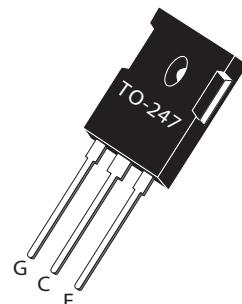


Thunderbolt IGBT[®]

The Thunderbolt IGBT[®] is a new generation of high voltage power IGBTs. Using Non-Punch-Through Technology, the Thunderbolt IGBT[®] offers superior ruggedness and ultrafast switching speed.

Features

- Low Forward Voltage Drop
- RBSOA and SCSOA Rated
- Low Tail Current
- High Frequency Switching to 150KHz
- RoHS Compliant
- Ultra Low Leakage Current



Maximum Ratings

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

Symbol	Parameter	Ratings	Unit
V _{CES}	Collector-Emitter Voltage	600	Volts
V _{GE}	Gate-Emitter Voltage	±20	
I _{C1}	Continuous Collector Current @ T _C = 25°C	80	Amps
I _{C2}	Continuous Collector Current @ T _C = 105°C	40	
I _{CM}	Pulsed Collector Current ^①	160	
SSOA	Switching Safe Operating Area @ T _J = 150°C	160A @ 600V	
P _D	Total Power Dissipation	345	Watts
T _J , T _{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C

Static Electrical Characteristics

Symbol	Characteristic / Test Conditions	Min	Typ	Max	Unit
V _{(BR)CES}	Collector-Emitter Breakdown Voltage (V _{GE} = 0V, I _C = 5mA)	600	-	-	Volts
V _{GE(TH)}	Gate Threshold Voltage (V _{CE} = V _{GE} , I _C = 500µA, T _j = 25°C)	3	4	5	
V _{CE(ON)}	Collector Emitter On Voltage (V _{GE} = 15V, I _C = 40A, T _j = 25°C)	1.6	2.15	2.5	
	Collector Emitter On Voltage (V _{GE} = 15V, I _C = 40A, T _j = 125°C)	-	-	2.8	
I _{CES}	Collector Cut-off Current (V _{CE} = 600V, V _{GE} = 0V, T _j = 25°C) ^②	-	-	80	µA
	Collector Cut-off Current (V _{CE} = 600V, V _{GE} = 0V, T _j = 125°C) ^②	-	-	2000	
I _{GES}	Gate-Emitter Leakage Current (V _{GE} = ±20V)	-	-	100	nA



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

Dynamic Characteristic

APT40GT60BR

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V, V_{CE} = 25V$ $f = 1MHz$	-	2190	-	pF
C_{oes}	Output Capacitance		-	220	-	
C_{res}	Reverse Transfer Capacitance		-	130	-	
V_{GEP}	Gate-to-Emitter Plateau Voltage	Gate Charge $V_{GE} = 15V$ $V_{CE} = 300V$ $I_C = 40A$	-	8.0	-	V
Q_g	Total Gate Charge ^③		-	200	-	nC
Q_{ge}	Gate-Emitter Charge		-	12	-	
Q_{gc}	Gate-Collector Charge		-	86	-	
SSOA	Switching Safe Operating Area	$T_J = 150^\circ C, R_G = 5\Omega, V_{GE} = 15V, L = 100\mu H, V_{CE} = 600V$	160			A
$t_{d(on)}$	Turn-On Delay Time	Inductive Switching ($25^\circ C$) $V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 40A$ $R_G = 5\Omega$ $T_J = +25^\circ C$	-	12	-	ns
t_r	Current Rise Time		-	36	-	
$t_{d(off)}$	Turn-Off Delay Time		-	124	-	
t_f	Current Fall Time		-	55	-	
E_{on1}	Turn-On Switching Energy ^④	Inductive Switching ($125^\circ C$) $V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 40A$ $R_G = 5\Omega$ $T_J = +125^\circ C$	-	-	-	μJ
E_{on2}	Turn-On Switching Energy ^⑤		-	945	-	
E_{off}	Turn-Off Switching Energy ^⑥		-	828	-	
$t_{d(on)}$	Turn-On Delay Time		-	12	-	
t_r	Current Rise Time		-	33	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	165	-	
t_f	Current Fall Time		-	58	-	
E_{on1}	Turn-On Switching Energy ^④		-	-	-	μJ
E_{on2}	Turn-On Switching Energy ^⑤		-	1342	-	
E_{off}	Turn-Off Switching Energy ^⑥		-	1150	-	

