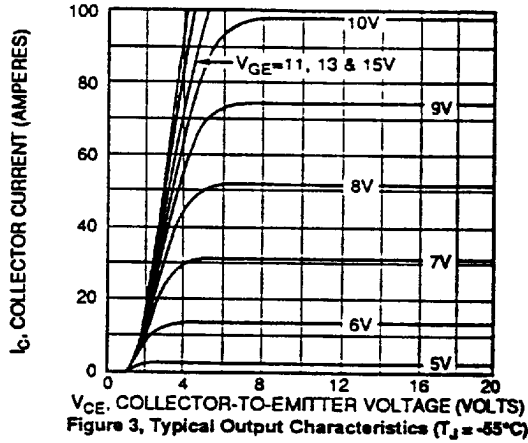
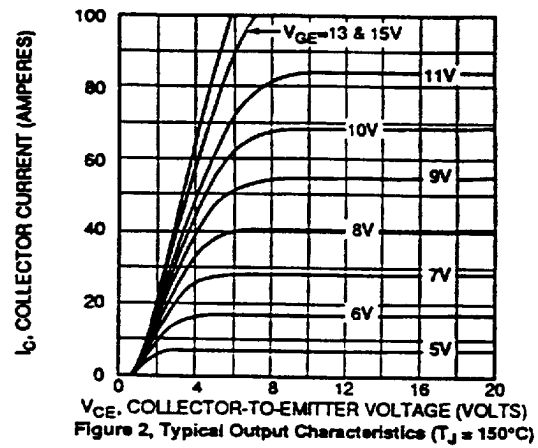
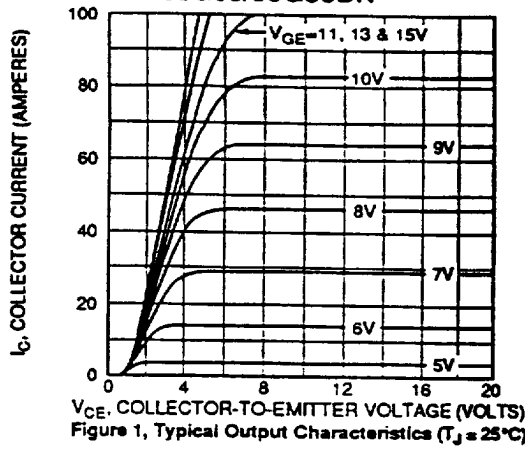
Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.625	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			40	
Torque	Mounting Torque using a 6-32 or 3mm Binding Head Machine Screw.		10		in-Lbs.

