

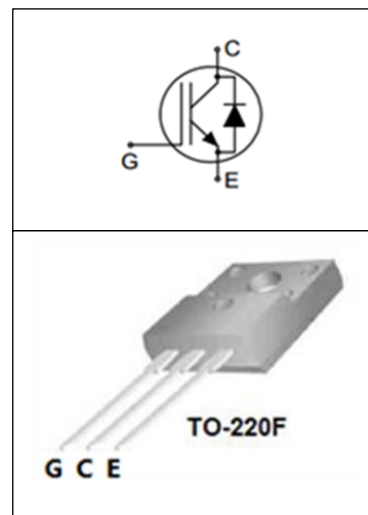
IGBT

Features

- 600V,15A
- $V_{CE(sat)}(typ.)=1.8V@V_{GE}=15V,I_C=15A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA

General Description

JIAEN trench 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	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Continuous Collector Current ($T_C=25^{\circ}C$)	14	A
	Continuous Collector Current ($T_C=100^{\circ}C$)	8	A
I_{CM}	Pulsed Collector Current (Note 1)	45	A
I_F	Diode Continuous Forward Current ($T_C=100^{\circ}C$)	8	A
I_{FM}	Diode Maximum Forward Current (Note 1)	45	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation ($T_C=25^{\circ}C$)	28	W
	Maximum Power Dissipation ($T_C=100^{\circ}C$)	11	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	4.4	$^{\circ}C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	5.2	$^{\circ}C/W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	65	$^{\circ}C/W$

Electrical Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV _{CES}	Collector-Emitter Breakdown Voltage	V _{GE} = 0V, I _C = 250uA	600	-	-	V
I _{CES}	Collector-Emitter Leakage Current	V _{CE} = 600V, V _{GE} = 0V	-	-	100	uA
I _{GES}	Gate Leakage Current, Forward	V _{GE} =20V, V _{CE} = 0V	-	-	100	nA
	Gate Leakage Current, Reverse	V _{GE} = -20V, V _{CE} = 0V	-	-	-100	nA
V _{GE(th)}	Gate Threshold Voltage	V _{GE} = V _{CE} , I _C = 250uA	4.5	-	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C = 15A	-	1.8	2.2	V
Q _g	Total Gate Charge	V _{CC} =400V V _{GE} =15V I _C =15A	-	70		nC
Q _{ge}	Gate-Emitter Charge		-	23		nC
Q _{gc}	Gate-Collector Charge		-	24		nC
t _{d(on)}	Turn-on Delay Time	V _{CC} =400V V _{GE} =15V I _C =15A R _G =10Ω Inductive Load 500uH T _C =25 °C	-	21	-	ns
t _r	Turn-on Rise Time		-	20	-	ns
t _{d(off)}	Turn-off Delay Time		-	89	-	ns
t _f	Turn-off Fall Time		-	57	-	ns
E _{on}	Turn-on Switching Loss		-	0.327	-	mJ
E _{off}	Turn-off Switching Loss		-	0.234	-	mJ
E _{ts}	Total Switching Loss		-	0.562	-	mJ
C _{ies}	Input Capacitance	V _{CE} =30V V _{GE} =0V f = 1MHz	-	634	-	pF
C _{oes}	Output Capacitance		-	84	-	pF
C _{res}	Reverse Transfer Capacitance		-	48	-	pF

Electrical Characteristics of Diode (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =15A	-	1.45	1.9	V
t _{rr}	Diode Reverse Recovery Time	V _{CE} = 300V I _F = 15A dI _F /dt = 500A/us	-	115		ns
I _{rr}	Diode peak Reverse Recovery Current		-	13		A
Q _{rr}	Diode Reverse Recovery Charge		-	620		nC

Notes:

