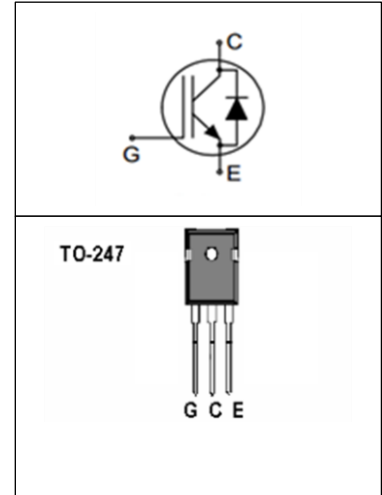


## IGBT

### 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	$\pm 20$	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 ( $T_C=25^\circ C$ )	105	W
	Maximum Power Dissipation ( $T_C=100^\circ C$ )	40	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	1.2	$^\circ C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	2.5	$^\circ C/W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	40	$^\circ C/W$

**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	$V_{GE}=0V, I_C=250\mu A$	600	-	-	V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE}=600V, V_{GE}=0V$	-	-	100	$\mu A$
$I_{GES}$	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	$V_{GE}=V_{CE}, I_C=250\mu A$	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	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=15A$ $R_G=10\Omega$ Inductive Load 500 $\mu H$ $T_C=25^\circ C$	-	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** ( $T_C=25^\circ\text{C}$  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	$V_{CE}=300V$ $I_F=15A$	-	115	-	ns
$I_{rr}$	Diode peak Reverse Recovery Current		-	13	-	A
$Q_{rr}$	Diode Reverse Recovery Charge	$dI_F/dt=500A/\mu s$	-	620	-	nC

