

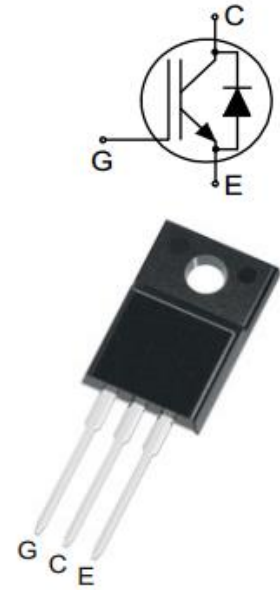
IGBT

Features

- 650V,15A
- $V_{CE(sat)(typ.)}=1.90V@V_{GE}=15V,I_C=15A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA using NPT technology

General Description

JIAEN NPT IGBTs offer lower losses and higher energy efficiency for application such as IH (induction heating),UPS, general inverter and other soft switching applications.



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Continuous Collector Current ($T_C=25^\circ C$)	30	A
	Continuous Collector Current ($T_C=100^\circ C$)	15	A
I_{CM}	Pulsed Collector Current (Note 1)	45	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ C$)	15	A
I_{FM}	Diode Maximum Forward Current (Note 1)	45	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation ($T_C=25^\circ C$)	27.5	W
	Maximum Power Dissipation ($T_C=100^\circ C$)	11.1	W
T_J	Operating Junction Temperature Range	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case for IGBT	4.5	$^\circ C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	5.6	$^\circ C/W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ C/W$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V	
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=650V, V_{GE}=0V$	-	-	100	μA	
I_{GES}	Gate Leakage Current	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	± 100	nA	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=250\mu A$	4.5	-	6.0	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=15A$	-	1.9	2.5	V	
Q_g	Total Gate Charge	$V_{CC}=520V$	-	36.5		nC	
Q_{ge}	Gate-Emitter Charge	$V_{GE}=15V$	-	6.5		nC	
Q_{gc}	Gate-Collector Charge	$I_C=15A$	-	20.3		nC	
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=15A$ $R_G=10\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	5	-	ns	
t_r	Turn-on Rise Time		-	24	-	ns	
$t_{d(off)}$	Turn-off Delay Time		-	67	-	ns	
t_f	Turn-off Fall Time		-	197	-	ns	
E_{on}	Turn-on Switching Loss		-	0.168	-	mJ	
E_{off}	Turn-off Switching Loss		-	0.517	-	mJ	
E_{ts}	Total Switching Loss		-	0.685	-	mJ	
$t_{d(on)}$	Turn-on Delay Time		$V_{CC}=400V$ $V_{GE}=15V$ $I_C=15A$ $R_G=10\Omega$ Inductive Load $T_C=125^\circ\text{C}$		8		ns
t_r	Turn-on Rise Time				24		ns
$t_{d(off)}$	Turn-off Delay Time				78		ns
t_f	Turn-off Fall Time			262		ns	
E_{on}	Turn-on Switching Loss			0.218		mJ	
E_{off}	Turn-off Switching Loss			0.607		mJ	
E_{ts}	Total Switching Loss			0.826		mJ	
C_{ies}	Input Capacitance	$V_{CE}=25V$	-	605	-	pF	
C_{oes}	Output Capacitance	$V_{GE}=0V$	-	45	-	pF	
C_{res}	Reverse Transfer Capacitance	$f=100\text{kHz}$	-	7.27	-	pF	
R_{Gint}	Integrated gate resistor			2.3		Ω	

Electrical Characteristics of Diode ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=15A$	-	1.56	2.3	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=400V$	-	95		ns
I_{rr}	Diode peak Reverse Recovery Current	$I_F=8A$	-	3.3		A
Q_{rr}	Diode Reverse Recovery Charge	$dI_F/dt=200A/\mu s$	-	141.79		nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Performance Characteristics

