



# TT050U065FBC

## 主要参数 MAIN CHARACTERISTICS

$I_c$	50A
$V_{CES}$	650V
$V_{cesat-typ}$	1.4V

### 用途

- 充电桩
- UPS 电源
- 光伏
- 储能

### APPLICATIONS

- Charging pile
- UPS
- Solar converters
- Energy Storage

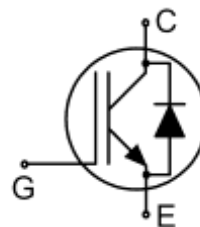
### 产品特性

- 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
- 内置 SiC 肖特基二极管

### FEATURES

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

## 封装 Package



Built in SiC SBD



## 订货信息 ORDER MESSAGE

订货型号 Order codes		印记 Marking	封装 Package
有卤-条管 Halogen-Free-Tube	无卤-条管 Halogen-Free-Tube		
TT050U065FBC-GE-B	TT050U065FBC-GE-BR	TT050U065FBC	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	$V_{CES}$	650	V
*连续集电极电流 Collector current-continuous	$I_C$	100( $T_C=25^\circ\text{C}$ )	A
		50( $T_C=100^\circ\text{C}$ )	A
最大脉冲集电极极电流 (注1) Collector current – pulse (note 1)	$I_{CM}$	200	A
*二极管正向测试电流 Diode RMS forward current	$I_F$	40 ( $T_C=25^\circ\text{C}$ )	A
		25 ( $T_C=100^\circ\text{C}$ )	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	$I_{FSM}$	100	A
最高栅极发射极电压 Gate-emitter Voltage	$V_{GES}$	$\pm 20$	V
瞬态栅极发射极电压 Transient gate-emitter voltage( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )	$V_{GES}$	$\pm 30$	V
安全工作区 Turn-off safe area $V_{CE} \leq 650\text{V}$ , $T_{vj} \leq 175^\circ\text{C}$ , $t_p=1\mu\text{s}$	-	200	A
耗散功率 Power dissipation	$P_D$ $T_C=25^\circ\text{C}$	394	W
工作结温 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, and  $T_C=25^\circ\text{C}$  limited by bondwire.

注释:

Notes:

1: 脉冲宽度由最高结温限制.

1: Pulse width limited by maximum junction temperature.



## 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
<b>关态特性 Off –Characteristics</b>						
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	$I_{CES}$	$V_{CE}=650V, V_{GE}=0V, T_{vj}=25^\circ C$ $V_{CE}=650V, V_{GE}=0V, T_{vj}=175^\circ C$	-	-	500 2000	$\mu A$
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
<b>通态特性 On-Characteristics</b>						
阈值电压 Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C=500\mu A$	3.5	4.5	5.5	V
饱和压降 Collector-emitter saturation voltage	$V_{CESAT}$	$V_{GE}=15V, I_C=50A$ $T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	-	1.4 1.65	1.7	V
<b>动态特性 Dynamic Characteristics</b>						
输入电容 Input capacitance	$C_{ies}$	$V_{CE}=25V$ $V_{GE}=0V$ $f=1.0MHz$	-	2643	-	pF
输出电容 Output capacitance	$C_{oes}$		-	325	-	pF
反向传输电容 Reverse transfer capacitance	$C_{res}$		-	58	-	pF
栅极电荷总量 Total gate charge	$Q_g$	$V_{CC}=520V, I_C=50A, V_{GE}=15V$	-	153	-	nC
栅极-发射极 Gate to emitter charge	$Q_{ge}$		-	19	-	
栅极-集电极 Gate to collector charge	$Q_{gc}$		-	85	-	