**Notes:**

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

## Typical Performance Characteristics

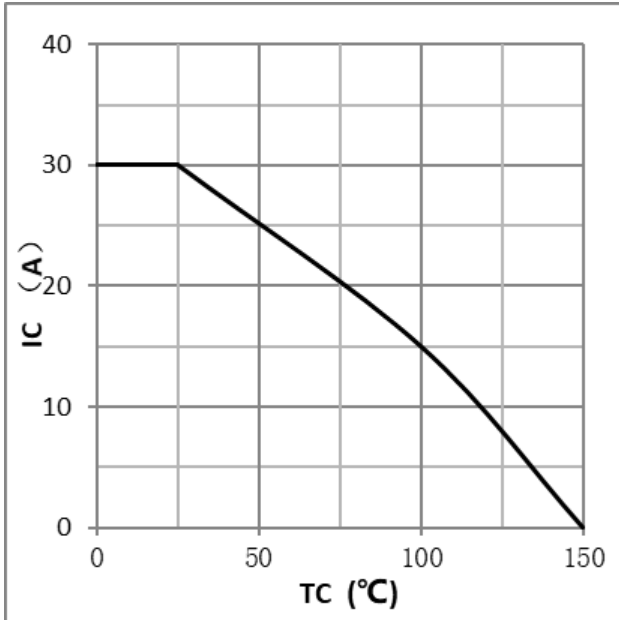


Figure 1. maximum DC collector current VS. case temperature

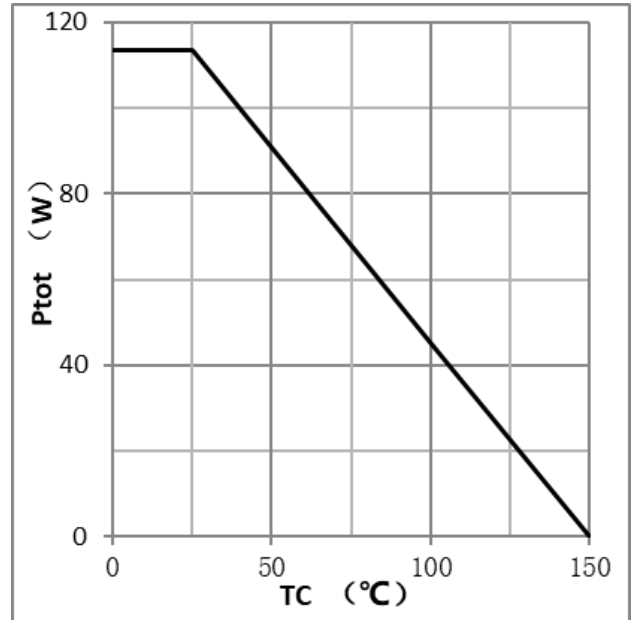


Figure 2. Power dissipation VS. case temperature

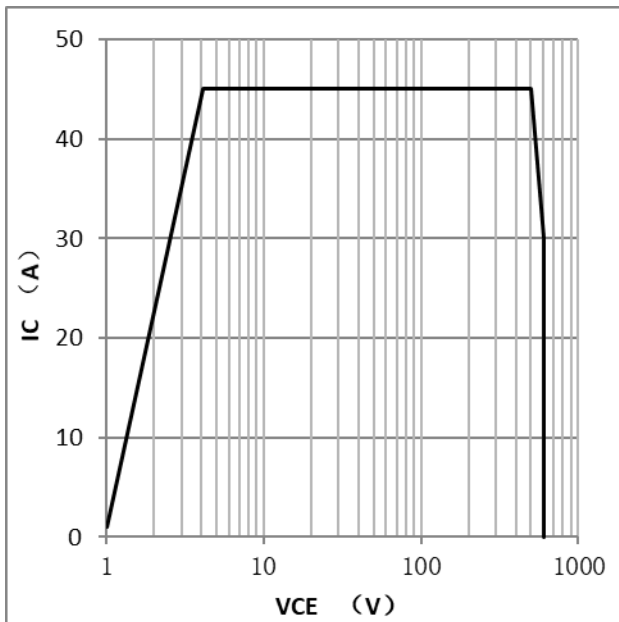


Figure 3. reverse bias SOA,  
Tj=125°C, Vge=15V

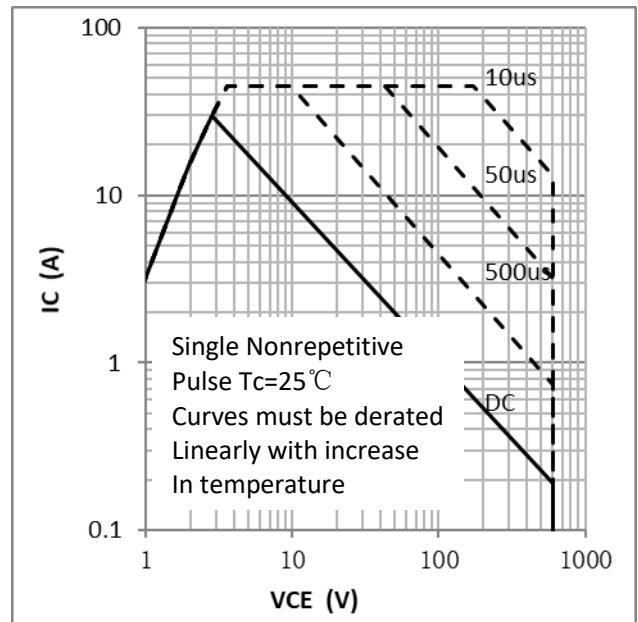


