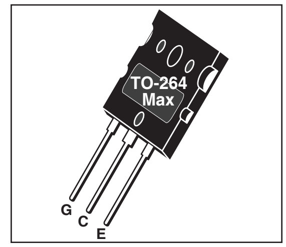
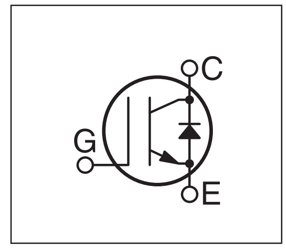
1200V
APT35GN120L2DQ2
APT35GN120L2DQ2G*

***G Denotes RoHS Compliant, Pb Free Terminal Finish.**



Utilizing the latest Non-Punch Through (NPT) Field Stop technology, these IGBT's have a very short, low amplitude tail current and low Eoff. The Trench Gate design results in superior $V_{CE(on)}$ performance. Easy paralleling results from very tight parameter distribution and slightly positive $V_{CE(on)}$ temperature coefficient. Built-in gate resistance ensures ultra-reliable operation. Low gate charge simplifies gate drive design and minimizes losses.



- **1200V NPT Field Stop**
- **Trench Gate: Low $V_{CE(on)}$**
- **Easy Paralleling**
- **10µs Short Circuit Capability**
- **Intergrated Gate Resistor: Low EMI, High Reliability**

Applications: Welding, Inductive Heating, Solar Inverters, SMPS, Motor drives, UPS

MAXIMUM RATINGS

All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT35GN120L2DQ2(G)	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{GE}	Gate-Emitter Voltage	±30	
I_{C1}	Continuous Collector Current @ T_C = 25°C	94	Amps
I_{C2}	Continuous Collector Current @ T_C = 110°C	46	
I_{CM}	Pulsed Collector Current ① @ T_C = 150°C	105	
SSOA	Switching Safe Operating Area @ T_J = 150°C	105A @ 1200V	
P_D	Total Power Dissipation	379	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	MIN	TYP	MAX	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 250µA)	1200			Volts
$V_{GE(TH)}$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 1mA, T_j = 25°C)	5	5.8	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 35A, T_j = 25°C)	1.4	1.7	2.1	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 35A, T_j = 125°C)		1.9		
I_{CES}	Collector Cut-off Current (V_{CE} = 1200V, V_{GE} = 0V, T_j = 25°C) ②			200	µA
	Collector Cut-off Current (V_{CE} = 1200V, V_{GE} = 0V, T_j = 125°C) ②			TBD	
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V)			600	nA
R_{GINT}	Intergrated Gate Resistor		6		Ω

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

DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** $V_{GE} = 0V$, $V_{CE} = 25V$ f = 1 MHz		2500		pF
C_{oes}	Output Capacitance			150		
C_{res}	Reverse Transfer Capacitance			120		
V_{GEP}	Gate-to-Emitter Plateau Voltage	Gate Charge $V_{GE} = 15V$ $V_{CE} = 600V$ $I_C = 35A$		9.5		V
Q_g	Total Gate Charge ③			220		nC
Q_{ge}	Gate-Emitter Charge			15		
Q_{gc}	Gate-Collector ("Miller") Charge			130		
SSOA	Switching Safe Operating Area	$T_J = 150°C$, $R_G = 2.2\Omega$⑦, $V_{GE} =$ 15V, L = 100μH, $V_{CE} = 1200V$	105			A
SCSOA	Short Circuit Safe Operating Area	$V_{CC} = 960V$, $V_{GE} = 15V$, $T_J = 125°C$, $R_G = 2.2\Omega$⑦	10			μs
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (25°C)** $V_{CC} = 800V$ $V_{GE} = 15V$ $I_C = 35A$ $R_G = 2.2\Omega$⑦ $T_J = +25°C$		24		ns
t_r	Current Rise Time			22		
$t_{d(off)}$	Turn-off Delay Time			300		
t_f	Current Fall Time			55		
E_{on1}	Turn-on Switching Energy ④			TBD		μJ
E_{on2}	Turn-on Switching Energy (Diode) ⑤			2395		
E_{off}	Turn-off Switching Energy ⑥			2315		
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (125°C)** $V_{CC} = 800V$ $V_{GE} = 15V$ $I_C = 35A$ $R_G = 2.2\Omega$⑦ $T_J = +125°C$		24		ns
t_r	Current Rise Time			22		
$t_{d(off)}$	Turn-off Delay Time			365		
t_f	Current Fall Time			100		
E_{on1}	Turn-on Switching Energy ④			TBD		μJ
E_{on2}	Turn-on Switching Energy (Diode) ⑤			3745		
E_{off}	Turn-off Switching Energy ⑥			3435		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case **(IGBT)**			.33	°C/W
$R_{\theta JC}$	Junction to Case **(DIODE)**			.61	
W_T	Package Weight		5.9		gm

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

② For Combi devices, I_{ces} includes both IGBT and FRED leakages

③ See MIL-STD-750 Method 3471.

④ E_{on1} is the clam ped inductive turn-on-energy of the IGBT only, without the effect of a commutating diode reverse recovery current adding to the IGBT turn-on loss. (See Figure 24.)

⑤ E_{on2} is the clamped inductive turn-on energy that includes a commutating diode reverse recovery current in the IGBT turn-on switching loss. (See Figures 21, 22.)