## 电特性 ELECTRICAL CHARACTERISTICS

## 开关特性 Switching Characteristics

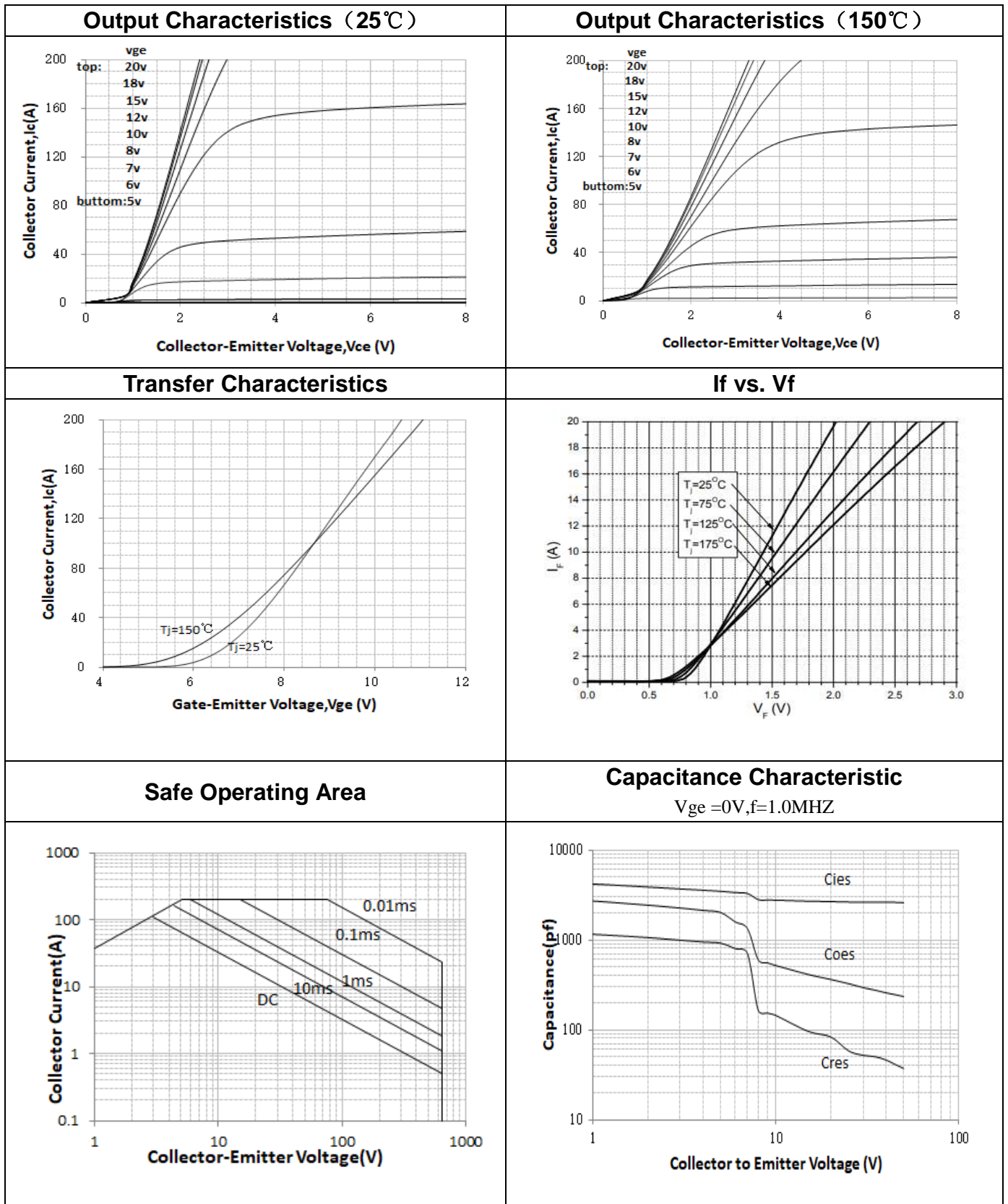
项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
开启延迟时间 Turn-on delay time	$t_d(\text{on})$	$V_{CC}=400V, I_c=50A, R_G=9\Omega$ $V_{GE}=15V$ $T_{vj}=25^\circ C$	-	24	-	ns
上升时间 Turn-on rise time	$t_r$		-	56	-	ns
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	196	-	ns
下降时间 Turn-off fall time	$t_f$		-	80	-	ns
开通损耗 Turn-on energy	$E_{on}$		-	0.98	-	mJ
关断损耗 Turn-off energy	$E_{off}$		-	1.34	-	mJ
总开关损耗 Total switching energy	$E_{tot}$		-	2.32	-	mJ
开启延迟时间 Turn-on delay time	$t_d(\text{on})$	$V_{CC}=400V, I_c=50A, R_G=9\Omega$ $V_{GE}=15V$ $T_{vj}=150^\circ C$	-	16	-	ns
上升时间 Turn-on rise time	$t_r$		-	56	-	ns
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	228	-	ns
下降时间 Turn-off fall time	$t_f$		-	140	-	ns
开通损耗 Turn-on energy	$E_{on}$		-	1.0	-	mJ
关断损耗 Turn-off energy	$E_{off}$		-	1.57	-	mJ
总开关损耗 Total switching energy	$E_{tot}$		-	2.57	-	mJ
开启延迟时间 Turn-on delay time	$t_d(\text{on})$	$V_{CC}=400V, I_c=25A, R_G=9\Omega$ $V_{GE}=15V$ $T_{vj}=25^\circ C$	-	20	-	ns
上升时间 Turn-on rise time	$t_r$		-	32	-	ns
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	218	-	ns
下降时间 Turn-off fall time	$t_f$		-	78	-	ns
开通损耗 Turn-on energy	$E_{on}$		-	0.28	-	mJ
关断损耗 Turn-off energy	$E_{off}$		-	0.7	-	mJ
总开关损耗 Total switching energy	$E_{tot}$		-	0.98	-	mJ
开启延迟时间 Turn-on delay time	$t_d(\text{on})$	$V_{CC}=400V, I_c=25A, R_G=9\Omega$ $V_{GE}=15V$ $T_{vj}=150^\circ C$	-	8	-	ns
上升时间 Turn-on rise time	$t_r$		-	32	-	ns
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	266	-	ns
下降时间 Turn-off fall time	$t_f$		-	146	-	ns
开通损耗 Turn-on energy	$E_{on}$		-	0.31	-	mJ
关断损耗 Turn-off energy	$E_{off}$		-	0.95	-	mJ
总开关损耗 Total switching energy	$E_{tot}$		-	1.26	-	mJ
<b>反并联二极管特性及最大额定值 Anti-Parallel Diode Characteristics and Maximum Ratings</b>						
正向压降 Diode forward voltage	$V_F$	$I_F=10A, T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	-	1.45 1.75	1.75 -	V
总存储电荷 Total capacitive charge	$Q_C$	$V_R=400V, I_F=40A$ $T_{vj}=25^\circ C$	-	28	-	nC