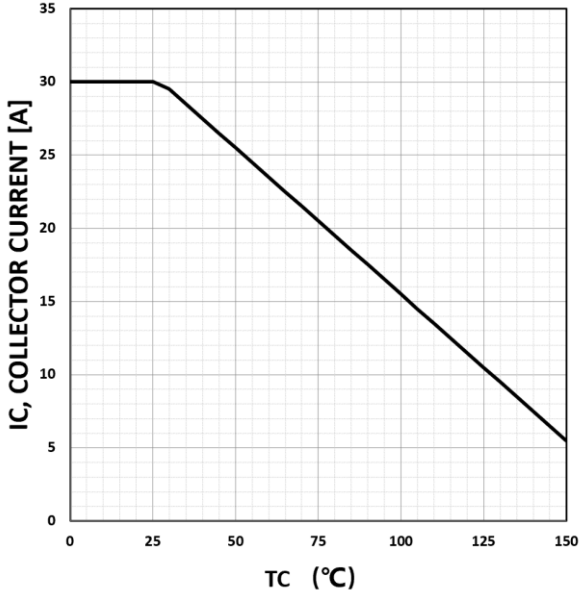


Figure1:maximum DC collector current VS. case temperature

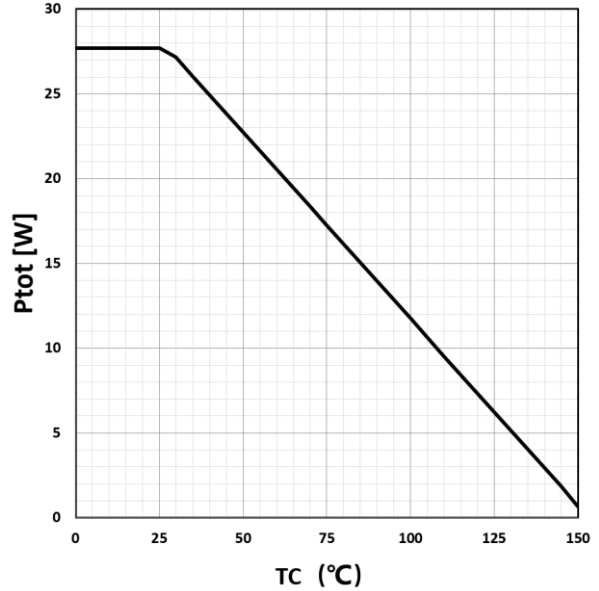


Figure2:power dissipation VS. case temperature

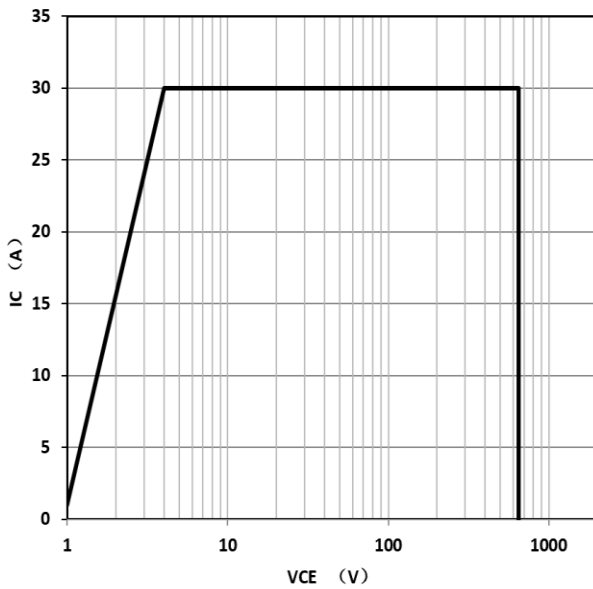


Figure3:reverse bias SOA,TJ=150°C,VGE=15V

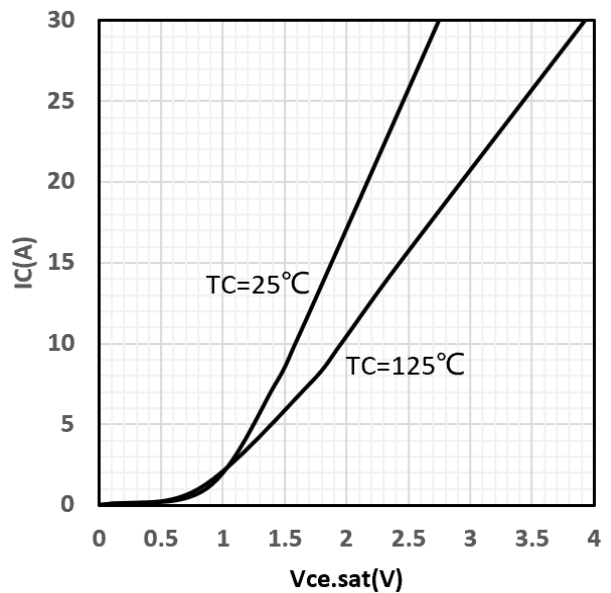


Figure4:Vce.sat VS IC

