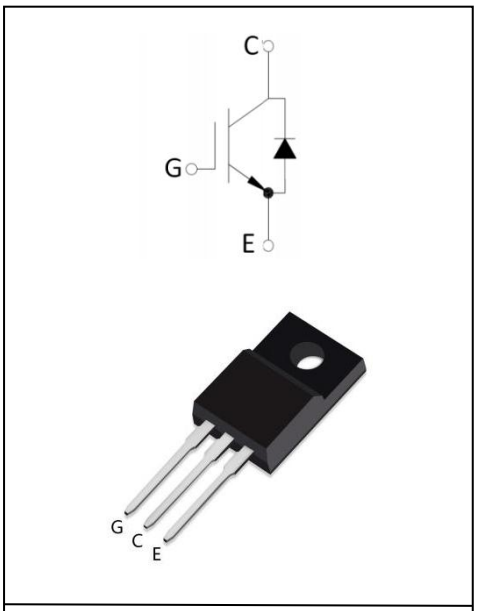
Thunder High Power Products

Silicon Trench NPT IGBT

Description

The THG20T65NQF is use advanced trench NPT technology.
The 650V NPT Trench IGBT offers superior conduction and switching performances.



THUNDER TO-220F

General Features

- High Speed Switching & Low Power Loss
- Low saturation voltage: $V_{CE(sat)}$ = 1.95V @ I_C = 20A
- E_{off} = 0.6mJ @ T_C = 25°C
- Maximum junction temperature 175°C

Application

- Solar Converters
- Welding Converters
- UPS
- PFC
- PV Inverter

Absolute Maximum Ratings @ Tc=25°C (unless otherwise specified)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current	40	A
	Collector Current @Tc=100°C	20	A
I_{CM}	Pulsed Collector Current	60	A
I_F	Diode Continuous Forward Current @Tc=100°C	20	A
I_{FM}	Pulsed Diode Forward Current	60	A
P_D	Total Dissipation at @Tc = 25°C	125	W
	Total Dissipation at @Tc = 100°C	62.5	
T_j	Operating Junction and Storage Temperature Range	-55 to +175	°C
T_L	Max Temperature For Soldering	260	°C
T_{SC}	Short circuit withstand time VGE=15V, VCC≤400V, Allowed number of short circuits<1000Time between short circuits:≥1.0s,Tj≤150°C	5	us

Electrical Characteristics @ Tc=25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
Static Characteristics							
V_{CES}	Collector-Emitter Voltage	V_{GE}=0V, I_{CE}=250μA		650	—	—	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=20A	T_j = 25°C	—	1.95	2.50	V
			T_j = 175°C	—	2.15	—	V
$V_{GE(th)}$	Gated Threshold Voltage	V_{CE}= V_{GE}, I_C=0.5mA		4.8	5.7	6.6	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE} =650V		—	—	10	uA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	V_{GE} = +20V, V_{CE} = 0V		—	—	200	nA
$I_{GES(R)}$	Gate to Emitter Reverse Leakage	V_{GE} = -20V, V_{CE} = 0V		—	—	-200	nA
Dynamic Characteristics							
C_{ies}	Input Capacitance	V_{GE} =0V, V_{CE}=25V, f=1.0MHZ		—	1200	—	pF
C_{oes}	Output Capacitance			—	90	—	pF
C_{res}	Reverse Transfer Capacitance			—	15.1	—	pF
Q_g	Total Gate Charge	V_{CE}=480V,I_C=20A,V_{GE}=15V		—	72	—	nC
Q_{ge}				—	12	—	
Q_{gc}				—	37	—	
Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V,I_C=20A V_{GE}=15V,R_G=10Ω		—	30	—	nS
t_r	Rise Time			—	24	—	
$t_{d(off)}$	Turn-off Delay Time			—	170	—	
t_f	Fall Time			—	22	—	
E_{on}	Turn-on Switching Loss				0.221		mJ
E_{off}	Turn-off Switching Loss				0.586		