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

Typical Performance Characteristics

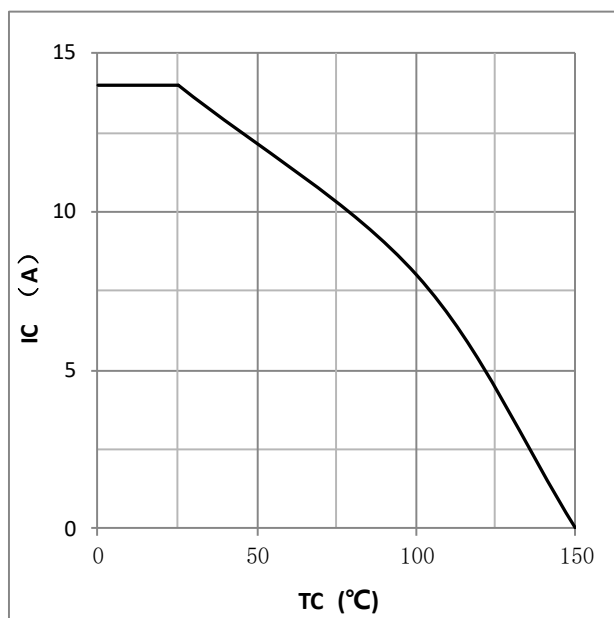


Figure 1. maximum DC collector current
VS. case temperature

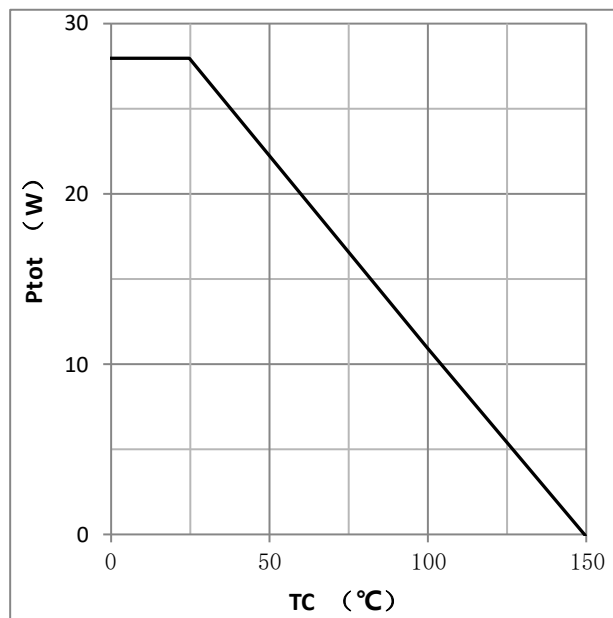


Figure 2. Power dissipation VS. case
temperature

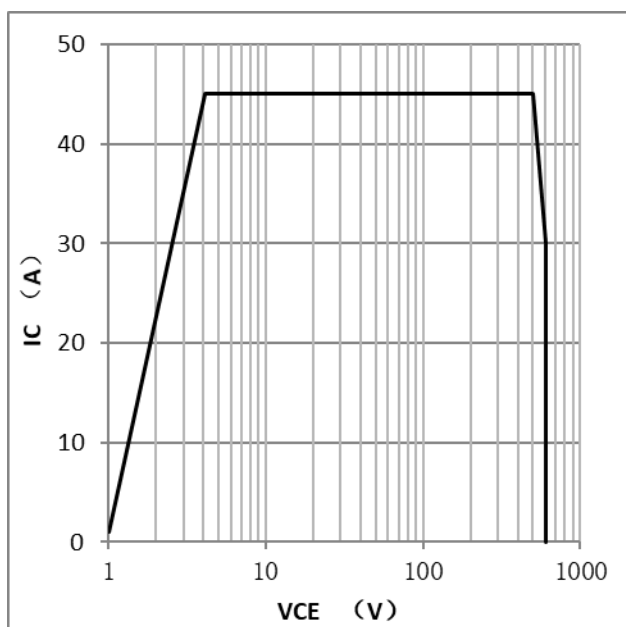


Figure 3. reverse bias SOA,
 $T_j=125^{\circ}\text{C}$, $V_{ge}=15\text{V}$

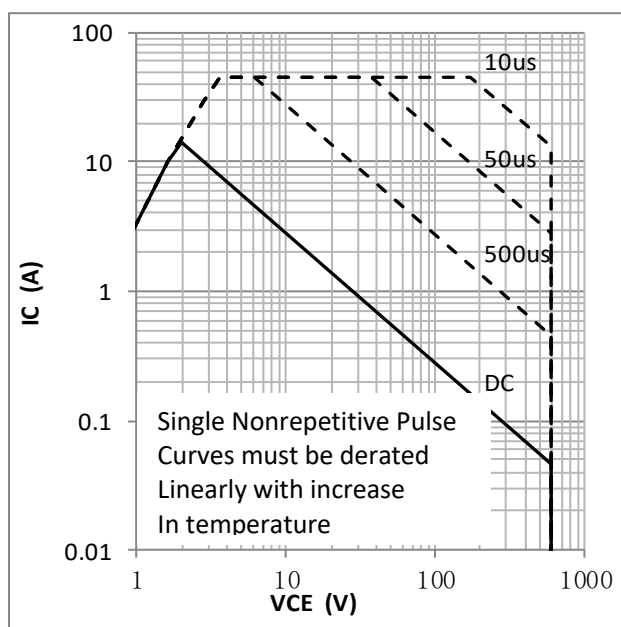


