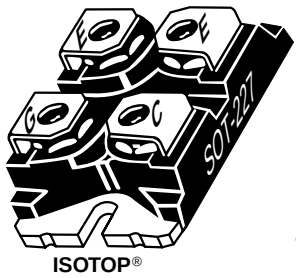
APT60GF120JRD

1200V

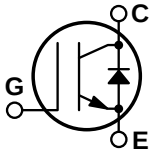
Fast IGBT & FRED



The Fast IGBT™ is a new generation of high voltage power IGBTs. Using Non-Punch Through Technology the Fast IGBT™ combined with an APT free-wheeling ultraFast Recovery Epitaxial Diode (FRED) offers superior ruggedness and fast switching speed

.

- **Low Forward Voltage Drop**
- **Low Tail Current**
- **RBSOA and SCSOA Rated**
- **Ultrafast Soft Recovery Antiparallel Diode**
- **20 kHz operation @ 800V, 24A**
- **10 kHz operation @ 800V, 40A**
- **Ultra Low Leakage Current**



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

Symbol	Parameter	APT60GF120JRD	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{GE}	Gate-Emitter Voltage	±20	
V_{GEM}	Gate-Emitter Voltage Transient	±30	
I_{C1}	Continuous Collector Current @ T_C = 25°C	115	Amps
I_{C2}	Continuous Collector Current @ T_C = 110°C	60	
I_{CM}	Pulsed Collector Current ① @ T_C = 25°C	360	
RBSOA	Reverse Bias Safe Operating Area @ T_J = 150°C	360A @ 960V	
P_D	Total Power Dissipation	521	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	UNIT
V_{GE}(TH)	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 500µA, T_j = 25°C)	3	4.5	6	Volts
V_{CE}(ON)	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 60A, T_j = 25°C)		2.1	3.4	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = 60A, T_j = 125°C)		2.5	3.4	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25°C)②			500	mA
	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 125°C)②			3000	
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)			±100	nA

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

DYNAMIC CHARACTERISTICS

APT60GF120JRD

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance**		7080		pF
C_{oes}	Output Capacitance	V_{GE} = 0V, V_{CE} = 25V		815		
C_{res}	Reverse Transfer Capacitance	f = 1 MHz		441		
V_{GEP}	Gate-to-Emitter Plateau Voltage	**Gate Charge**		9		V
Q_g	Total Gate Charge ③	V_{GE} = 15V		695		nC
Q_{ge}	Gate-Emitter Charge	V_{CE} = 600V		65		
Q_{gc}	Gate-Collector ("Miller") Charge	I_C = 60A		390		
RBSOA	Reverse Bias Safe Operating Area	T_J = 150°C, R_G = 5Ω, V_{GE} = 15V, L = 100µH, V_{CE} = 960V	360			A
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (25°C)**		52		ns
t_r	Current Rise Time	V_{CC} = 800V		79		
$t_{d(off)}$	Turn-off Delay Time	V_{GE} = 15V		676		
t_f	Current Fall Time	I_C = 60A		56		
E_{on1}	Turn-on Switching Energy ④	R_G = 5Ω		TBD		µJ
E_{on2}	Turn-on Switching Energy (Diode) ⑤	T_J = +25°C		8404		
E_{off}	Turn-off Switching Energy ⑥			6806		
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching (125°C)**		52		ns
t_r	Current Rise Time	V_{CC} = 800V		65		
$t_{d(off)}$	Turn-off Delay Time	V_{GE} = 15V		764		
t_f	Current Fall Time	I_C = 60A		126		
E_{on1}	Turn-on Switching Energy ④	R_G = 5Ω		TBD		µJ
E_{on2}	Turn-on Switching Energy (Diode) ⑤	T_J = +125°C		11878		
E_{off}	Turn-off Switching Energy ⑥			8955		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case (IGBT)			.24	°C/W
$R_{\Theta JC}$	Junction to Case (DIODE)			.66	
W_T	Package Weight			29.2	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 clamped 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. A Combi device is used for the clamping diode as shown in the E_{on2} test circuit. (See Figures 21, 22.)

⑥ E_{off} is the clamped inductive turn-off energy. (See Figures 21, 23.)

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

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TYPICAL PERFORMANCE CURVES

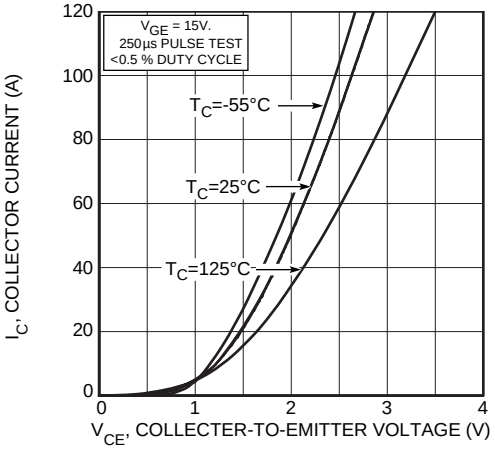


FIGURE 1, Output Characteristics(V_{GE} = 15V)

