



25GU60

主要参数 Main Characteristics

I_C	25A
V_{ces}	600 V
$V_{cesat-typ}$	2.1V

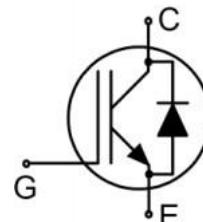
用途

- 光伏逆变器
- UPS 电源
- 电焊机
- 中高频率逆变器

Applications

- Solar Converters
- Uninterrupted Power Supply
- Welding Converters
- Mid to High Range Switching

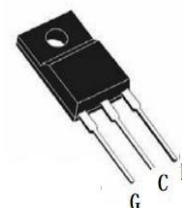
Frequency Converters



TO-220MF

产品特性

- 650V, 20A
- $V_{CE(sat)(typ.)} = 2.1V @ V_{GE} = 15V, I_C = 25A$
- Maximum Junction Temperature 150°C
- Pb-free Lead Plating; RoHS Compliant



产品中有毒有害物质或元素的名称及含量

部件名称 含量要求	有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
	≤0.1%	≤0.1%	≤0.01%	≤0.1%	≤0.1%	≤0.1%
引线框	○	○	○	○	○	○
塑封树脂	○	○	○	○	○	○
管 芯	○	○	○	○	○	○
内引线	○	○	○	○	○	○
焊 料	×	○	○	○	○	○
说 明	○：表示该元素的含量在 SJ/T11363-2006 标准的限量要求以下。 ×：表示该元素的含量超出 SJ/T11363-2006 标准的限量要求。 目前产品的焊料中含有铅 (Pb) 成分，但属于欧盟 RoHS 指令豁免范围。					

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-Emmitter Voltage	V_{ces}	600	V
最高栅极发射极电压 Gate-Emmitter Voltage	V_{GES}	± 30	V
连续集电极电流 Collector Current-continuous	$I_c \quad T=25^{\circ}\text{C}$	45	A
	$I_c \quad T=100^{\circ}\text{C}$	25	A
最大脉冲集电极极电流 (注 1) Collector Current – pulse (note 1)	I_{CM}	45	A
二极管正向电流 Diode Continuous Forward Current	$I_F \quad T=100^{\circ}\text{C}$	25	A
二极管最大正向电流 Diode Maximum Forward Current (Note 1)	I_{FM}	45	A
短路时间 Short Circuit Withstand Time	t_{sc}	10	μs
耗散功率 Power Dissipation	$P_D \quad T_c=25^{\circ}\text{C}$	42	W
	$P_D \quad T_c=100^{\circ}\text{C}$	16.7	W
最高结温 Operating Junction Temperature	T_J	$-55 \sim +150$	$^{\circ}\text{C}$
存储温度 Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^{\circ}\text{C}$

热特性 **Electrical Characteristics**

项 目 Parameter	符 号 Symbol	数 值 Value	单 位 Unit
IGBT结到管壳的热阻 Thermal Resistance, Junction to case for IGBT	R_{thj-c}	3.0	$^{\circ}\text{C/W}$
FRD结到管壳的热阻 Thermal Resistance, Junction to case for Diode	R_{thj-c}	2.9	$^{\circ}\text{C/W}$
结到环境的热阻 Thermal Resistance, Junction to Ambient	R_{thj-a}	65	$^{\circ}\text{C/W}$

IGBT电特性 Electrical Characteristics of IGBT($T_c=25^\circ\text{C}$ unless otherwise noted)

