



TT060U065FQ

主要参数 MAIN CHARACTERISTICS

I _c	60A
V _{CE}	650V
V _{cesat-typ}	1.9V

用途

- PFC
- 储能

APPLICATIONS

- Power factor corrector (PFC)
- Energy Storage

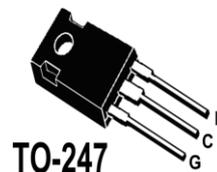
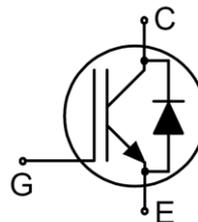
产品特性

- 低栅极电荷
- Trench FS 技术
- RoHS 产品
- 快开关速度
- 低开关损耗
- V_{CE(sat)}正温度系数

FEATURES

- Low gate charge
- Trench FS Technology
- RoHS product
- Fast switching speed
- Low switching losses
- V_{CE(sat)} with positive temperature coefficient

封装 Package



订货信息 ORDER MESSAGE

订货型号 Order codes	印记 Marking	封装 Package
无卤-条管 Halogen-Free-Tube		
TT060U065FQ-GE-BR	TT060U065FQ	TO-247

绝对最大额定值 ABSOLUTE RATINGS ($T_C=25^{\circ}\text{C}$)

项 目 Parameter	符 号 Symbol	数 值 Value	单 位 Unit
最高集电极—发射极直流电压 Collector-emitter voltage	V_{CE}	650	V
*连续集电极电流 Collector current-continuous	I_C	120($T_C=25^{\circ}\text{C}$)	A
		60($T_C=100^{\circ}\text{C}$)	A
最大脉冲集电极极电流 (注1) Collector current – pulse (note 1)	I_{CM}	240	A
*二极管正向测试电流 Diode RMS forward current	I_F	120 ($T_C=25^{\circ}\text{C}$)	A
		60 ($T_C=100^{\circ}\text{C}$)	A
二极管正向不重复峰值电流 (浪涌电流) Surge non repetitive forward current $t_p=10\text{ ms}$ sinusoidal	I_{FSM}	240	A
最高栅极发射极电压 Gate-emitter voltage	V_{GE}	± 20	V
瞬态栅极发射极电压 Transient gate-emitter voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$)	V_{GE}	± 30	V
安全工作区 Turn-off safe area $V_{CE} \leq 650\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p=1\mu\text{s}$	-	240	A
耗散功率(TO-247) Power dissipation	P_D $T_C=25^{\circ}\text{C}$ P_D $T_C=100^{\circ}\text{C}$	375	W
		187	
耗散功率(TO-3PH) Power dissipation	P_D $T_C=25^{\circ}\text{C}$ P_D $T_C=100^{\circ}\text{C}$	90	W
		45	
工作结温 (注2) Operating junction temperature range	T_{vj}	$-40 \sim +175$	$^{\circ}\text{C}$
存储温度 Storage temperature	T_{STG}	$-55 \sim +150$	$^{\circ}\text{C}$
引线最高焊接温度 Maximum lead Temperature for soldering purposes	T_L	260	$^{\circ}\text{C}$

*连续集电极电流由最高结温限制。

*Collector current limited by maximum junction temperature.

For optimum lifetime and reliability, JSMC recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet

注释:

1: 脉冲宽度由最高结温限制。

2: 过载工况时, 允许在最高结温 $T_{vjop}=175^{\circ}\text{C}$ 下运行, 最大占空比 < 20% (最多持续 60s)

Notes:

1: Pulse width limited by maximum junction temperature.