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

APT50G60/50G50BN



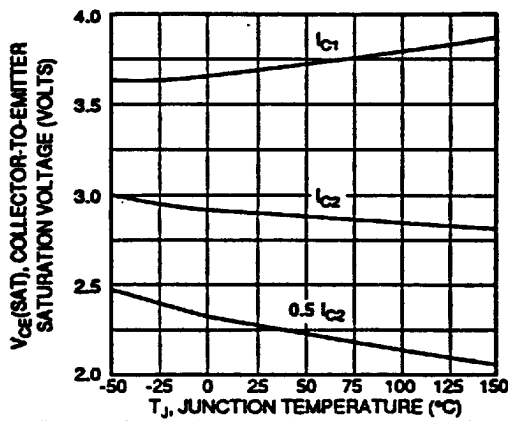


Figure 8, Typical $V_{CE(SAT)}$ Voltage vs Junction Temperature

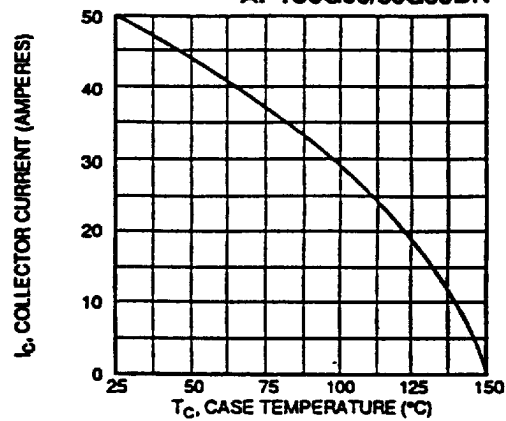


Figure 9, Maximum Collector Current vs Case Temperature

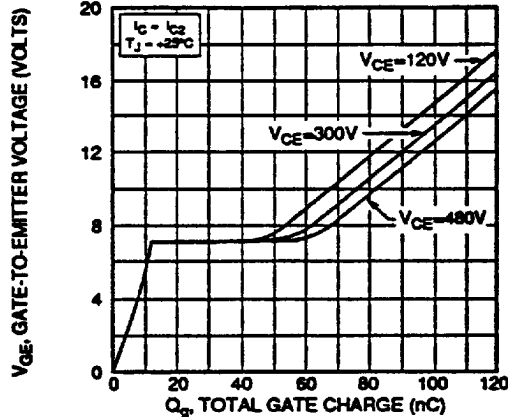


Figure 10, Gate Charges vs Gate-To-Emitter Voltage

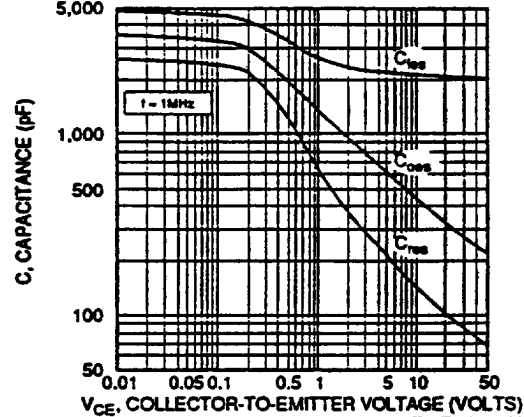


Figure 11, Typical Capacitance vs Collector-To-Emitter Voltage

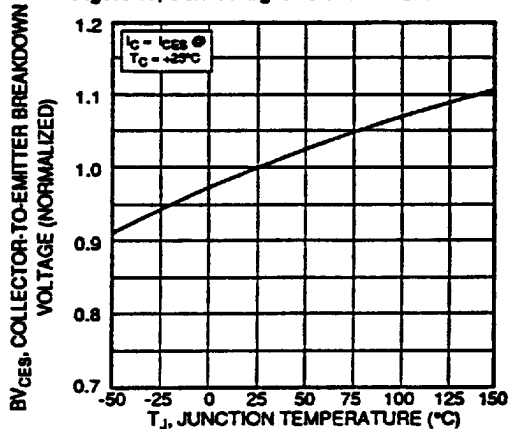


Figure 12, Breakdown Voltage vs Junction Temperature

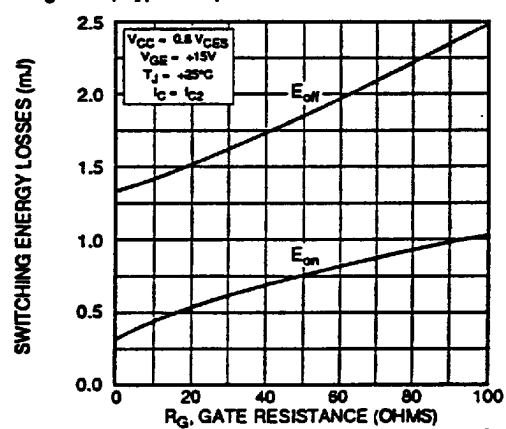


