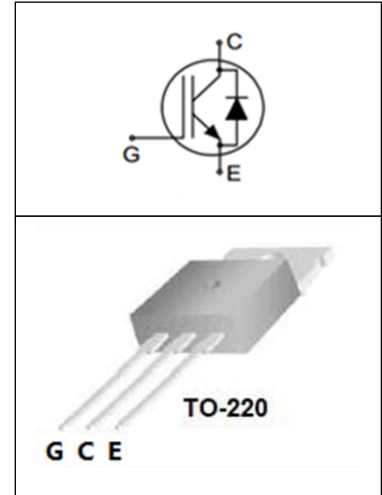


## IGBT

### 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	62	$^\circ C/W$

**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	$V_{CE}=30V$	-	634	-	pF
$C_{oes}$	Output Capacitance	$V_{GE}=0V$	-	84	-	pF
$C_{res}$	Reverse Transfer Capacitance	$f=1MHz$	-	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	$V_{CE}=300V$	-	115	-	ns
$I_{rr}$	Diode peak Reverse Recovery Current	$I_F=15A$	-	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**

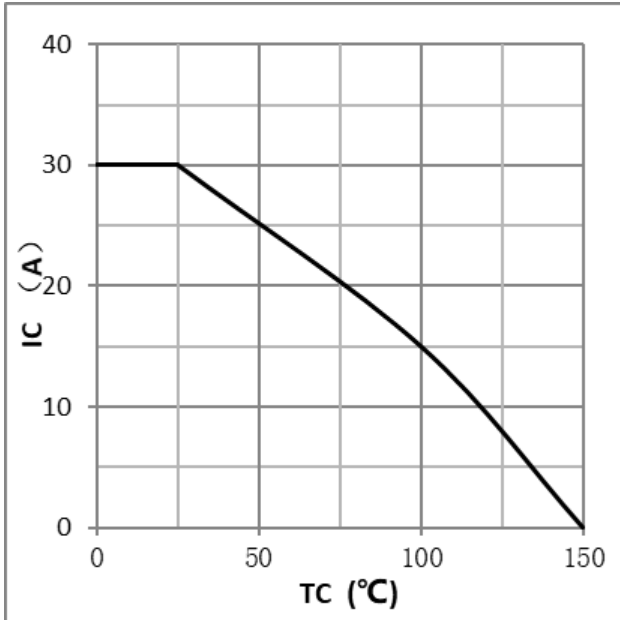


Figure 1. maximum DC collector current VS. case temperature

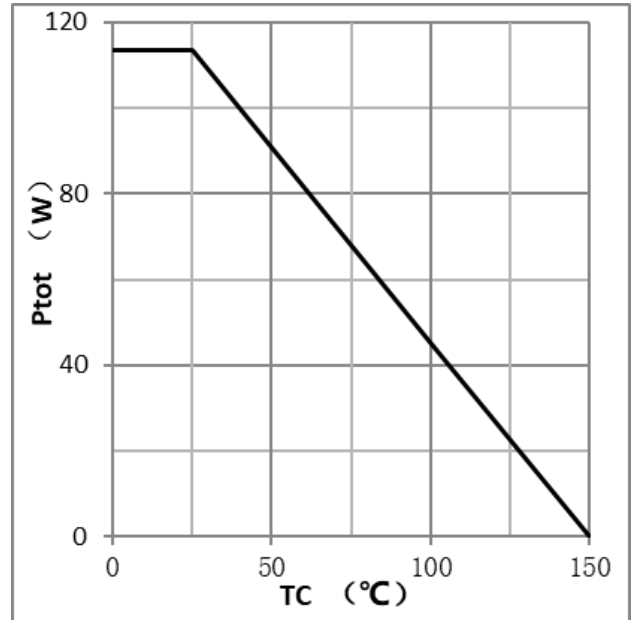


Figure 2. Power dissipation VS. case temperature

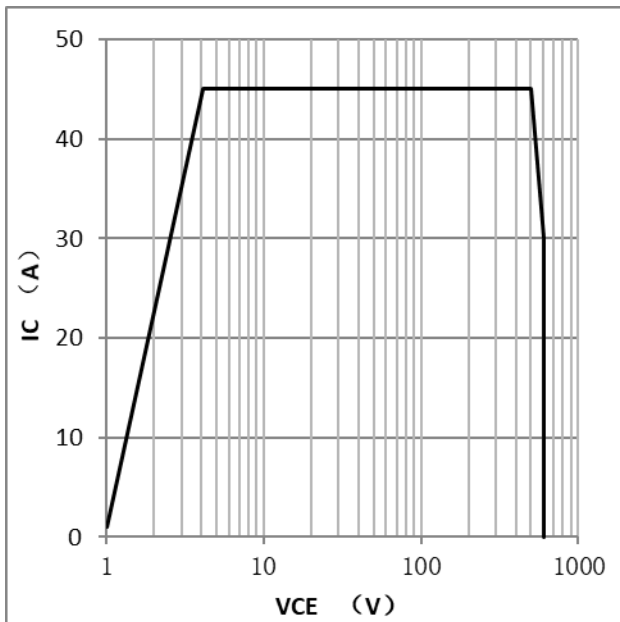


Figure 3. reverse bias SOA,  
Tj=125°C, Vge=15V

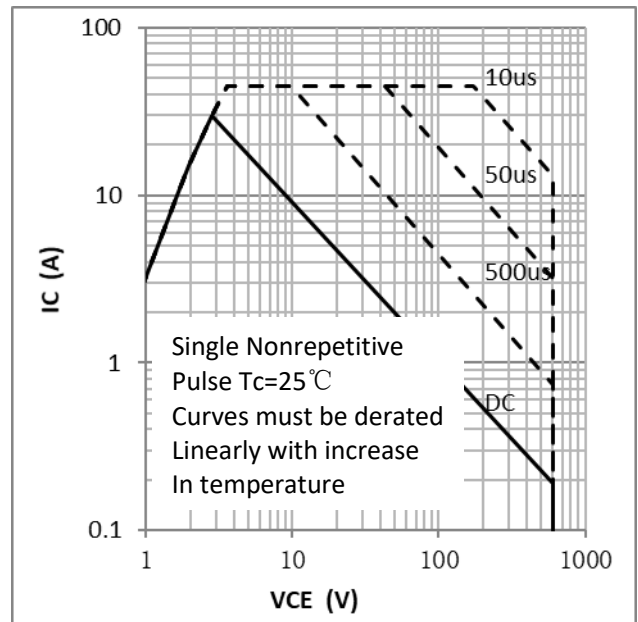


Figure 4. forward SOA  
Tc=25°C Tj≤150°C