Figure 4. forward SOA  
Tc=25°C Tj≤150°C

## Typical Performance Characteristics

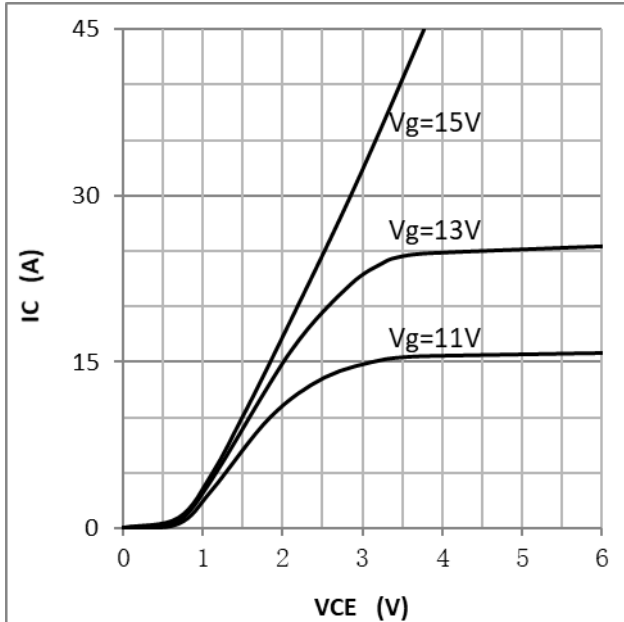


Figure 5. typical output characteristics

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

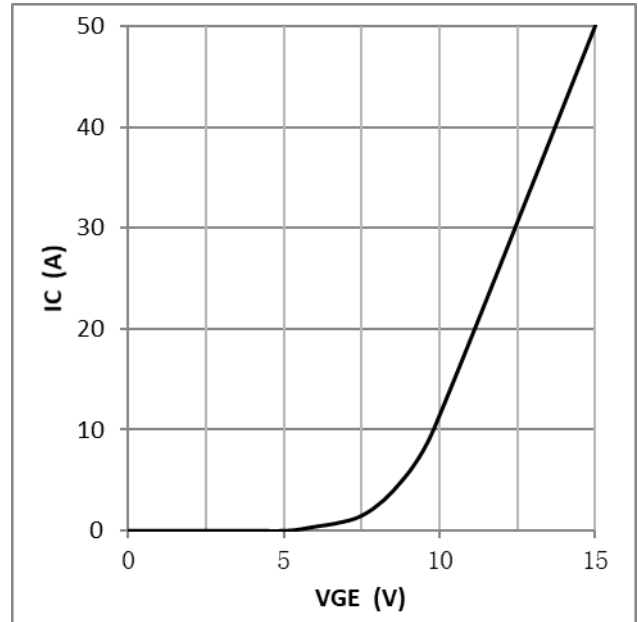


Figure 6. transfer characteristics

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

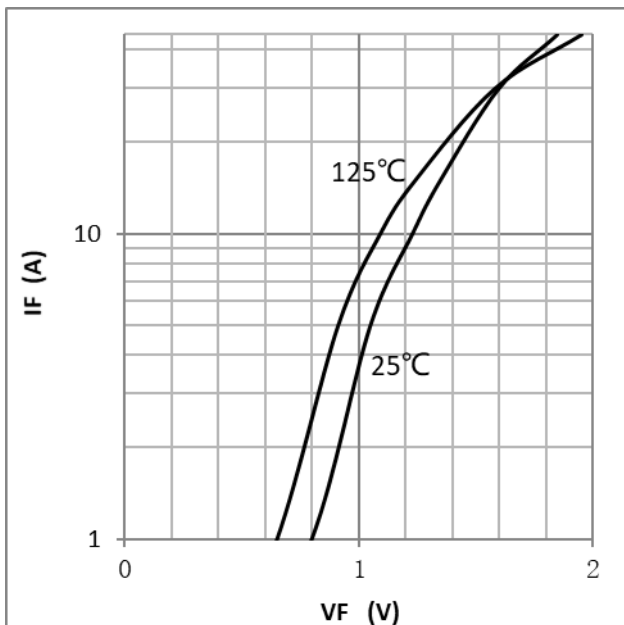