Thermal and Mechanical Characteristics

Symbol	Characteristic / Test Conditions	Min	Typ	Max	Unit
$R_{θJC}$	Junction to Case (IGBT)	-	-	0.36	°C/W
$R_{θJC}$	Junction to Case (DIODE)	-	-	N/A	
W_T	Package Weight	-	6.1	-	g
Torque	Terminals and Mounting Screws	-	-	10	in-lbf
		-	-	1.1	N·m
$V_{Isolation}$	RMS Voltage (50-60Hz Sinusoidal Waveform from Terminals to Mounting Base for 1 Min.)	2500	-	-	Volts

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 z a the IGBT turn-on loss. Tested in inductive switching test circuit shown in figure 21, but with a Silicon Carbide diode.

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 gate driver impedance.

Typical Performance Curves

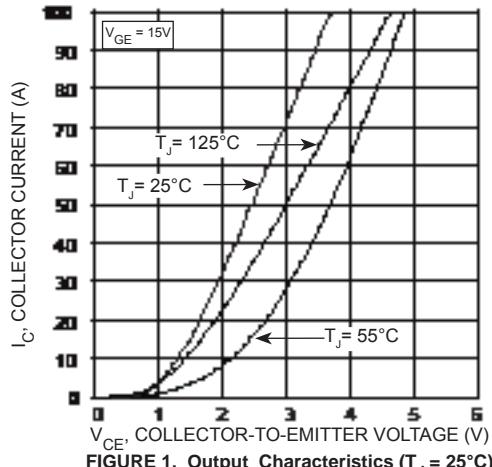


FIGURE 1, Output Characteristics ($T_j = 25^\circ\text{C}$)