2: Under overload condition, it is allowed to operate at the maximum junction temperature $T_{vjop}=175^{\circ}\text{C}$, and the maximum duty ratio is less than 20% (lasting for 60 s at most)





电特性 ELECTRICAL CHARACTERISTICS

项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
集电极-发射极击穿电压 Collector-emitter Voltage	BV_{CES}	$I_C=250\mu A, V_{GE}=0V$	650	-	-	V
零栅压下集电极漏电流 Zero gate voltage collector current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_{vj}=25^\circ C$	-	-	80	μA
正向栅极体漏电流 Gate-body leakage current, forward	I_{GESF}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^\circ C$	-	-	200	nA
反向栅极体漏电流 Gate-body leakage current, reverse	I_{GESR}	$V_{CE}=0V, V_{GE}=-20V, T_{vj}=25^\circ C$	-	-	-200	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C=0.6mA$	3.5	4.5	5.5	V
饱和压降 Collector-emitter saturation voltage	V_{CESAT}	$V_{GE}=15V, I_C=60A$ $T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$	- -	1.9 2.3	2.3 -	V
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C_{ies}	$V_{CE}=25V$ $V_{GE}=0V$ $f=1.0MHz$	-	3280	-	pF
输出电容 Output capacitance	C_{oes}		-	213	-	pF
反向传输电容 Reverse transfer capacitance	C_{res}		-	36	-	pF
栅极电荷总量 Total gate charge	Q_g	$V_{CC}=480V, I_C=60A, V_{GE}=15V$	-	128	-	nC
栅极-发射极 Gate to emitter charge	Q_{ge}		-	21	-	
栅极-集电极 Gate to collector charge	Q_{gc}		-	71	-	



电特性 ELECTRICAL CHARACTERISTICS

开关特性 Switching Characteristics

项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
开启延迟时间 Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, I_c=60A, R_G=5\Omega$ $V_{GE}=15V$ $T_{vj}=25^\circ C$	-	12	-	ns
上升时间 Turn-on rise time	t_r		-	80	-	ns
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	98	-	ns
下降时间 Turn-off fall time	t_f		-	82	-	ns
开通损耗 Turn-on energy	Eon		-	1.46	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.34	-	mJ
总开关损耗 Total switching energy	Etot		-	2.80	-	mJ
开启延迟时间 Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, I_c=60A, R_G=5\Omega$ $V_{GE}=15V$ $T_{vj}=150^\circ C$	-	14	-	ns
上升时间 Turn-on rise time	t_r		-	80	-	ns
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	122	-	ns
下降时间 Turn-off fall time	t_f		-	112	-	ns
开通损耗 Turn-on energy	Eon		-	1.60	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.84	-	mJ
总开关损耗 Total switching energy	Etot		-	3.44	-	mJ