⑥ E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1. (See Figures 21, 23.)

⑦ R_G is external gate resistance, not including R_{Gint} nor gate driver impedance. (MIC4452)

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

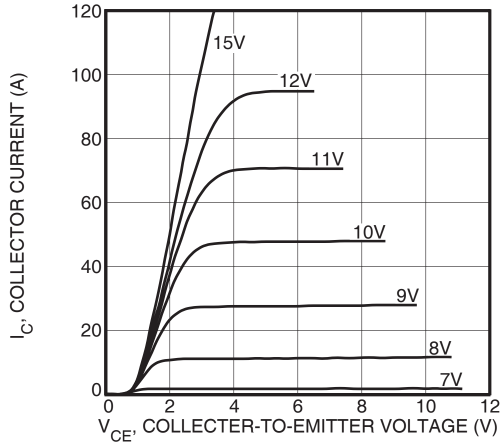


FIGURE 1, Output Characteristics(T_J = 25°C)

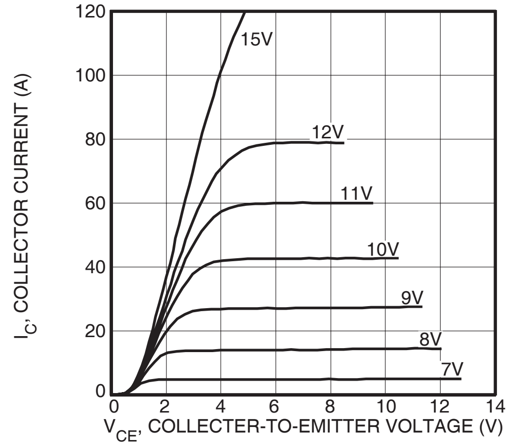


FIGURE 2, Output Characteristics (T_J = 125°C)