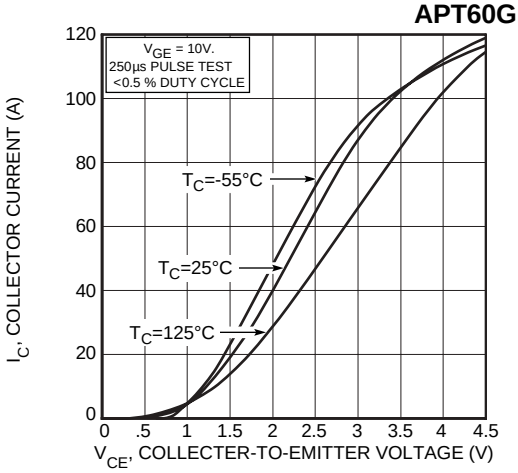


FIGURE 2, Output Characteristics (V_{GE} = 10V)

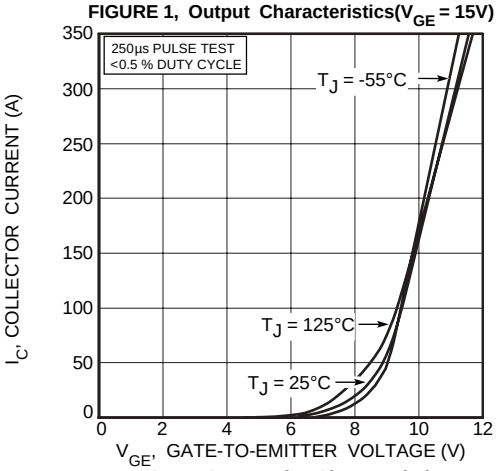


FIGURE 3, Transfer Characteristics

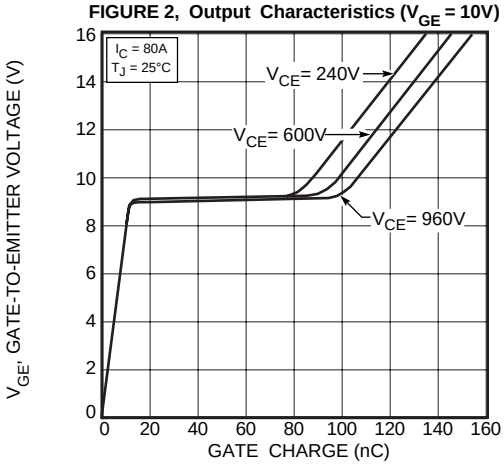


FIGURE 4, Gate Charge

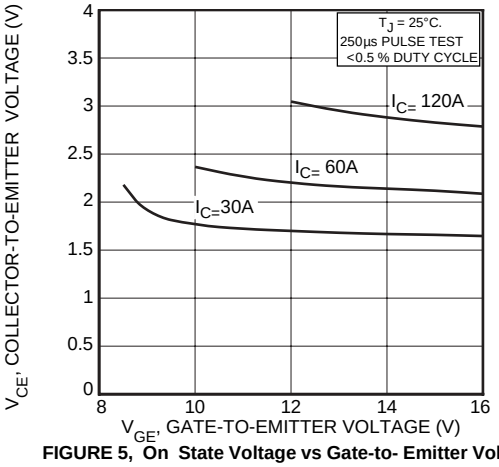


FIGURE 5, On State Voltage vs Gate-to- Emitter Voltage

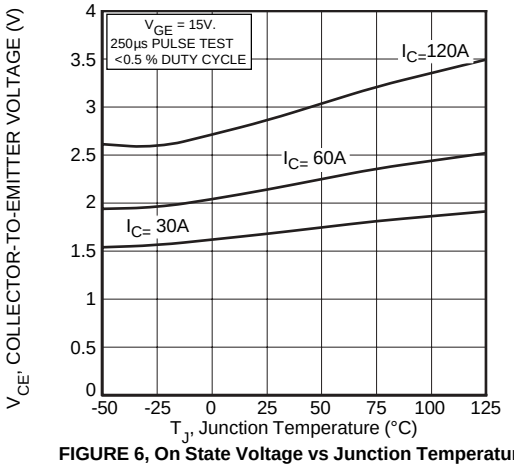


FIGURE 6, On State Voltage vs Junction Temperature

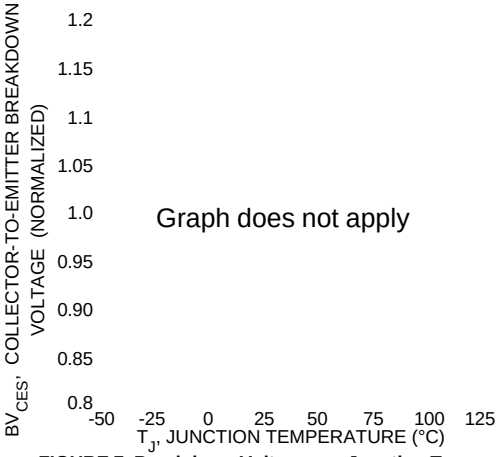


FIGURE 7, Breakdown Voltage vs. Junction Temperature

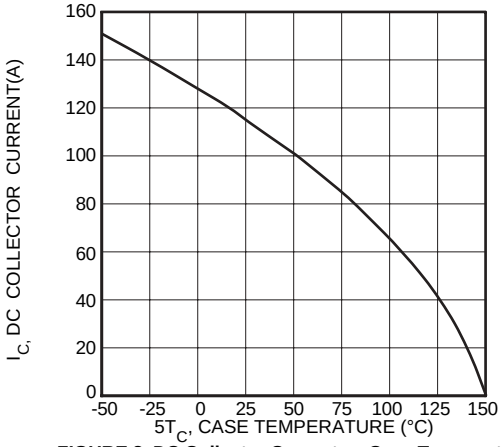


FIGURE 8, DC Collector Current vs Case Temperature

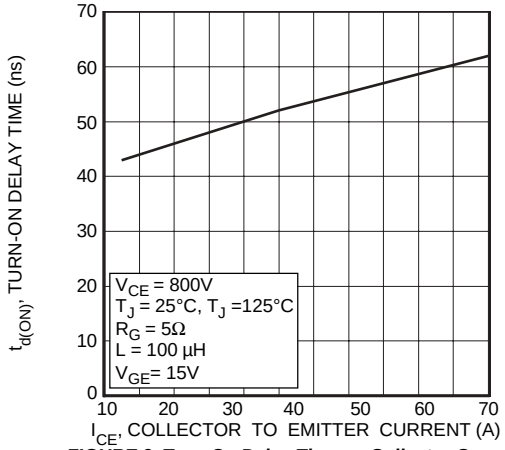


FIGURE 9, Turn-On Delay Time vs Collector Current

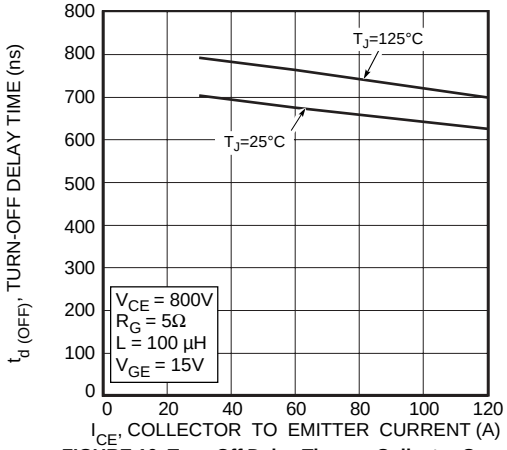


FIGURE 10, Turn-Off Delay Time vs Collector Current

