



ATT040K065EQ

主要参数 MAIN CHARACTERISTICS

I_C	40 A
V_{CE}	650V
$V_{cesat-typ}(V_{ge}=15V)$	1.7V

用途

- 逆变器
- UPS 电源
- 电机控制

产品特性

- 低栅极电荷
- Trench FS 技术
- RoHS 产品

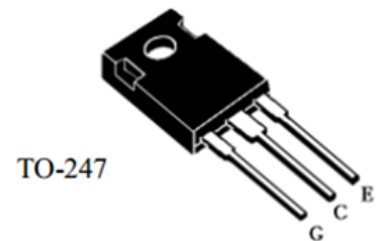
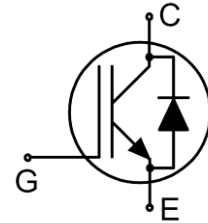
APPLICATIONS

- General purpose inverters
- UPS
- Motor Control

FEATURES

- Low gate charge
- Trench FS Technology
- RoHS product

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		
ATT040K065EQ-GE-BR	ATT040K065EQ	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	80($T_C=25^\circ\text{C}$)	A
		40($T_C=100^\circ\text{C}$)	A
最大脉冲集电极极电流 (注 1) Collector current – pulse (note 1)	I_{CM}	160	A
二极管正向测试电流 Diode forward current	I_F	80($T_C=25^\circ\text{C}$)	A
		40($T_C=100^\circ\text{C}$)	A
二极管正向脉冲电流 Diode pulsed current	I_{FSM}	160	A
最高栅极发射极电压 Gate-emitter voltage	V_{GE}	± 20	V
Turn-off safe area	-	160	A
耗散功率 Power dissipation	P_D $T_C=25^\circ\text{C}$	340	W
存储温度 Storage temperature range	T_{STG}	$-55\sim+150$	$^\circ\text{C}$
结温 Junction temperature range	T_{VJ}	$-55\sim+175$	$^\circ\text{C}$
引线最高焊接温度 Maximum lead temperature for soldering purposes	T_L	300	$^\circ\text{C}$

*连续集电极电流由最高结温限制

*Collector current limited by maximum junction temperature

注释:

1: 脉冲宽度由最高结温限制

Notes:

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
关态特性 Off –Characteristics						
集电极-发射极击穿电压 Collector-emitter voltage	BV_{CES}	$I_C=1mA, V_{GE}=0V$	650	-	-	V
零栅压下集电极漏电流 Zero gate voltage collector current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_C=25^\circ C$	-	-	40	μA
正向栅极体漏电流 Gate-body leakage current, forward	I_{GESF}	$V_{CE}=0V, V_{GE}=20V$	-	-	200	nA
反向栅极体漏电流 Gate-body leakage current, reverse	I_{GESR}	$V_{CE}=0V, V_{GE}=-20V$	-	-	-200	nA
通态特性 On-Characteristics						
阈值电压 Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C=250\mu A$	4.5	-	6.5	V
饱和压降 Collector-emitter saturation voltage	V_{CESAT}	$V_{GE}=15V, I_C=40A$ $T_C=25^\circ C$ $T_C=175^\circ C$	- -	1.7 2.2	2.4 -	V
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C_{ies}	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1.0MHz$	-	2392	-	pF
输出电容 Output capacitance	C_{oes}		-	193	-	pF
反向传输电容 Reverse transfer capacitance	C_{res}		-	64.5	-	pF
栅极电荷总量 Total gate charge	Q_g	$V_{CC}=480V, I_C=40A, R_G=10\Omega, V_{GE}=15V$ $T_C=25^\circ C$	-	79.2	-	nC
栅极-发射极 Gate to emitter charge	Q_{ge}		-	24.6	-	
栅极-集电极 Gate to collector charge	Q_{gc}		-	34.1	-	
栅极电阻-Gate resistance	R_g	$f=1MHz, \text{open collector}$	-	1.3	-	Ω



