

Silicon Trench NPT IGBT

Description

The THG15T65NQF is use advanced trench NPT technology.

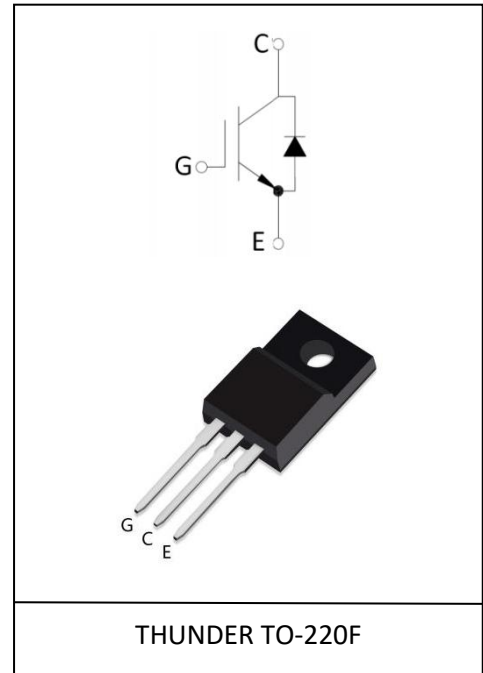
The 650V NPT Trench IGBT offers superior conduction and switching performances.

General Features

- High Speed Switching & Low Power Loss
- Low saturation voltage: $V_{CE(sat)} = 1.95V @ I_C = 15A$
- $E_{off} = 0.3mJ @ T_C = 25^{\circ}C$
- Maximum junction temperature $175^{\circ}C$

Application

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



Absolute Maximum Ratings @ $T_C=25^{\circ}C$ (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	30	A
	Collector Current @ $T_C=100^{\circ}C$	15	A
I_{CM}	Pulsed Collector Current	45	A
I_F	Diode Continuous Forward Current @ $T_C=100^{\circ}C$	15	A
I_{FM}	Pulsed Diode Forward Current	45	A
P_D	Total Dissipation at @ $T_C = 25^{\circ}C$	107	W
	Total Dissipation at @ $T_C = 100^{\circ}C$	53	
T_j	Operating Junction and Storage Temperature Range	-55 to +175	$^{\circ}C$
T_L	Max Temperature For Soldering	260	$^{\circ}C$
T_{SC}	Short circuit withstand time $V_{GE}=15V, V_{CC} \leq 400V$, Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0s, T_j \leq 150^{\circ}C$	5	us

Electrical Characteristics @ T_c=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 =15A	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 =15A, 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 =15A 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	15	—	—	A
I _{FM}	Pulsed Diode Forward Current	T _C = 25°C	45	—	—	A
V _F	Diode Forward Voltage	I _F =15A	—	1.4	2.1	V
t _{rr}	Reverse Recovery Time	T _J =25°C, I _F =15A 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	--	1.4	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Themal Resistance,Junction to Ambient	--	62.5	$^{\circ}\text{C}/\text{W}$