Figure 4. forward SOA

$T_c=25^{\circ}\text{C}$ $T_j\leq 150^{\circ}\text{C}$

Typical Performance Characteristics

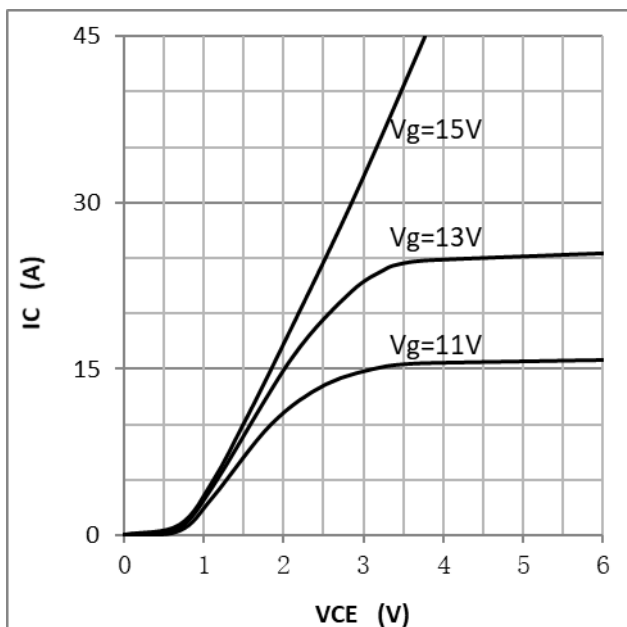


Figure 5. typical output characteristics

$T_c=25^{\circ}\text{C}$ $t_p=300\mu\text{s}$

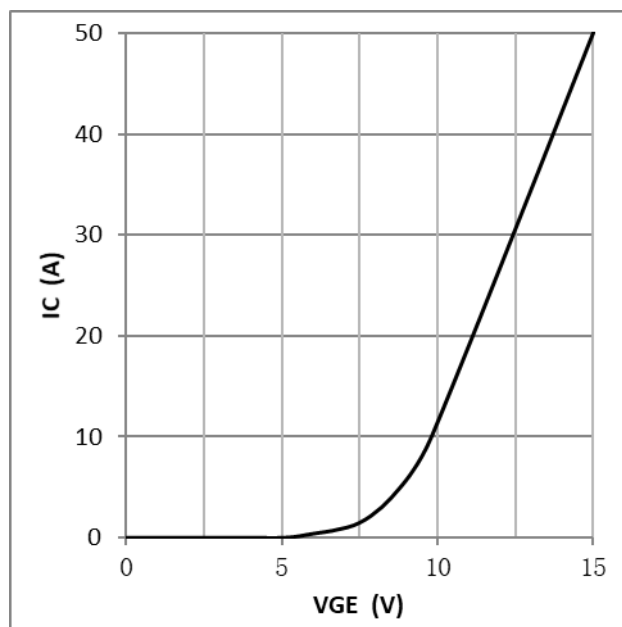


Figure 6. transfer characteristics

$T_c=25^{\circ}\text{C}$ $V_{DS}=20\text{V}$

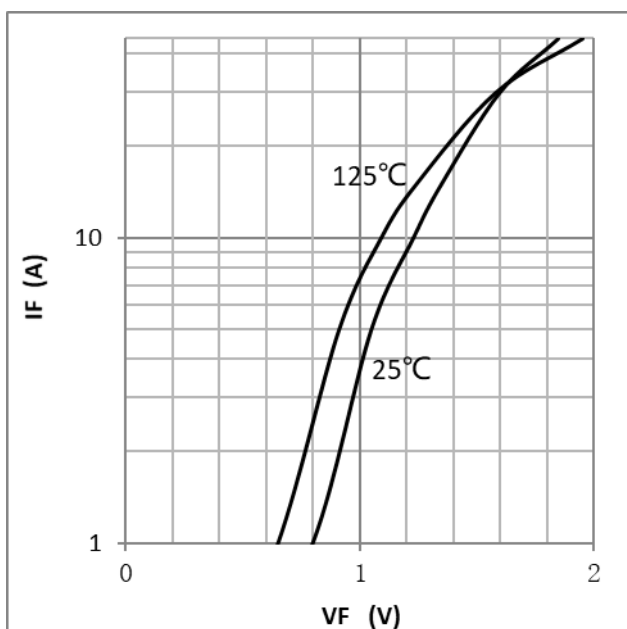