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	$t_d(\text{on})$	$V_{CC}=400V, I_c=40A, R_G=10.5\Omega$ $V_{GE}=15V$ $T_C=25^\circ C$	-	24	-	ns
上升时间 Turn-on rise time	t_r		-	84	-	ns
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	70	-	ns
下降时间 Turn-off fall time	t_f		-	78	-	ns
开通损耗 Turn-on energy	E_{on}		-	1.11	-	mJ
关断损耗 Turn-off energy	E_{off}		-	1.11	-	mJ
总开关损耗 Total switching energy	E_{tot}		-	2.22	-	mJ
开启延迟时间 Turn-on delay time	$t_d(\text{on})$	$V_{CC}=400V, I_c=40A, R_G=10.5\Omega$ $V_{GE}=15V$ $T_C=175^\circ C$	-	30	-	ns
上升时间 Turn-on rise time	t_r		-	78	-	ns
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	96	-	ns
下降时间 Turn-off Fall time	t_f		-	160	-	ns
开通损耗 Turn-on energy	E_{on}		-	1.13	-	mJ
关断损耗 Turn-off energy	E_{off}		-	1.25	-	mJ
总开关损耗 Total switching energy	E_{tot}		-	2.38	-	mJ

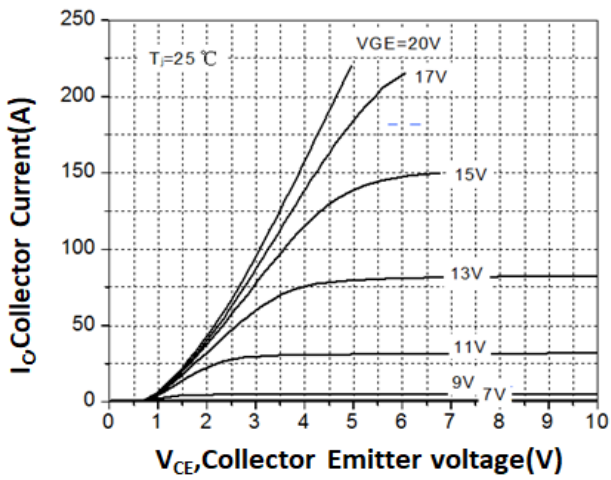
反并联二极管特性及最大额定值 Anti-Parallel Diode Characteristics and Maximum Ratings						
正向压降 Diode Forward Voltage	V_F	$V_{GE}=0V, I_F=20A, T_C=25^\circ C$	-	1.5	2.1	V
		$V_{GE}=0V, I_F=20A, T_C=175^\circ C$	-	1.15	-	V
反向恢复时间 Diode reverse recovery time	t_{rr}	$V_{GE}=0V, V_R=400V, I_F=15A$	-	36	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}	$dl_F/dt=1000A/\mu s$	-	0.3	-	μC
反向恢复电流 Diode reverse recovery current	I_{rrm}	$T_C=25^\circ C$	-	10	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	$V_{GE}=0V, V_R=400V, I_F=15A$	-	116	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}	$dl_F/dt=1000A/\mu s$	-	1.1	-	μC
反向恢复电流 Diode reverse recovery current	I_{rrm}	$T_C=175^\circ C$	-	15.8	-	A

项 目 Parameter	符 号 Symbol	TYP	MAX	单 位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case IGBT	$R_{th(j-c)}$	0.44	0.55	$^\circ C/W$
结到管壳的热阻 Thermal Resistance, Junction to Case diode	$R_{th(j-c)}$	0.81	1.0	$^\circ C/W$
结到环境的热阻 Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$		40	$^\circ C/W$