反并联二极管特性及最大额定值 Anti-Parallel Diode Characteristics and Maximum Ratings

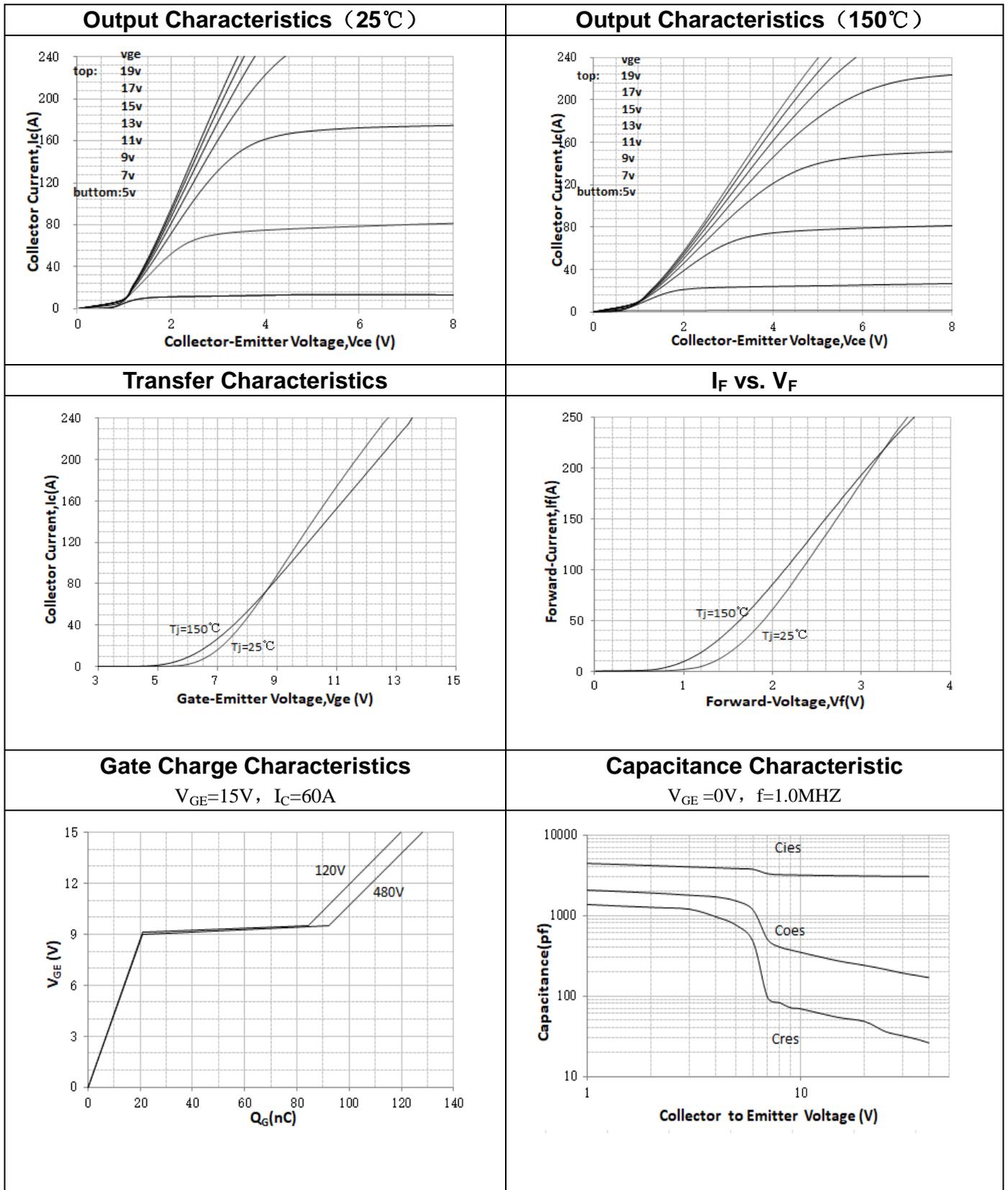
正向压降 Diode forward voltage	V_F	$I_F=60A, T_{vj}=25^\circ C$	-	1.6	2.0	V
反向恢复时间 Diode reverse recovery time	t_{rr}	$V_R=200V, I_F=50A$ $dI_F/dt=200A/\mu s$ $T_{vj}=25^\circ C$	-	160	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	0.79	-	nC
反向恢复电流 Diode reverse recovery current	I_{rrm}		-	8.0	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}		$V_R=200V, I_F=50A$ $dI_F/dt=200A/\mu s$ $T_{vj}=150^\circ C$	-	270	-
反向恢复电荷 Diode reverse recovery charge	Q_{rr}	-		3.1	-	nC
反向恢复电流 Diode reverse recovery current	I_{rrm}	-		17	-	A

项 目 Parameter	符 号 Symbol	MAX	单 位 Unit
结到管壳的热阻 Junction to case IGBT	$R_{th(j-c)}$	0.4	$^\circ C/W$
结到管壳的热阻 Junction to case Diode	$R_{th(j-c)}$	0.6	$^\circ C/W$
结到环境的热阻 Junction to ambient	$R_{th(j-a)}$	40	$^\circ C/W$