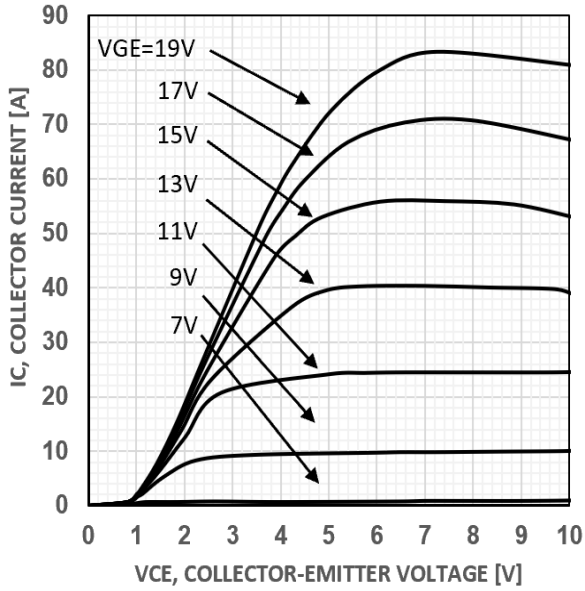


Figure5: typical IGBT output characteristics,
TC=25°C

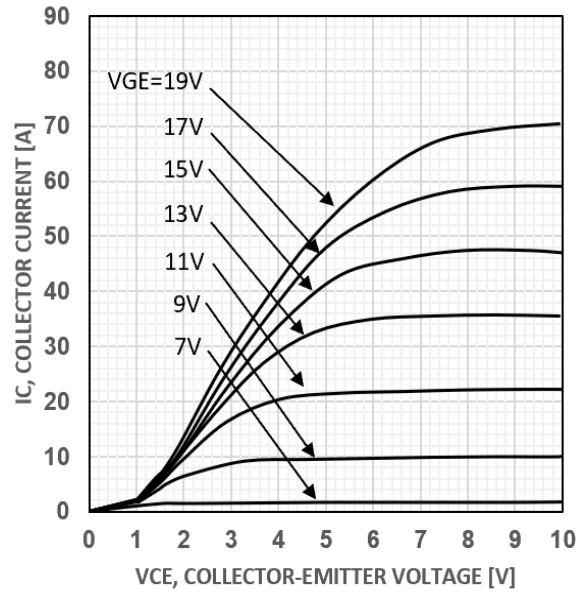


Figure6: typical IGBT output characteristics
TC=125°C

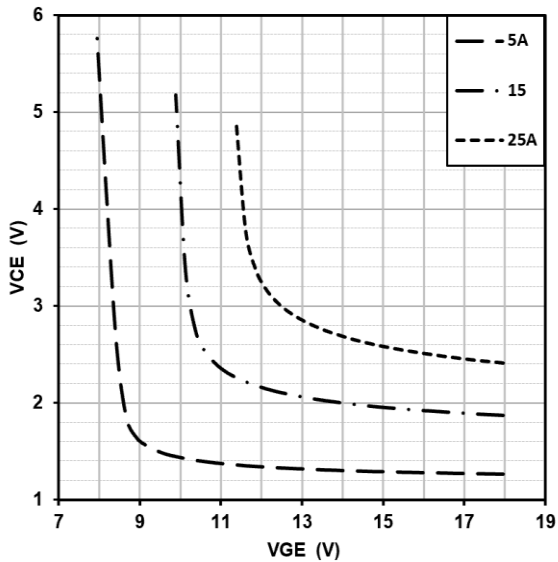


Figure7: typical VCE VS. VGE, TJ=25°C

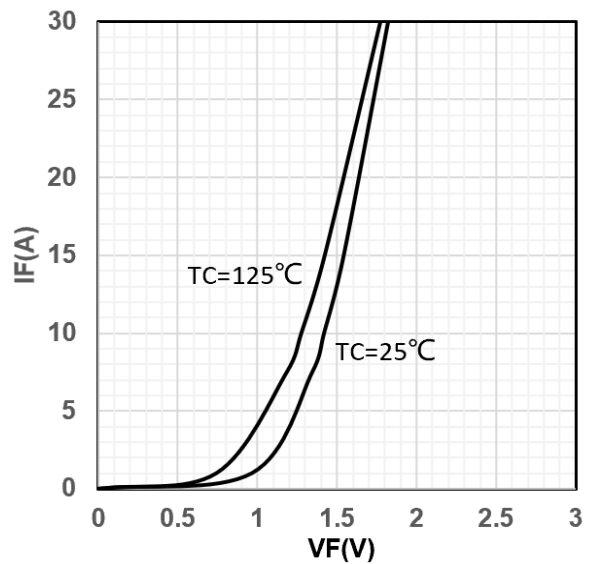


Figure8: typical diode forward characteristic