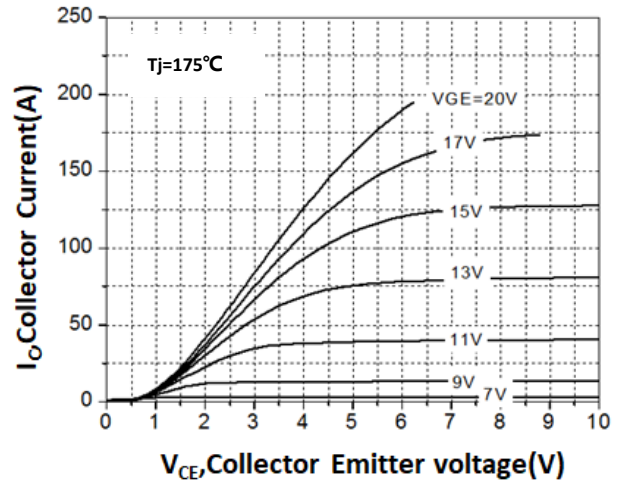


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

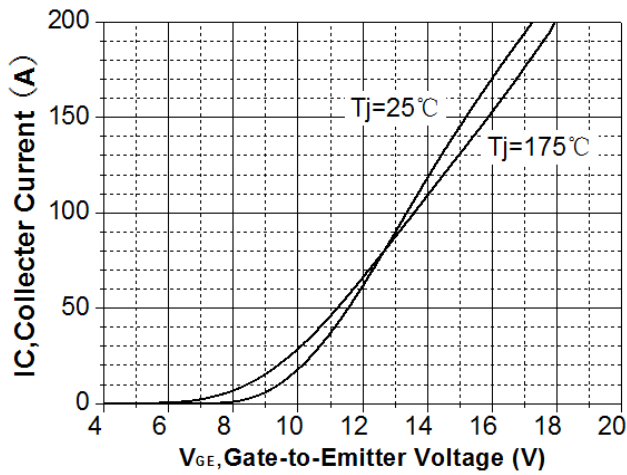
Output Characteristics (25°C)



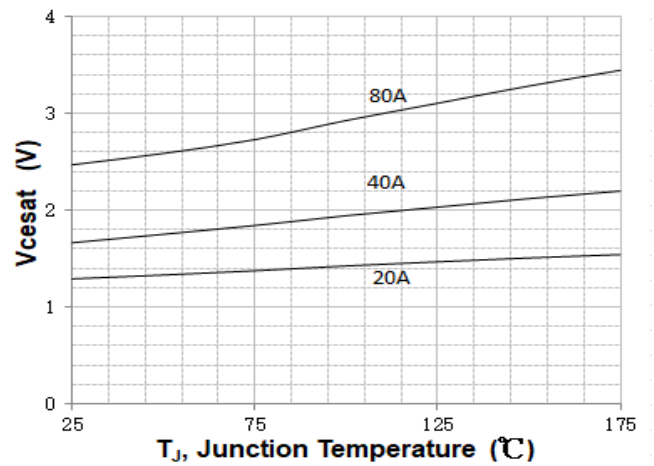
Output Characteristics (175°C)