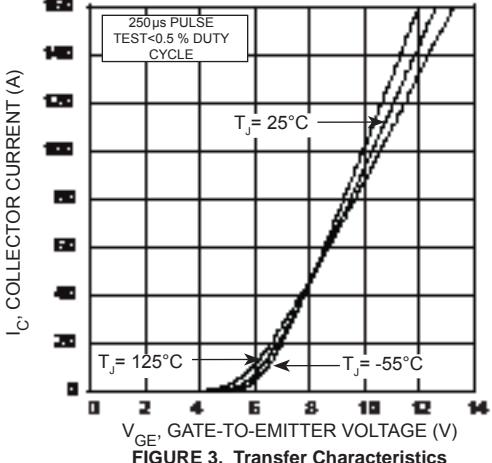


FIGURE 3, Transfer Characteristics

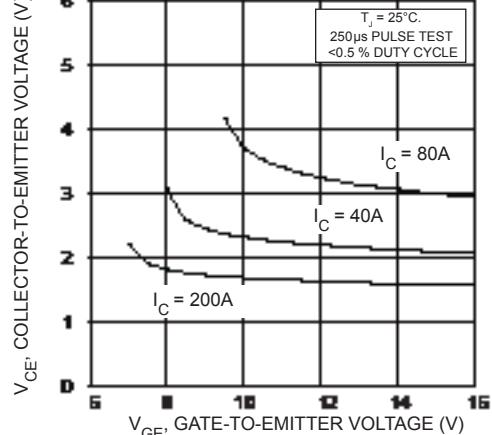


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

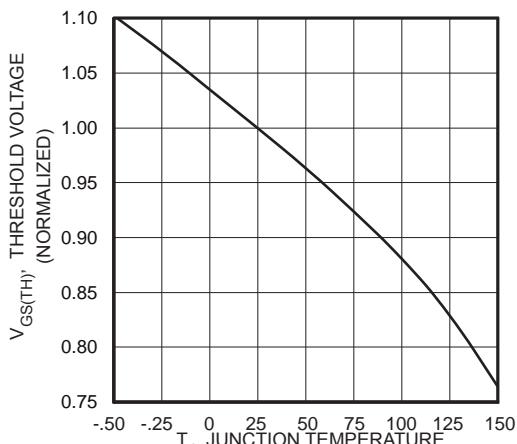


FIGURE 7, Threshold Voltage vs Junction Temperature

APT40GT60BR

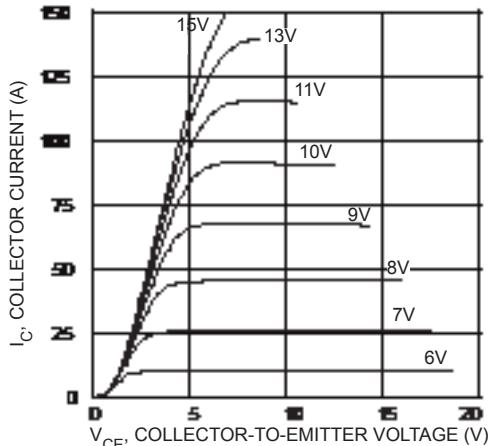


FIGURE 2, Output Characteristics ($T_j = 25^\circ\text{C}$)