**Typical Performance Characteristics**

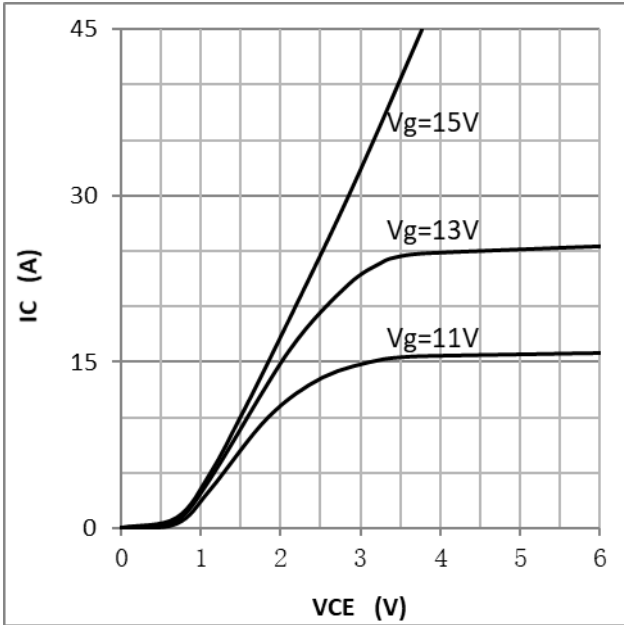


Figure 5. typical output characteristics  
Tc=25°C tp=300us

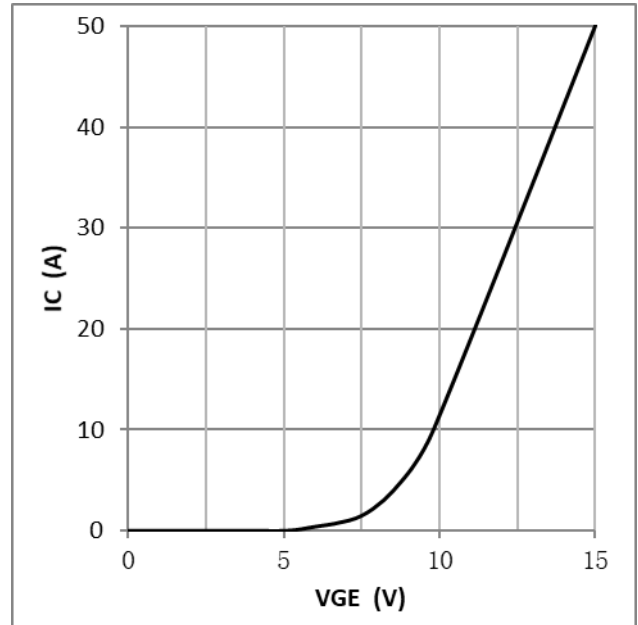


Figure 6. transfer characteristics  
Tc=25°C VCE=20V

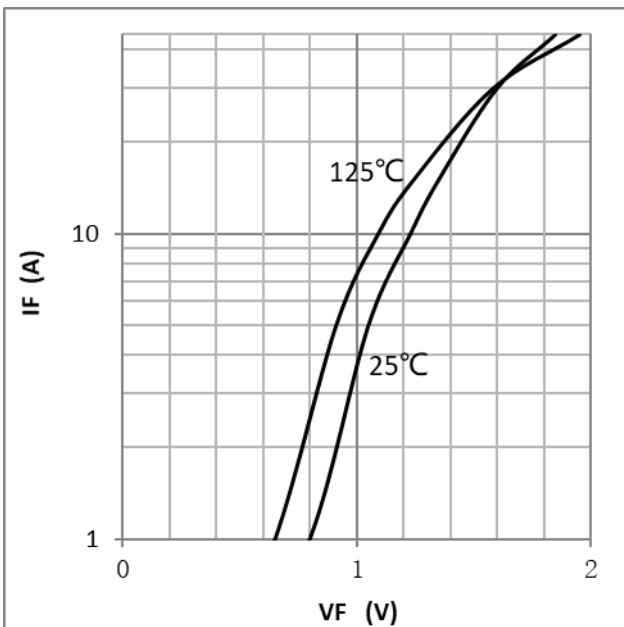


Figure 7. typical diode forward characteristics

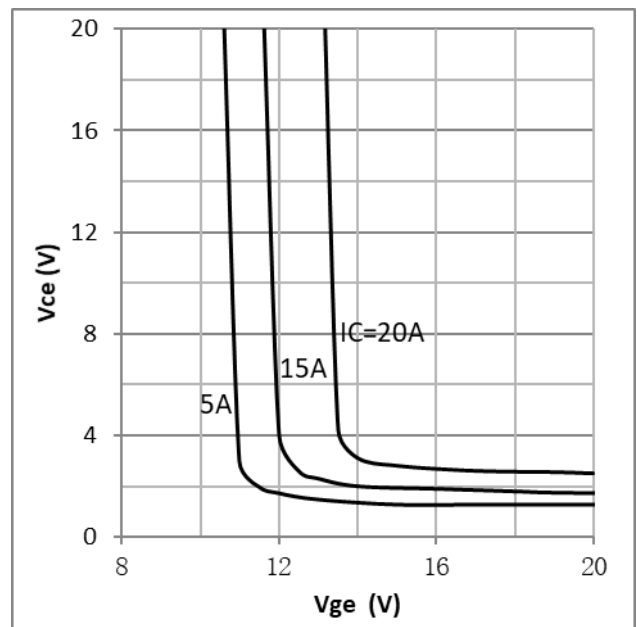


Figure 8. typical Saturation Voltage vs. Vge  
Tc=25°C