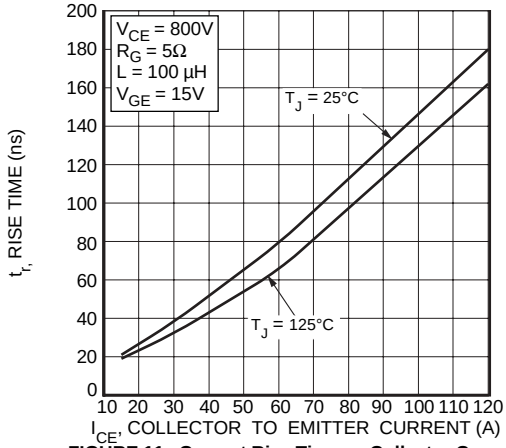


FIGURE 11, Current Rise Time vs Collector Current

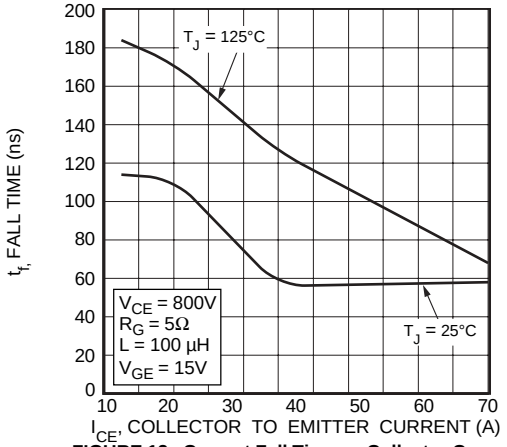


FIGURE 12, Current Fall Time vs Collector Current

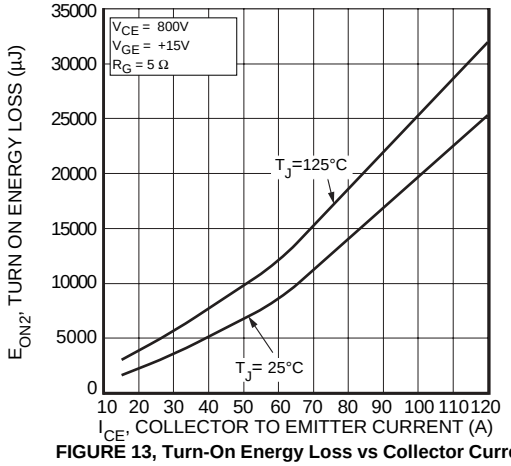


FIGURE 13, Turn-On Energy Loss vs Collector Current

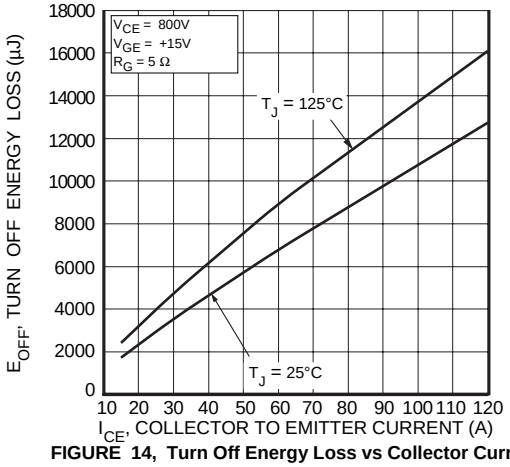


FIGURE 14, Turn Off Energy Loss vs Collector Current

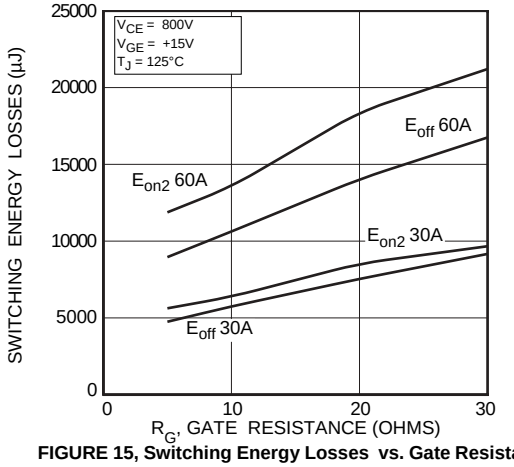


FIGURE 15, Switching Energy Losses vs. Gate Resistance

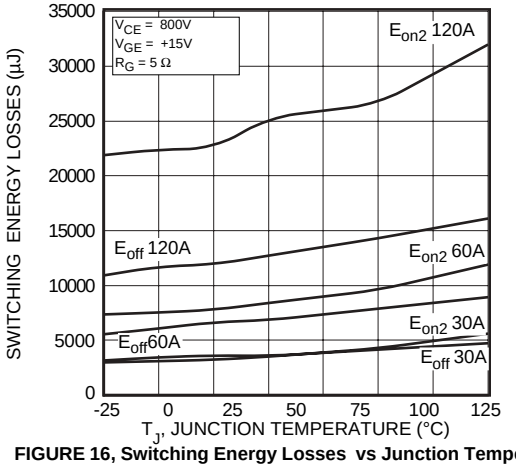


FIGURE 16, Switching Energy Losses vs Junction Temperature

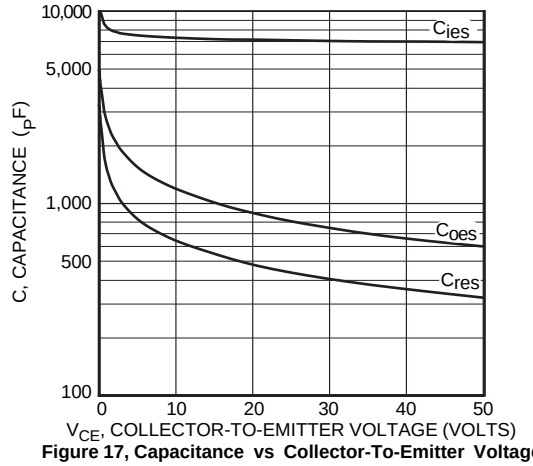


Figure 17, Capacitance vs Collector-To-Emitter Voltage

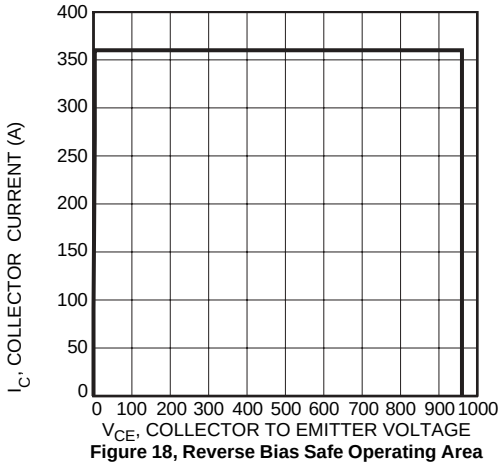


Figure 18, Reverse Bias Safe Operating Area

