



TT015N060EQ

主要参数 MAIN CHARACTERISTICS

IC	15 A
VCES	600V
Vcesat-typ (Vge=15V)	1.8V

用途

- 逆变器
- 电机控制

APPLICATIONS

- General purpose inverters
- Motor Control

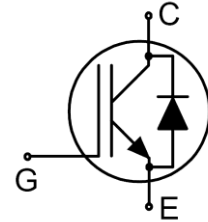
产品特性

- 低栅极电荷
- Trench FS 技术,
- RoHS 产品

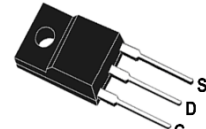
FEATURES

- Low gate charge
- Trench FS Technology,
- RoHS product

封装 Package



TO-220MF



TO-220MF-K1

订货信息 ORDER MESSAGE

订 货 型 号 Order codes				印 记 Marking	封 装 Package
有卤-条管 Halogen-Tube	无卤-条管 Halogen-Free-Tube	有卤-编带 Halogen-Reel	无卤-编带 Halogen-Free-Reel		
TT015N060EQ-F-B	TT015N060EQ-F-BR	N/A	N/A	TT015N060EQ	TO-220MF
TT015N060EQ-F1-B	TT015N060EQ-F1-BR	N/A	N/A	TT015N060EQ	TO-220MF-K1



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}	600	V
*连续集电极电流 Collector current-continuous	I_C $T=25^{\circ}\text{C}$	30	A
	I_C $T=100^{\circ}\text{C}$	15	A
最大脉冲集电极电流 (注 1) Collector current - pulse (note 1)	I_{CM}	45	A
二极管正向测试电流 Diode RMS forward current	I_F $T=25^{\circ}\text{C}$	30	A
	I_F $T=100^{\circ}\text{C}$	15	A
二极管正向脉冲电流 Diode pulse current	I_{FSM}	45	A
最高栅极发射极电压 Gate-emitter voltage	V_{GES}	± 20	V
安全工作区 Turn-off safe area	—	45	A
耗散功率 Power dissipation	P_D $T_c=25^{\circ}\text{C}$	36.7	W
最高结温及存储温度 Operating and storage temperature range	T_J, T_{STG}	$-55\sim+150$	$^{\circ}\text{C}$
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 =250 μ A, V _{GE} =0V	600	—	—	V
零栅压下集电极漏电流 Zero gate voltage collector current	I _{CES}	V _{CE} =600V, V _{GE} =0V	—	—	25	μ A
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 μ A	4.5	—	6.5	V
饱和压降 Collector-emitter saturation voltage	V _{CESAT}	V _{GE} =15V , I _C =15A, T _C =25℃	—	1.8	2.2	V
		V _{GE} =15V , I _C =15A, T _C =150℃	—	2.1	—	V
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f=1.0MHz	—	652	—	pF
输出电容 Output capacitance	C _{oes}		—	64	—	pF
反向传输电容 Reverse transfer capacitance	C _{res}		—	23	—	pF
栅极电荷总量 Total gate charge	Q _g	V _{CC} =400V, I _C =15A, V _{GE} =15 V T _C =25℃	—	24.8	—	nC
栅极—发射极 Gate to emitter charge	Q _{ge}		—	9.2	—	
栅极—集电极 Gate to collector charge	Q _{gc}		—	10.4	—	

项 目 Parameter	符 号 Symbol	MAX	单 位 Unit
		TO-220MF/TO-220MF-K1	
结到管壳的热阻 Thermal resistance, junction to case IGBT	$R_{th(j-c)}$	3.4	$^\circ C/W$
结到管壳的热阻 Thermal resistance, junction to case diode	$R_{th(j-c)}$	4.5	$^\circ C/W$
结到环境的热阻 Thermal resistance, junction to ambient	$R_{th(j-A)}$	62.5	$^\circ C/W$