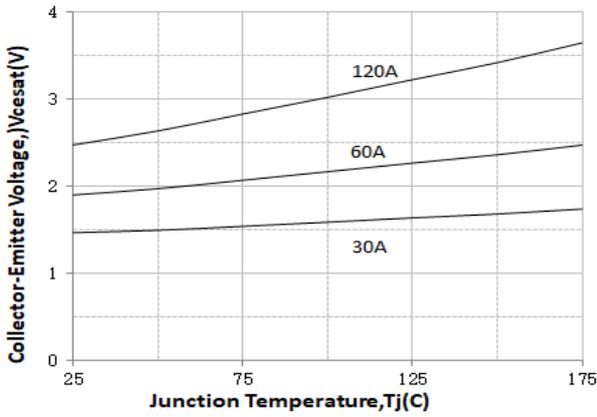
特征曲线 ELECTRICAL CHARACTERISTICS (curves)





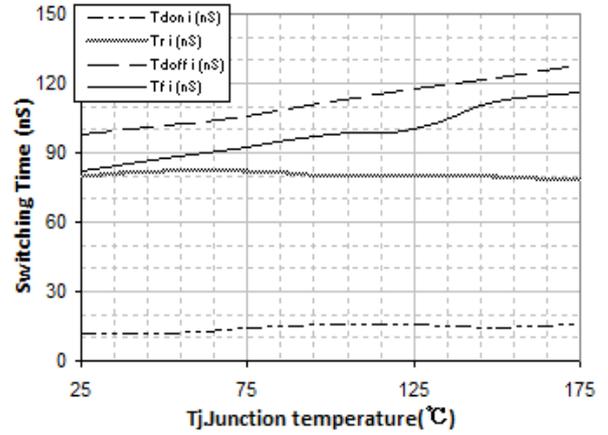
Vcesat vs. Tj

$V_{GE}=15V, I_C=30A, 60A, 120A$



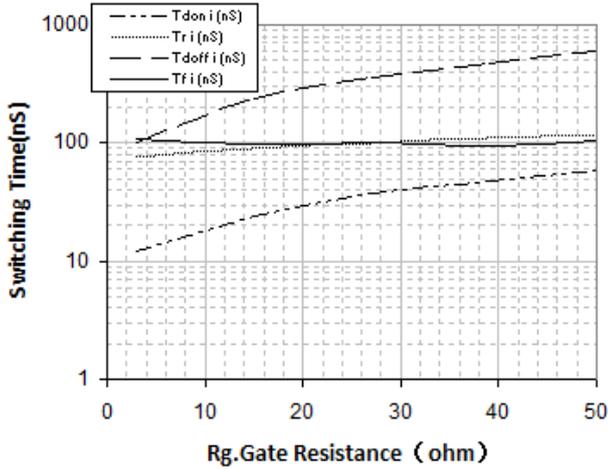
Switching Time vs. Tj

$V_{GE}=15V, V_{GE}=400V, I_C=60A, R_G=5\Omega$



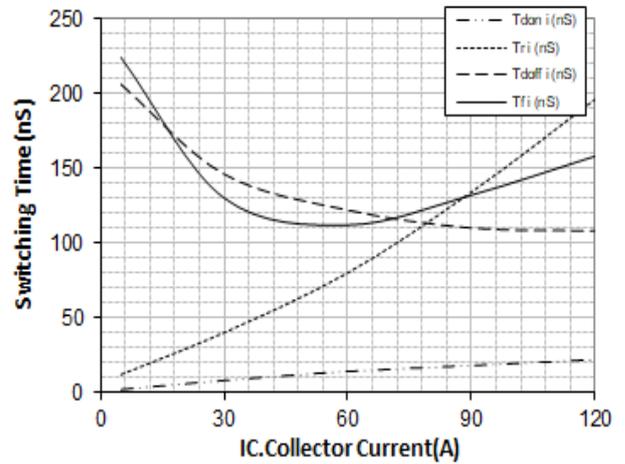
Switching Time vs. Rg(150°C)