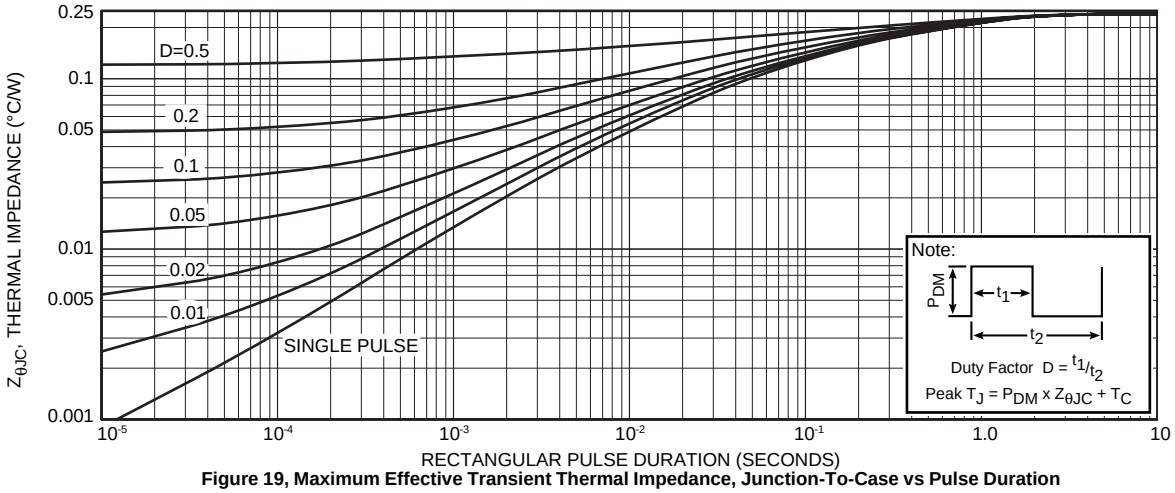


Figure 19, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

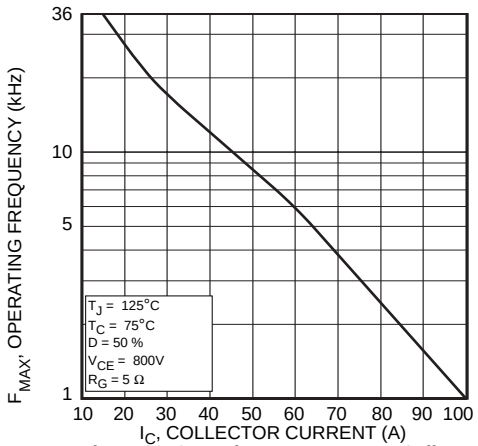


Figure 20, Operating Frequency vs Collector Current

$$F_{max} = \min(f_{max1}, f_{max2})$$

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

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

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

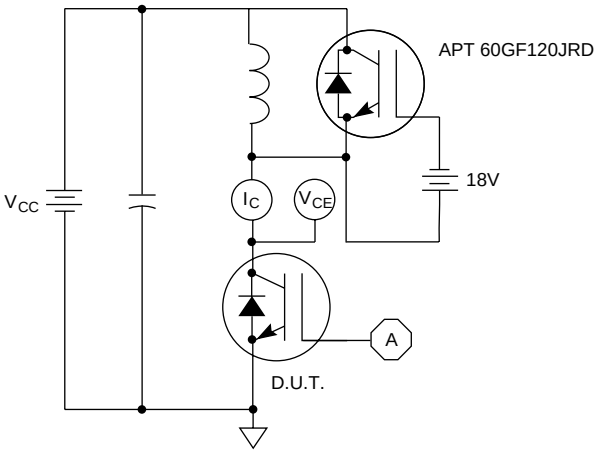


Figure 21, Inductive Switching Test Circuit

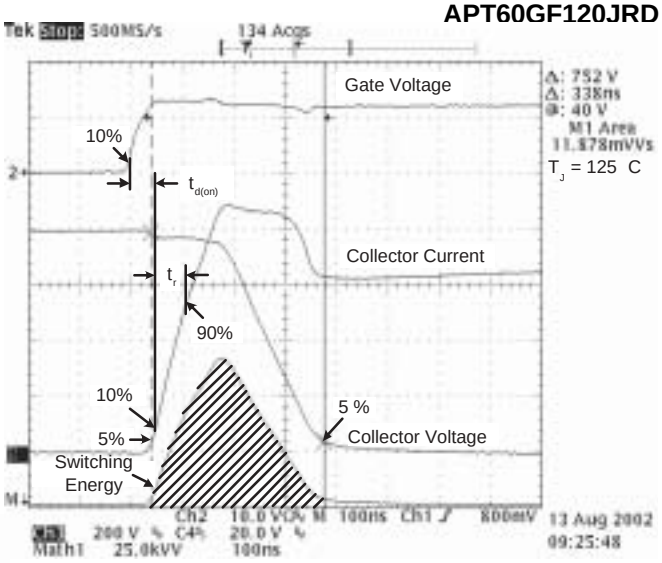


Figure 22, Turn-on Switching Waveforms and Definitions

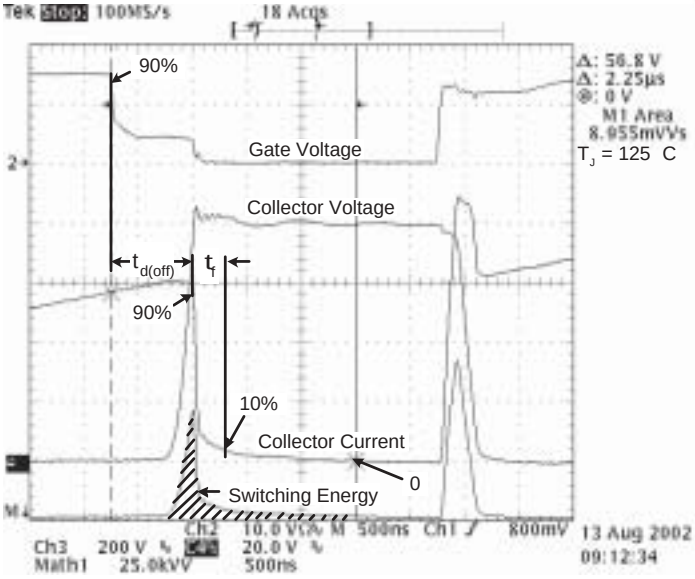


Figure 23, Turn-off Switching Waveforms and Definitions

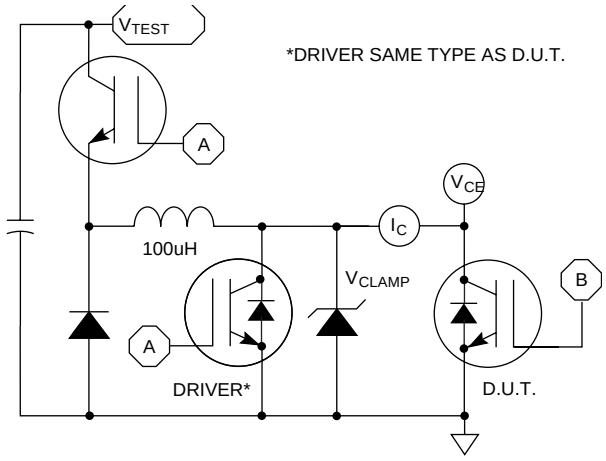


Figure 24, E_{ON1} Test Circuit

ULTRAFAST SOFT RECOVERY ANTI-PARALLEL DIODE