Electrical Characteristics of the Diode @T_C= 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I_F	Diode Continuous Forward Current	T_C = 100°C	20	—	—	A
I_{FM}	Pulsed Diode Forward Current	T_C = 25°C	60	—	—	A
V_F	Diode Forward Voltage	I_F =20A	—	1.6	2.4	V
t_{rr}	Reverse Recovery Time	T_J=25°C, I_F=20A di/dt=200A/us	—	80	—	nS
Q_{rr}	Reverse Recovery Charge		—	4.9	—	nC
*Pulse Test: Pulse Width <= 300μs, Duty Cycle< =2%						

Thermal Characteristic

Symbol	Paramter	Typ	MAX	Units
$R_{\theta JC}$	Themal Resistance,Junction to case for IGBT	--	1.2	°C/W
$R_{\theta JA}$	Themal Resistance,Junction to Ambient	--	59.5	°C/W

Typical Performance Characteristics

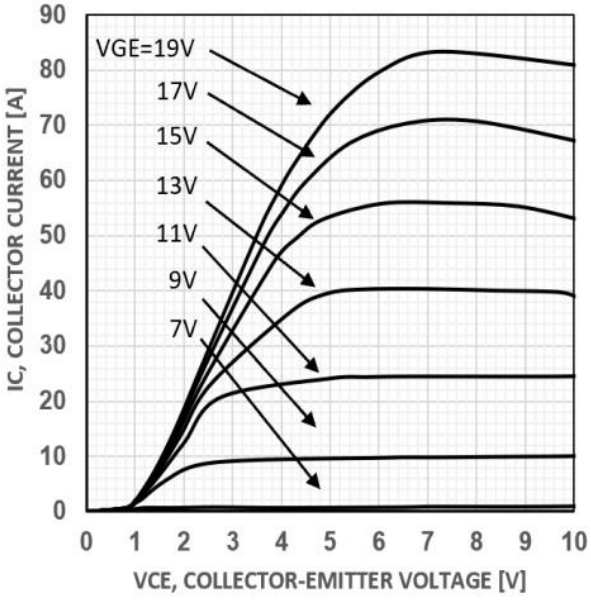


Figure1:typical IGBT output characteristics, TC=25℃

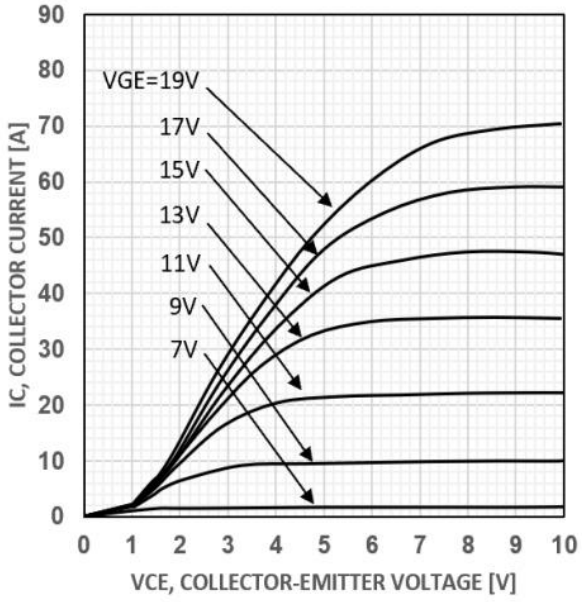


Figure2: typical IGBT output characteristics TC=125℃

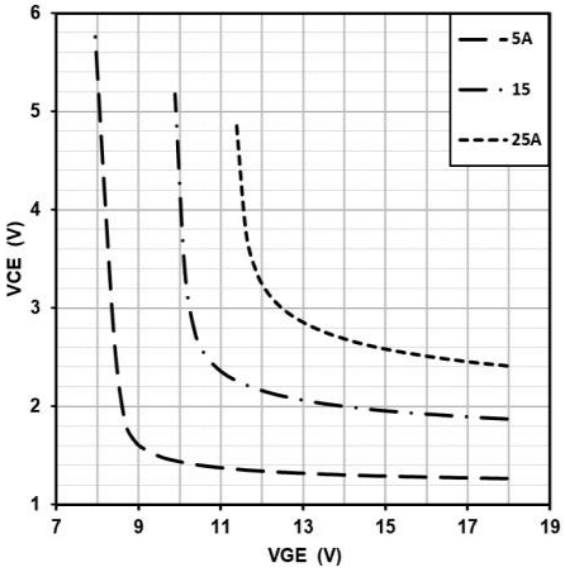


Figure3: typical VCE VS. VGE,TJ=25℃

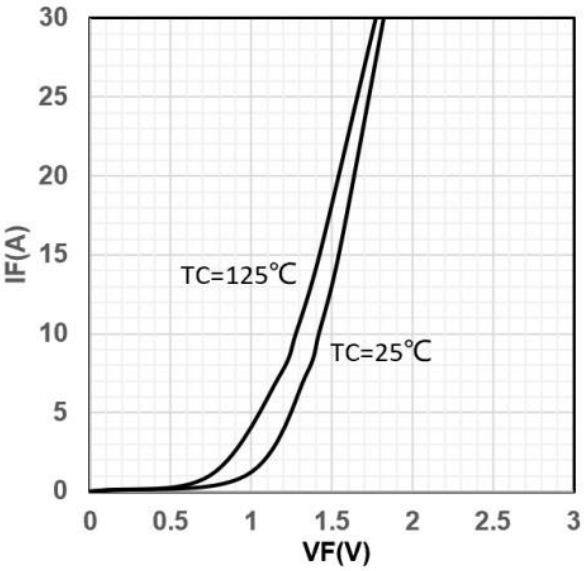


Figure4:typical diode forward characteristic

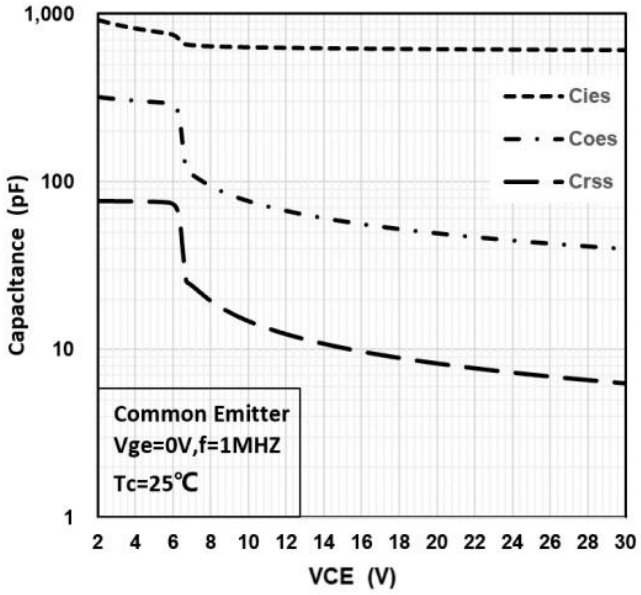


Figure5:typical capacitance VS. VCE,VGE=0V,f=100kHz

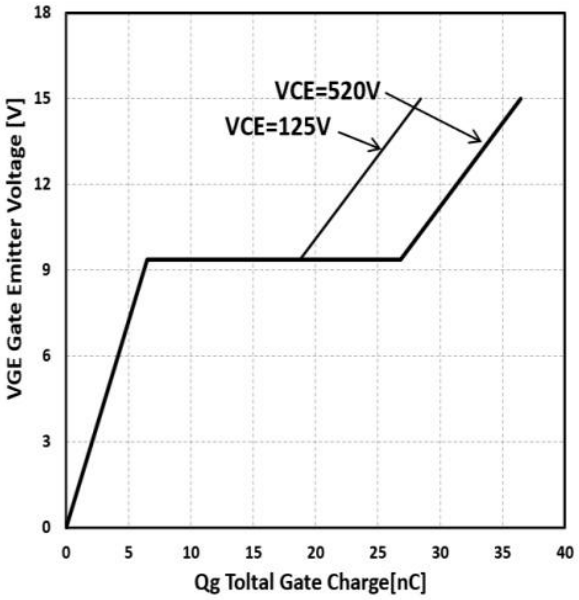