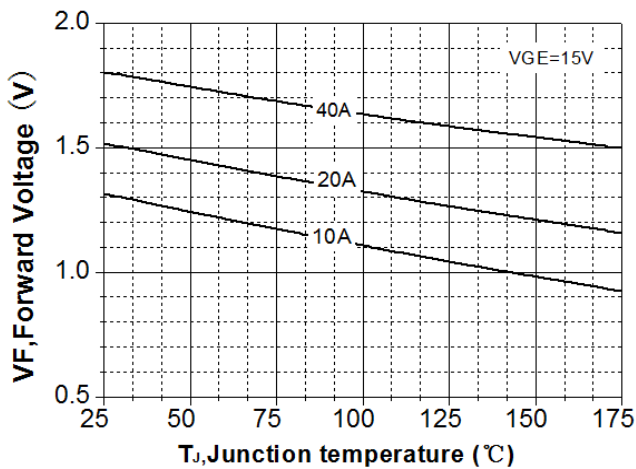
Transfer Characteristics



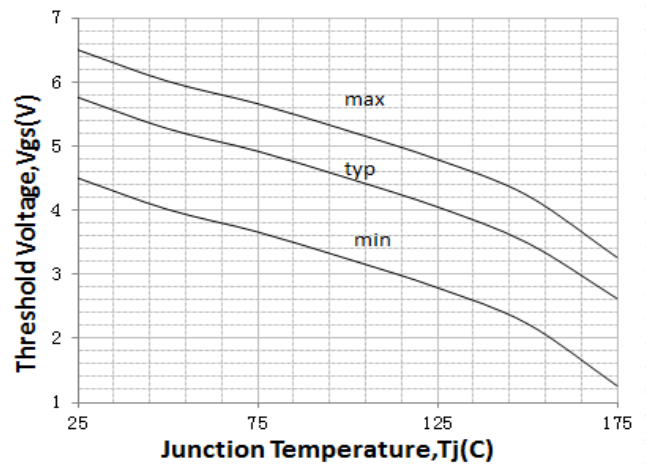
V_CEsat vs. T_J



V_F vs. T_J

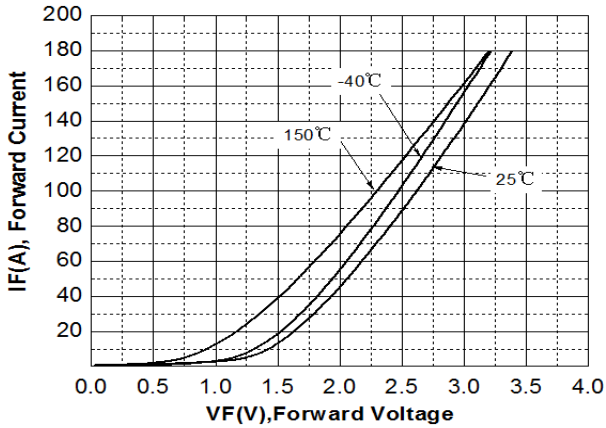


V_TH vs. T_J

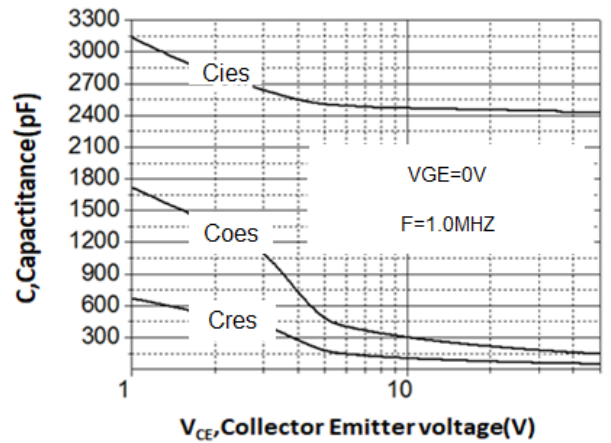




Diode Characteristic

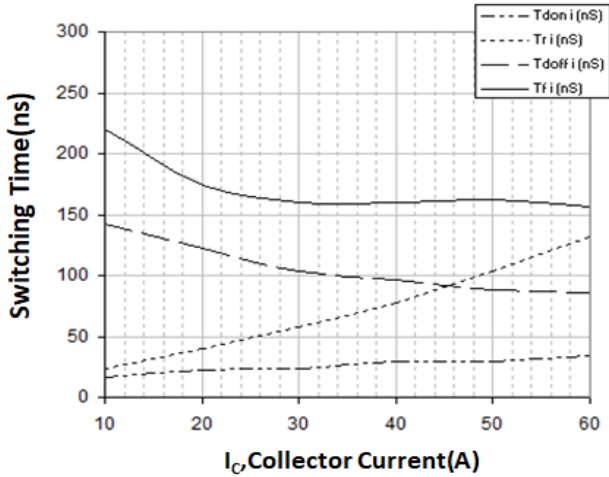


Capacitance Characteristic



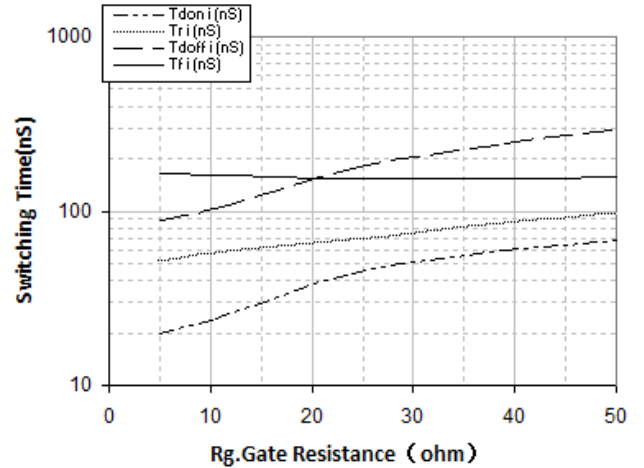
Switching Time vs. IC(175°C)