电特性 ELECTRICAL CHARACTERISTICS

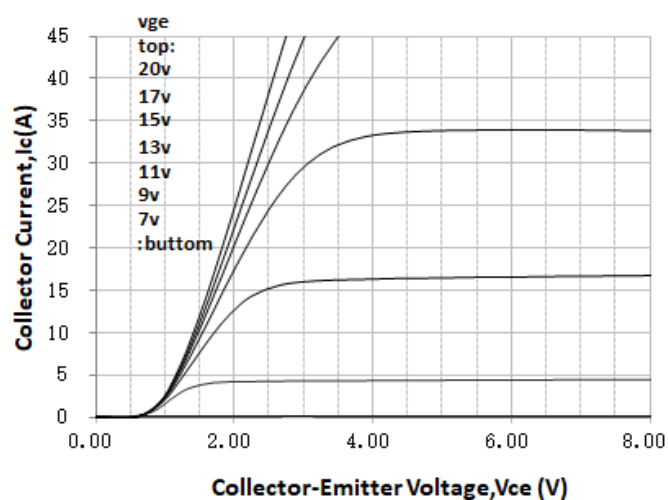
开关特性 Switching Characteristics						
项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
开启延迟时间 Turn-on delay time	t _d (on)	V _{CC} =400V, I _c =15A, R _G =10 Ω V _{GE} =15 V, T _c =25℃	—	4	—	ns
上升时间 Turn-on rise time	t _r		—	26	—	ns
关断延迟时间 Turn-off delay time	t _d (off)		—	26	—	ns
下降时间 Turn-off fall time	t _f		—	80	—	ns
开通损耗 Turn-on energy	E _{on}		—	0.18	—	mJ
关断损耗 Turn-off energy	E _{off}		—	0.27	—	mJ
总开关损耗 Total switching energy	E _{tot}		—	0.45	—	mJ
开启延迟时间 Turn-on delay time	t _d (on)	V _{CC} =400V, I _c =15A, R _G =10 Ω V _{GE} =15 V, T _c =150℃	—	6	—	ns
上升时间 Turn-on rise time	t _r		—	28	—	ns
关断延迟时间 Turn-off delay time	t _d (off)		—	28	—	ns
下降时间 Turn-off Fall time	t _f		—	134	—	ns
开通损耗 Turn-on energy	E _{on}		—	0.2	—	mJ
关断损耗 Turn-off energy	E _{off}		—	0.4	—	mJ
总开关损耗 Total switching energy	E _{tot}		—	0.6	—	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 =15A, T _c =25℃	—	1.8	2.1	V
		V _{GE} =0V, I _F =15A, T _c =150℃	—	1.6	—	V
反向恢复时间 Diode reverse recovery time	t _{rr}	V _{GE} =0V, V _R =400V, I _F =15A dI _F /dt=200A/ μ s T _c =25℃	—	40	—	ns
反向恢复电荷 Diode reverse recovery charge	Q _{rr}		—	22	—	nC
反向恢复电流 Diode reverse recovery current	I _{RRM}		—	0.98	—	A
反向恢复时间 Diode reverse recovery time	t _{rr}	V _{GE} =0V, V _R =400V, I _F =15A dI _F /dt=200A/ μ s T _c =150℃	—	182	—	ns
反向恢复电荷 Diode reverse recovery charge	Q _{rr}		—	256	—	nC
反向恢复电流 Diode reverse recovery current	I _{RRM}		—	2.5	—	A