$V_{GE}=15V, V_{CE}=400V, I_C=60A$



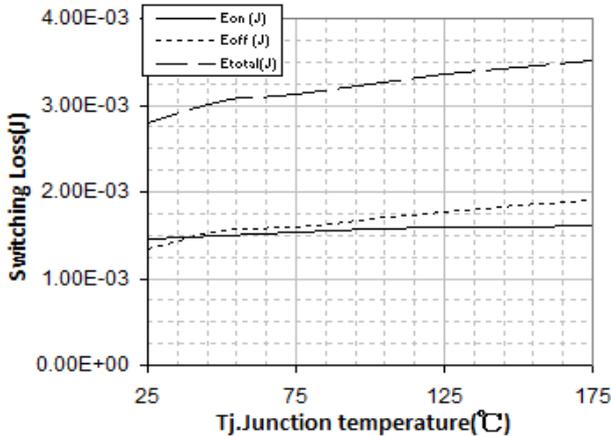
Switching Time vs. Ic(150°C)

$V_{CE}=400V, V_{GE}=15V, R_G=5\Omega$



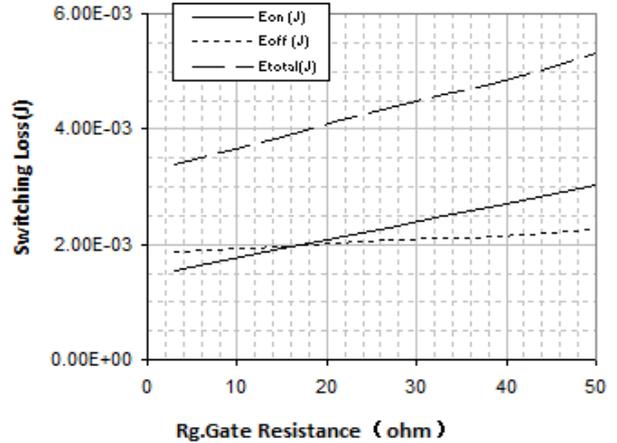
Switching Loss vs. Tj

$V_{GE}=15V, V_{CE}=400V, I_C=60A, R_G=5\Omega$



Switching Loss vs. Rg(150°C)