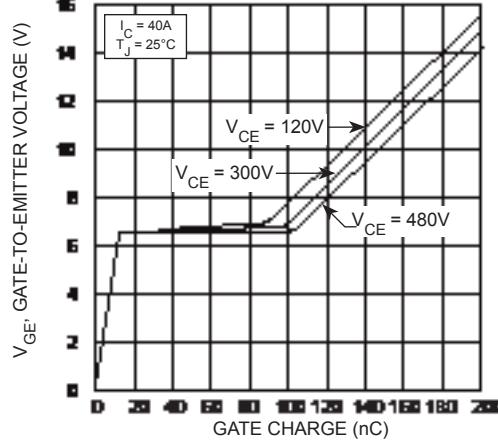


FIGURE 4, Gate charge

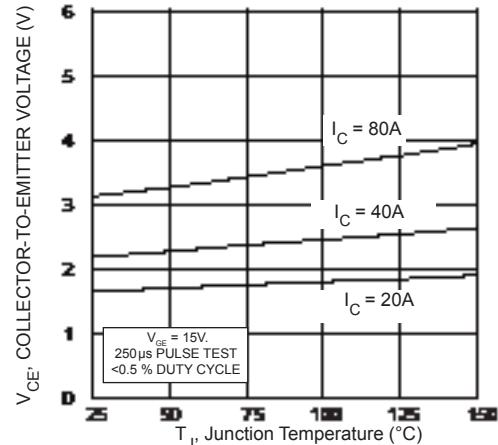


FIGURE 6, On State Voltage vs Junction Temperature

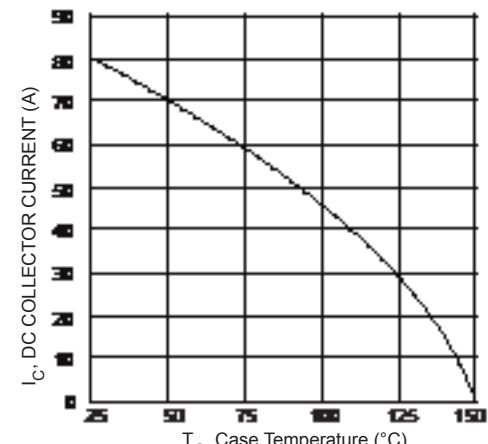


FIGURE 8, DC Collector Current vs Case Temperature

Typical Performance Curves

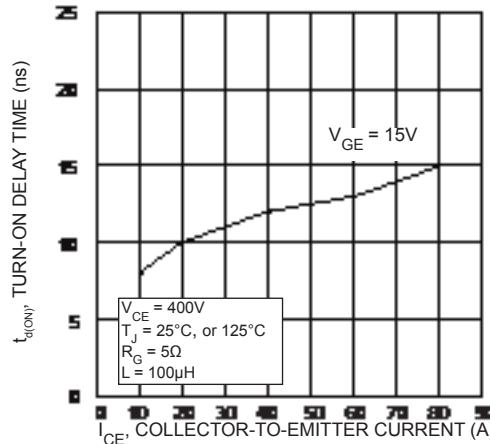


FIGURE 9, Turn-On Delay Time vs Collector Current

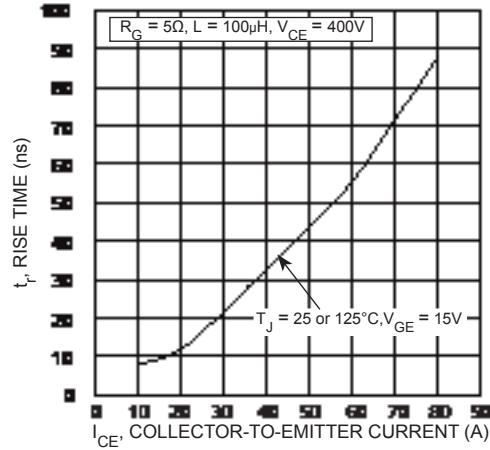


FIGURE 11, Current Rise Time vs Collector Current

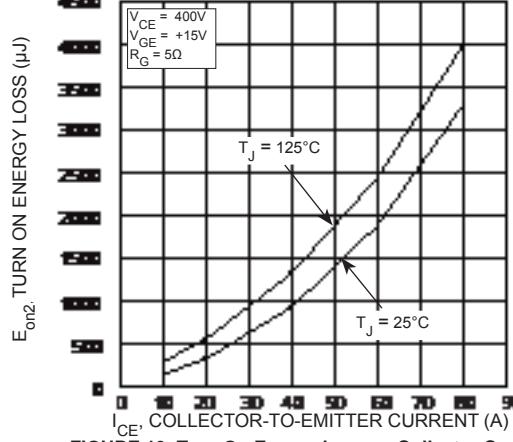


FIGURE 13, Turn-On Energy Loss vs Collector Current