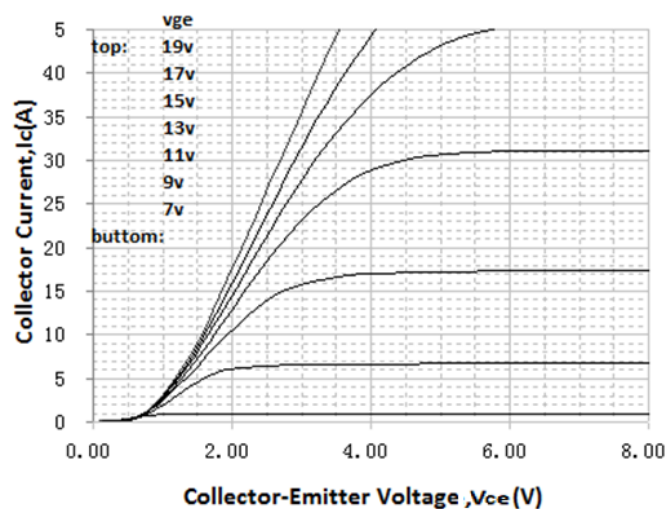


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

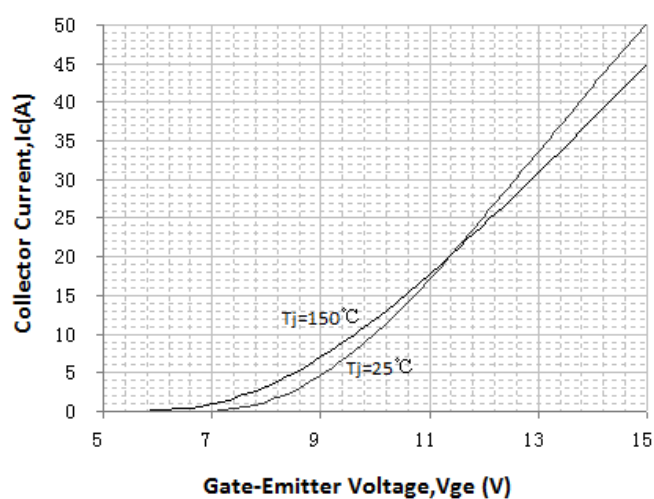
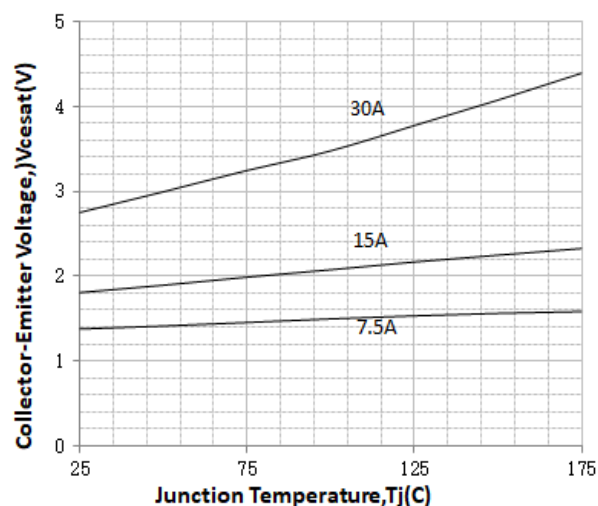
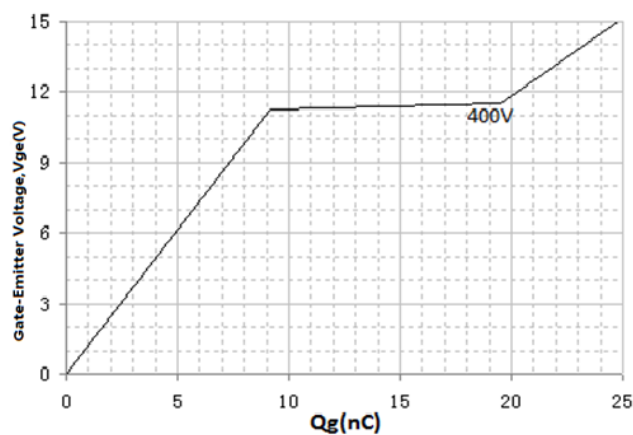
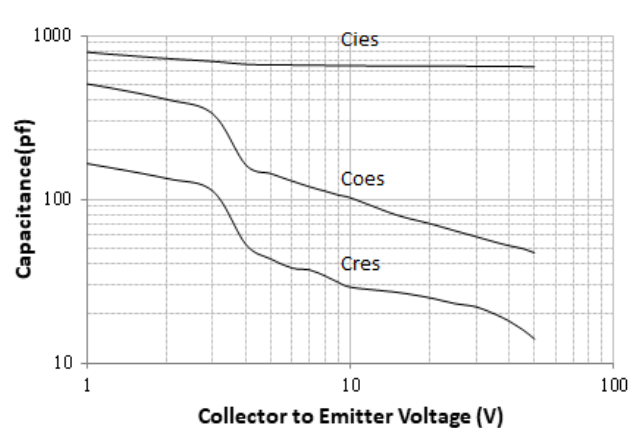
Output Characteristics (25°C)