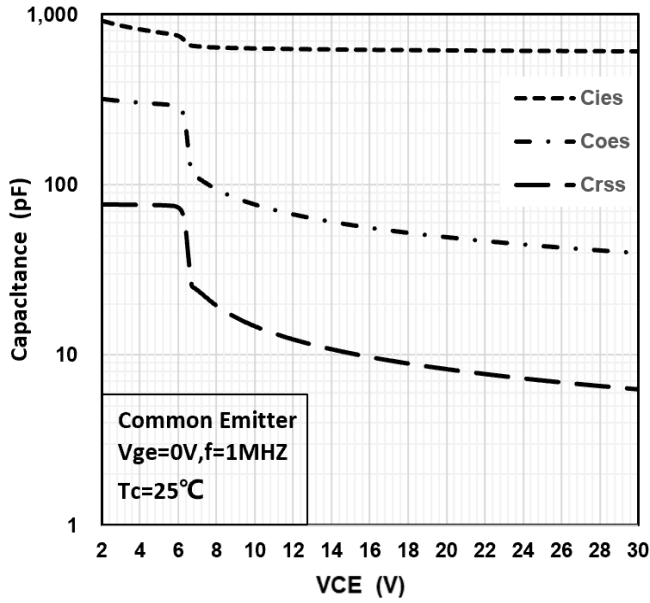


Figure9: typical capacitance VS. VCE, VGE=0V, f=100kHz

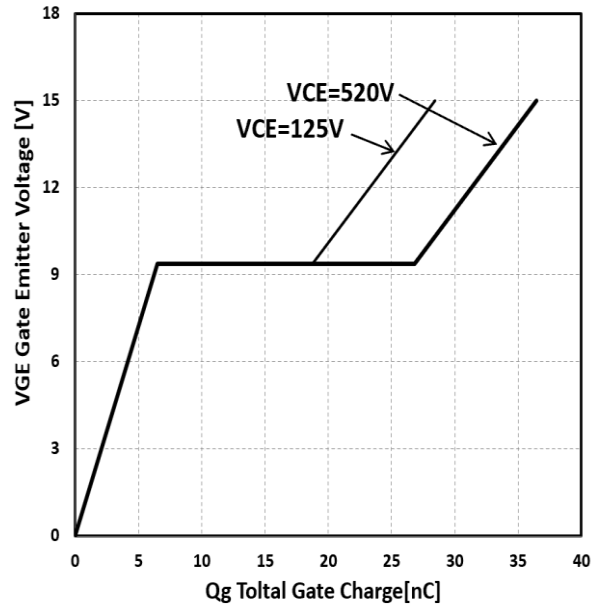


Figure10: typical gate charge VS. VGE, IC=15A

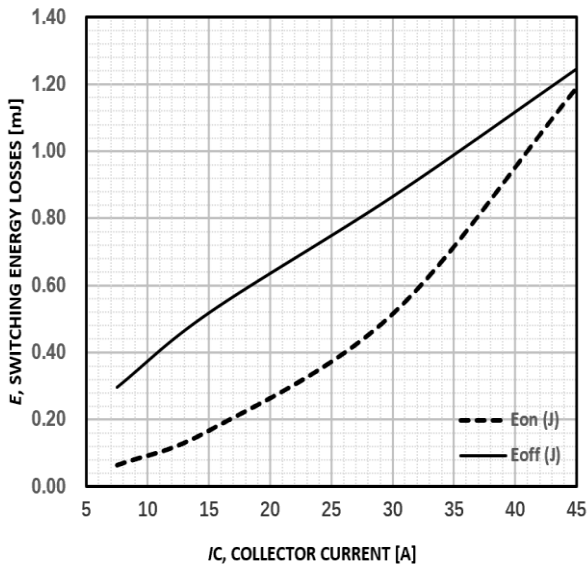


Figure11: typical energy loss VS. IC, TC=25°C,

L=500uH, VCE=400V, VGE=15V, Rg=10Ω

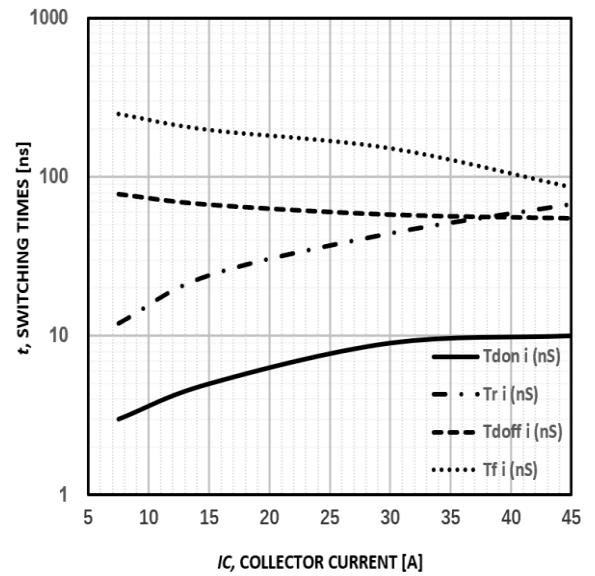