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

Symbol	Characteristic / Test Conditions	APT60GF120JRD			UNIT
$I_F(AV)$	Maximum Average Forward Current (T_C = 80°C, Duty Cycle = 0.5)		60		Amps
$I_F(RMS)$	RMS Forward Current		100		
I_{FSM}	Non-Repetitive Forward Surge Current (T_J = 45°C, 8.3ms)		540		

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
V_F	Maximum Forward Voltage	I_F = 60A			2.5	Volts
		I_F = 120A		2.0		
		I_F = 60A, T_J = 150°C			2.0	

DYNAMIC CHARACTERISTICS

Symbol	Characteristic		MIN	TYP	MAX	UNIT
t_{rr1}	Reverse Recovery Time, I_F = 1.0A, di_F/dt = -15A/µs, V_R = 30V, T_J = 25°C			70	85	ns
t_{rr2}	Reverse Recovery Time	T_J = 25°C		70		
t_{rr3}	I_F = 60A, di_F/dt = -480A/µs, V_R = 650V	T_J = 100°C		130		
t_{fr1}	Forward Recovery Time	T_J = 25°C		170		
t_{fr2}	I_F = 60A, di_F/dt = 480A/µs, V_R = 650V	T_J = 100°C		170		
I_{RRM1}	Reverse Recovery Current	T_J = 25°C		18	30	Amps
I_{RRM2}	I_F = 60A, di_F/dt = -480A/µs, V_R = 650V	T_J = 100°C		29	40	
Q_{rr1}	Recovery Charge	T_J = 25°C		630		nC
Q_{rr2}	I_F = 60A, di_F/dt = -480A/µs, V_R = 650V	T_J = 100°C		1820		
V_{fr1}	Forward Recovery Voltage	T_J = 25°C		12		Volts
V_{fr2}	I_F = 60A, di_F/dt = 480A/µs, V_R = 650V	T_J = 100°C		12		
diM/dt	Rate of Fall of Recovery Current	T_J = 25°C		900		A/µs
	I_F = 60A, di_F/dt = -480A/µs, V_R = 650V (See Figure 33)	T_J = 100°C		600		

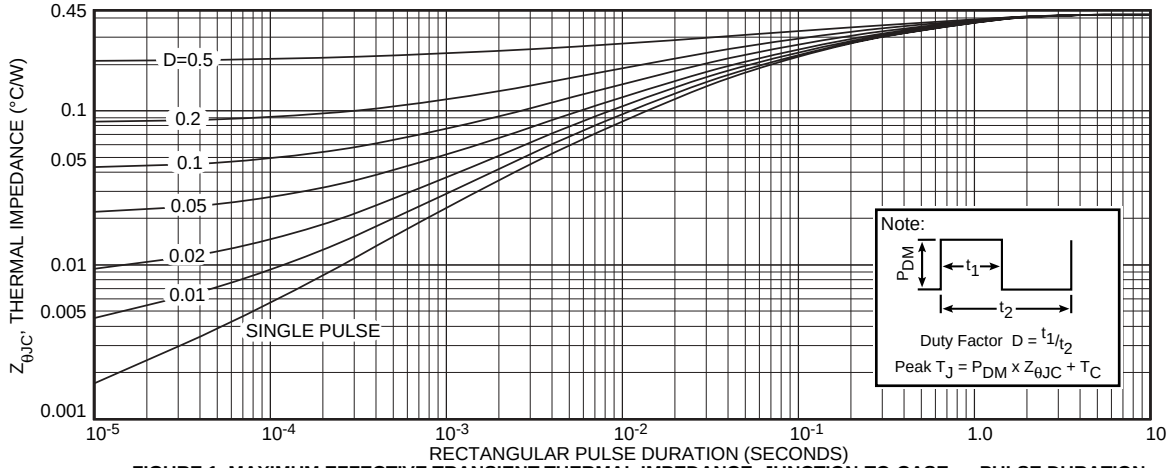


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT's devices are covered by one or more of the following U.S.patents: 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058