项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
集电极-发射极击穿电压 Collector-Emitter Breakdown Voltage	BV_{CES}	$I_C=250\mu\text{A}$, $V_{GE}=0\text{V}$	600	-	-	V
零栅压下集电极漏电流 Collector-Emitter Leakage Current	I_{CES}	$V_{CE}=650\text{V}$, $V_{GE}=0\text{V}$,	-	-	100	μA
正向栅极体漏电流 Gate Leakage Current	I_{GES}	$V_{GE}=\pm 30\text{V}$, $V_{CE}=0\text{V}$	-	-	± 100	nA
阈值电压 Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$, $I_C=250\mu\text{A}$	4.5	-	6.5	V
饱和压降 Collector-Emmitter saturation Voltage	$V_{CE(SAT)}$	$V_{GE}=15\text{V}$, $I_C=20\text{A}$	-	2.1	2.6	V
栅极电荷总量 Total Gate Charge	Q_g	$V_{CC}=480\text{V}$ $V_{GE}=15\text{V}$ $I_C=25\text{A}$	-	41.0	-	nC
栅极-反射极 Gate to emitter charge	Q_{ge}		-	13.9	-	nC
栅极-集电极 Gate to collector charge	Q_{gc}		-	24.5	-	nC
开启延迟时间 Turn-On delay time	$t_{d(on)}$	$V_{CC}=400\text{V}$ $V_{GE}=15\text{V}$ $I_C=25\text{A}$ $R_G=15\Omega$ Inductive Load $T_c=25^\circ\text{C}$	-	37	-	ns
上升时间 Turn-On rise time	t_r		-	97	-	ns
关断延迟时间 Turn-Off delay time	$t_{d(off)}$		-	76	-	ns
下降时间 Turn-Off Fall time	t_f		-	88	-	ns
开通损耗 Turn-On energy	E_{on}		-	1.38	-	mJ
关断损耗 Turn-off energy	E_{off}		-	0.53	-	mJ
总开关损耗 Total switching energy	E_{tot}		-	1.91	-	mJ
输入电容 Input capacitance	C_{ies}	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1.0\text{MHz}$	-	967	-	pF
输出电容 Output capacitance	C_{oes}		-	58	-	pF
反向传输电容 Reverse transfer capacitance	C_{res}		-	18.5	-	pF

二极管电特性 Electrical Characteristics of Diode ($T_c=25^\circ\text{C}$ unless otherwise noted)

正向压降 Diode Forward Voltage	V_F	$I_F=25\text{A}$	-	1.55	2.45	V
反向恢复时间 Diode Reverse Recovery Time	t_{rr}	$V_{CE}=400\text{V}$ $I_F=25\text{A}$ $R_g=15\Omega$	-	70		ns
反向恢复电流 Diode peak Reverse Recovery Current	I_{rr}		-	10.6		A
反向恢复电荷 Diode Reverse Recovery Charge	Q_{rr}		-	433		nC

Note1: Repetitive rating, pulse width limited by maximum junction temperature

特征曲线 ELECTRICAL CHARACTERISTICS (curves)