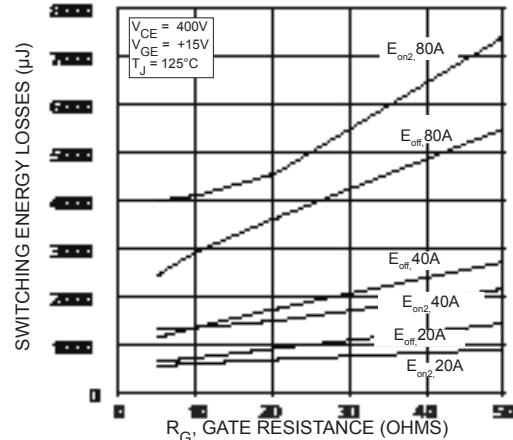


FIGURE 15, Switching Energy Losses vs Gate Resistance

APT40GT60BR

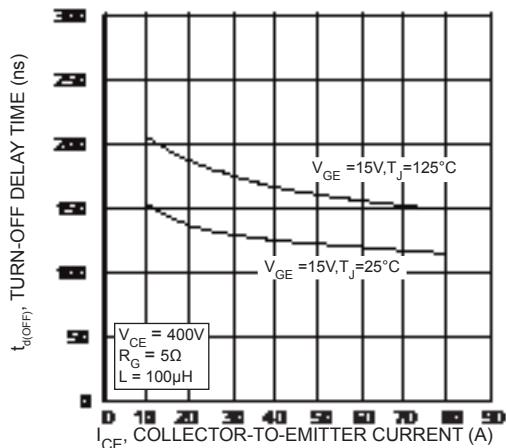


FIGURE 10, Turn-Off Delay Time vs Collector Current

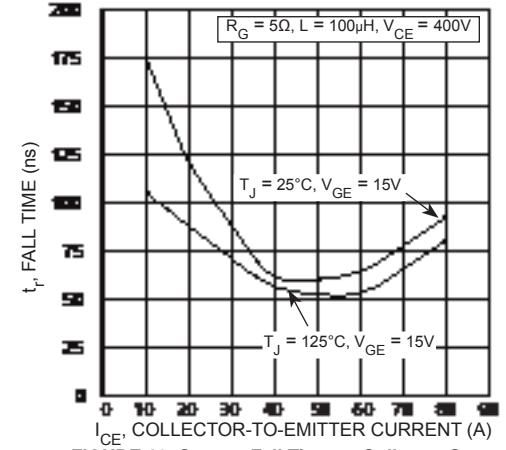


FIGURE 12, Current Fall Time vs Collector Current

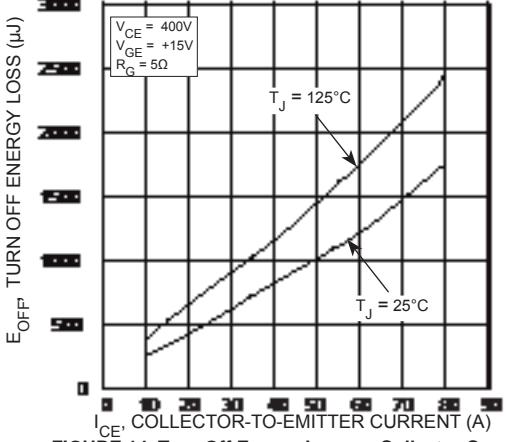


FIGURE 14, Turn-Off Energy Loss vs Collector Current

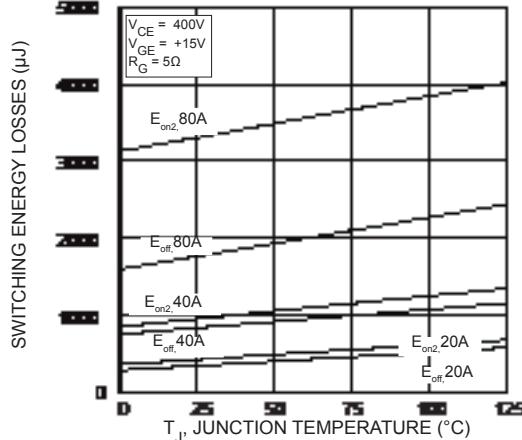


FIGURE 16, Switching Energy Losses vs Junction Temperature

Typical Performance Curves

APT40GT60BR

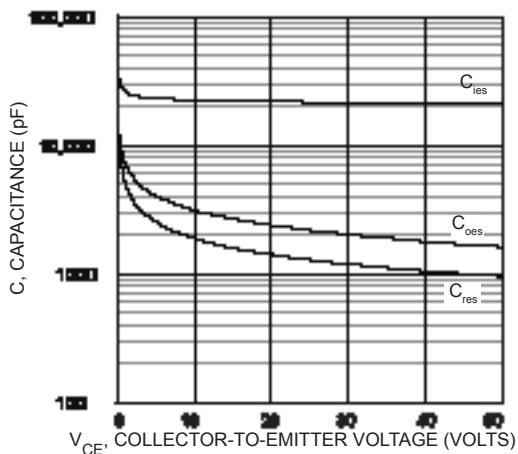