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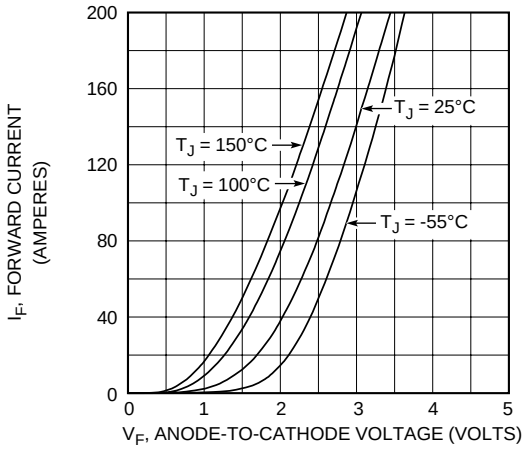


Figure 2, Forward Voltage Drop vs Forward Current

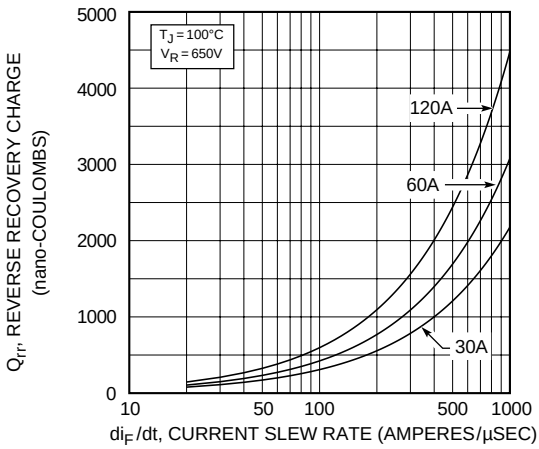


Figure 3, Reverse Recovery Charge vs Current Slew Rate

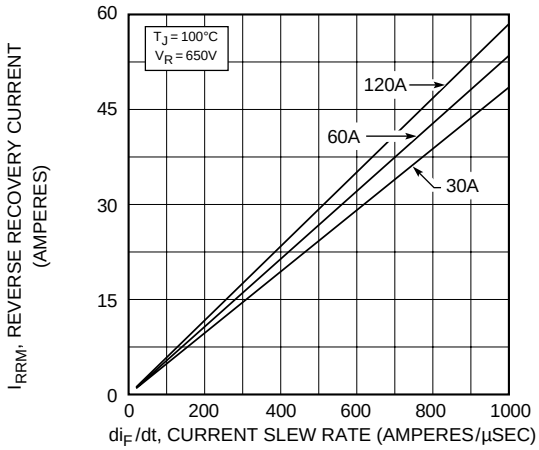


Figure 4, Reverse Recovery Current vs Current Slew Rate

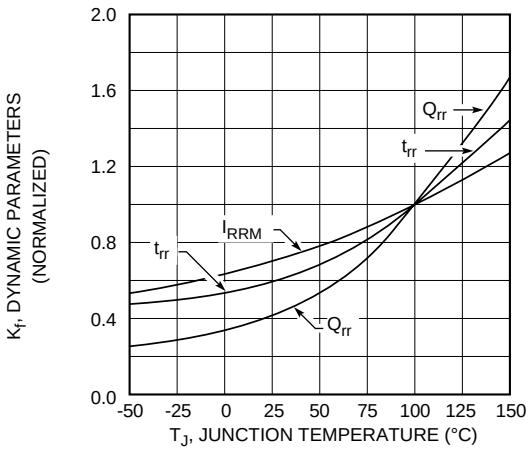


Figure 5, Dynamic Parameters vs Junction Temperature

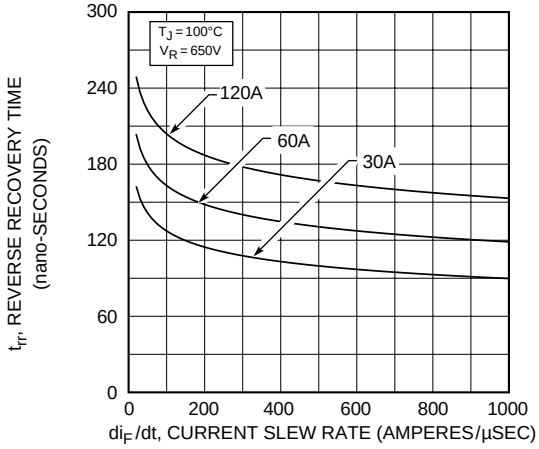


Figure 6, Reverse Recovery Time vs Current Slew Rate

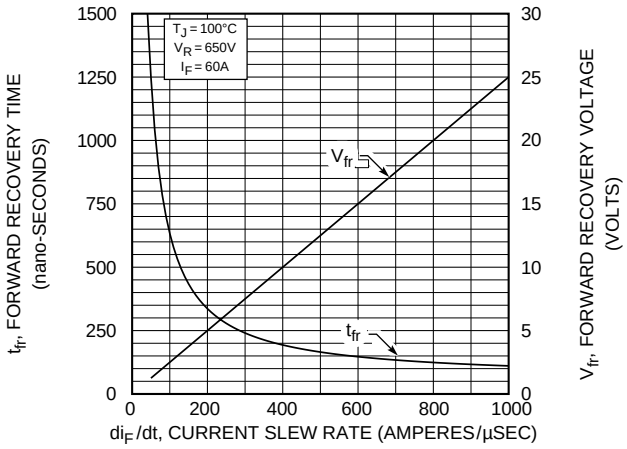


Figure 7, Forward Recovery Voltage/Time vs Current Slew Rate

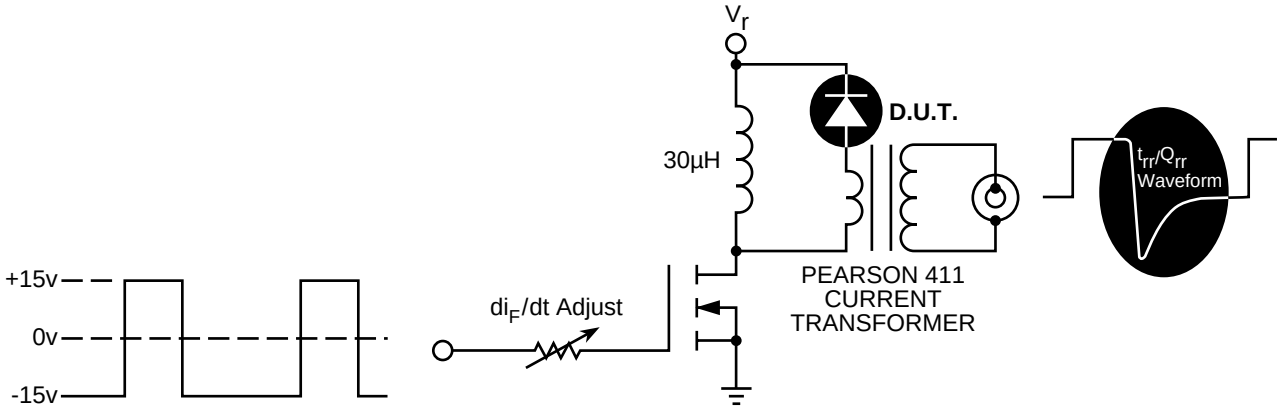


Figure 32, Diode Reverse Recovery Test Circuit and Wave Forms

1. I_F - Forward Conduction Current
2. di_F/dt - Current Slew Rate, Rate of Forward Current Change Through Zero Crossing.
3. I_{RRM} - Peak Reverse Recovery Current.
4. t_{rr} - Reverse Recovery Time Measured from Point of I_F Current Falling Through Zero to a Tangent Line {6 diM/dt} Extrapolated Through Zero Defined by 0.75 and 0.50 I_{RRM}.