**Typical Performance Characteristics**

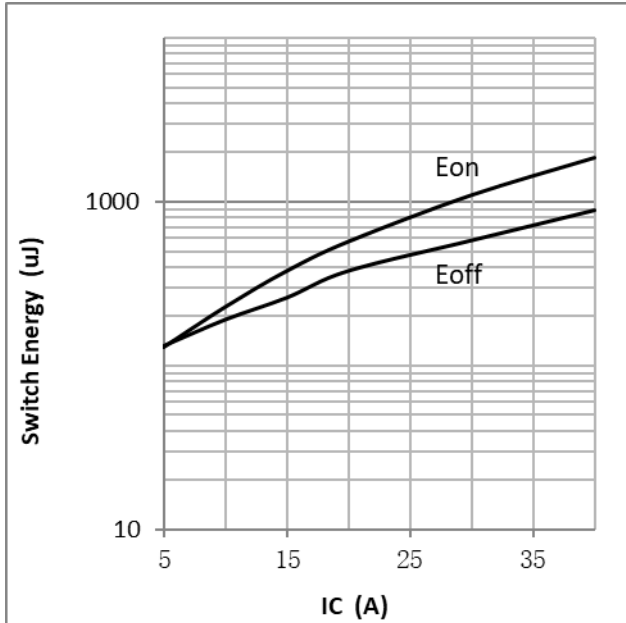


Figure 9. switch energy loss vs.  $I_c$   $T_c=25^\circ\text{C}$

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

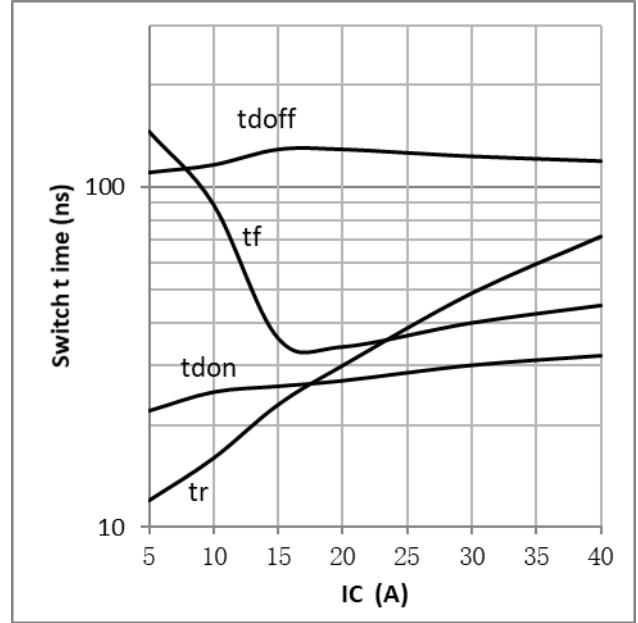


Figure 10. typical switch time vs.  $I_c$   $T_c=25^\circ\text{C}$

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

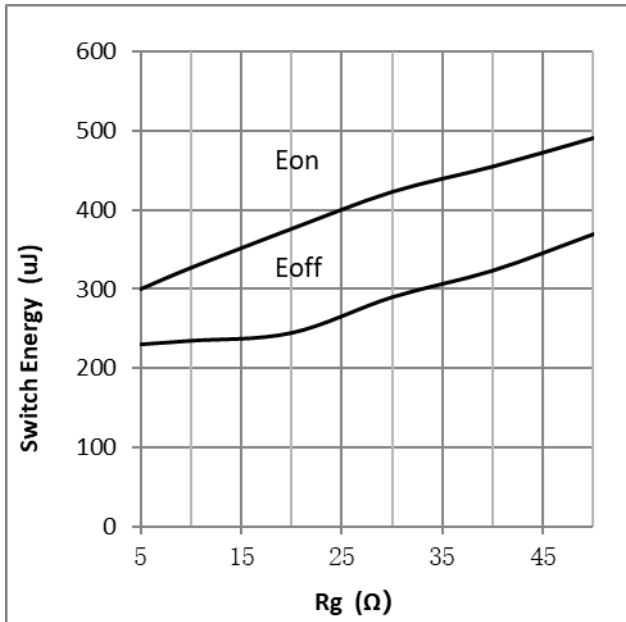


Figure 11. typical switch energy loss vs.  $R_g$