V_{GE}=15V, V_{CE}=400V, R_G=10.5Ω



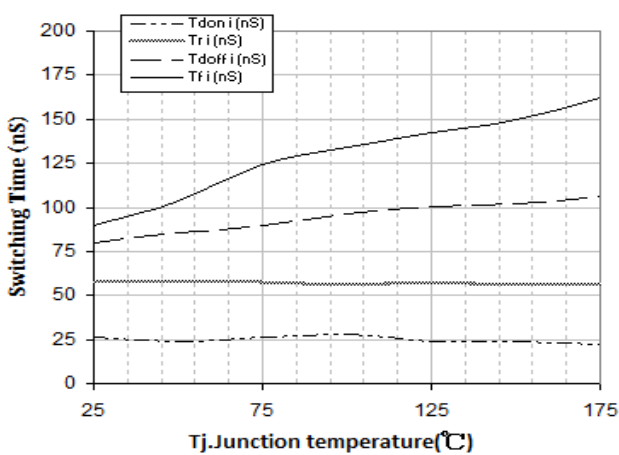
Switching Time vs. Rg(175°C)

V_{GE}=15V, V_{CE}=400V, I_C=40A



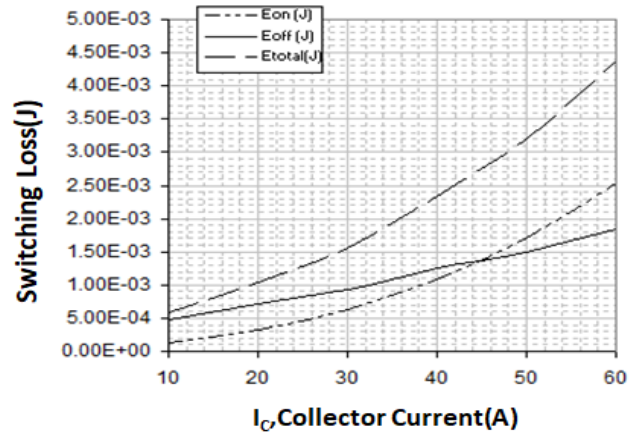
Switching Time vs. Tj

V_{GE}=15V, V_{CE}=400V, I_C=40A, R_G=10.5Ω



Switching Loss vs. IC(175°C)

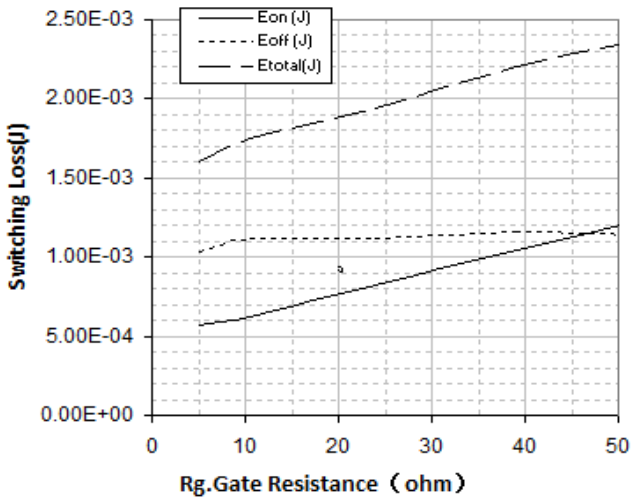
V_{GE}=15V, V_{CE}=400V, R_G=10.5Ω





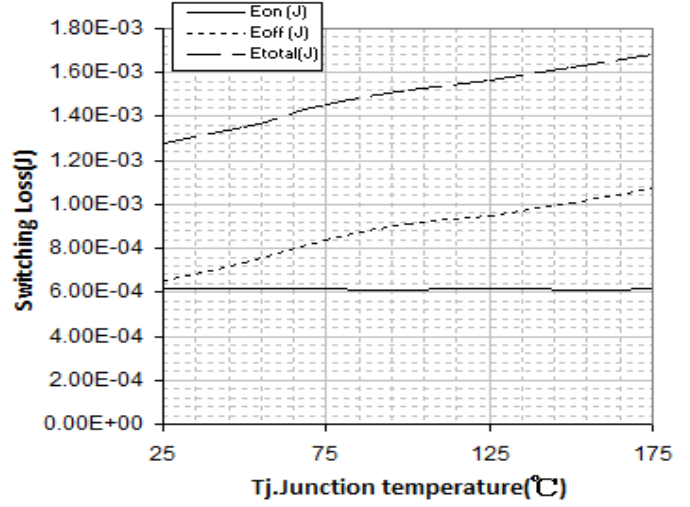
Switching Loss vs. Rg(175°C)