Figure12: typical switching time VS. IC, TC=25°C,

L=500uH, VCE=400V, VGE=15V, Rg=10Ω

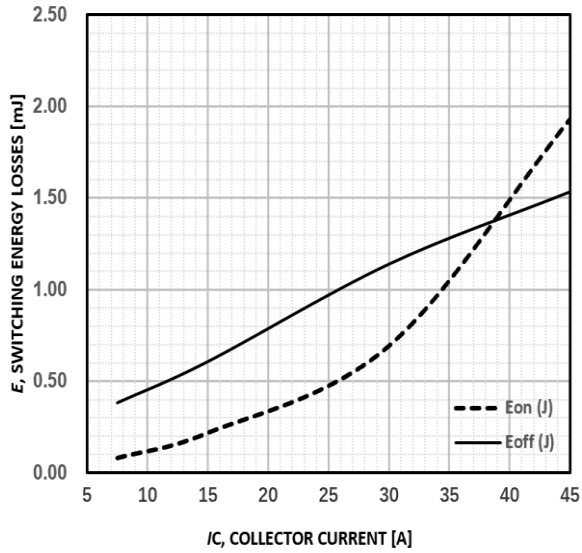


Figure13: typical energy loss VS. IC, TC=125°C,
L=500uH , VCE=400V,VGE=15V,Rg=10Ω

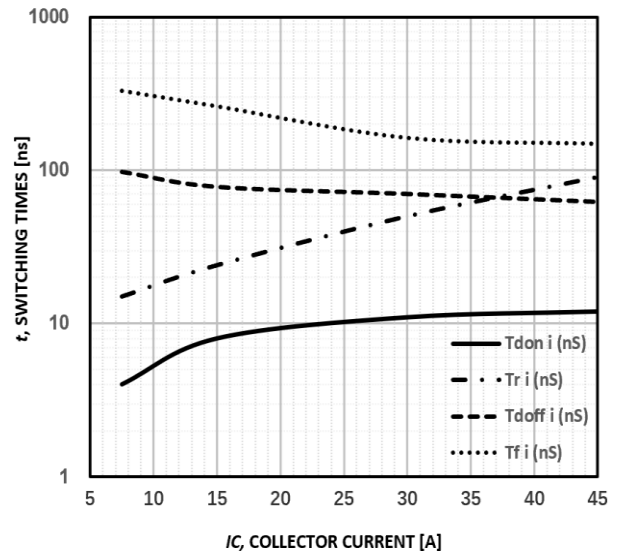


Figure14: typical switching time VS. IC, TC=125°C,
L=500uH, VCE=400V,VGE=15V,Rg=10Ω