Typical Performance Characteristics

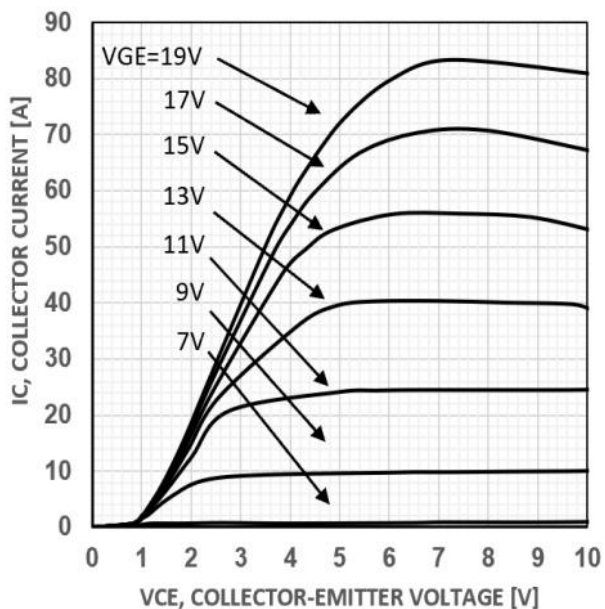


Figure1: typical IGBT output characteristics,
TC=25°C

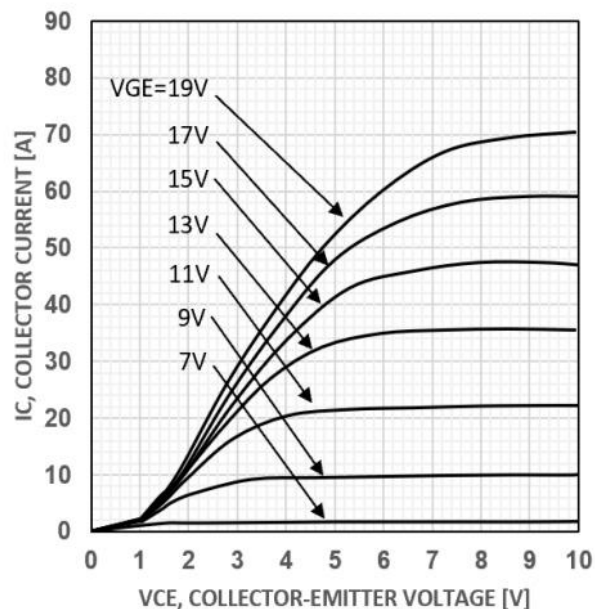


Figure2: typical IGBT output characteristics
TC=125°C

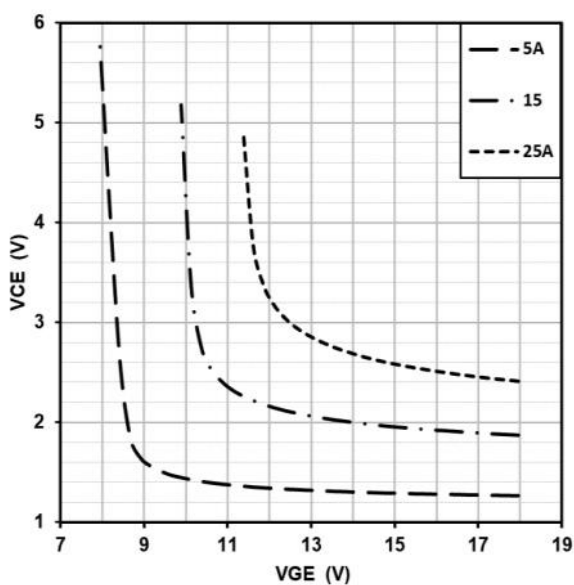


Figure3: typical VCE VS. VGE, TJ=25°C

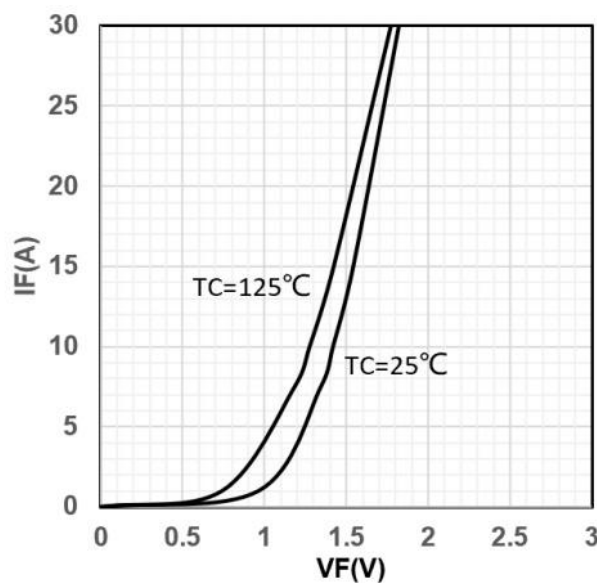


Figure4: typical diode forward characteristic

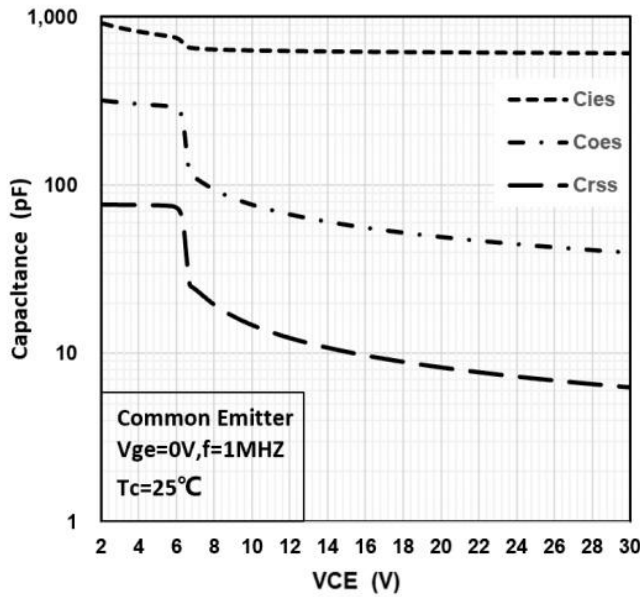