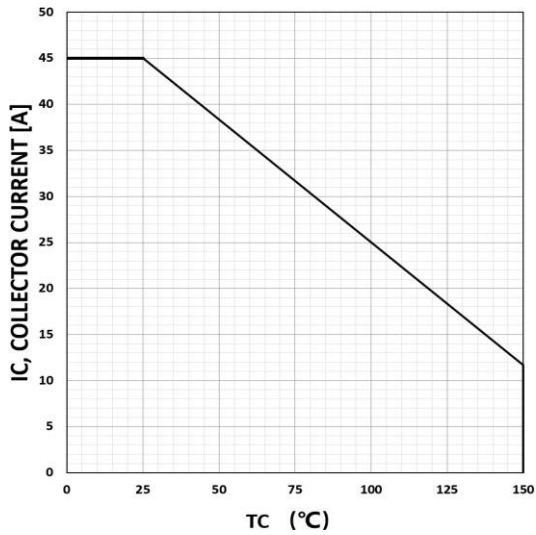


Figure 1. Maximum DC collector current
VS. case temperature

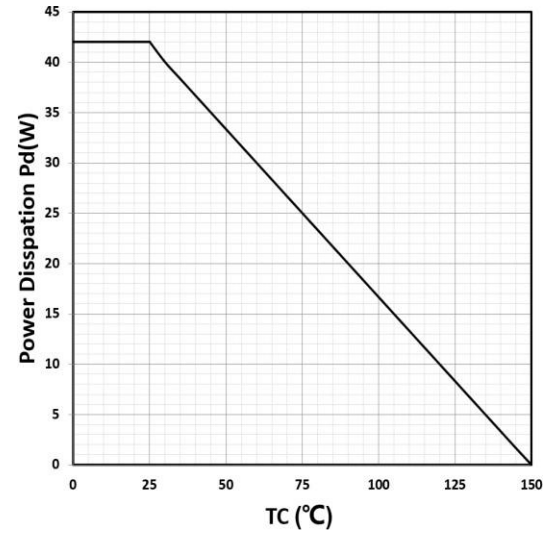


Figure 2. Power dissipation VS. case temperature

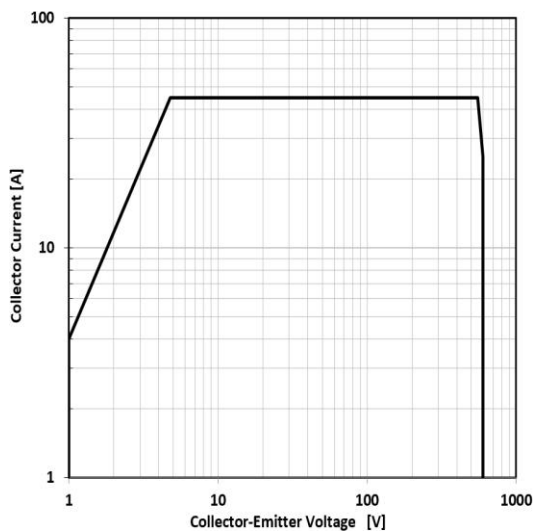


Figure 3. Reverse bias SOA, $T_j=125^\circ\text{C}$, $V_{ge}=15\text{V}$

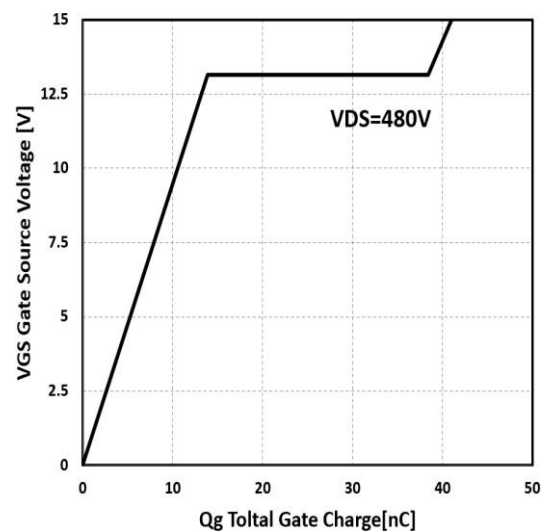


Figure 4: Typical gate charge VS. V_{GS} , $I_C=25\text{A}$

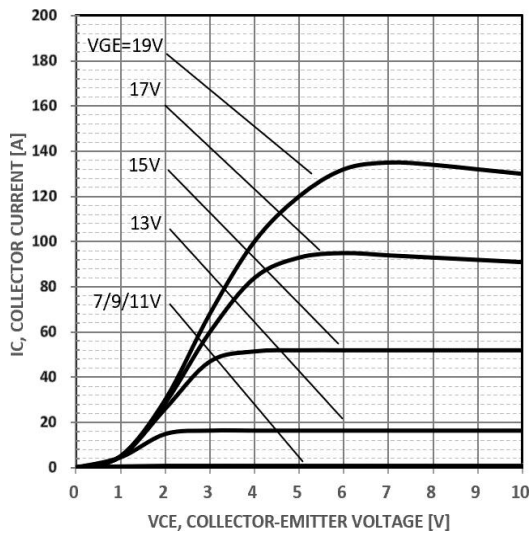


Figure 5. Typical output characteristics
 $t_p=300\mu\text{s}$ $T_c=25^{\circ}\text{C}$