项 目 Parameter	符 号 Symbol	MAX	单 位 Unit
结到管壳的热阻 Junction to Case IGBT	$R_{th(j-c)}$	0.38	$^{\circ}C/W$
结到管壳的热阻 Junction to Case Diode	$R_{th(j-c)}$	1.09	$^{\circ}C/W$
结到环境的热阻 Junction to Ambient	$R_{th(j-A)}$	40	$^{\circ}C/W$



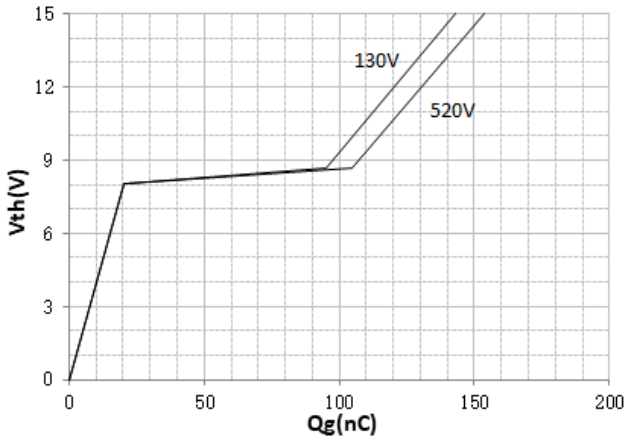
## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)