Figure 7. typical diode forward characteristics

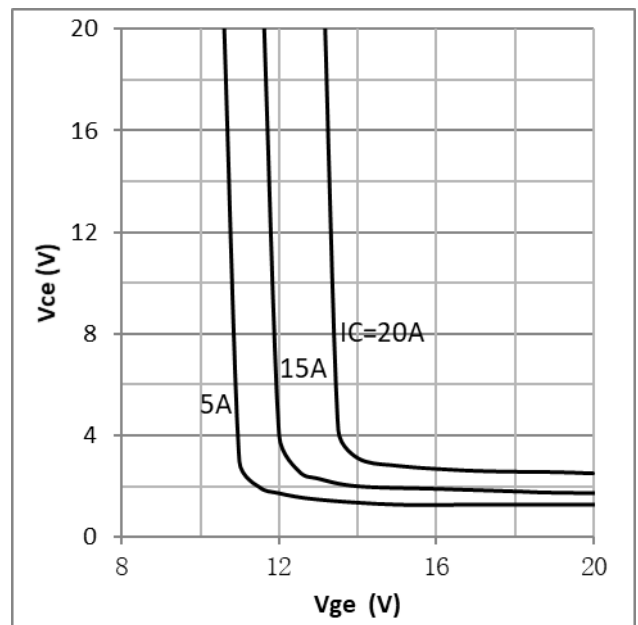


Figure 8. typical Saturation Voltage vs.  $V_{ge}$

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

## Typical Performance Characteristics

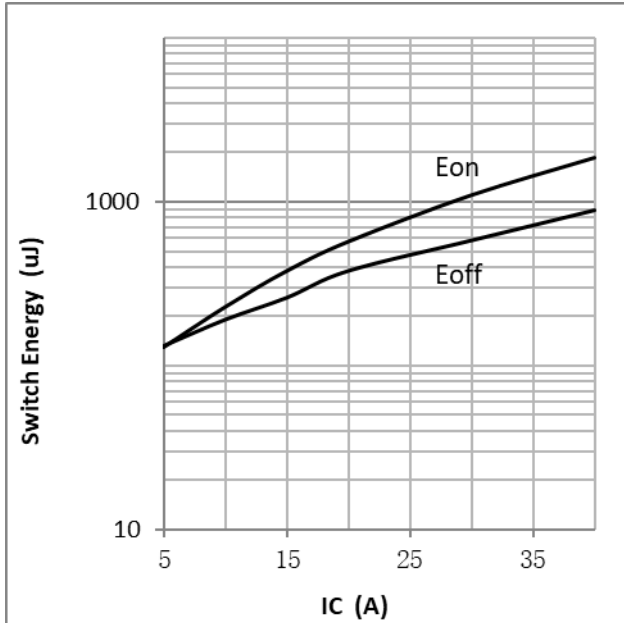


Figure 9. switch energy loss vs.  $I_c$   $T_c=25^\circ\text{C}$

$T_c=25^\circ\text{C}$   $L=500\mu\text{H}$   $V_{cc}=400\text{V}$   $V_{ge}=15\text{V}$   $R_g=20\Omega$