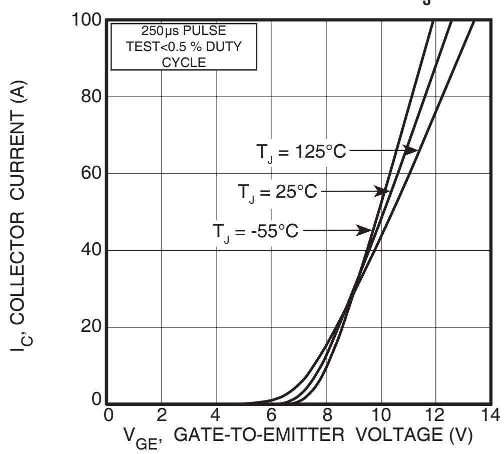


FIGURE 3, Transfer Characteristics

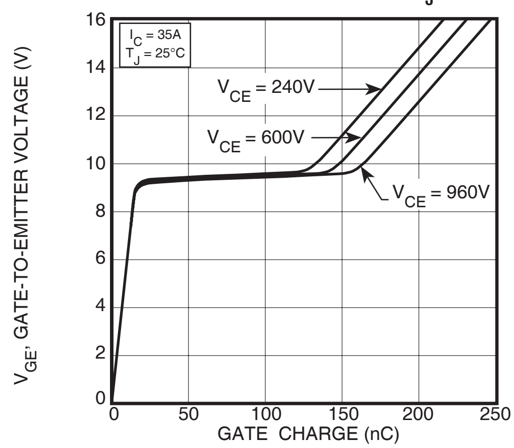


FIGURE 4, Gate Charge

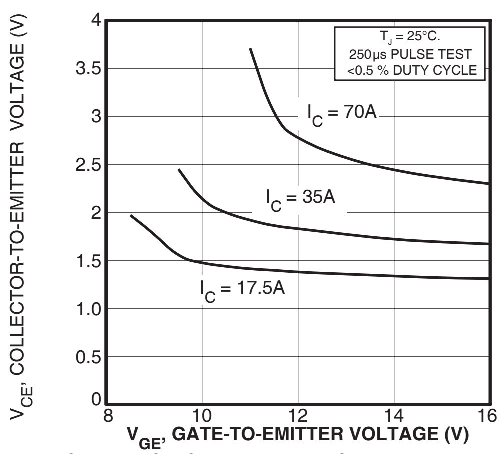


FIGURE 5, On State Voltage vs Gate-to- Emitter Voltage

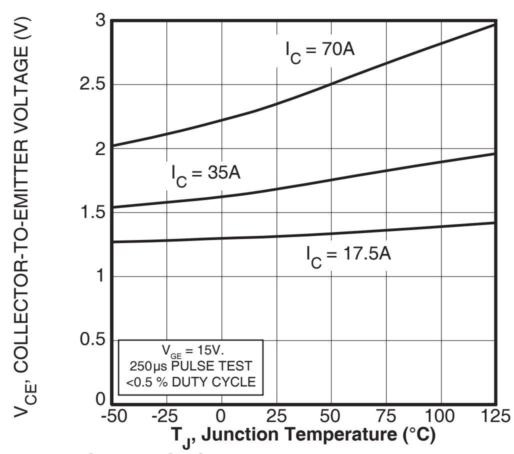


FIGURE 6, On State Voltage vs Junction Temperature

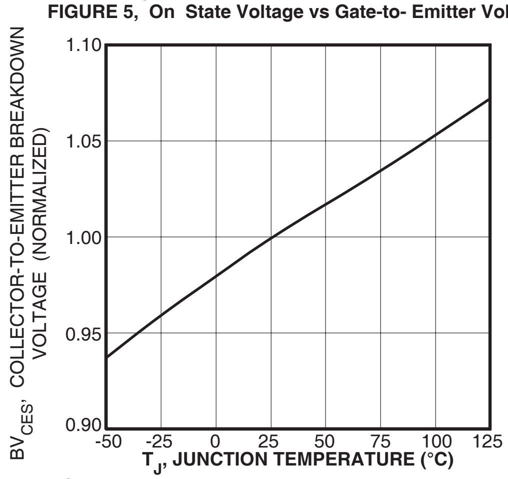


FIGURE 7, Breakdown Voltage vs. Junction Temperature

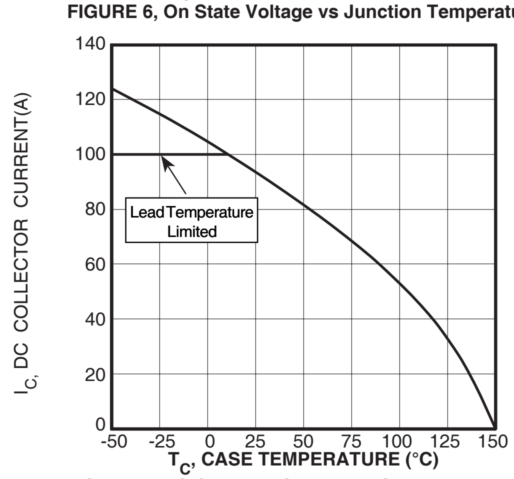


FIGURE 8, DC Collector Current vs Case Temperature

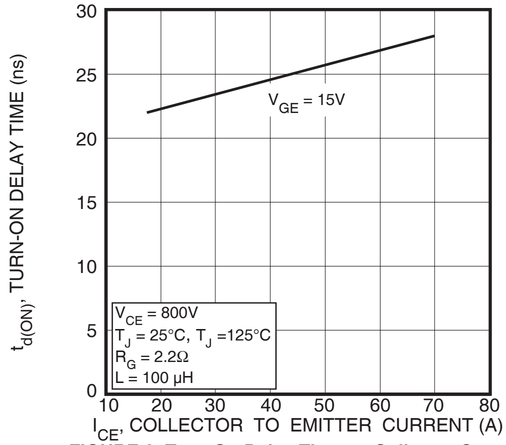