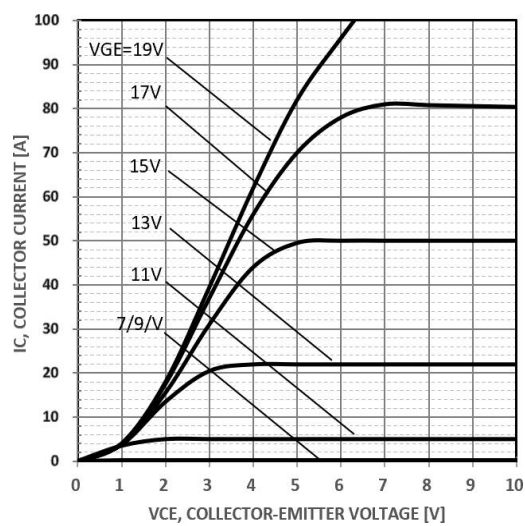


Figure 6. Typical output characteristics
 $t_p=300\mu\text{s}$ $T_c=150^{\circ}\text{C}$

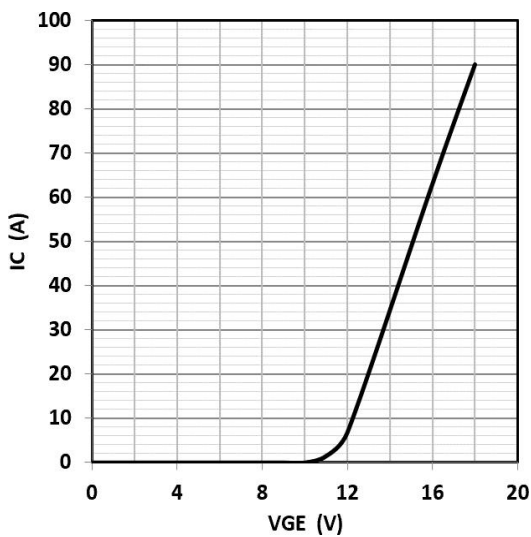


Figure 7. Typical gate threshold voltage

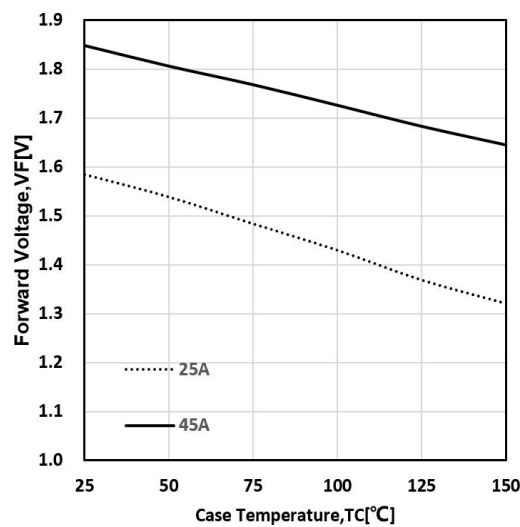


Figure 8. Typical forward voltage vs T_c

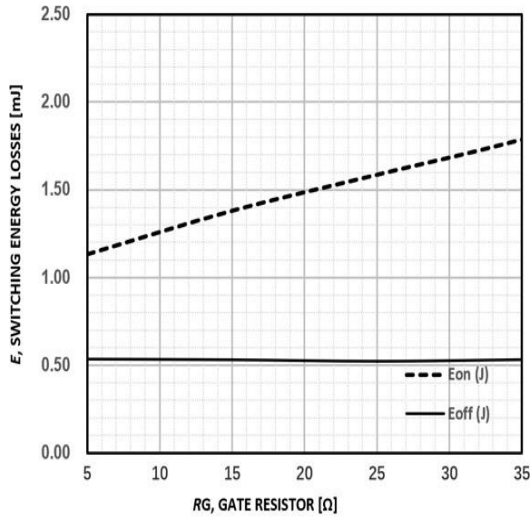


Figure9: Typical energy loss VS. Rg, TC=25°C,
VCE=400V, VGE=15V, IC=25A

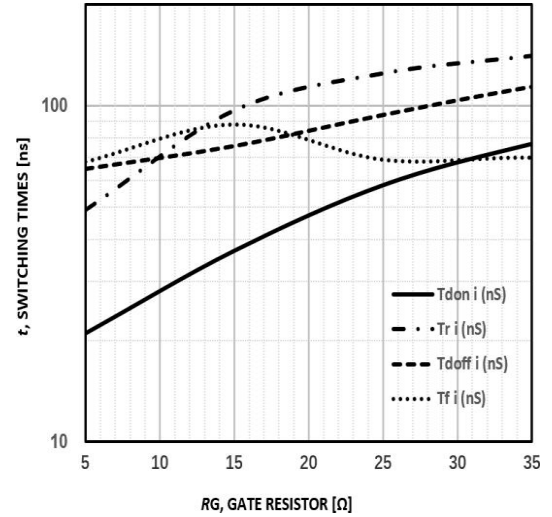


Figure10: Typical switching time VS. Rg, TC=25°C,