FIGURE 17, Capacitance vs Collector-To-Emitter Voltage

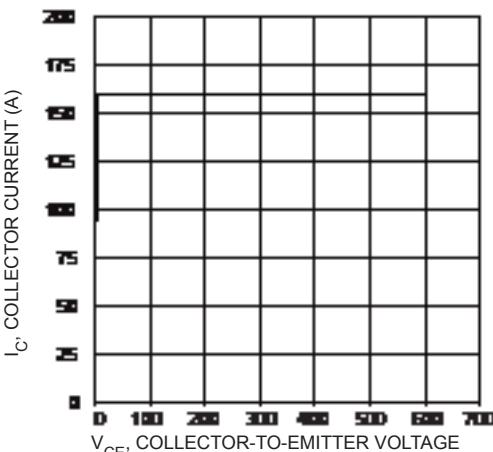


FIGURE 18, Minimum Switching Safe Operating Area

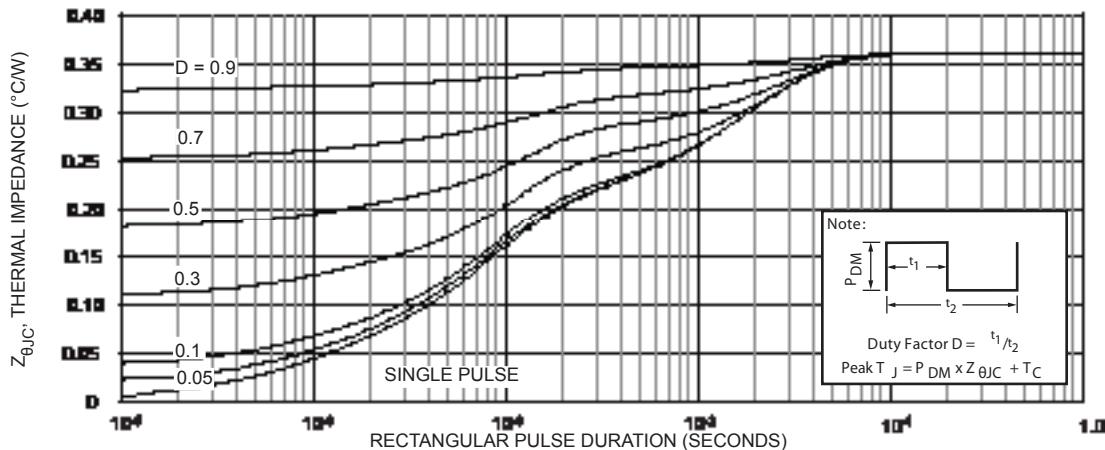


Figure 19a, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

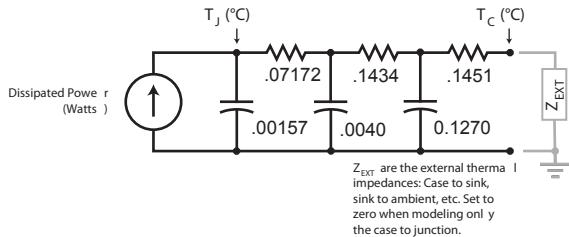


FIGURE 19b, TRANSIENT THERMAL IMPEDANCE MODEL

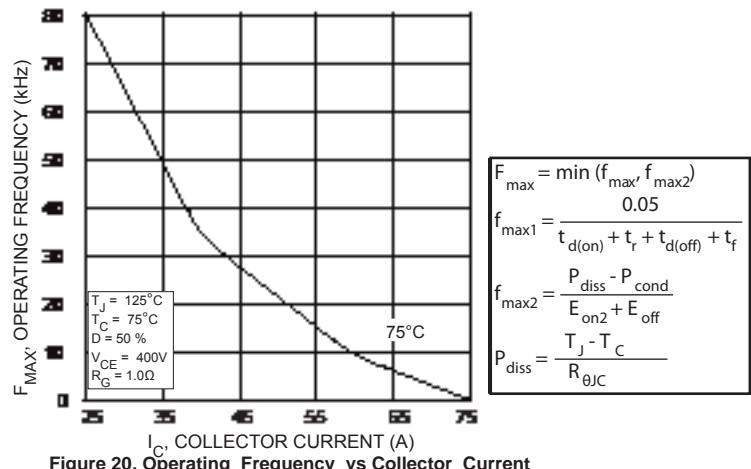


Figure 20, Operating Frequency vs Collector Current

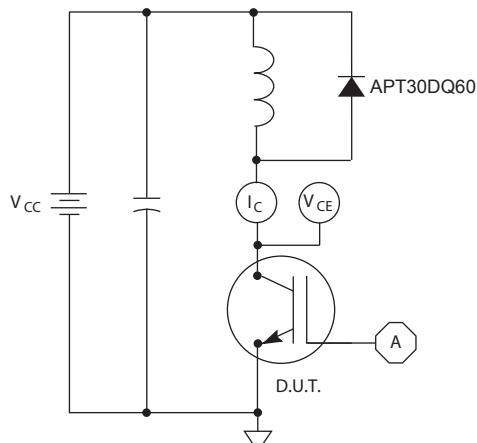


Figure 21, Inductive Switching Test Circuit

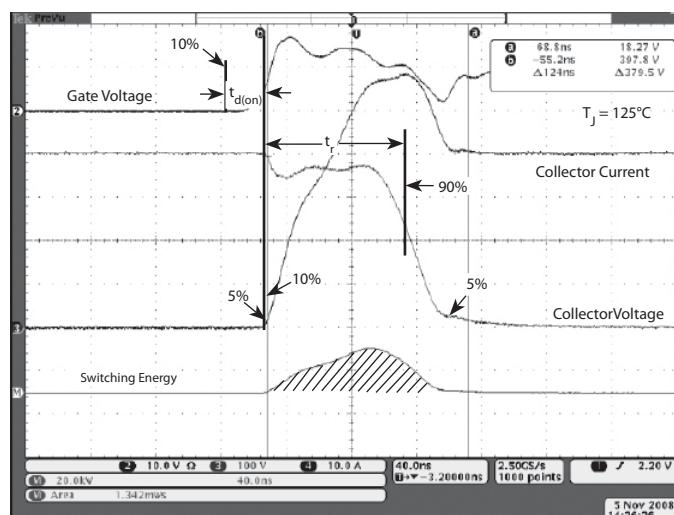