FIGURE 9, Turn-On Delay Time vs Collector Current

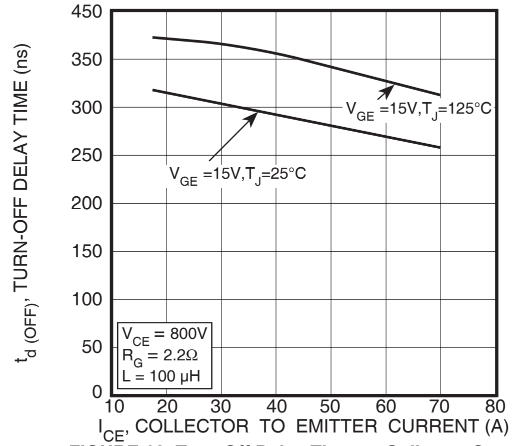


FIGURE 10, Turn-Off Delay Time vs Collector Current

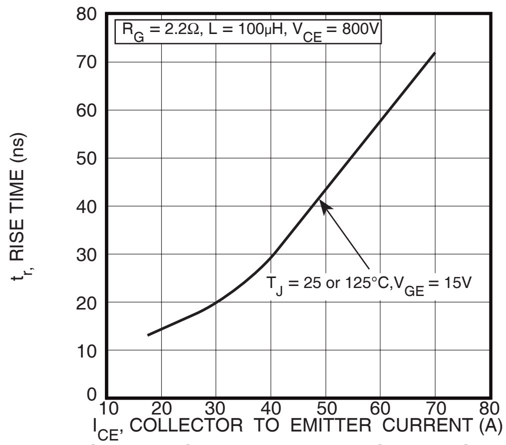


FIGURE 11, Current Rise Time vs Collector Current

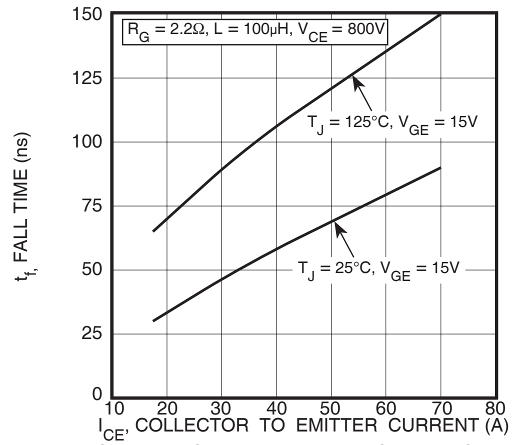


FIGURE 12, Current Fall Time vs Collector Current

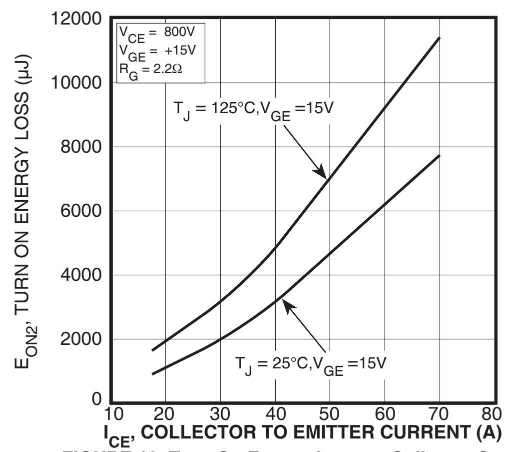


FIGURE 13, Turn-On Energy Loss vs Collector Current

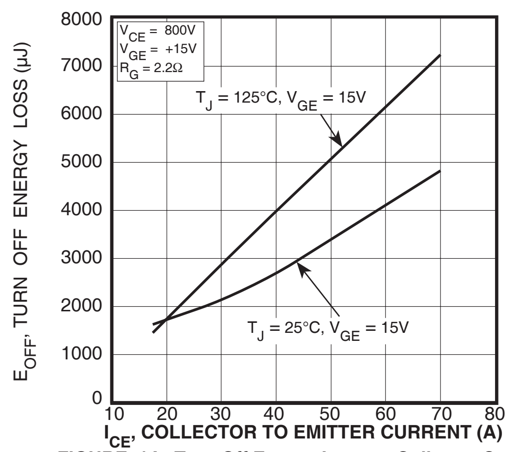


FIGURE 14, Turn Off Energy Loss vs Collector Current

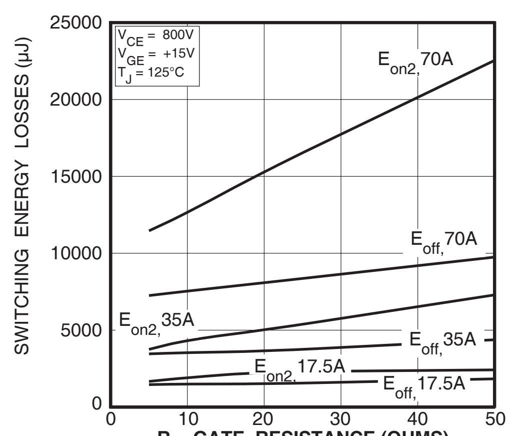