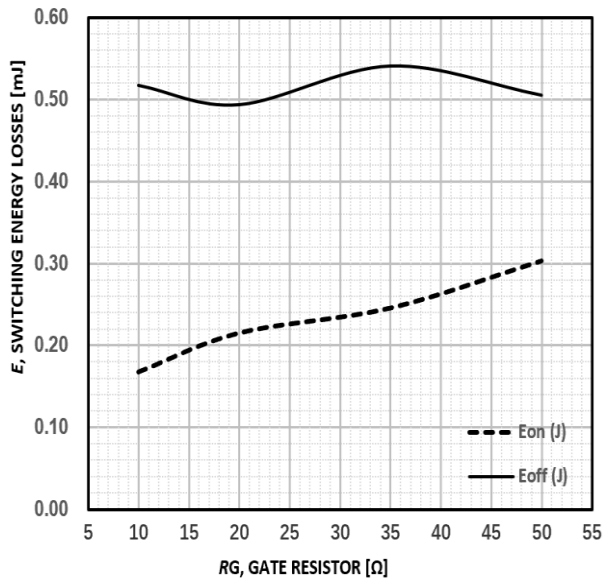


Figure15: typical energy loss VS. Rg,TC=25°C,
L=500uH, VCE=400V, VGE=15V ,IC=15A

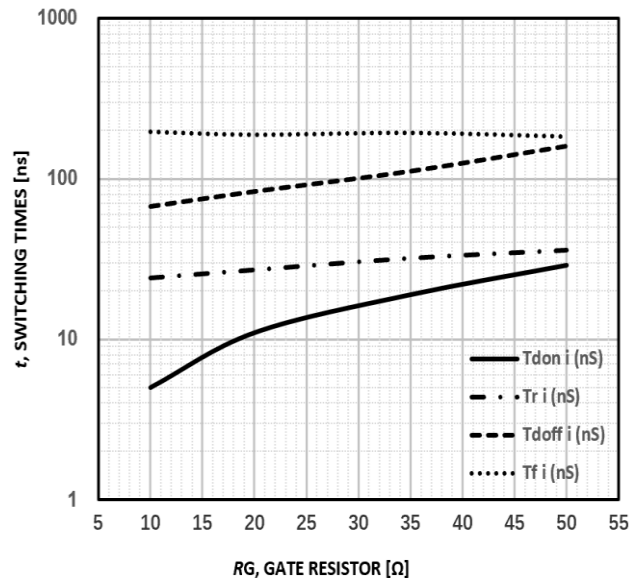


Figure16: typical switching time VS. Rg,TC=25°C,
L=500uH,VCE=400V,VGE=15V,IC=15A

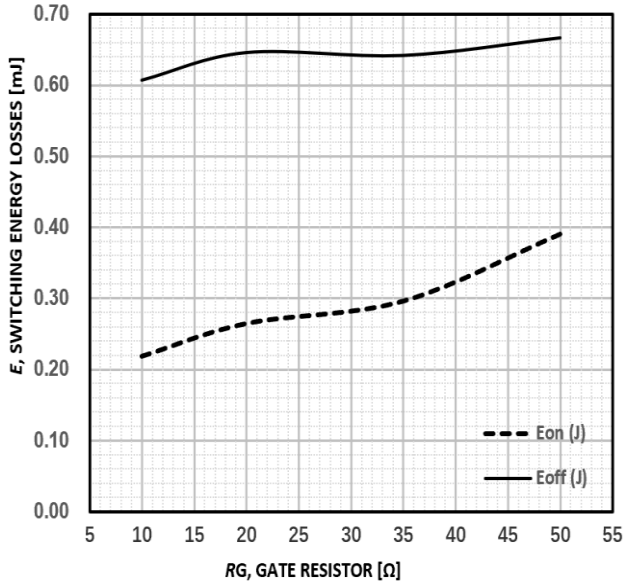


Figure17: typical energy loss VS. Rg,TC=125°C,
L=500uH, VCE=400V, VGE=15V ,IC=15A