Figure 13, Typical Switching Energy Losses vs Gate Resistance

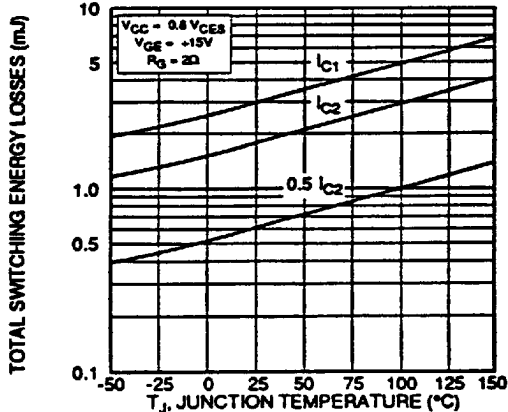


Figure 14, Typical Switching Energy Losses vs. Junction Temperature

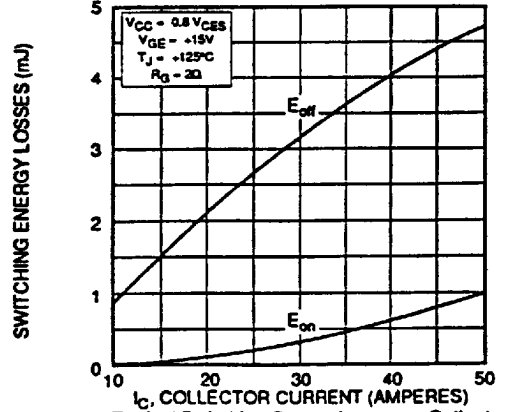


Figure 15, Typical Switching Energy Losses vs Collector Current

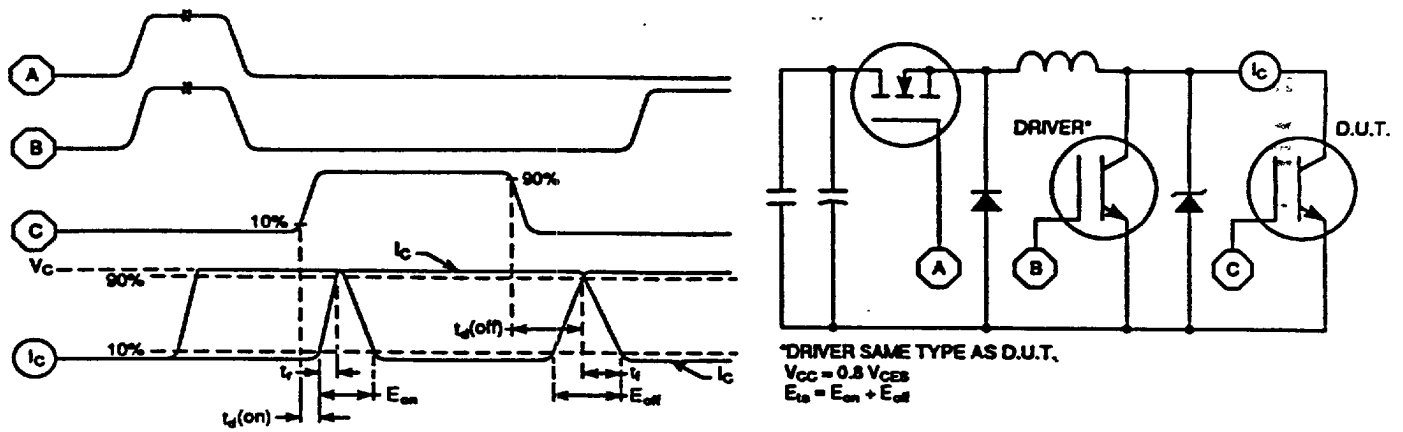


Figure 16, Switching Loss Test Circuit and Waveforms

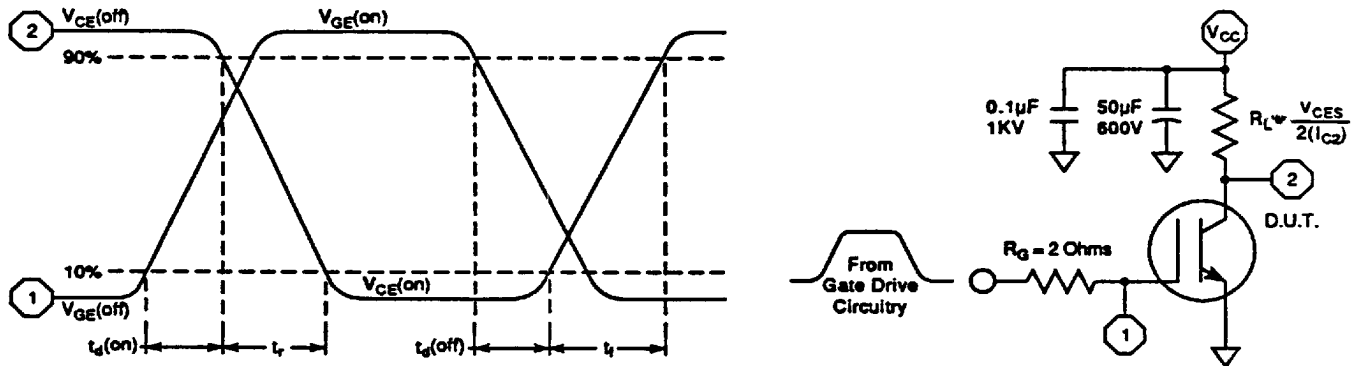
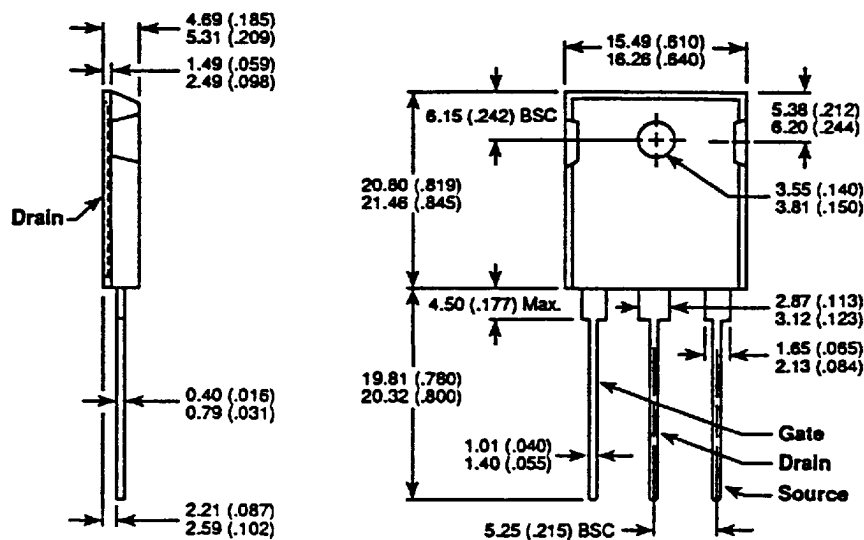


Figure 17, Resistive Switching Time Test Circuit and Waveforms

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)

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