FIGURE 15, Switching Energy Losses vs. Gate Resistance

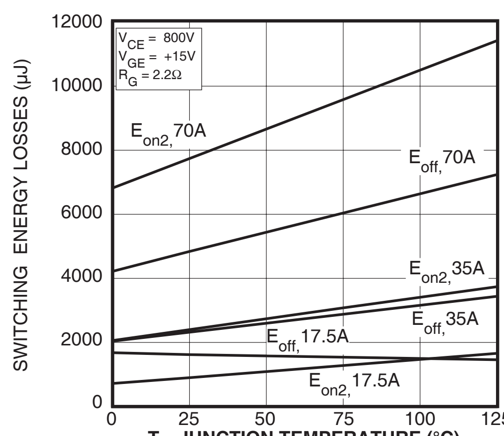


FIGURE 16, Switching Energy Losses vs Junction Temperature

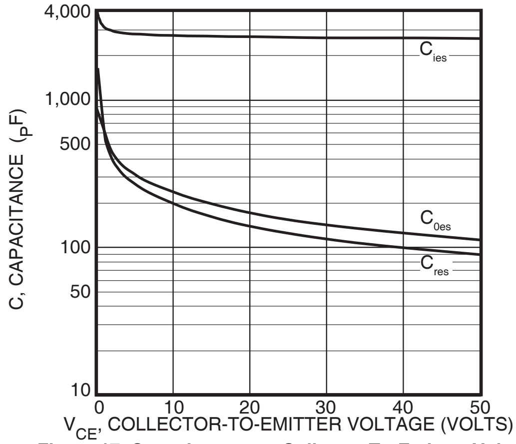


Figure 17, Capacitance vs Collector-To-Emitter Voltage

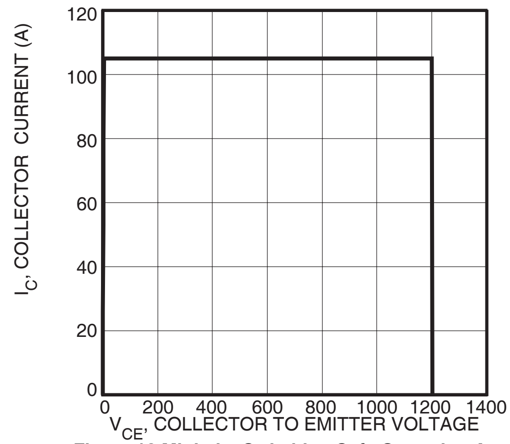


Figure 18,Minimim Switching Safe Operating Area

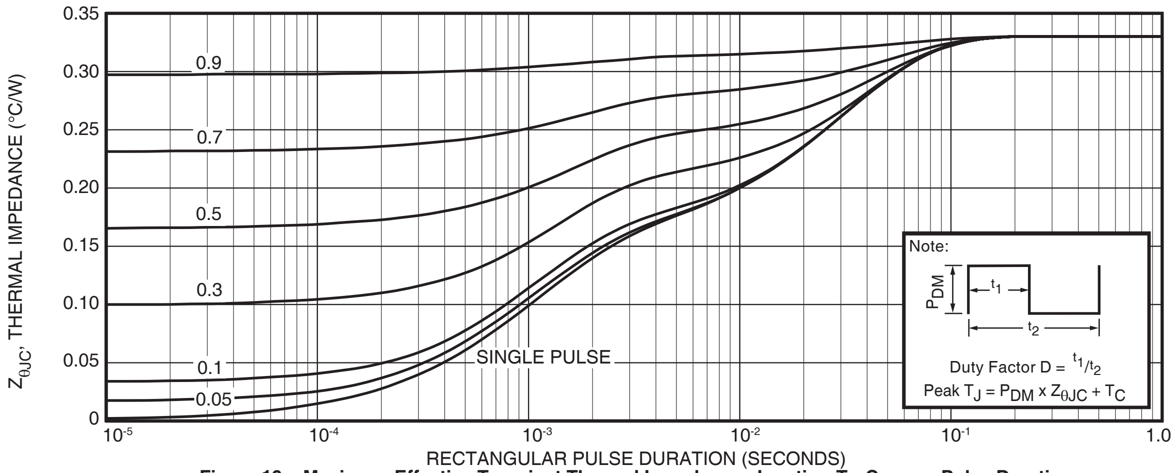


Figure 19a, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

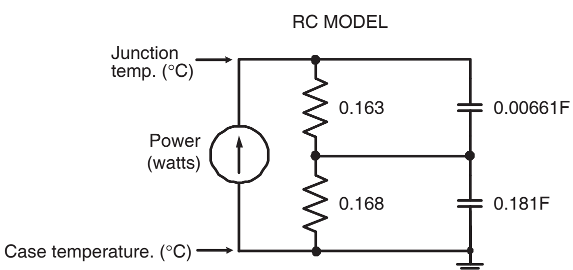
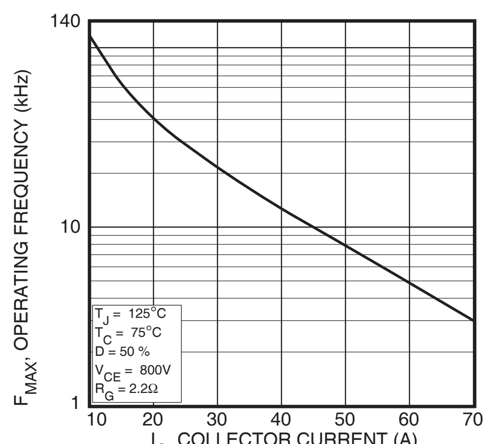