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

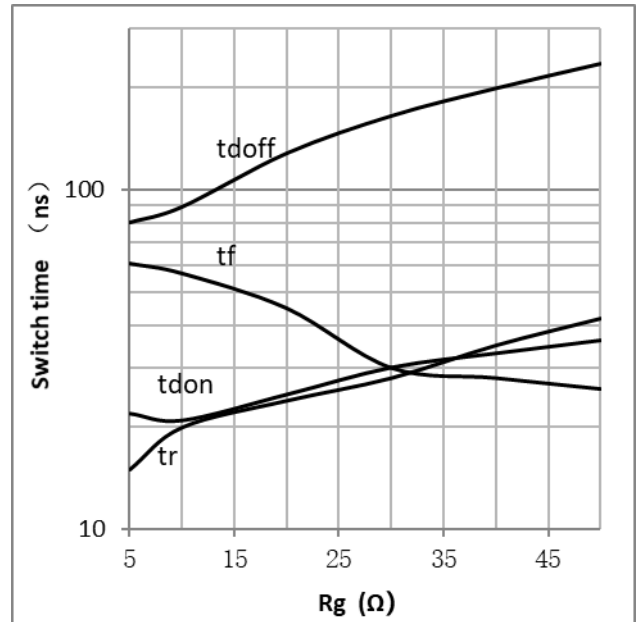


Figure 12. typical switch time vs.  $R_g$

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

**Typical Performance Characteristics**

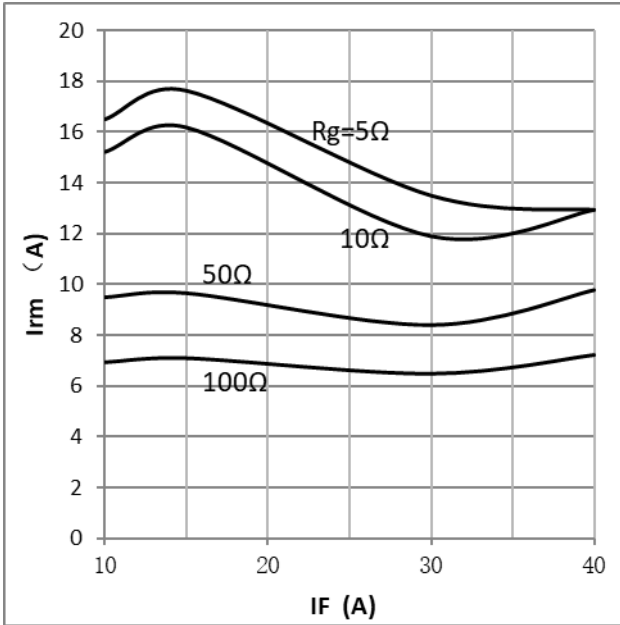


Figure 13. typical diode Irm vs. IF  
Tc=25°C Vcc=300V Vge=15V

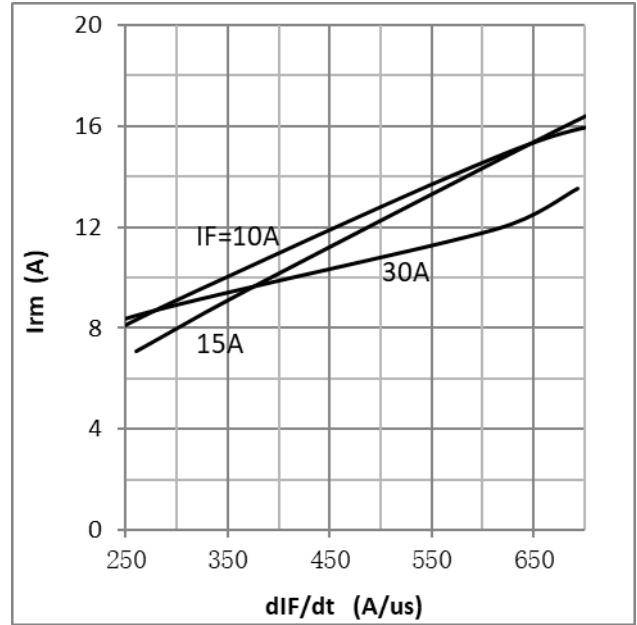


Figure 14. typical diode Irm vs. dIF/dt  
Tc=25°C Vcc=300V Vge=15V