Output Characteristics (175°C)

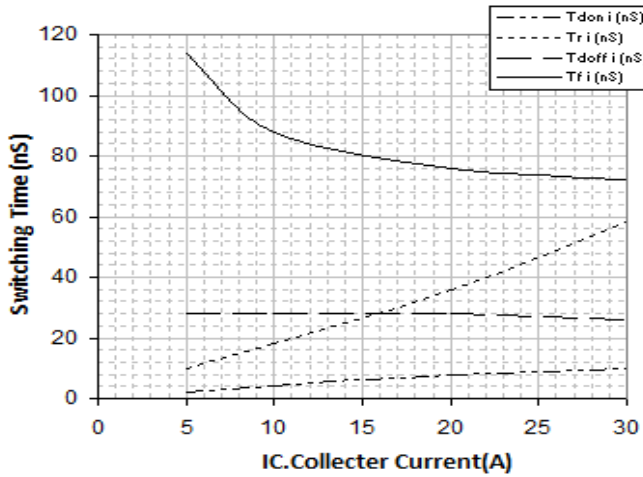


Transfer Characteristics

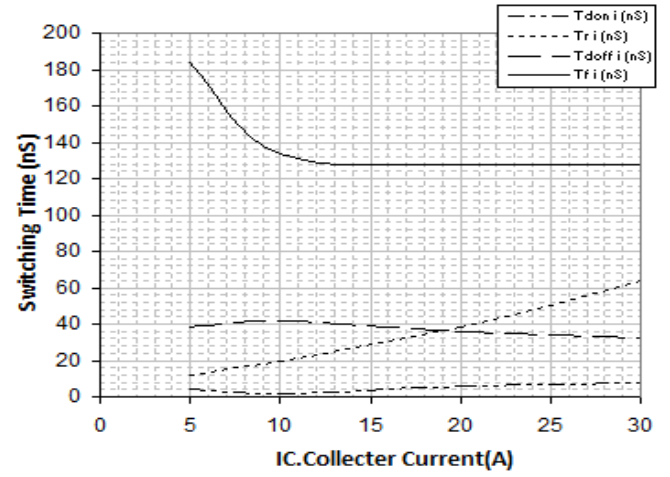
 V_{cesat} vs. T_j Gate Charge Characteristics
 $V_{ge}=15\text{V}$, $V_{cc}=400\text{V}$, $I_c=15\text{A}$ Capacitance Characteristic
 $V_{ge}=0\text{V}$, $f=1.0\text{MHz}$ 



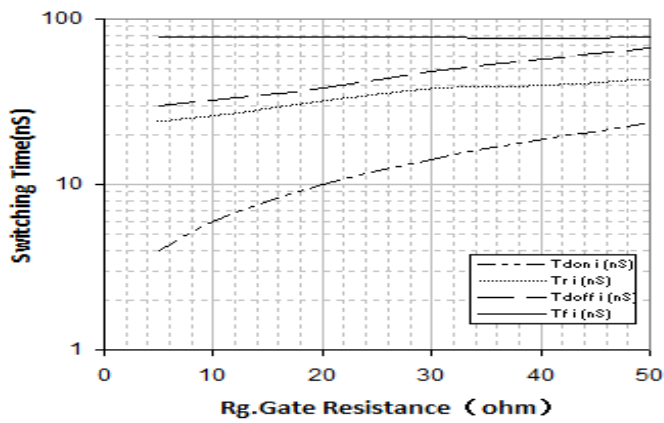
Switching Time vs. I_C (25°C)
VCE=400V, VGE=15V, Rg=10 Ω