VCE=400V, VGE=15V, IC=25A

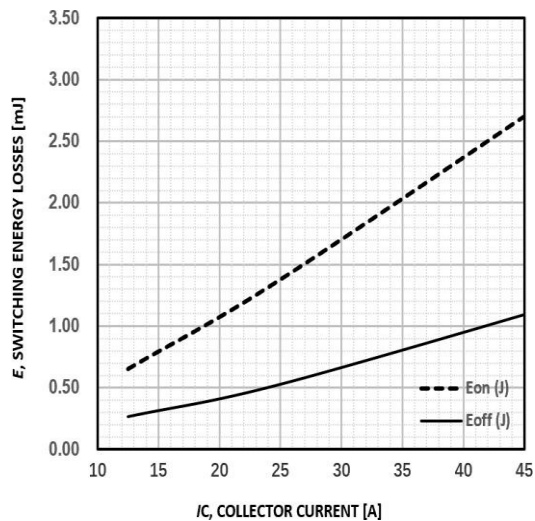


Figure11: Typical energy loss VS. IC, TC=25°C,
VCE=400V, VGE=15V, RG=15Ω

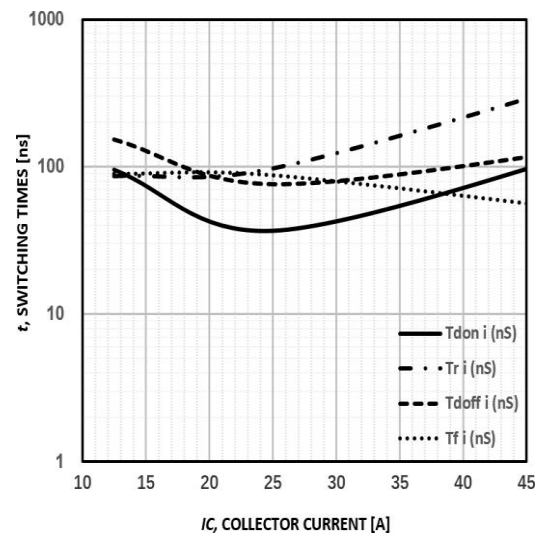


Figure12: Typical switching time VS. IC, TC=25°C,
VCE=400V, VGE=15V, RG=15Ω

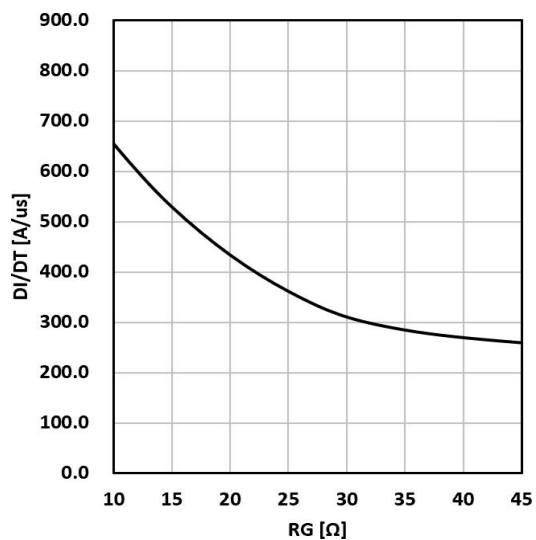


Figure 13. Typical diode di/dt vs rg Tc=25°C
VCE=400V VGE=15V IF=25A

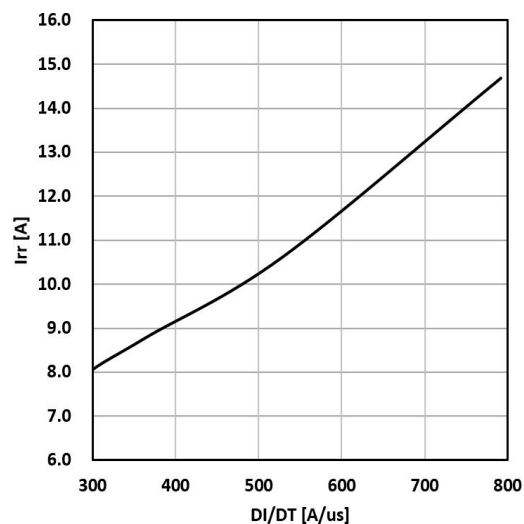


Figure 14. Typical diode irr vs di/dt Tc=25°C
VCE=400V VGE=15V IF=25A