FIGURE 19b, TRANSIENT THERMAL IMPEDANCE MODEL



$$F_{max} = \min(f_{max}, f_{max2})$$

$$f_{max1} = \frac{0.05}{t_{d(on)} + t_r + t_{d(off)} + t_f}$$

$$f_{max2} = \frac{P_{diss} - P_{cond}}{E_{on2} + E_{off}}$$

$$P_{diss} = \frac{T_J - T_C}{R_{\theta JC}}$$

Figure 20, Operating Frequency vs Collector Current

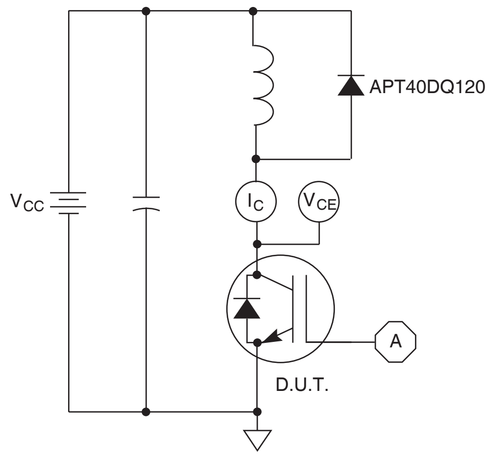


Figure 21, Inductive Switching Test Circuit

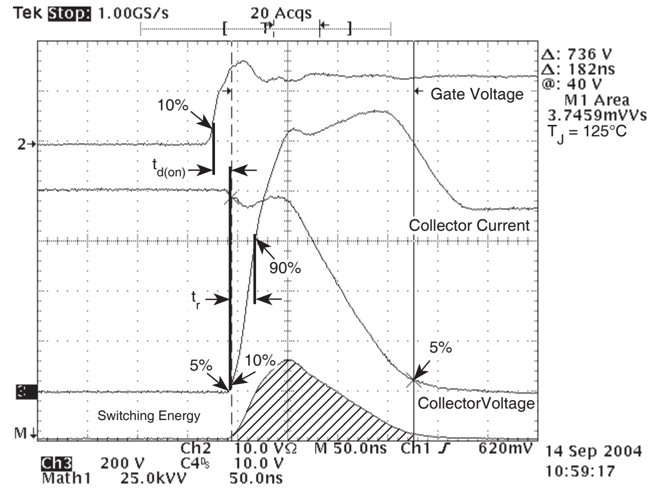


Figure 22, Turn-on Switching Waveforms and Definitions

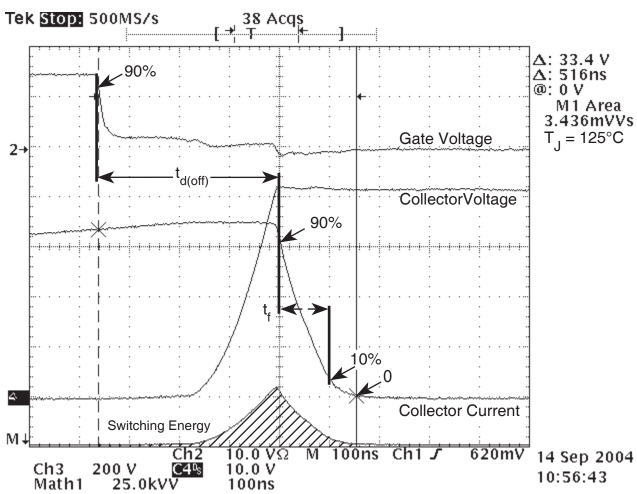


Figure 23, Turn-off Switching Waveforms and Definitions

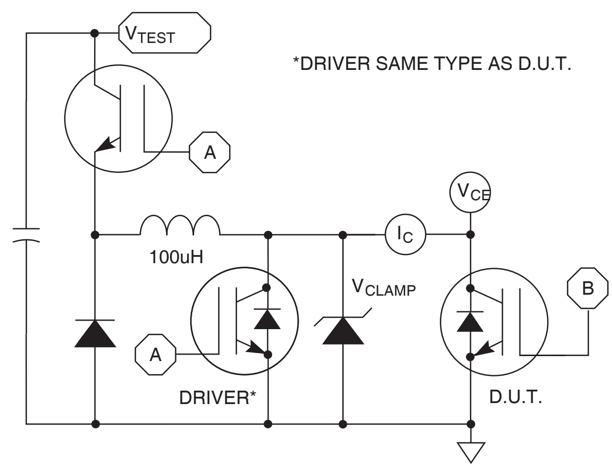


Figure 24, E_{ON1} Test Circuit

ULTRAFAST SOFT RECOVERY ANTI-PARALLEL DIODE

MAXIMUM RATINGS

All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Characteristic / Test Conditions	APT35GP120L2DQ2(G)	UNIT
$I_F(AV)$	Maximum Average Forward Current (T_C = 112°C, Duty Cycle = 0.5)	40	Amps
$I_F(RMS)$	RMS Forward Current (Square wave, 50% duty)	63	Amps
I_{FSM}	Non-Repetitive Forward Surge Current (T_J = 45°C, 8.3ms)	210	Amps

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
V_F	Forward Voltage	I_F = 35A		2.7		Volts
		I_F = 70A		3.28		
		I_F = 35A, T_J = 125°C		2.06		

DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
t_{rr}	Reverse Recovery Time	I_F = 1A, di_F/dt = -100A/µs, V_R = 30V, T_J = 25°C	-	26		ns
t_{rr}	Reverse Recovery Time	I_F = 40A, di_F/dt = -200A/µs V_R = 800V, T_C = 25°C	-	350		ns
Q_{rr}	Reverse Recovery Charge		-	570		nC
I_{RRM}	Maximum Reverse Recovery Current		-	4	-	Amps
t_{rr}	Reverse Recovery Time	I_F = 40A, di_F/dt = -200A/µs V_R = 800V, T_C = 125°C	-	430		ns
Q_{rr}	Reverse Recovery Charge		-	2200		nC
I_{RRM}	Maximum Reverse Recovery Current		-	9	-	Amps
t_{rr}	Reverse Recovery Time	I_F = 40A, di_F/dt = -1000A/µs V_R = 800V, T_C = 125°C	-	210		ns
Q_{rr}	Reverse Recovery Charge		-	3400		nC
I_{RRM}	Maximum Reverse Recovery Current		-	29		Amps