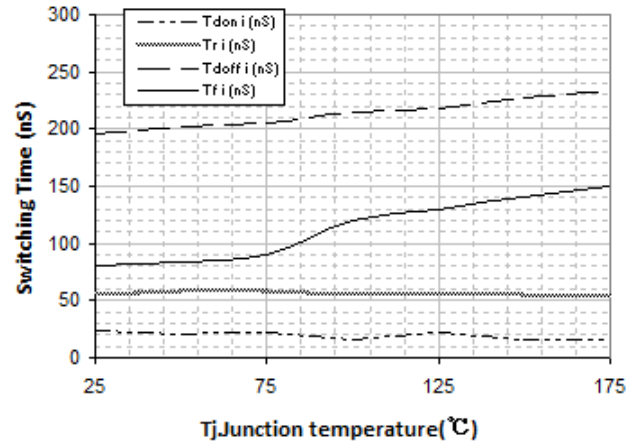
**Gate Charge Characteristics**

$V_{ge}=15V, I_c=50A$



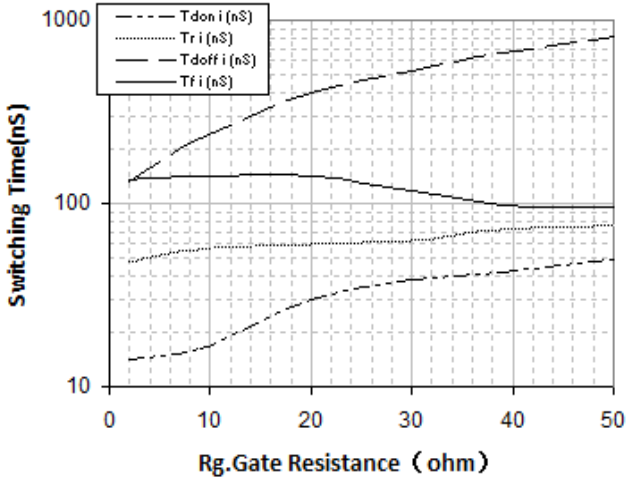
**Switching Time vs. Tj**

$V_{ge}=15V, V_{ce}=400V, I_c=50A, R_g=9\Omega$



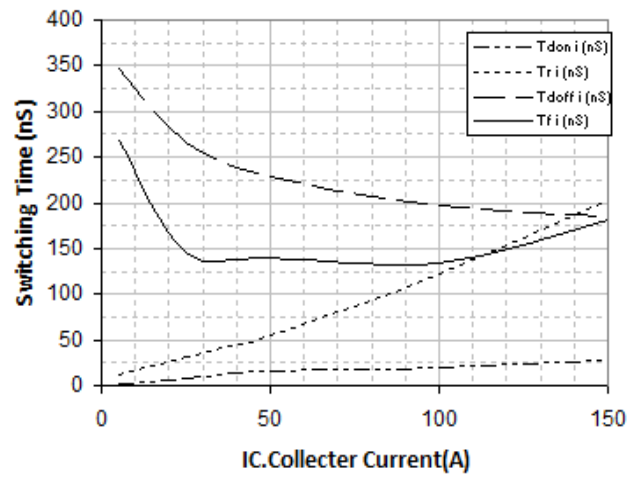
**Switching Time vs. Rg(150°C)**

$V_{ge}=15V, V_{ce}=400V, I_c=50A$



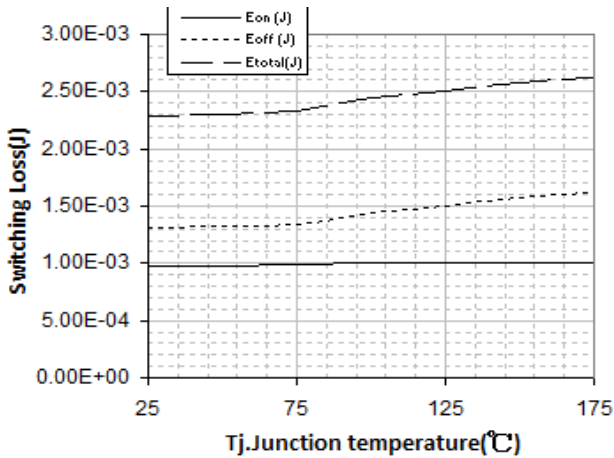
**Switching Time vs. Ic(150°C)**

$V_{ce}=400V, V_{ge}=15V, R_g=9\Omega$



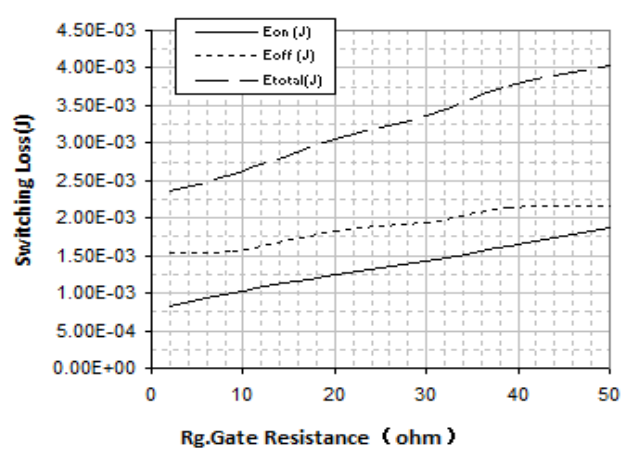