Figure 6 :typical gate charge VS. VGE,IC=15A

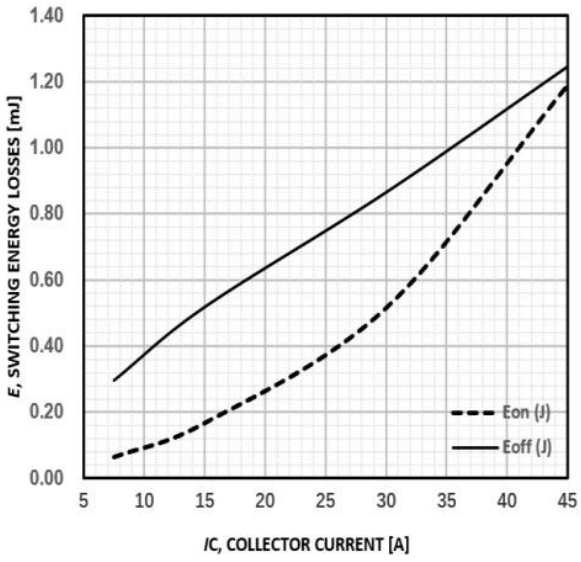


Figure 7 : typical energy loss VS. IC, TC=25℃,

L=500uH， VCE=400V,VGE=15V,Rg=10Ω

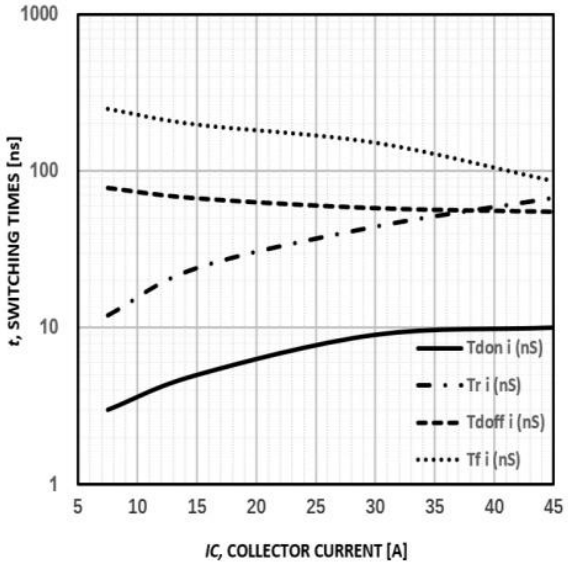


Figure 8 : typical switching time VS. IC, TC=25℃,

L=500uH, VCE=400V,VGE=15V,Rg=10Ω

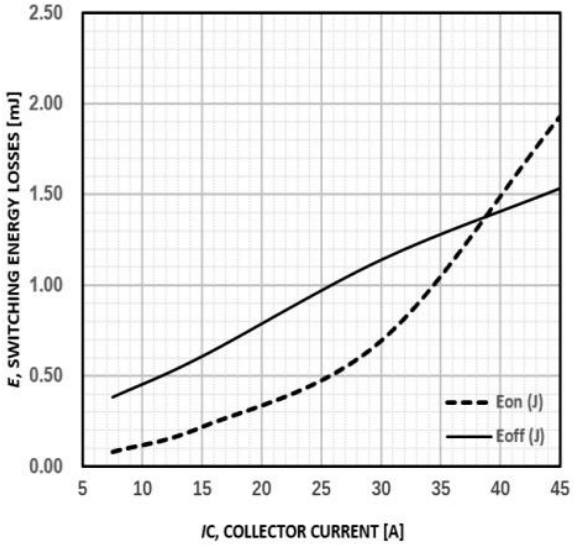


Figure 9 : typical energy loss VS. IC, TC=125℃,
L=500uH， VCE=400V,VGE=15V,Rg=10Ω

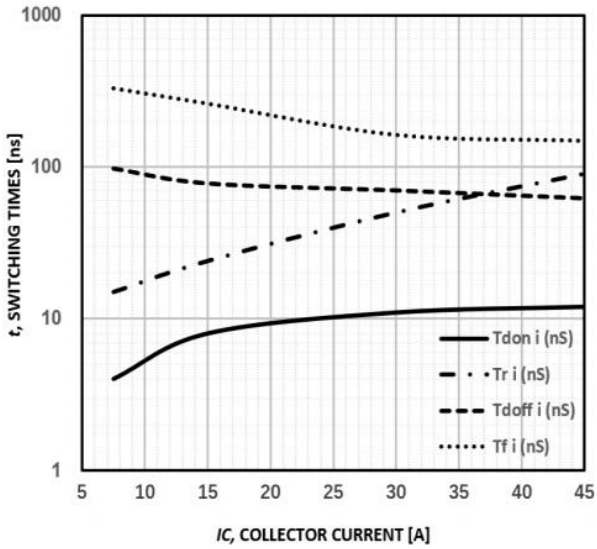


Figure10: typical switching time VS. IC, TC=125℃,
L=500uH, VCE=400V,VGE=15V,Rg=10Ω