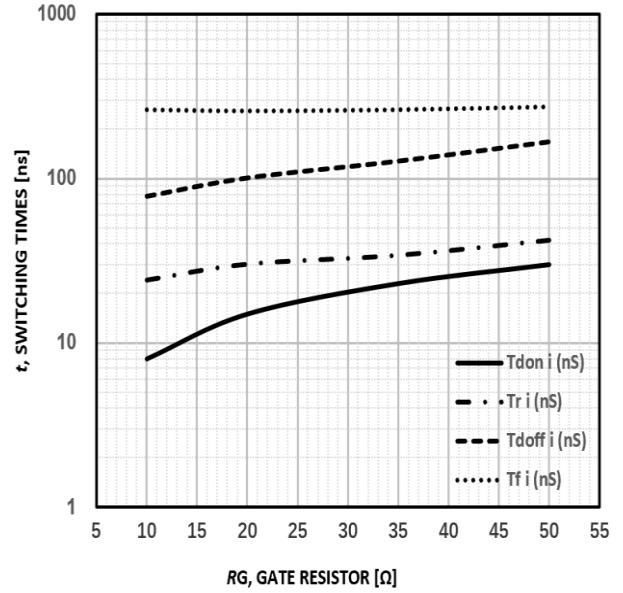


Figure17: typical switching time VS. Rg,TC=125°C,
L=500uH,VCE=400V,VGE=15V,IC=15A