**Switching Loss vs. Tj**

$V_{ge}=15V, V_{ce}=400V, I_c=50A, R_g=9\Omega$



**Switching Loss vs. Rg(150°C)**

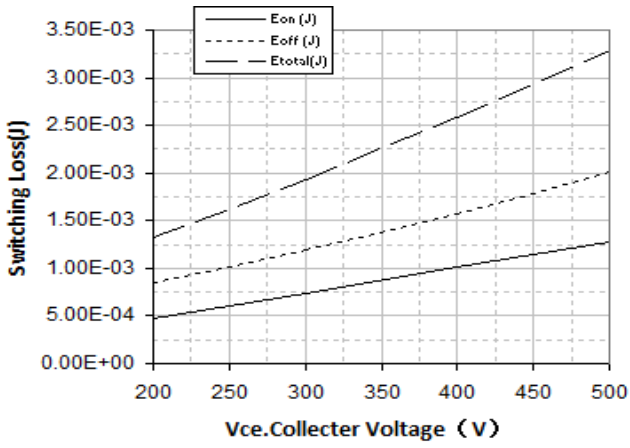
$V_{ge}=15V, V_{ce}=400V, I_c=50A$



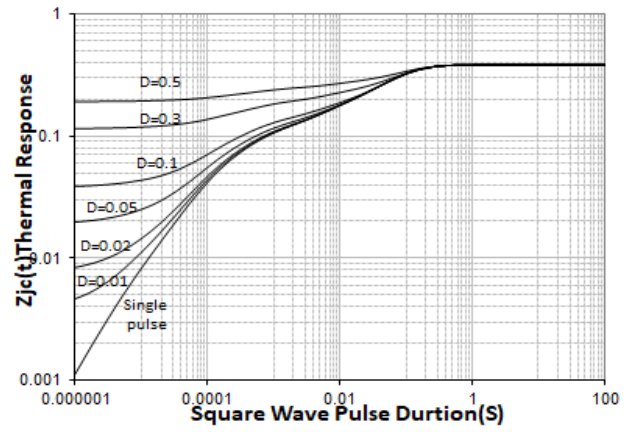


### Switching Loss vs. VCE(150°C)

$V_{ge}=15V, I_c=50A, R_g=9\Omega$



### Transient Thermal Impedance for IGBT



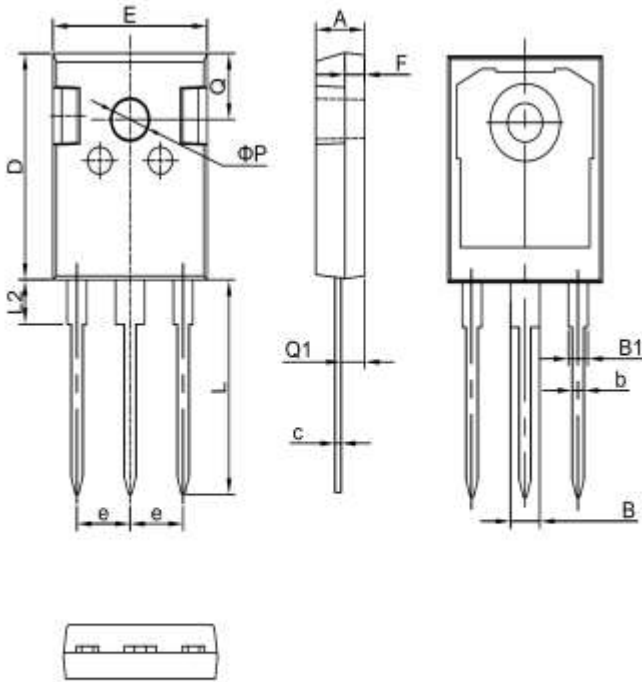




## 外形尺寸 PACKAGE MECHANICAL DATA

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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