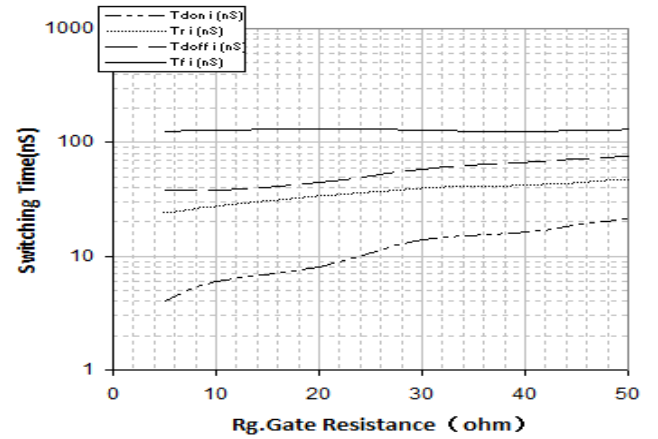
Switching Time vs. I_C (150°C)
VCE=400V, VGE=15V, Rg=10 Ω



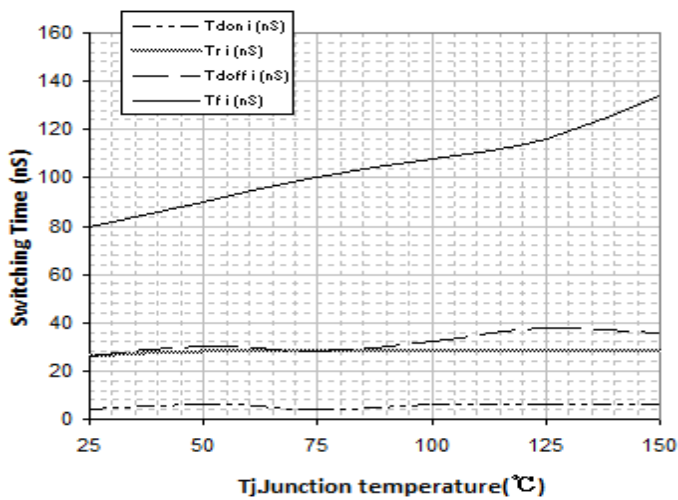
Switching Time vs. Rg (25°C)
VGE=15V, VCE=400V, IC=15A



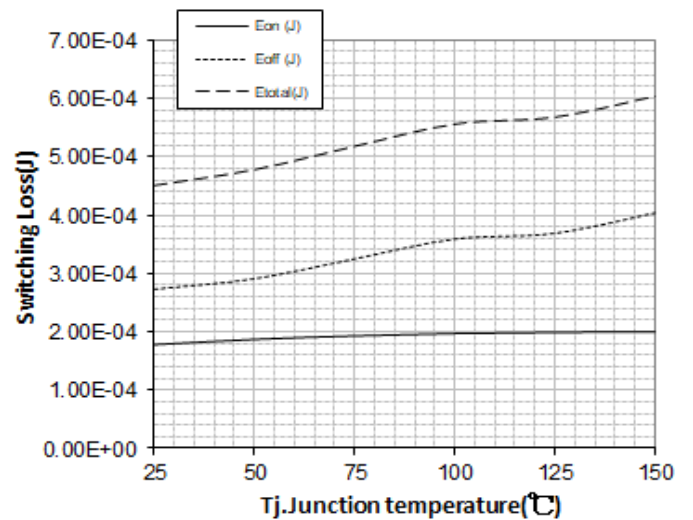
Switching Time vs. Rg (150°C)
VGE=15V, VCE=400V, IC=15A