VGE=15V, VCE=400V, IC=40A

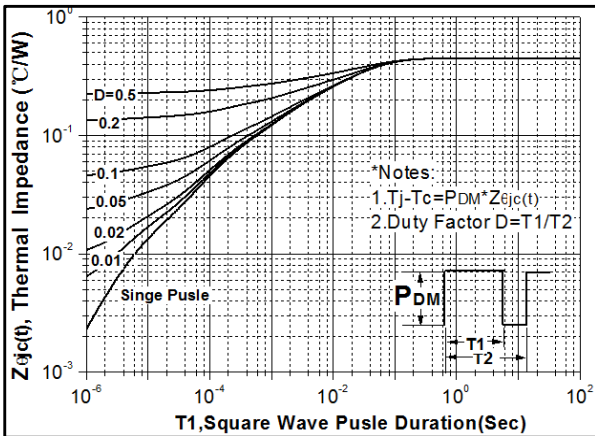


Switching Loss vs. Tj

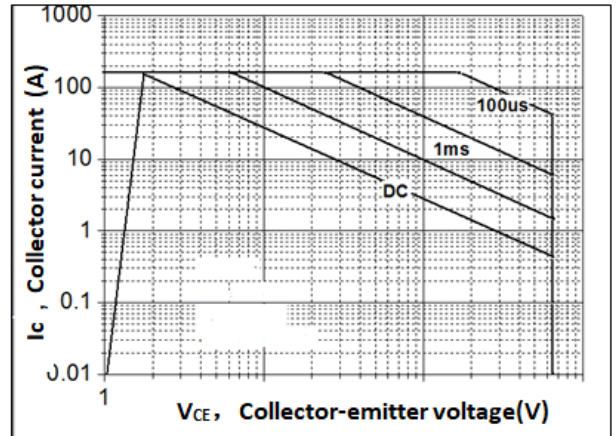
VGE=15V, VCE=400V, IC=40A, Rg=10.5Ω



Transient Thermal Impedance for IGBT



Forward Bias SOA

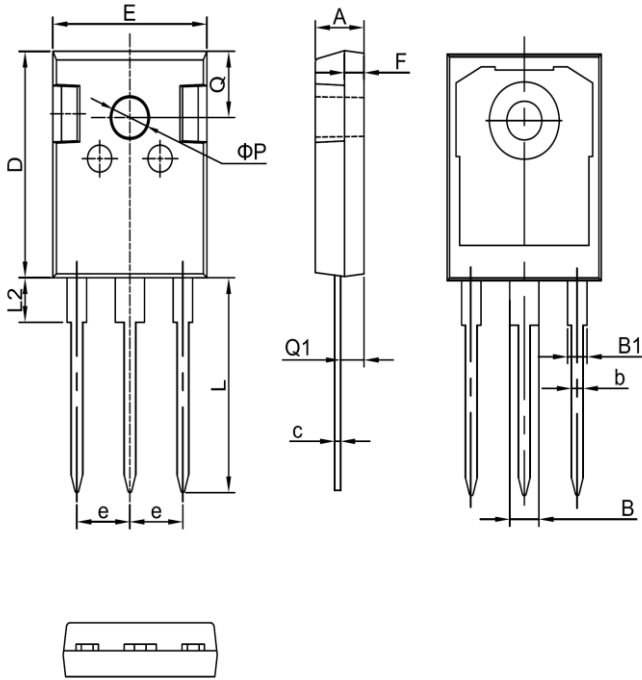




外形尺寸 PACKAGE MECHANICAL DATA

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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