Figure 5: typical capacitance VS. VCE, VGE=0V, f=100kHz

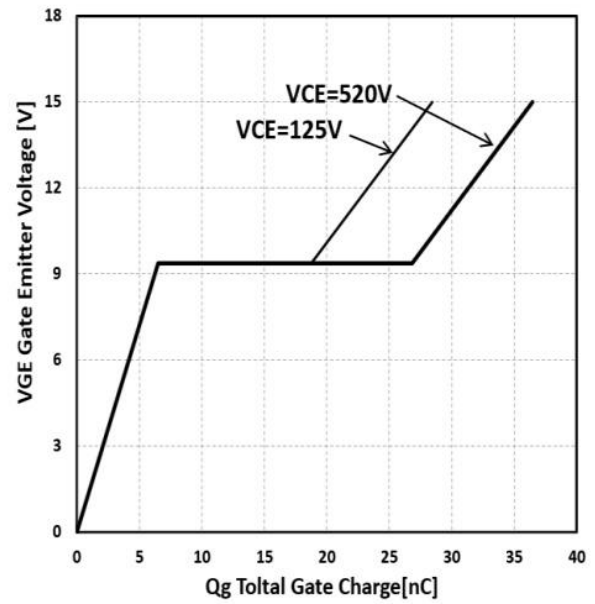


Figure 6 : typical gate charge VS. VGE, IC=15A

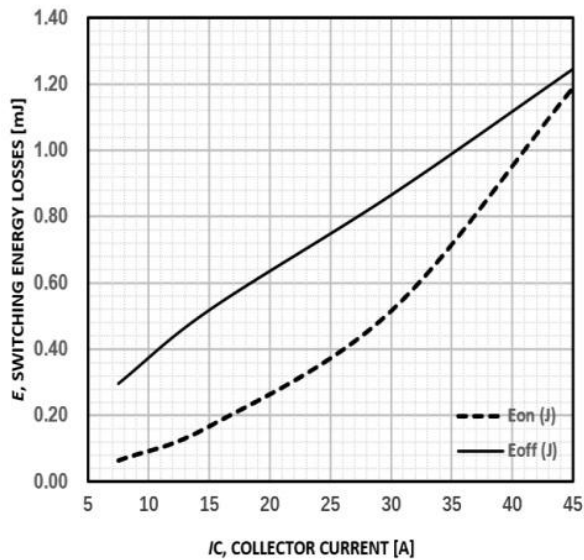


Figure 7 : typical energy loss VS. IC, TC=25°C,

L=500uH , VCE=400V, VGE=15V, Rg=10Ω

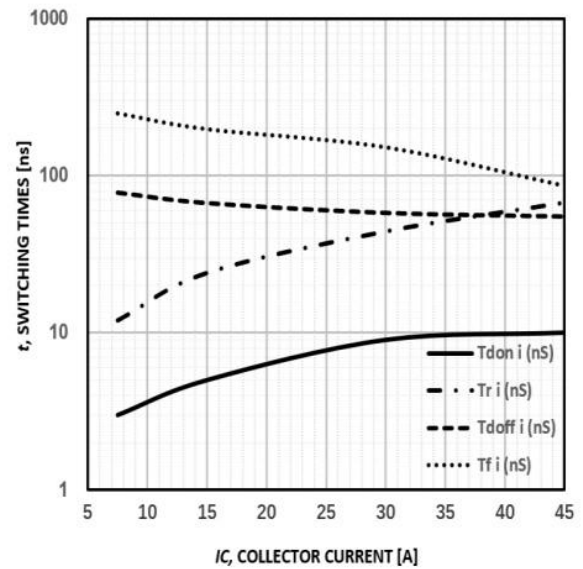


Figure 8 : typical switching time VS. IC, TC=25°C,

L=500uH, VCE=400V, VGE=15V, Rg=10Ω