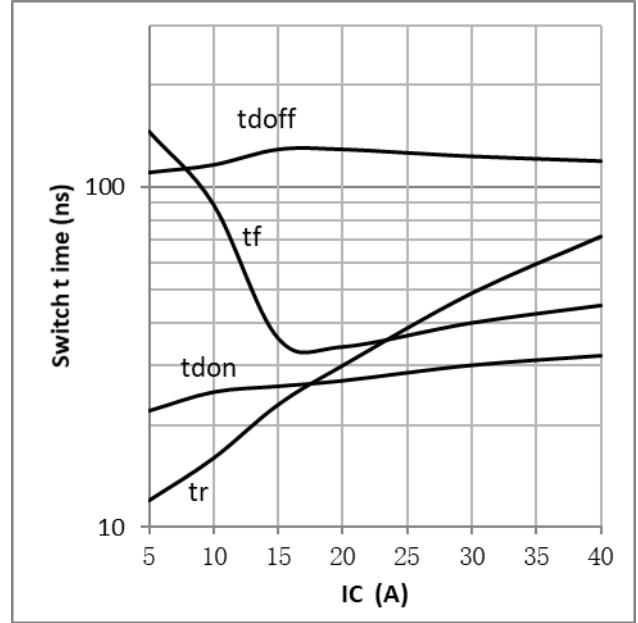


Figure 10. typical switch time vs.  $I_c$   $T_c=25^\circ\text{C}$

$L=500\mu\text{H}$   $V_{cc}=400\text{V}$   $V_{ge}=15\text{V}$   $R_g=20\Omega$

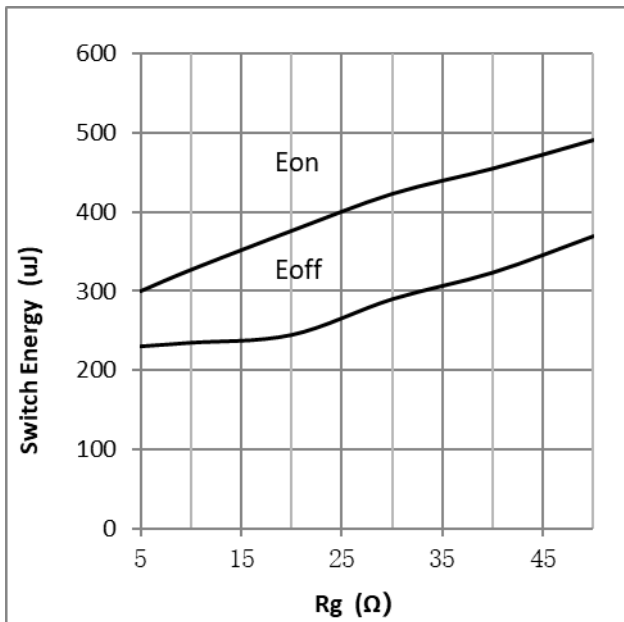


Figure 11. typical switch energy loss vs.  $R_g$

$T_c=25^\circ\text{C}$   $L=500\mu\text{H}$   $V_{cc}=400\text{V}$   $V_{ge}=15\text{V}$   $I_c=15\text{A}$

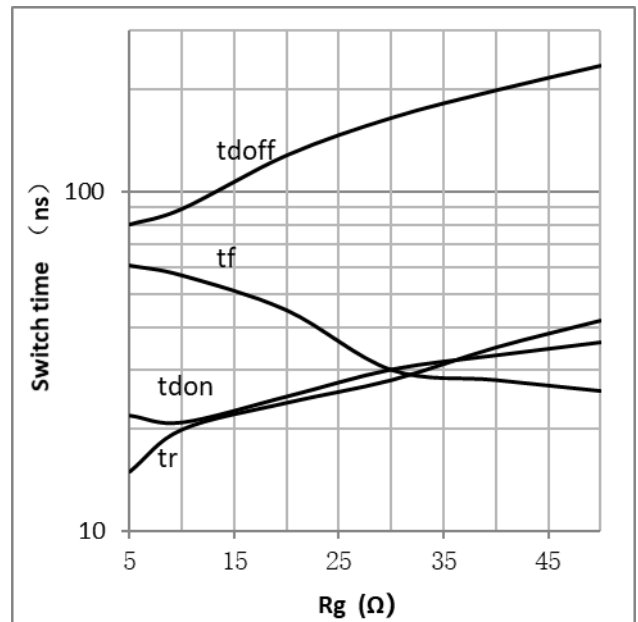


Figure 12. typical switch time vs.  $R_g$

$T_c=25^\circ\text{C}$   $L=500\mu\text{H}$   $V_{cc}=400\text{V}$   $V_{ge}=15\text{V}$   $I_c=15\text{A}$

## Typical Performance Characteristics

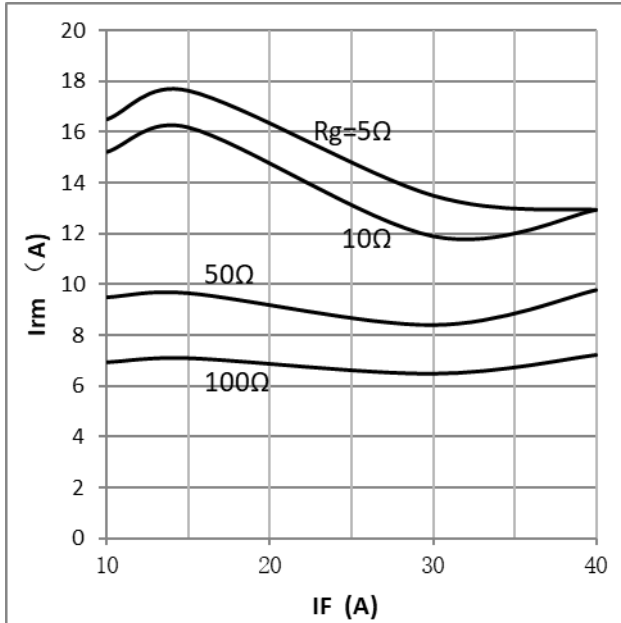


Figure 13. typical diode  $I_{rm}$  vs.  $I_F$   
 $T_c=25^\circ\text{C}$   $V_{cc}=300\text{V}$   $V_{ge}=15\text{V}$