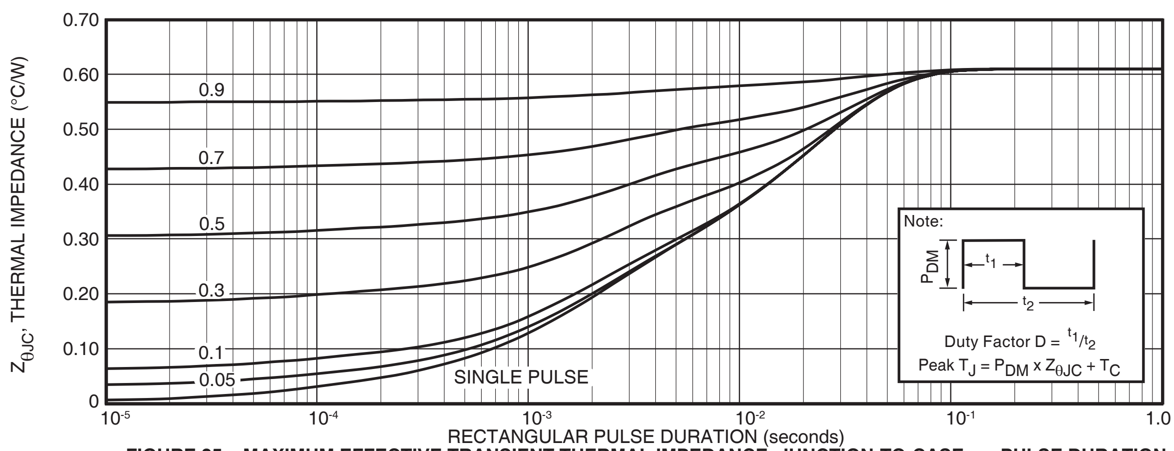


FIGURE 25a. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION

RC MODEL

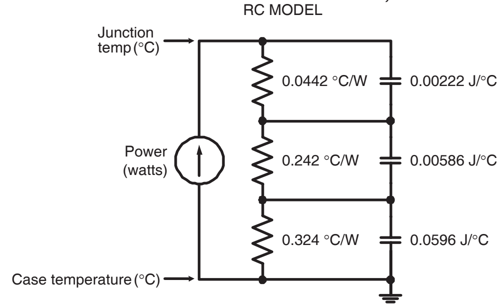


FIGURE 25b, TRANSIENT THERMAL IMPEDANCE MODEL

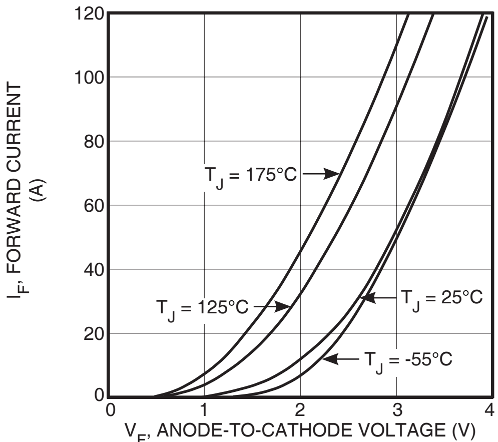


Figure 26. Forward Current vs. Forward Voltage

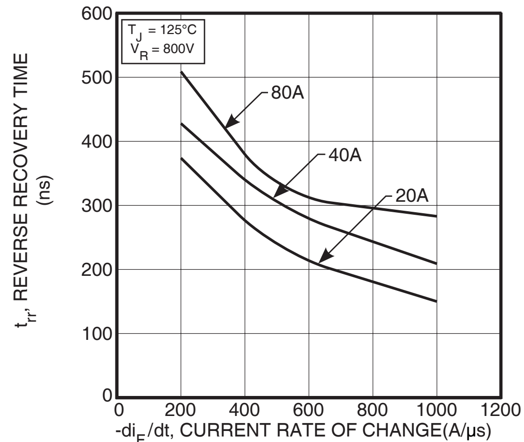


Figure 27. Reverse Recovery Time vs. Current Rate of Change

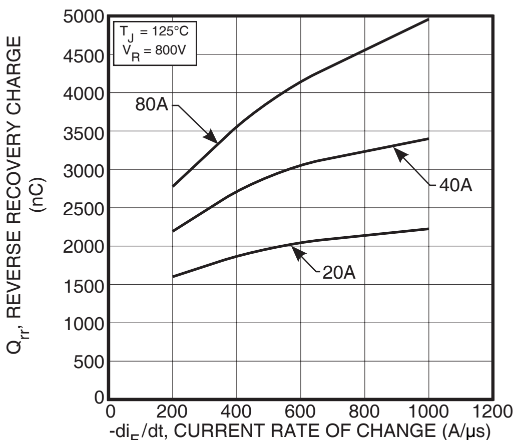


Figure 28. Reverse Recovery Charge vs. Current Rate of Change

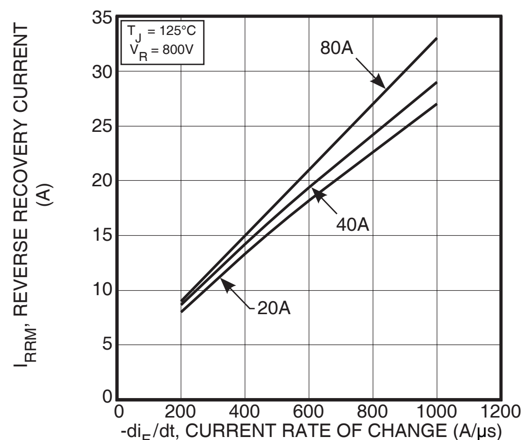


Figure 29. Reverse Recovery Current vs. Current Rate of Change

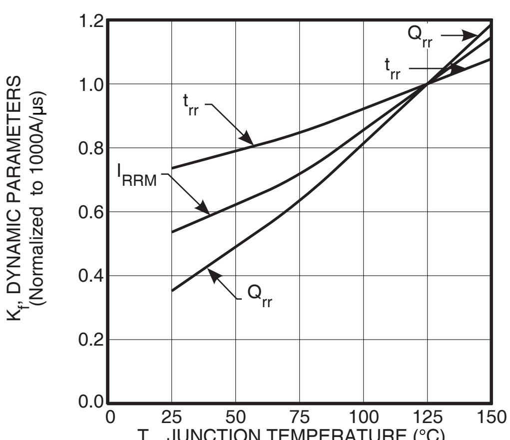


Figure 30. Dynamic Parameters vs. Junction Temperature

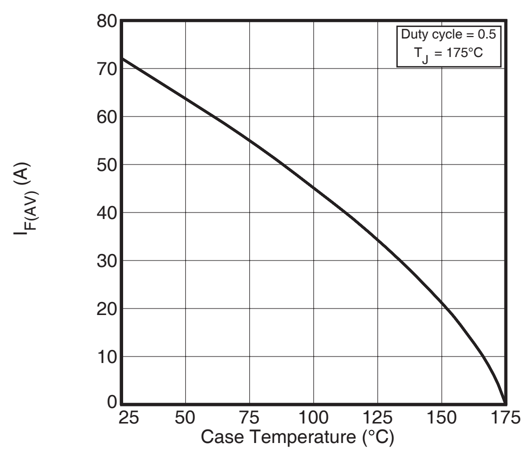


Figure 31. Maximum Average Forward Current vs. CaseTemperature

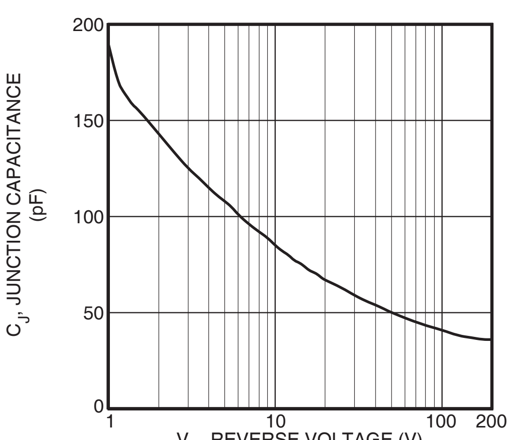


Figure 32. Junction Capacitance vs. Reverse Voltage

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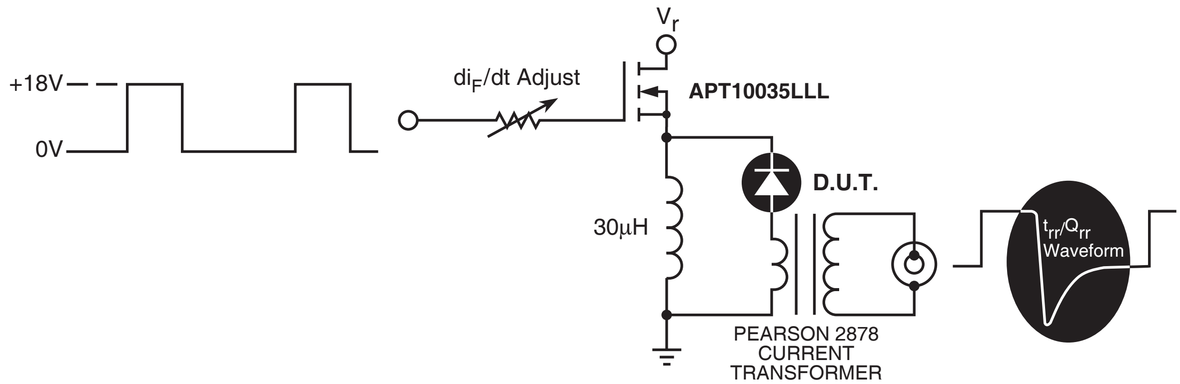