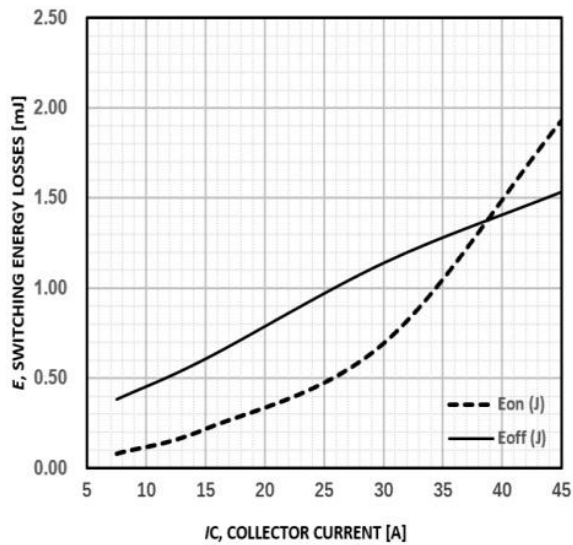


Figure 9 : typical energy loss VS. IC, TC=125°C,

L=500uH , VCE=400V,VGE=15V,Rg=10Ω

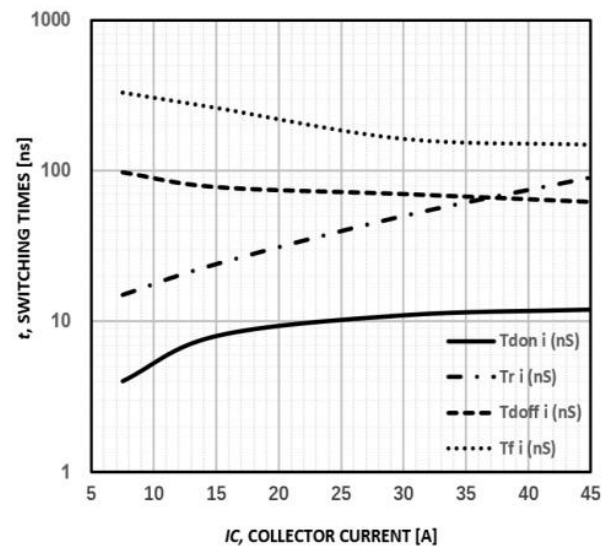


Figure10: typical switching time VS. IC, TC=125°C,

L=500uH, VCE=400V,VGE=15V,Rg=10Ω

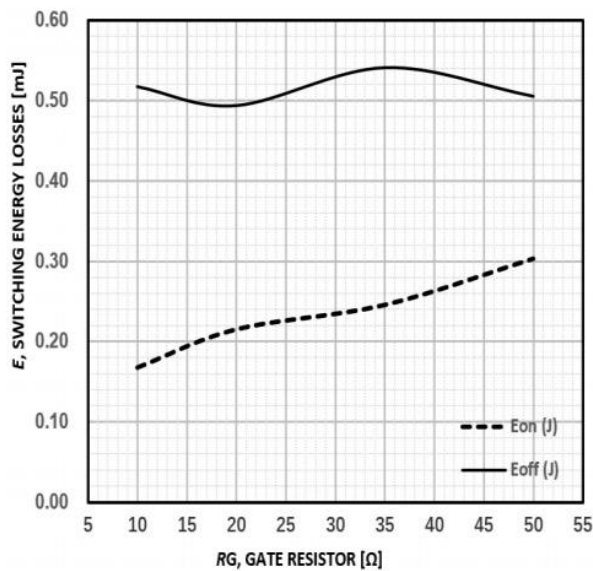


Figure11: typical energy loss VS. Rg,TC=25°C,

L=500uH, VCE=400V, VGE=15V ,IC=15A

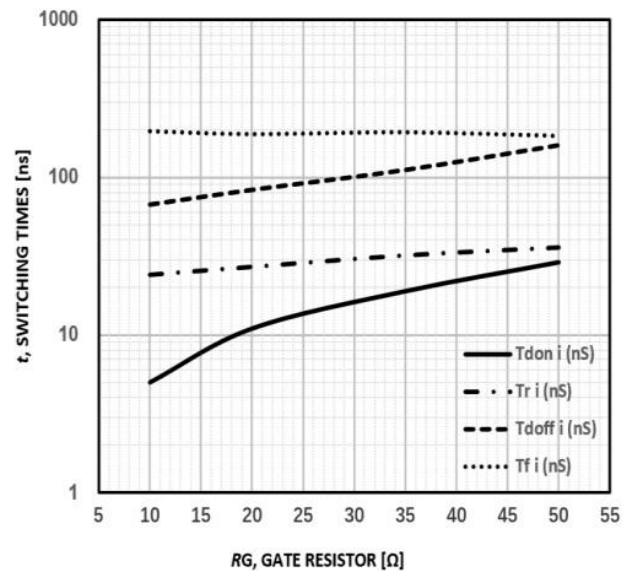