Figure 7. typical diode forward characteristics

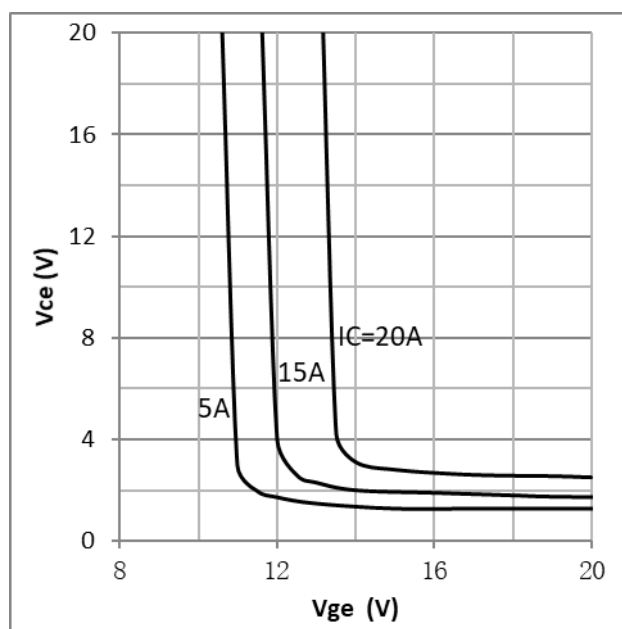


Figure 8. typical Saturation Voltage vs. V_{ge}

$T_c=25^{\circ}\text{C}$

Typical Performance Characteristics

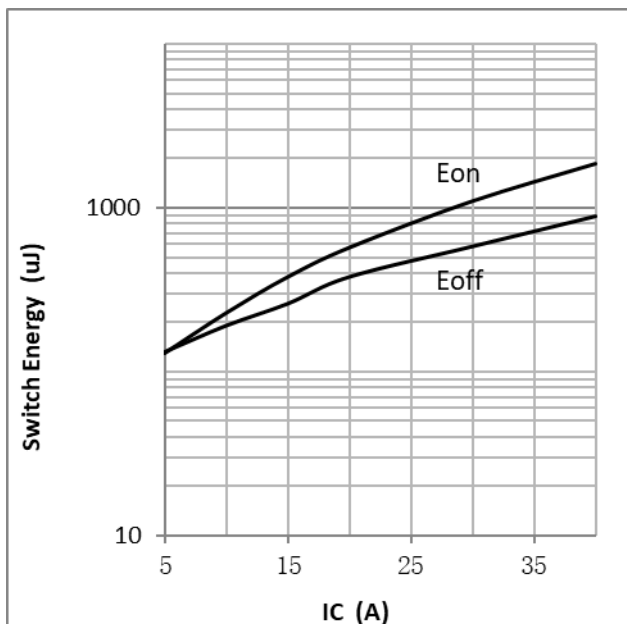


Figure 9. switch energy loss vs. Ic Tc=25°C

Tc=25°C L=500uH Vcc=400V Vge=15V Rg=20Ω

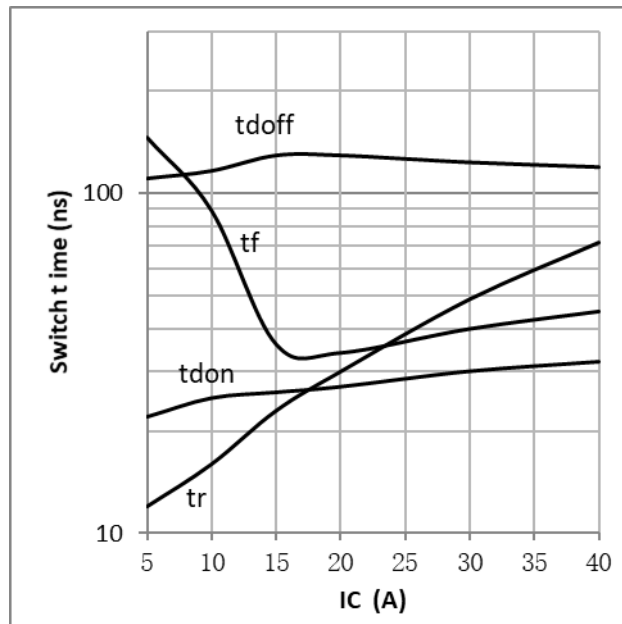


Figure 10. typical switch time vs. Ic Tc=25°C

L=500uH Vcc=400V Vge=15V Rg=20Ω