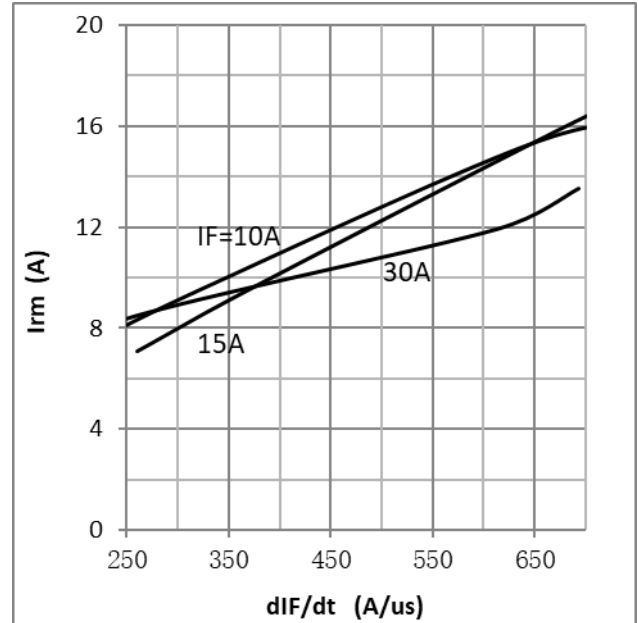


Figure 14. typical diode  $I_{rm}$  vs.  $dI_F/dt$   
 $T_c=25^\circ\text{C}$   $V_{cc}=300\text{V}$   $V_{ge}=15\text{V}$

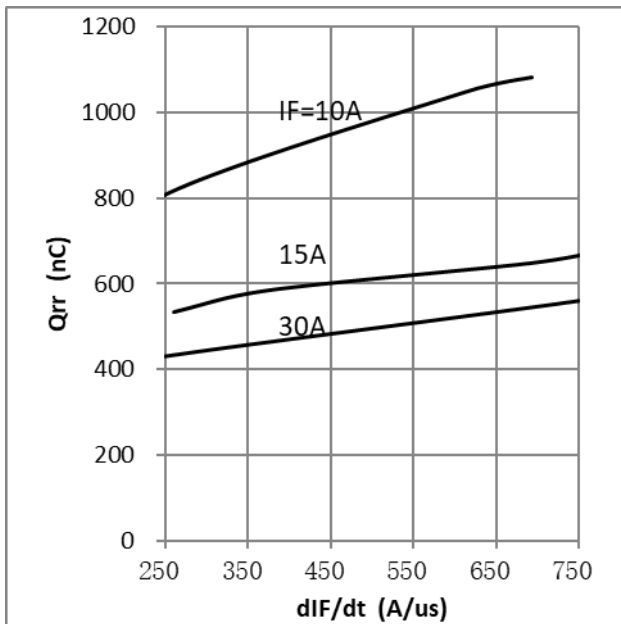


Figure 15. typical diode  $Q_{rr}$  vs.  $dI_F/dt$   
 $T_c=25^\circ\text{C}$   $V_{cc}=300\text{V}$   $V_{ge}=15\text{V}$

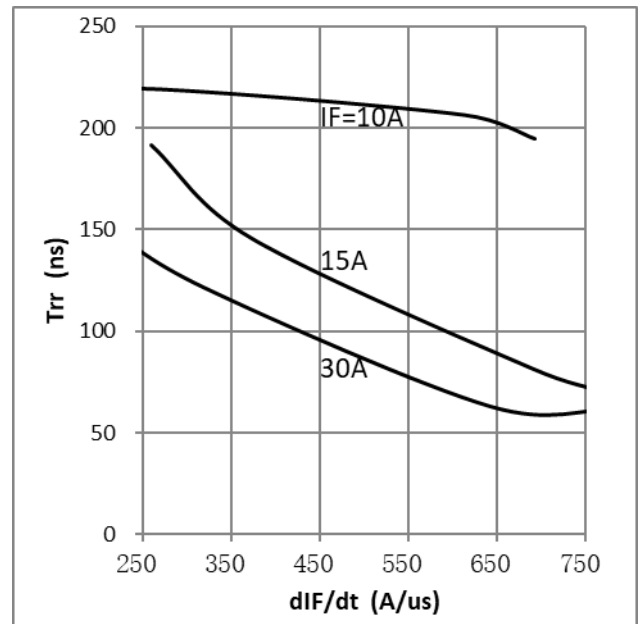


Figure 16. typical diode  $t_{rr}$  vs.  $dI_F/dt$   
 $T_c=25^\circ\text{C}$   $V_{cc}=300\text{V}$   $V_{ge}=15\text{V}$