Figure 33. Diode Test Circuti

1. I_F - Forward Conduction Current
2. di_F/dt - Rate of Diode Current Change Through Zero Crossing.
3. I_{RRM} - Maximum Reverse Recovery Current.
4. t_{rr} - Reverse Recovery Time, measured from zero crossing where diode current goes from positive to negative, to the point at which the straight line through I_{RRM} and $0.25 \bullet I_{RRM}$ passes through zero.
5. Q_{rr} - Area Under the Curve Defined by I_{RRM} and t_{rr}.

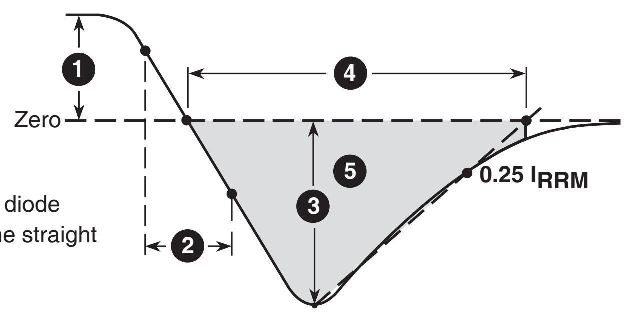
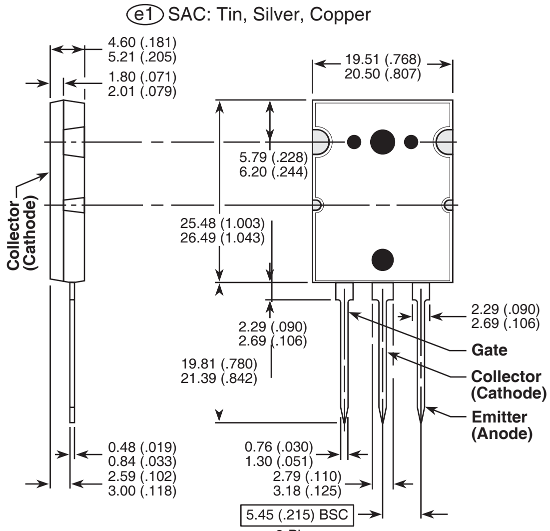


Figure 34, Diode Reverse Recovery Waveform and Definitions

TO-264MAX (L2) Package Outline

e1 SAC: Tin, Silver, Copper



Dimensions in Millimeters and (Inches)

APT's products are covered by one or more of U.S.patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. US and Foreign patents pending. All Rights Reserved.

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На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

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