Switching Time vs. T_J
VGE=15V, VCE=400V, IC=15A, Rg=10 Ω

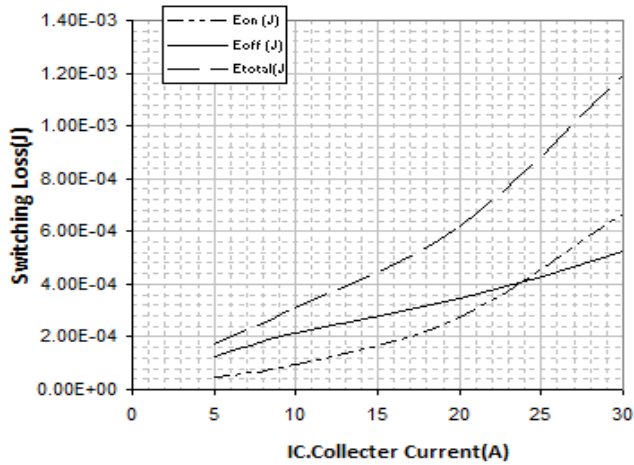


Switching Loss vs. T_J
VGE=15V, VCE=400V, IC=15A, Rg=10 Ω

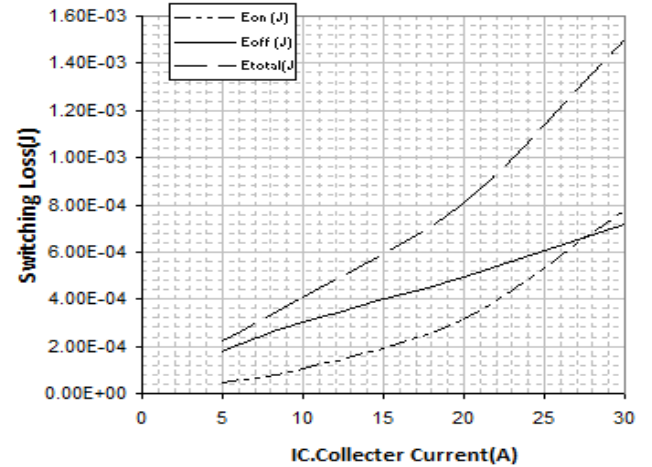




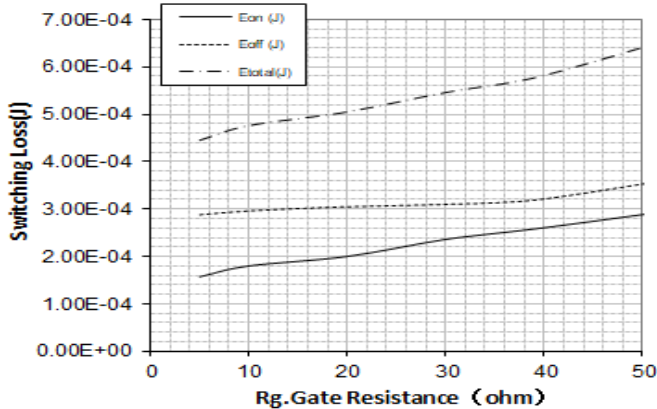
Switching Loss vs. IC(25°C)
VGE=15V, VCE=400V, Rg=10 Ω



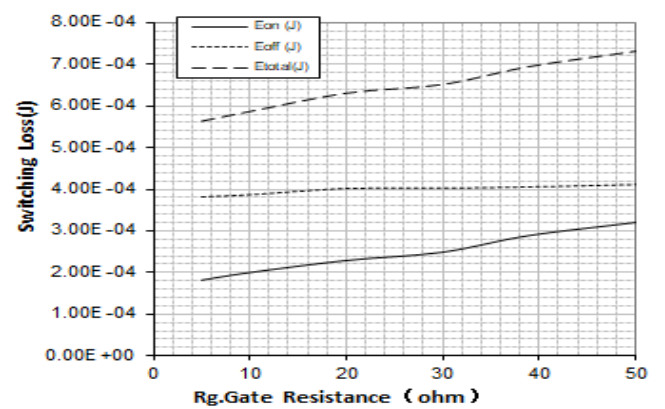
Switching Loss vs. IC(150°C)
VGE=15V, VCE=400V, Rg=10 Ω