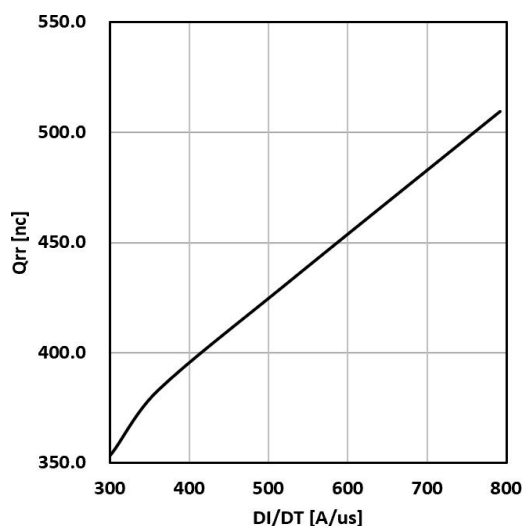


Figure 15. Typical diode Qrr vs di/dt Tc=25°C
VCE=400V VGE=15V IF=25A

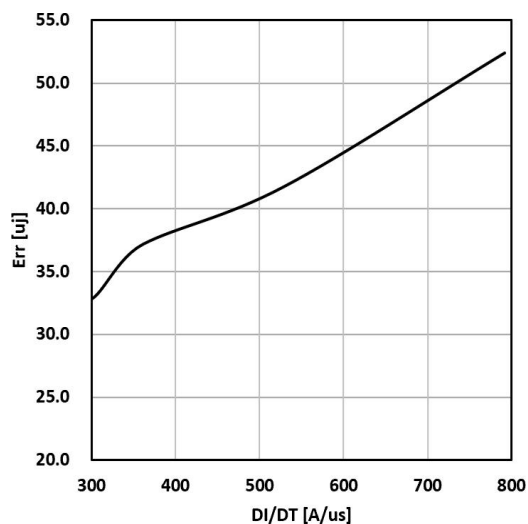


Figure 16. Typical diode Err vs di/dt Tc=25°C
VCC=400V VGE=15V IF=25A

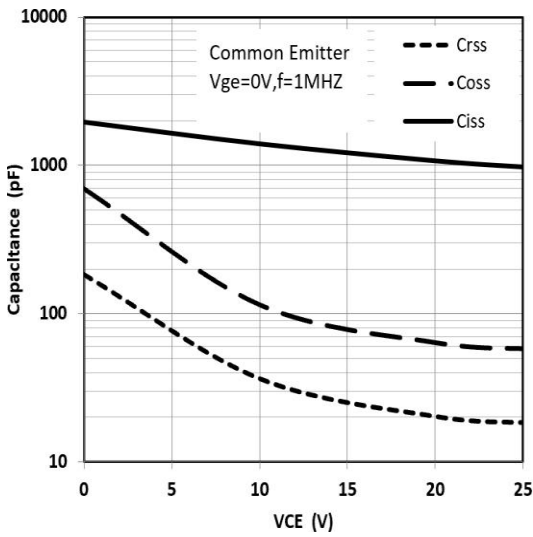


Figure17:Typical capacitance VS. VCE,
VGE=0V,f=1MHz

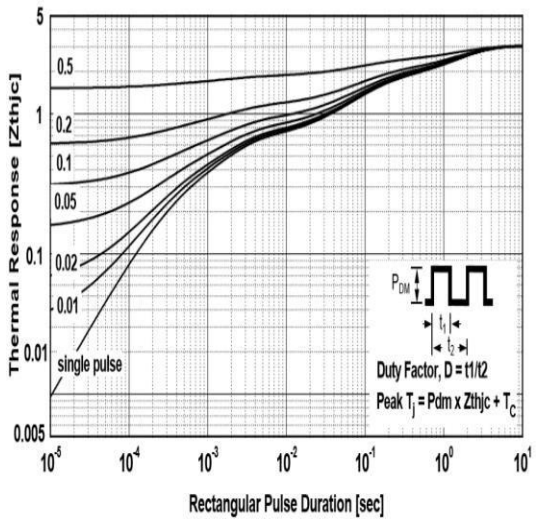
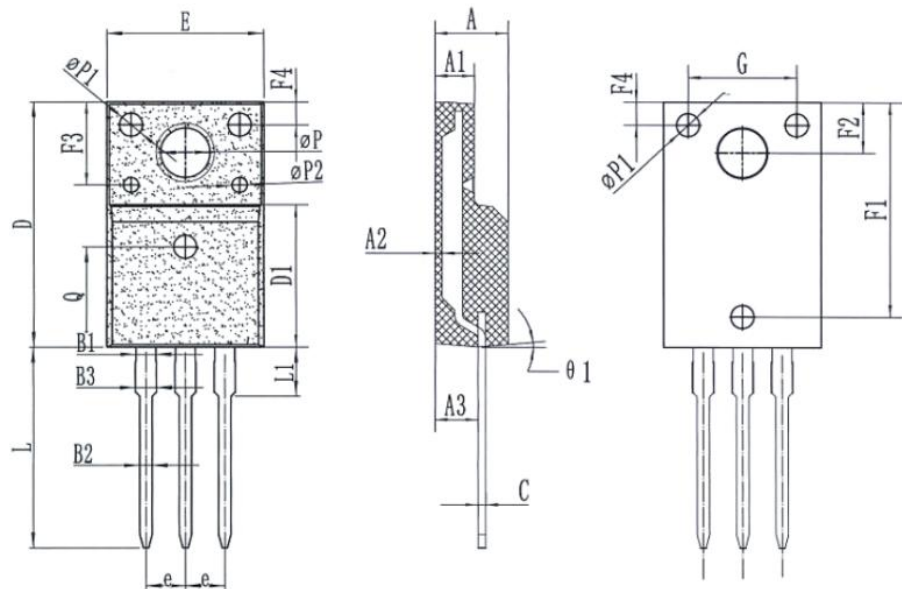


Figure18. normalized transient thermal impedance,
junction-to-case

外形尺寸 PACKAGE MECHANICAL DATA

TO-220MF



COMMON DIMENSIONS			
SYMBOL	MIN	NOM	MAX
A	4.60	4.70	4.80
A1	2.44	2.54	2.64
A2	0.38	0.43	0.48
A3	2.66	2.76	2.86
B1	1.24	1.29	1.34
B2	0.75	0.80	0.85
B3	1.28	1.36	1.44
C	0.45	0.50	0.55
D	15.67	15.87	16.07
D1	9.07	9.17	9.27
e	2.54BSC		
E	10.06	10.16	10.26
E1	9.92	10.02	10.12
E2	9.36	9.46	9.56
F1	13.80	13.90	14.00
F2	3.20	3.30	3.40
F3	5.30	5.40	5.50
F4	1.40	1.50	1.60
G	6.90	7.00	7.10
K	0.65	0.70	0.75
L	12.76	12.96	13.16
L1	2.73	2.93	3.13
Q	6.47REF		
φP	3.00	3.18	3.38
φP1	1.40	1.50	1.60
φP2	0.95	1.00	1.05
θ 1	3°	5°	7°