Figure 22, Turn-on Switching Waveforms and Definitions

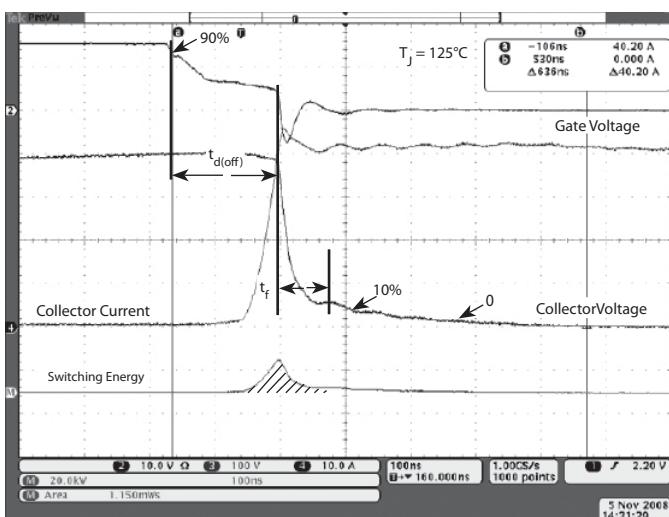
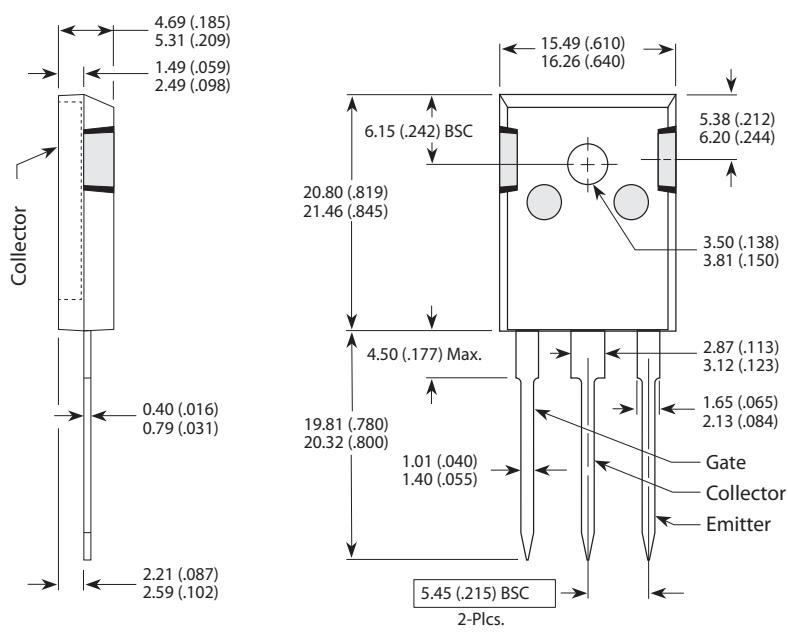


Figure 23, Turn-off Switching Waveforms and Definitions

TO-247 (B) Package Outline



Dimensions in Millimeters and (Inches)

ООО "ЛайфЭлектроникс"

"LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибуторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибуторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помочь разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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