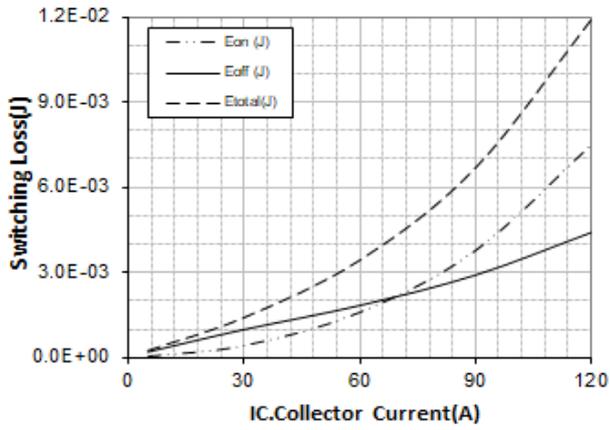
$V_{GE}=15V, V_{CE}=400V, I_C=60A$



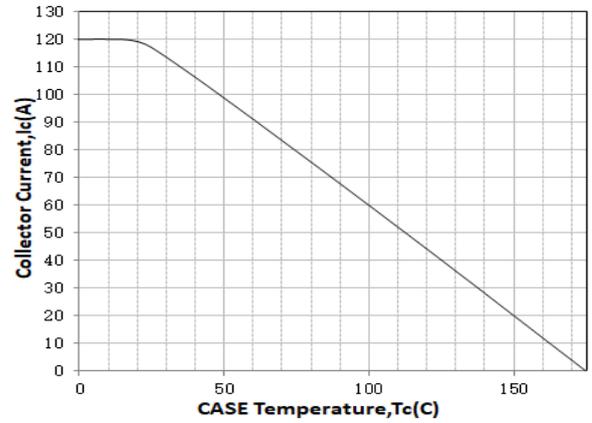


Switching Loss vs. $I_c(150^\circ\text{C})$

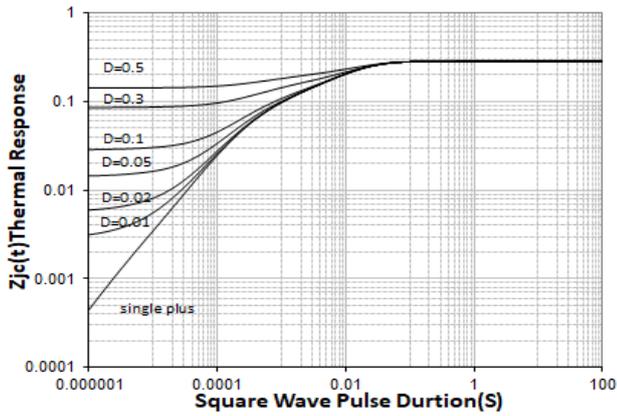
$V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $R_G=5\Omega$



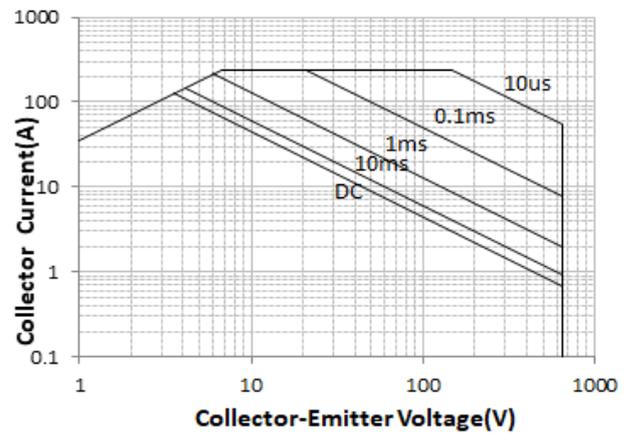
Collector current vs. case temperature



Transient Thermal Impedance for IGBT TO-247



Forward Bias Safe Operating Area TO-247

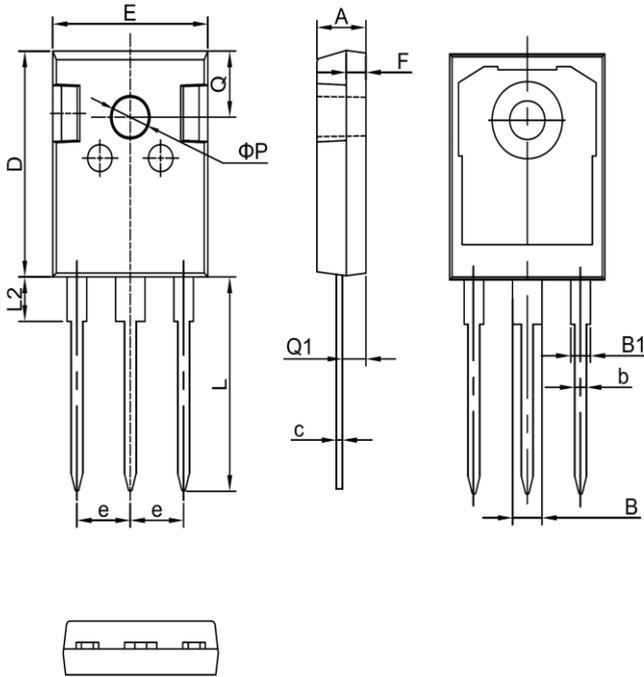




外形尺寸 PACKAGE MECHANICAL DATA

TO-247

单位 Unit: mm



符号 symbol	MIN	MAX
A	4.90	5.10
B	2.95	3.35
B1	1.95	2.35
b	1.15	1.35
c	0.50	0.70
D	20.90	21.10
E	15.70	15.90
e	5.34	5.54
F	1.90	2.10
L	19.40	20.40
L2	4.03	4.23
Q	6.00	6.40
Q1	2.30	2.50
P	3.50	3.70



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