Figure12: typical switching time VS. Rg,TC=25°C,

L=500uH,VCE=400V,VGE=15V,IC=15A

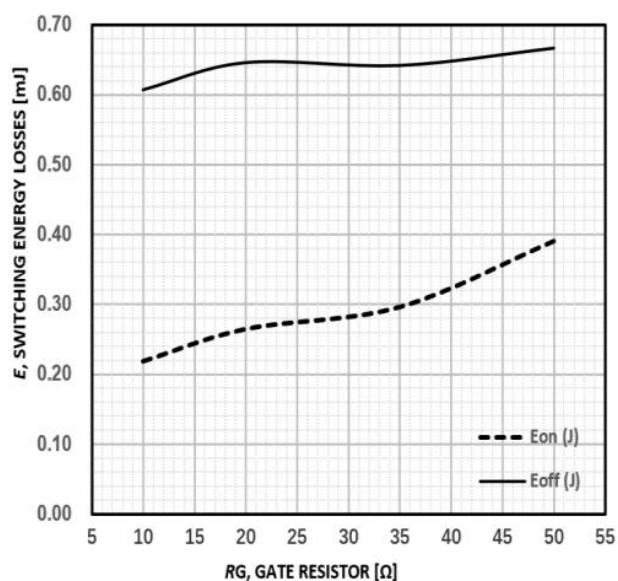


Figure13: typical energy loss VS. R_g , $T_C=125^{\circ}\text{C}$,
 $L=500\mu\text{H}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$

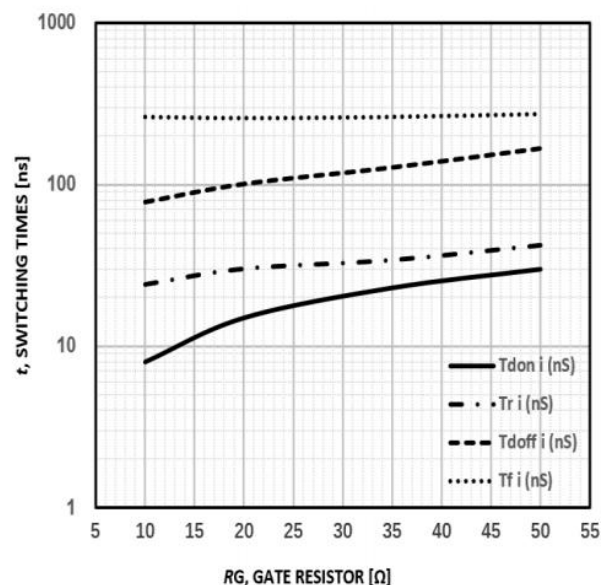


Figure14: typical switching time VS. R_g , $T_C=125^{\circ}\text{C}$,
 $L=500\mu\text{H}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$