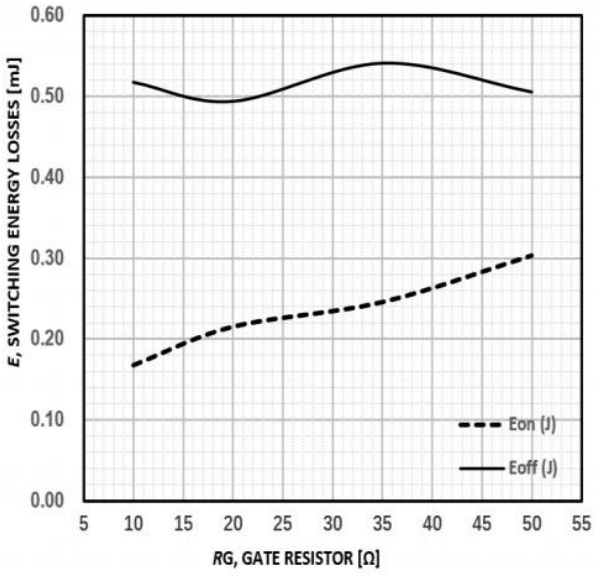


Figure11: typical energy loss VS. Rg,TC=25℃,
L=500uH, VCE=400V, VGE=15V ,IC=15A

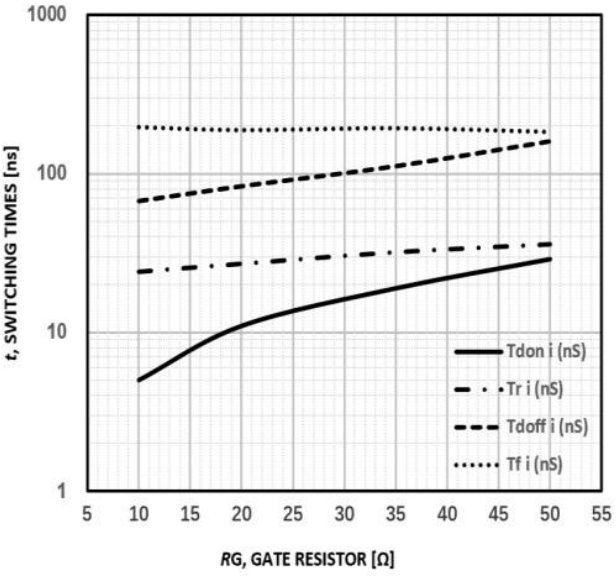


Figure12: typical switching time VS. Rg,TC=25℃,
L=500uH,VCE=400V,VGE=15V,IC=15A

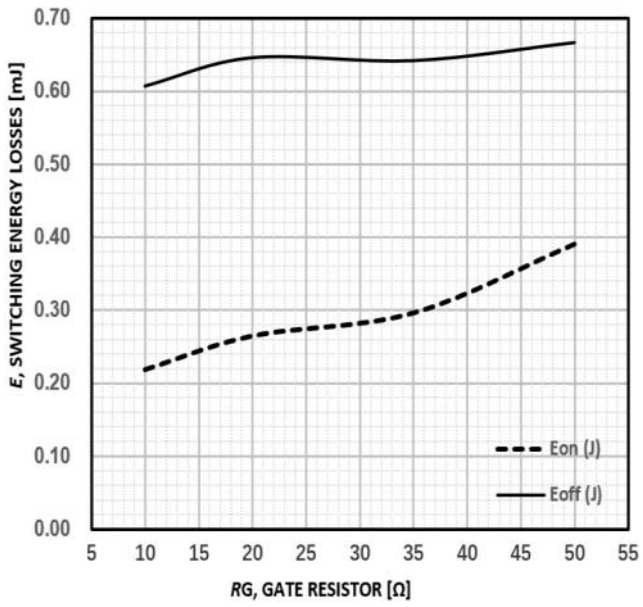


Figure13: typical energy loss VS. Rg,TC=125℃, L=500uH, VCE=400V, VGE=15V ,IC=15A