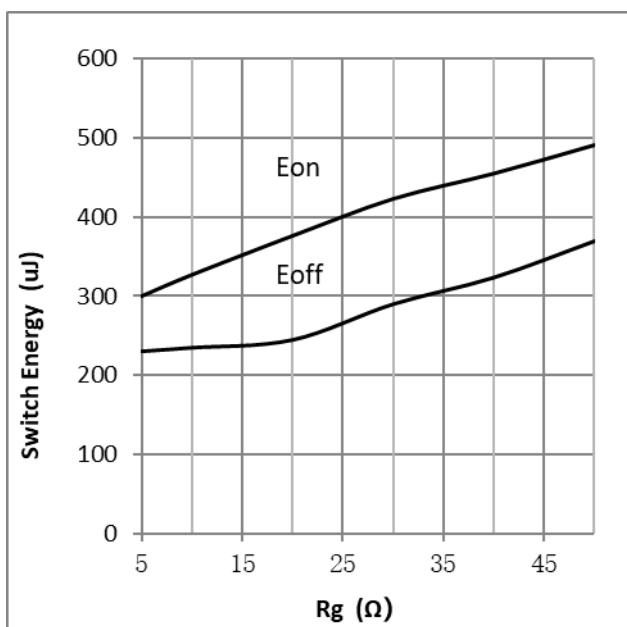


Figure 11. typical switch energy loss vs. Rg

Tc=25°C L=500uH Vcc=400V Vge=15V Ic=15A

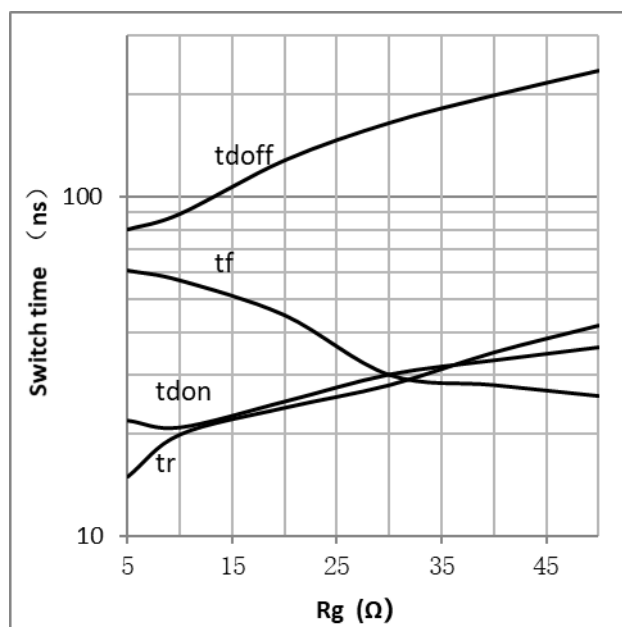


Figure 12. typical switch time vs. Rg

Tc=25°C L=500uH Vcc=400V Vge=15V Ic=15A

Typical Performance Characteristics

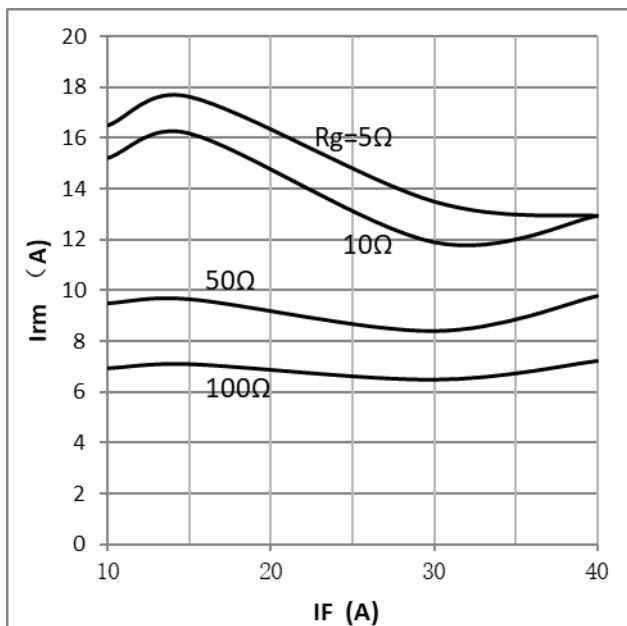


Figure 13. typical diode I_{rm} vs. I_F
 $T_c=25^\circ\text{C}$ $V_{cc}=300\text{V}$ $V_{ge}=15\text{V}$