## Typical Performance Characteristics

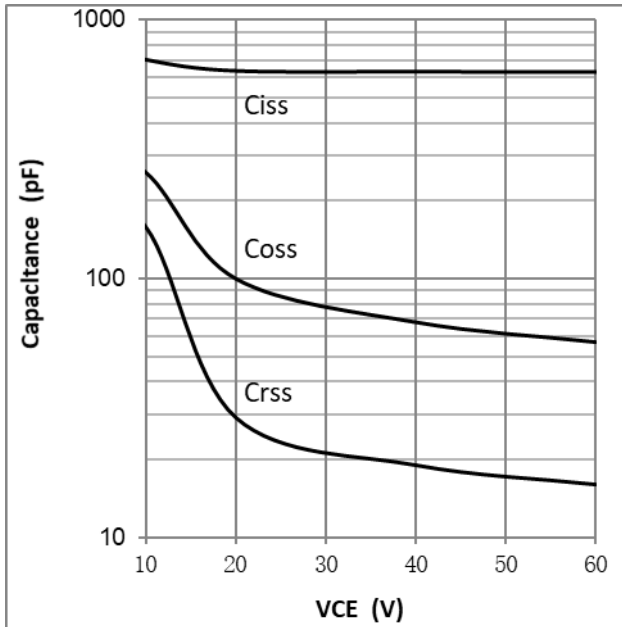


Figure 17. typical Capacitance vs. VCE  
Tc=25°C f=1MHz Vge=0V

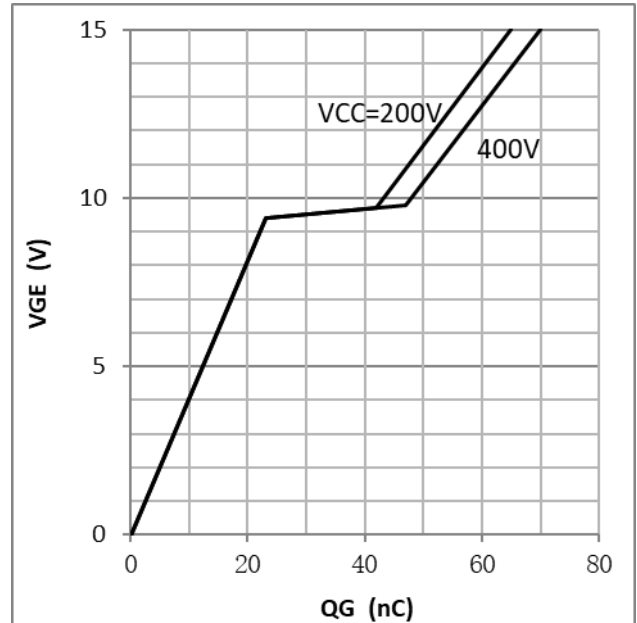


Figure 18. typical gate charge vs. VGE  
Tc=25°C Ic=15A

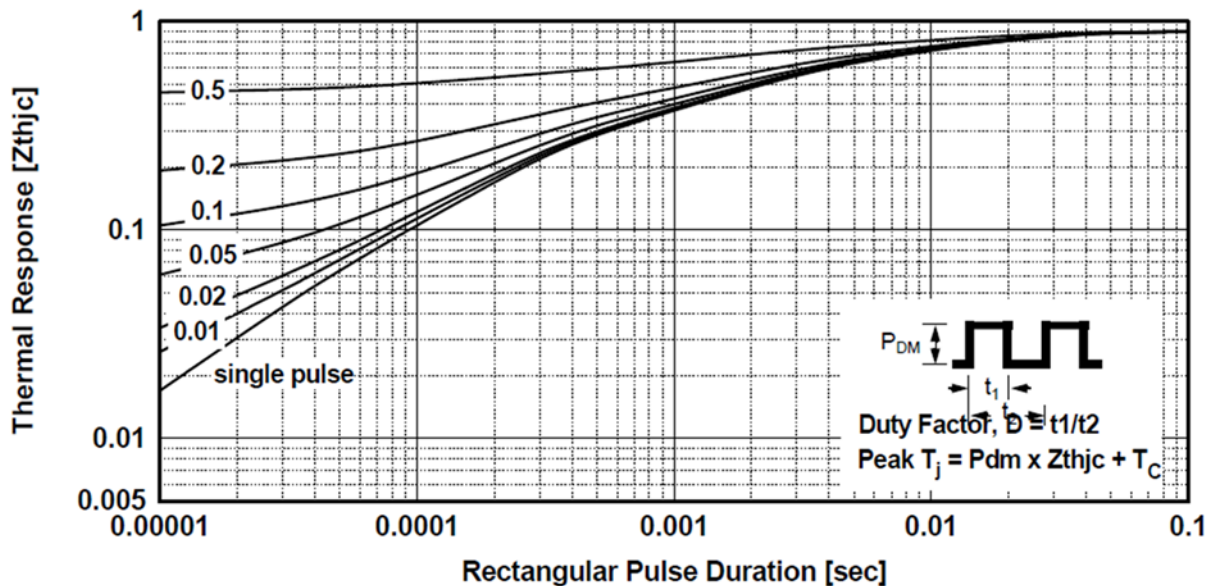
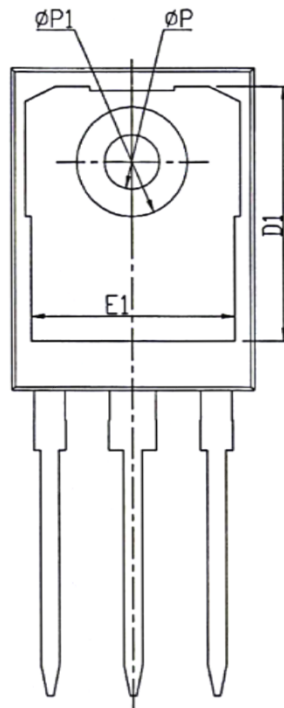
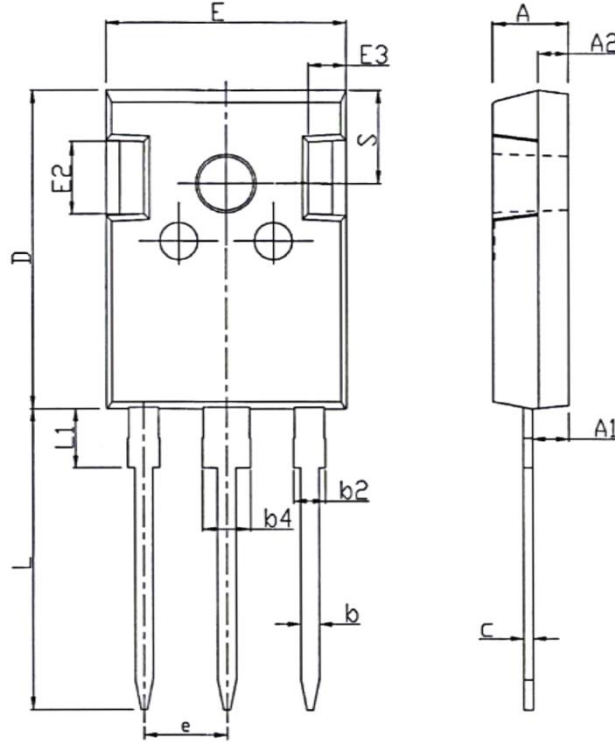


Figure19. normalized transient thermal impedance, junction-to-case

## Mechanical Dimensions



SYMBOL	MM		
	MIN	NOM	MAX
A	4.8	5	5.2
A1	2.21	2.41	2.61
A2	1.85	2	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.7	21	21.3
D1	16.25	16.55	16.85
E	15.5	15.8	16.1
E1	13	13.3	13.6
E2	1.8	5	5.2
E3	2.3	2.5	2.7
e	5.44 BSC		
L	19.62	19.92	20.22
L1	-	-	4.3
ΦP	3.4	3.6	3.8
ΦP1	-	-	7.3
S	6.15 BSC		



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