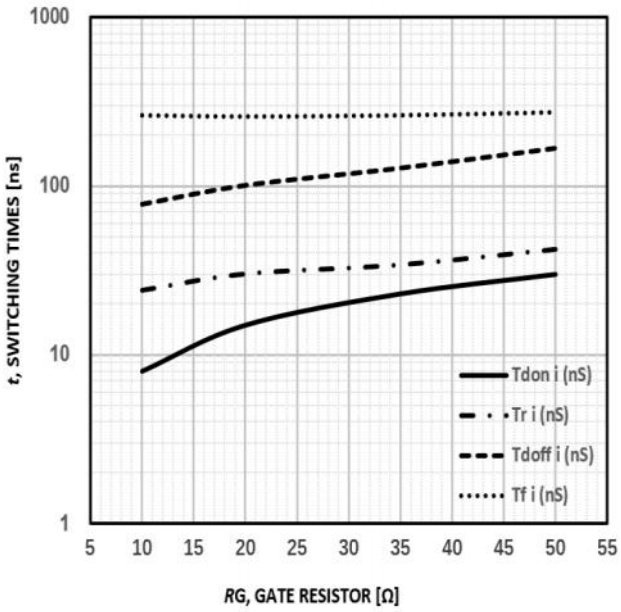


Figure14: typical switching time VS. Rg,TC=125℃, L=500uH,VCE=400V,VGE=15V,IC=15A

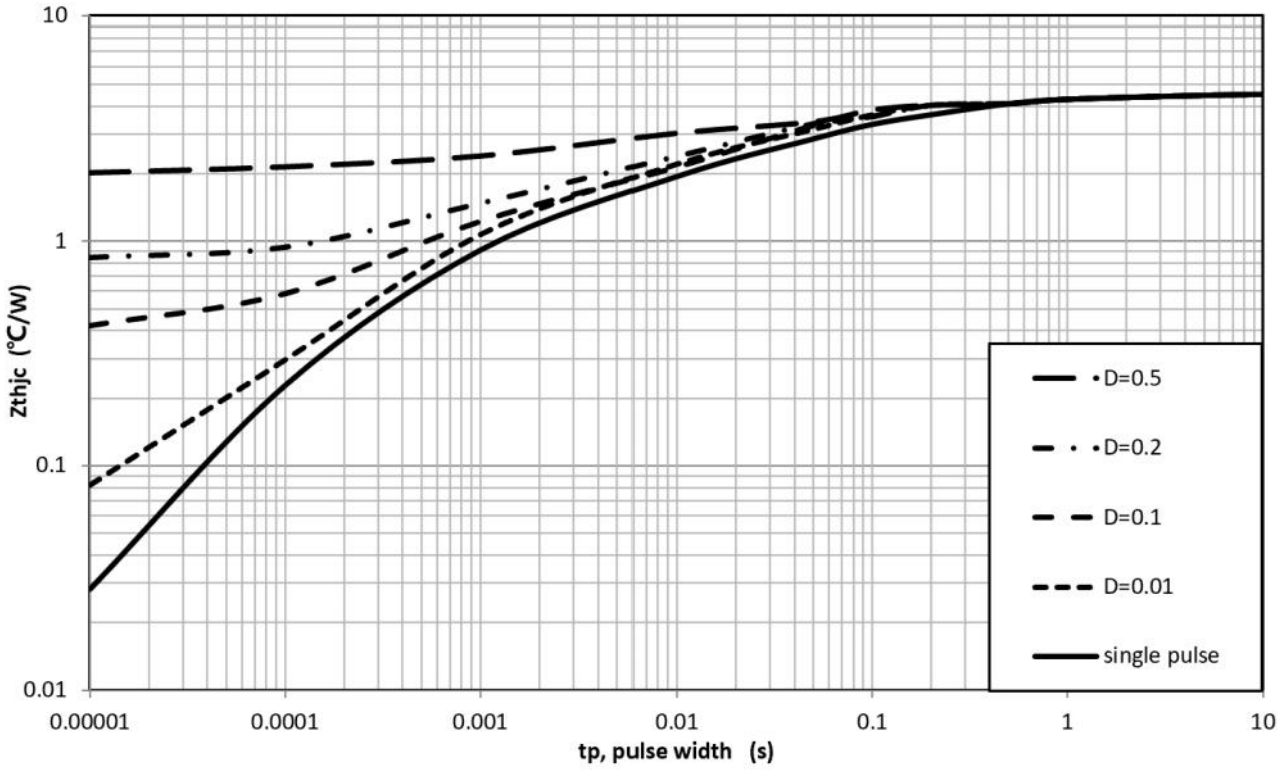
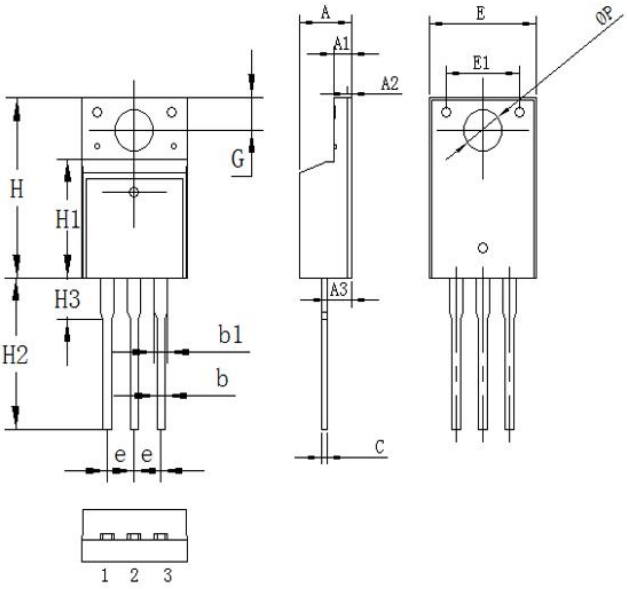


Figure15:normalized transient thermal impedance, junction-to-case

Package Information

TO-220F PACKAGE



基本尺寸

Symbol	单位 mm		
	Min	Nom	Max
A	4.55	4.75	4.95
A1	2.40	2.60	2.80
A2	0.40	0.60	0.80
A3	2.10	2.30	2.50
b1	1.10	1.30	1.50
b	0.60	0.80	1.00
c	0.42	0.50	0.58
e	2.30	2.50	2.70
E	9.9	10.1	10.3
E1	6.8	7	7.2
H	15.8	16.0	16.2
H1	9.10	9.30	9.50
H2	12.5	13.0	13.5
H3	3.10	3.30	3.50
G	3.00	3.20	3.40
ΦP	3.00	3.20	3.40

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