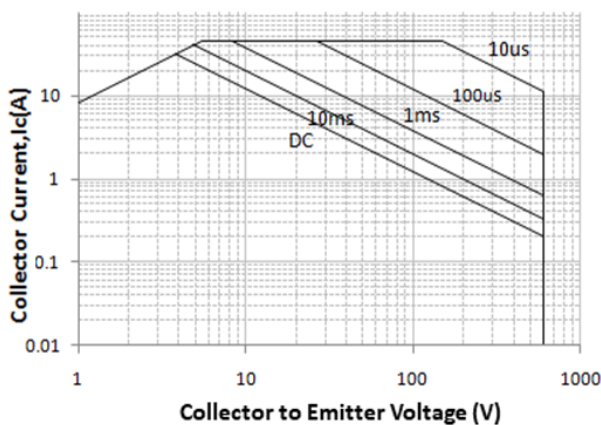
Switching Loss vs. Rg(25°C)
VGE=15V, VCE=400V, IC=15A



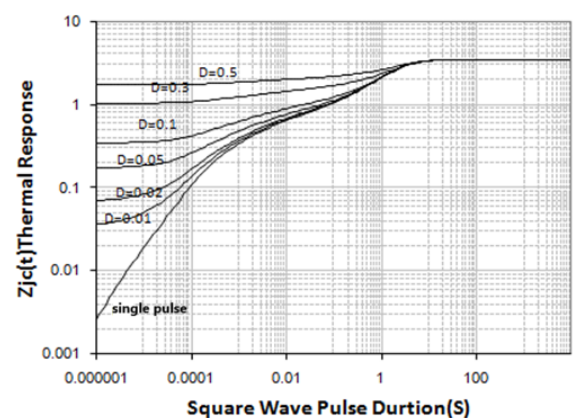
Switching Loss vs. Rg(150°C)
VGE=15V, VCE=400V, IC=15A



Forward Bias SOA
TO-220MF/TO-220MF-K1



Normalized Maximum Transient Thermal
Impedance for IGBT (RJC) TO-220MF/TO-220MF-K1