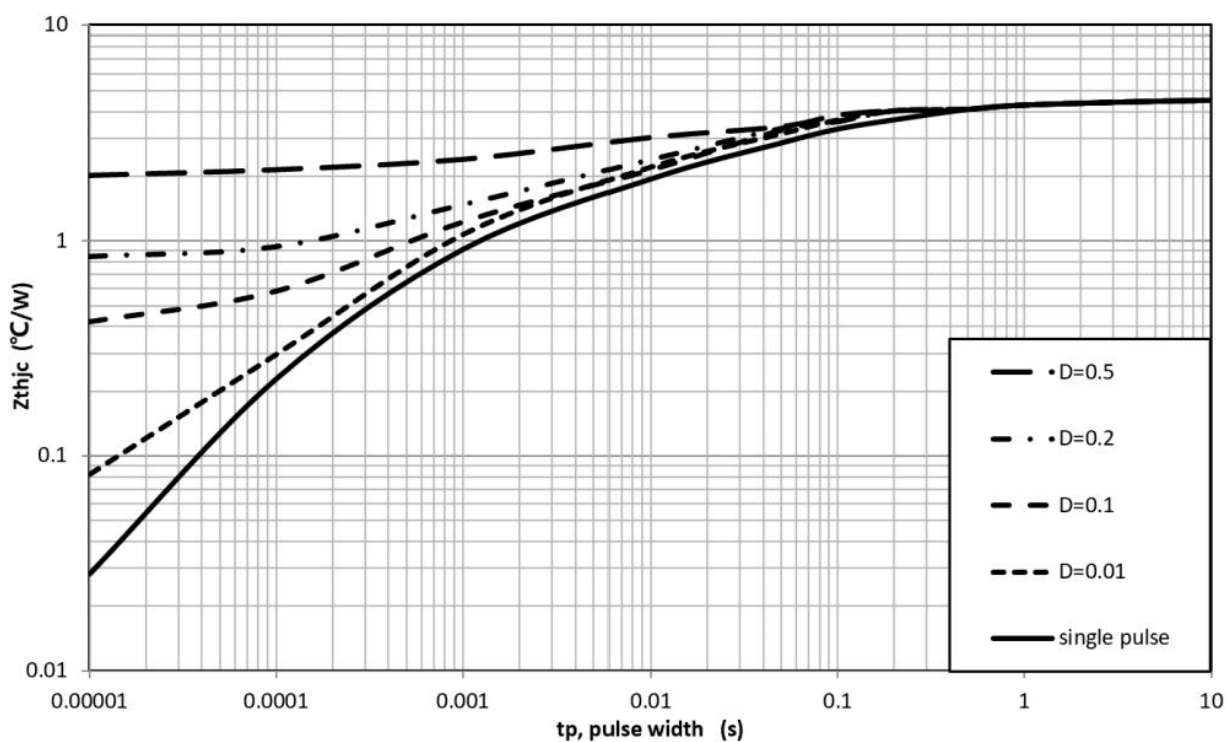
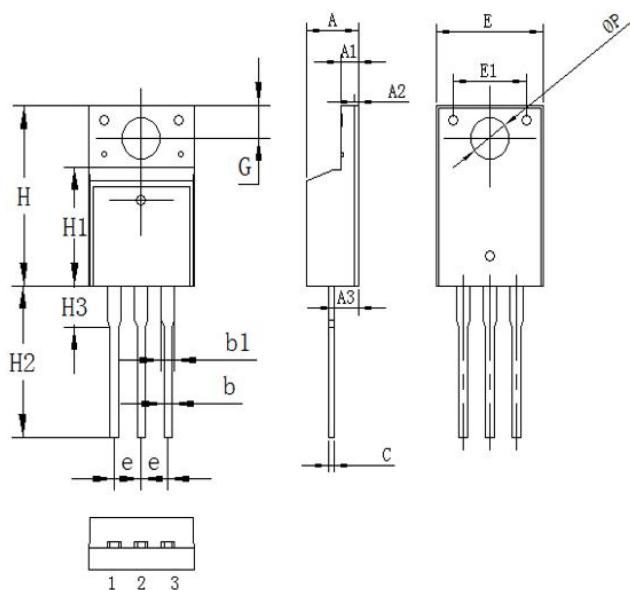


Figure15: normalized transient thermal impedance, junction-to-case

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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