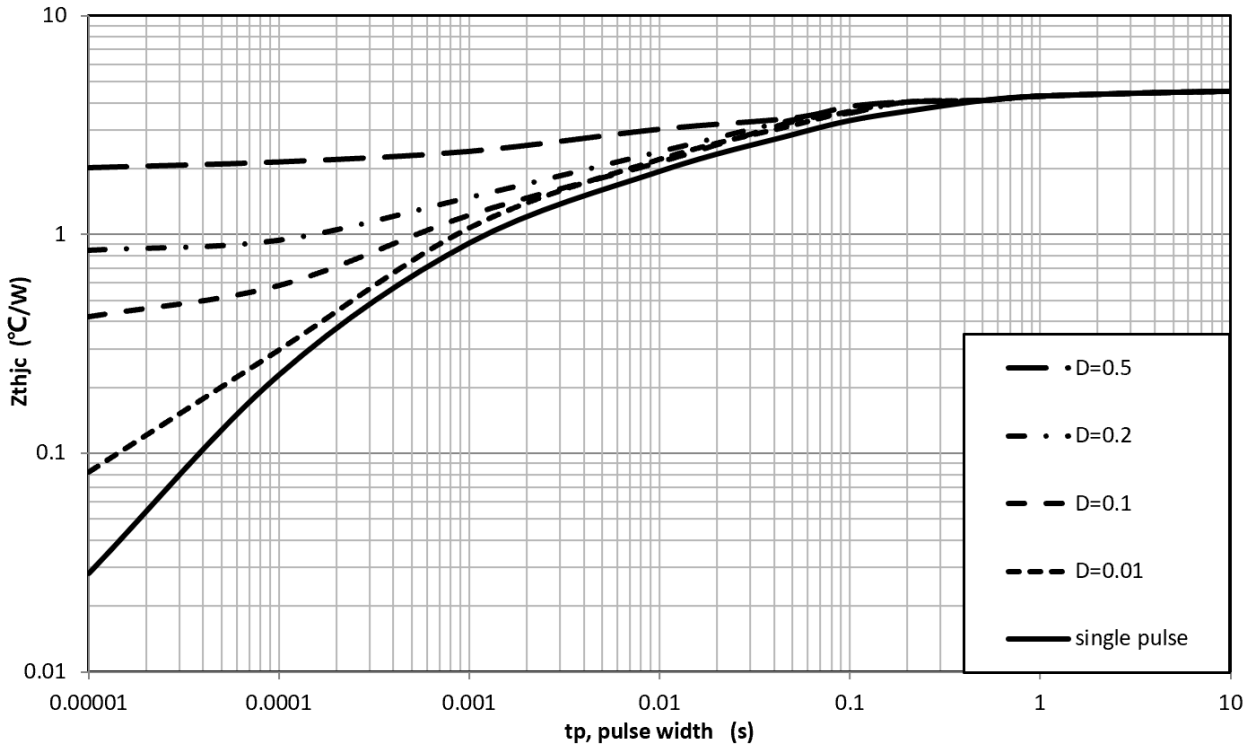
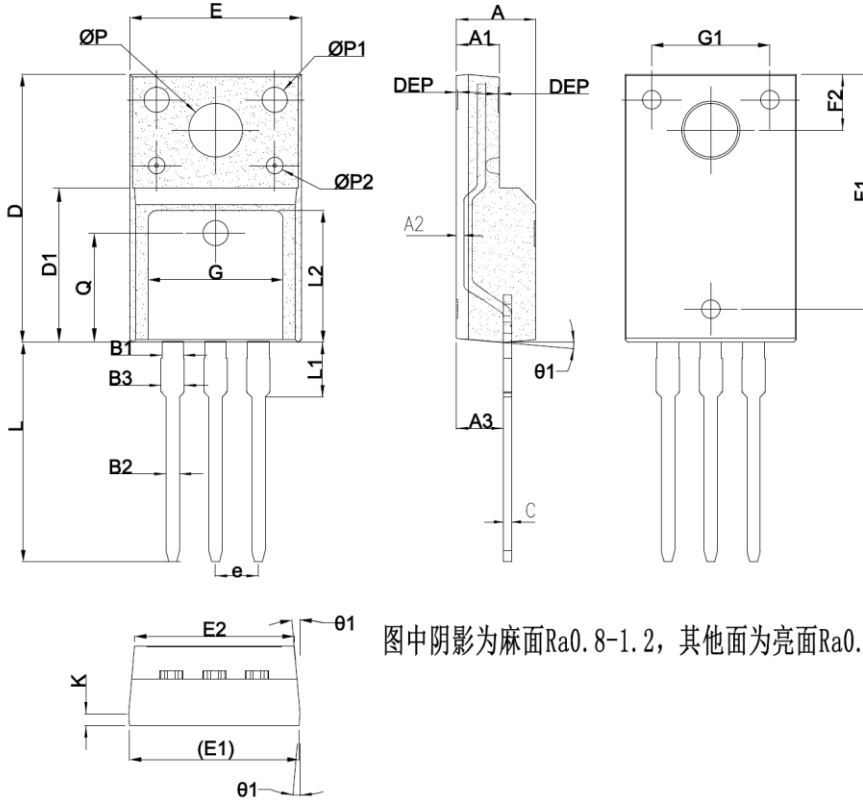


Figure11:normalized transient thermal impedance, junction-to-case

Note1.Duty factor $D=t_1/t_2$; Note2:peak $T_J=PDM \times Z_{thjc} + T_C$

TO220F PACKAGE OUTLINE



SYMBOL	COMMON DIMENSIONS		
	mm		
	MIN	NOM	MAX
*A	4.50	4.70	4.90
*A1	2.34	2.54	2.74
*A2	0.38	0.43	0.48
*A3	2.66	2.76	2.86
B1	1.23	1.28	1.33
*B2	0.75	0.80	0.85
*B3	1.28	-	1.43
*C	0.45	0.50	0.60
*D	15.67	15.87	16.07
*D1	9.04	9.12	9.20
*e	2.49	2.54	2.59
*E	10.00	10.16	10.32
E1	9.94	10.04	10.14
E2	9.36	9.46	9.56
F1	13.80	13.90	14.00
*F2	3.20	3.30	3.40
G	7.80	8.00	8.20
G1	6.90	7.00	7.10
K	0.65	0.70	0.75
*L	12.78	12.98	13.18
*L1	3.13	3.23	3.33
L2	7.70	7.80	7.90
Q	6.5REF		
*φP	3.08	-	3.48
φP1	1.40	1.50	1.60
φP2	0.95	1.00	1.05
*θ1	3°	5°	7°
DEP	0.05	0.10	0.15

图中阴影为麻面Ra0.8-1.2，其他面为亮面Ra0.2-0.4

带*为检验尺寸

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