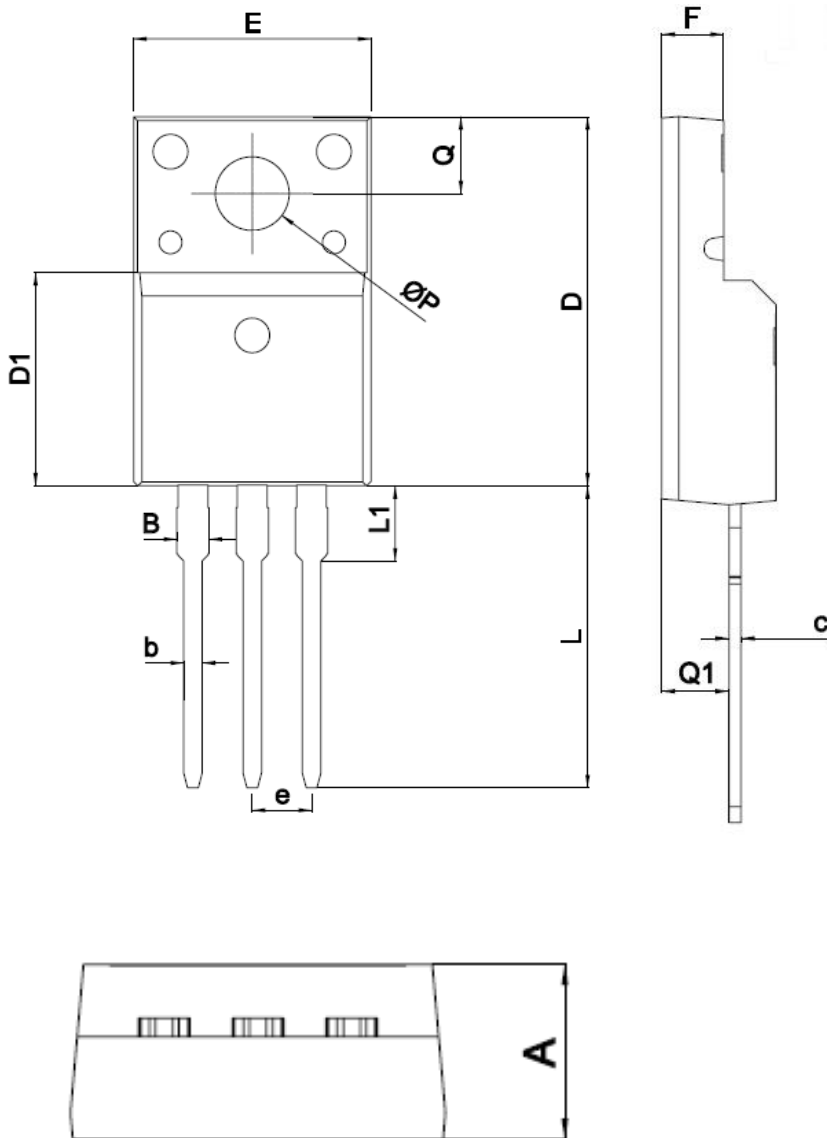




外形尺寸 PACKAGE MECHANICAL DATA

TO-220MF

单位 Unit: mm



SYMBOL	mm	
	MIN	MAX
A	4.5	4.9
B		1.47
b	0.7	0.9
c	0.45	0.60
D	15.67	16.07
D1	9.04	9.20
e	2.54TYPE	
E	9.96	10.36
F	2.34	2.74
L	12.58	13.38
L1	3.13	3.33
Q	3.2	3.4
Q1	2.56	2.96
ΦP	3.08	3.28

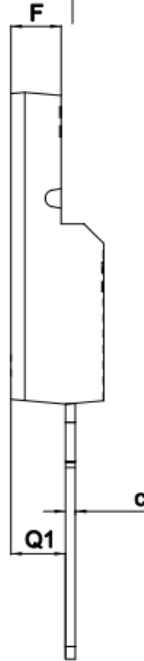
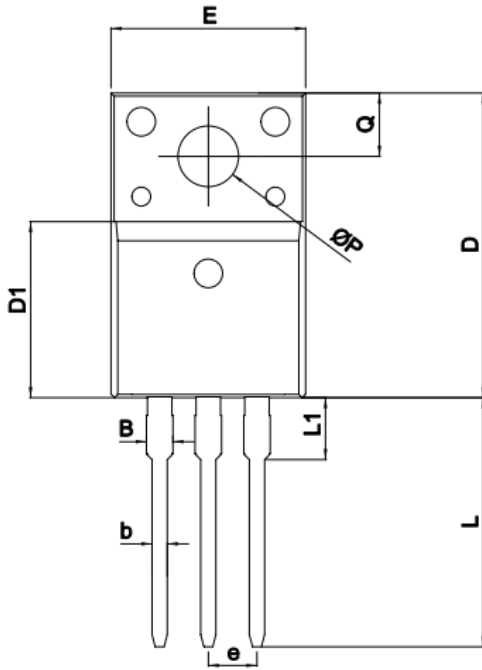




外形尺寸 PACKAGE MECHANICAL DATA

TO-220MF-K1

单位 Unit: mm



SYMBOL	mm	
	MIN	MAX
A	4.5	4.9
B	1.22	1.47
b	0.7	0.9
c	0.45	0.60
D	15.6	16.1
D1	9.0	9.3
e	2.54TYPE	
E	9.9	10.4
F	2.3	2.8
L	12.6	13.3
L1	3.1	3.4
Q	3.2	3.4
Q1	2.6	2.9
ΦP	3.0	3.5





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