5. Q_{rr} - Area Under the Curve Defined by I_{RRM} and t_{rr}.
6. diM/dt - Maximum Rate of Current Change During the Trailing Portion of t_{rr}.

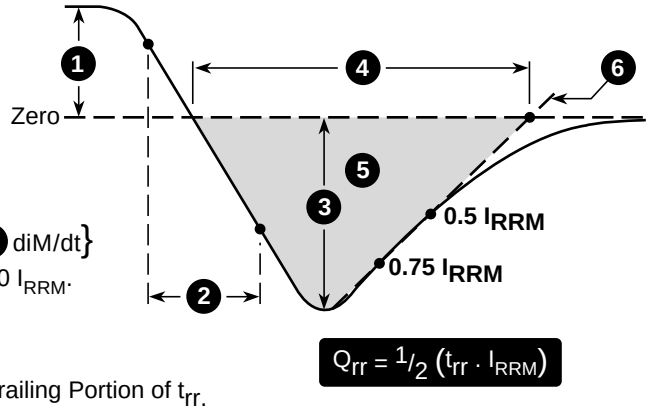
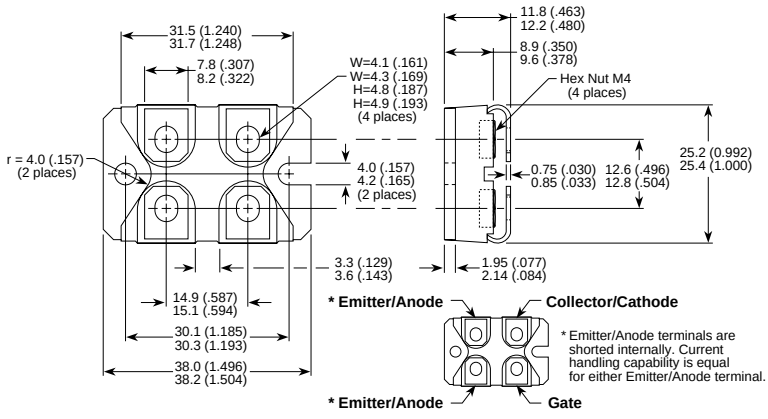


Figure 33, Diode Reverse Recovery Wave Forms and Definitions

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

APT's devices are covered by one or more of the following U.S.patents: 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058

ENTEGRECİ

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Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

www.entegreci.com

Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

Kategorilere göz atın

Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

Üreticileri görün

Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

www.entegreci.com | **destek@entegreci.com** | **0850 305 90 34**

Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

Bu sayfa Entegreci tarafından eklenmiştir. Belgenin önceki sayfaları asıl yayıncısına aittir ve içeriği değiştirilmemiştir; en güncel sürüm için belgenin yayıncısına başvurun.