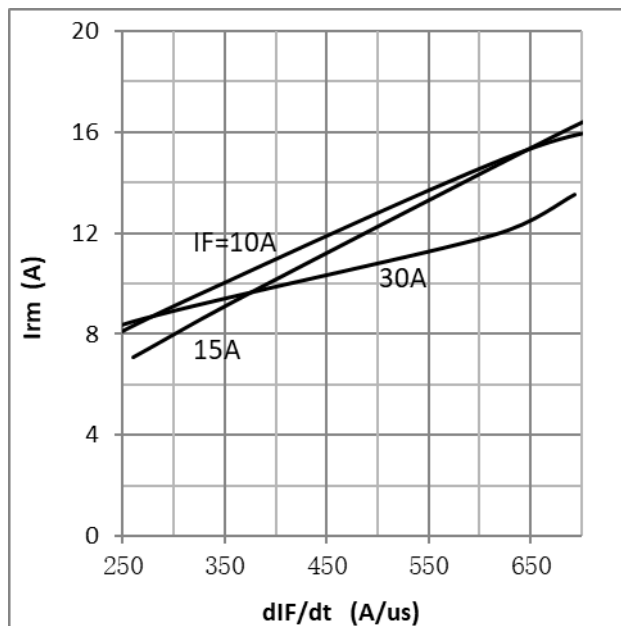


Figure 14. typical diode I_{rm} vs. dI_F/dt
 $T_c=25^\circ\text{C}$ $V_{cc}=300\text{V}$ $V_{ge}=15\text{V}$

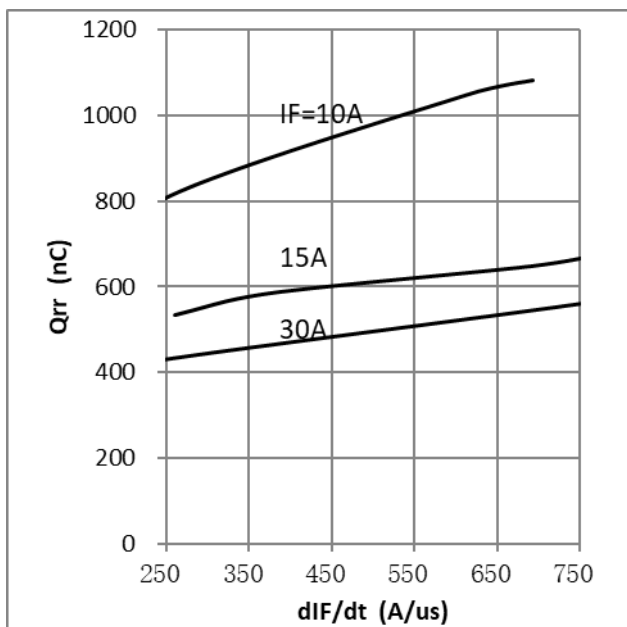


Figure 15. typical diode Q_{rr} vs. dI_F/dt
 $T_c=25^\circ\text{C}$ $V_{cc}=300\text{V}$ $V_{ge}=15\text{V}$

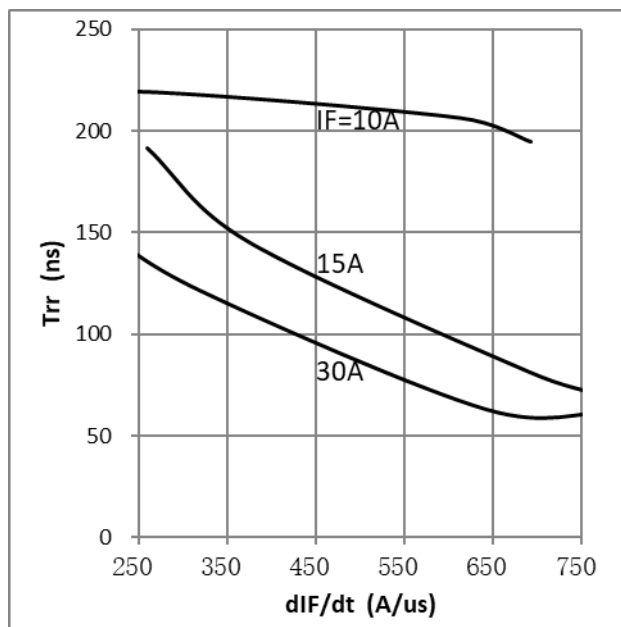


Figure 16. typical diode t_{rr} vs. dI_F/dt
 $T_c=25^\circ\text{C}$ $V_{cc}=300\text{V}$ $V_{ge}=15\text{V}$

Typical Performance Characteristics

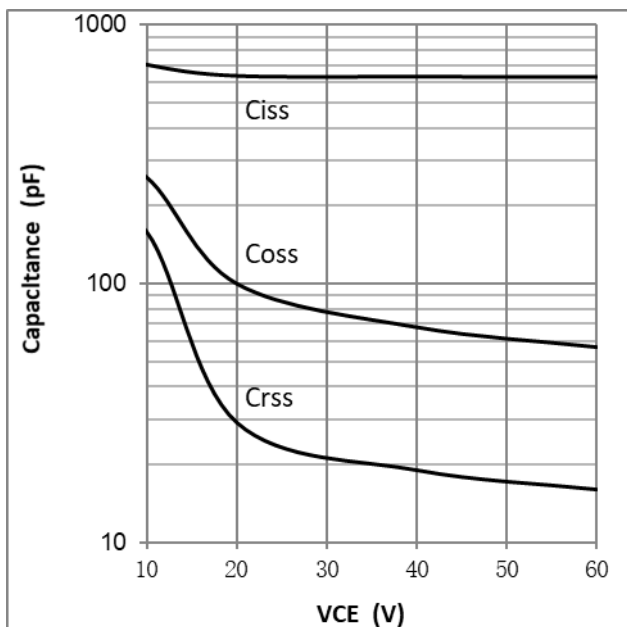


Figure 17. typical Capacitance vs. VCE

$T_c=25^{\circ}\text{C}$ $f=1\text{MHz}$ $V_{ge}=0\text{V}$

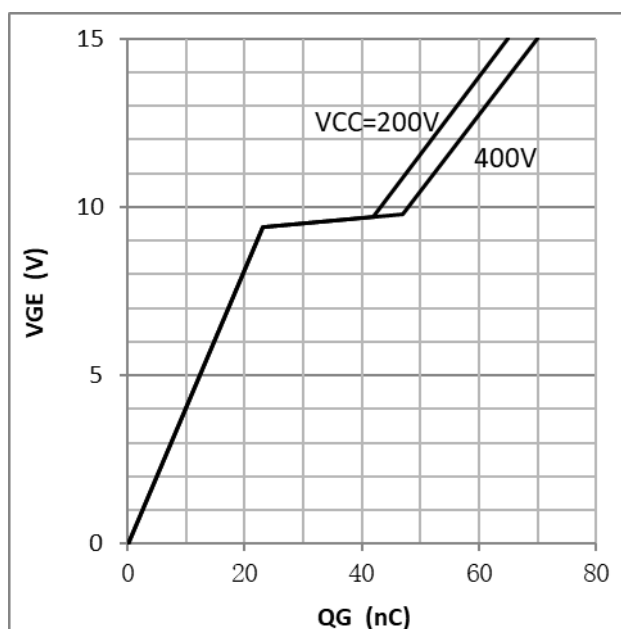


Figure 18. typical gate charge vs. VGE

$T_c=25^{\circ}\text{C}$ $I_c=15\text{A}$

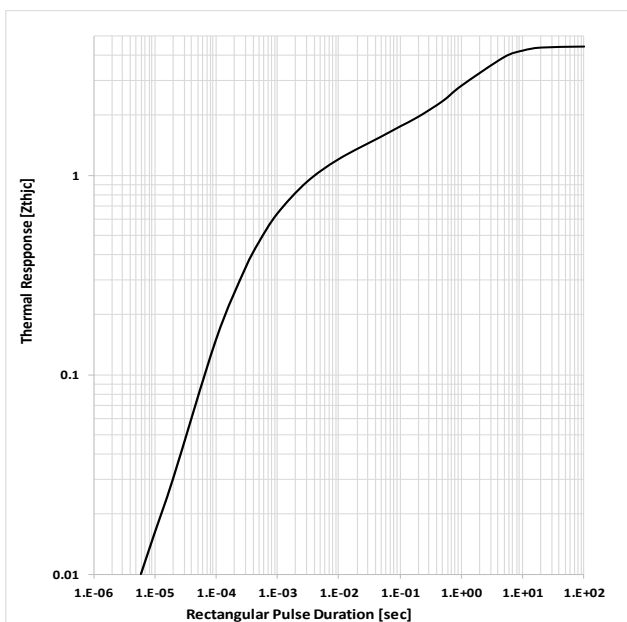
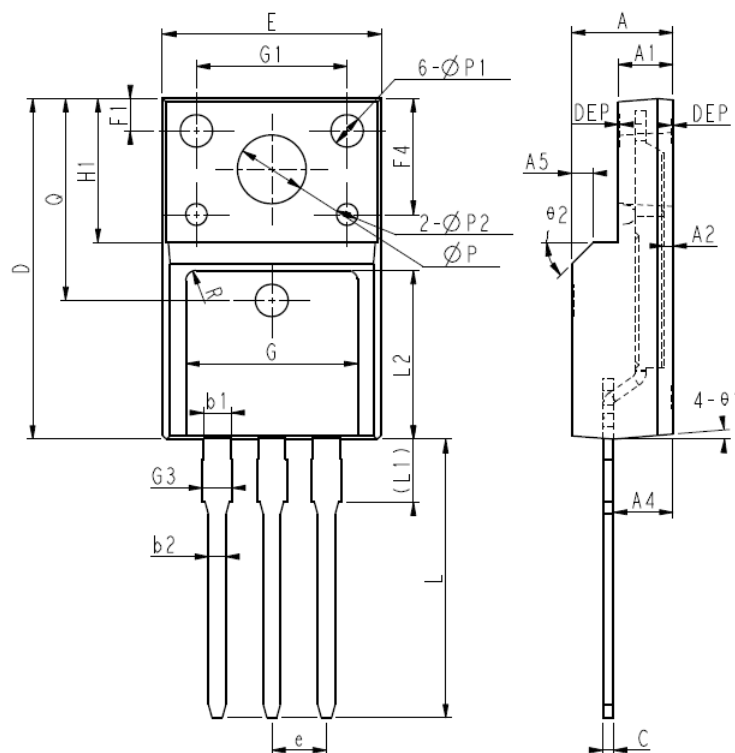


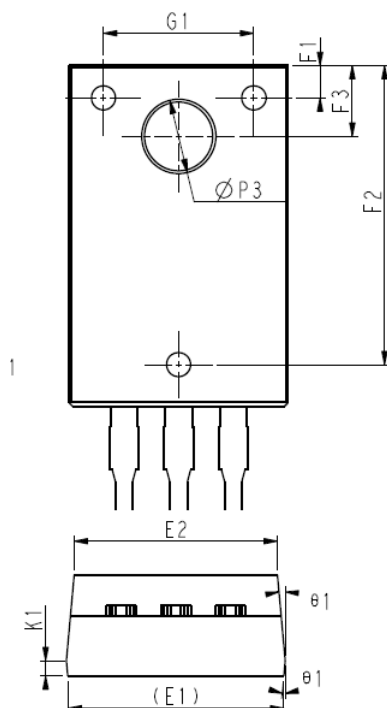
Figure19. normalized transient thermal impedance,
junction-to-case

Mechanical Dimensions



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	10.00	10.16	10.32
E1	9.91	10.04	10.14
E2	9.36	9.46	9.56
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.43	-	0.48
A4	2.66	2.76	2.86
A5	1.00REF		
c	0.45	0.50	0.60
D	15.67	15.87	16.07
Q	9.40REF		
H1	6.70REF		
e	2.54BSC		
ØP	3.18REF		
L	12.78	12.98	13.18
L1	2.83	2.93	3.03
L2	7.70	7.80	7.90
ØP1	1.40	1.50	1.60
ØP2	0.95	1.00	1.05
ØP3	3.45REF		
θ1	3°	5°	7°
θ2	-	45°	-
DEP	0.05	0.10	0.15
F1	1.00	1.50	2.00
F2	13.80	13.90	14.00
F3	3.20	3.30	3.40
F4	5.30	5.40	5.50
G	7.80	8.00	8.20
G1	6.90	7.00	7.10
G3	1.25	1.35	1.45
b1	1.23	1.28	1.38
b2	0.75	0.80	0.90
K1	0.65	0.70	0.75
R	0.50REF		



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