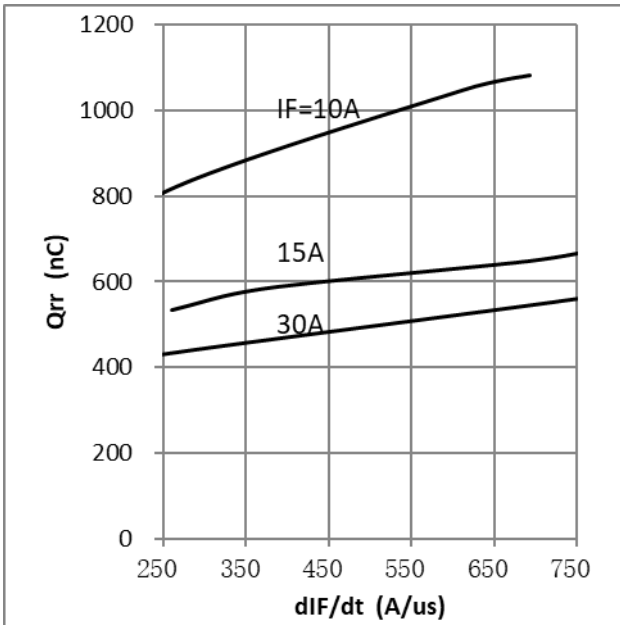


Figure 15. typical diode Qrr vs. dIF/dt  
Tc=25°C Vcc=300V Vge=15V

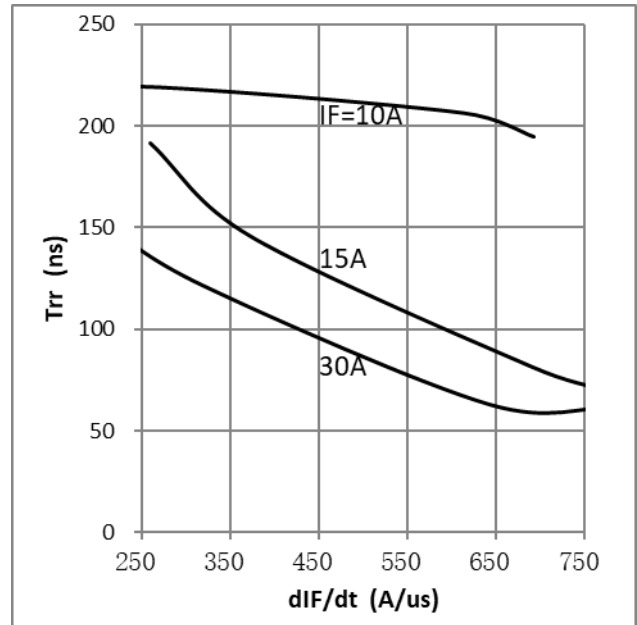


Figure 16. typical diode trr vs. dIF/dt  
Tc=25°C Vcc=300V Vge=15V

**Typical Performance Characteristics**

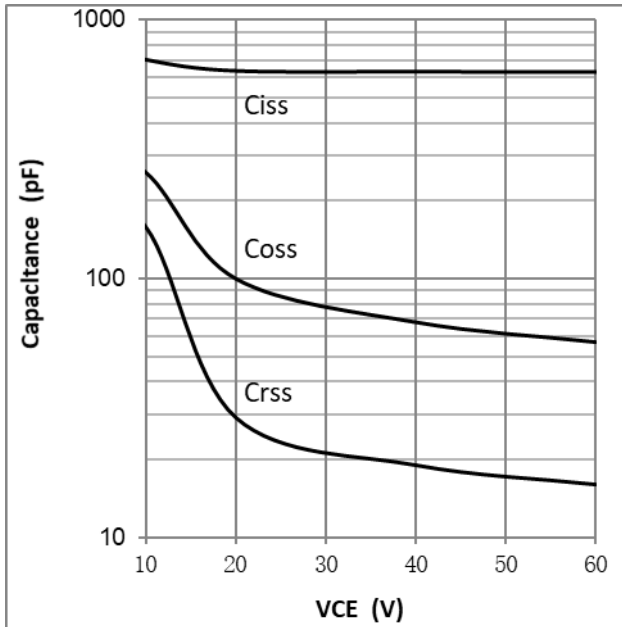


Figure 17. typical Capacitance vs. VCE  
Tc=25°C f=1MHz Vge=0V

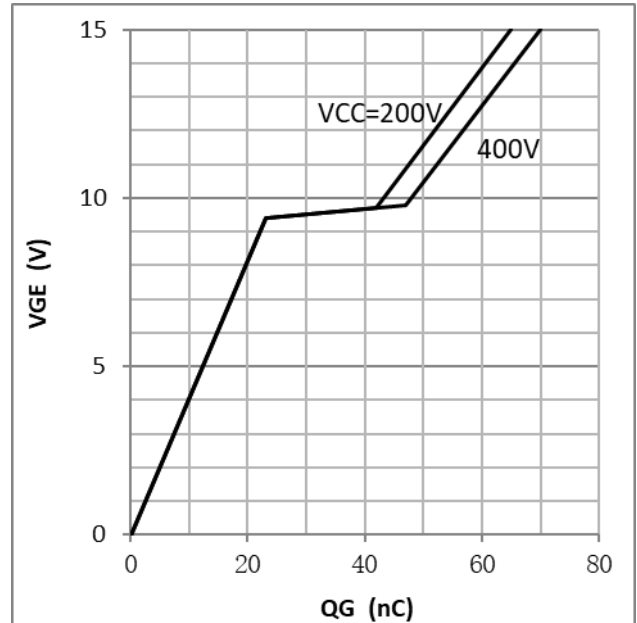


Figure 18. typical gate charge vs. VGE  
Tc=25°C Ic=15A

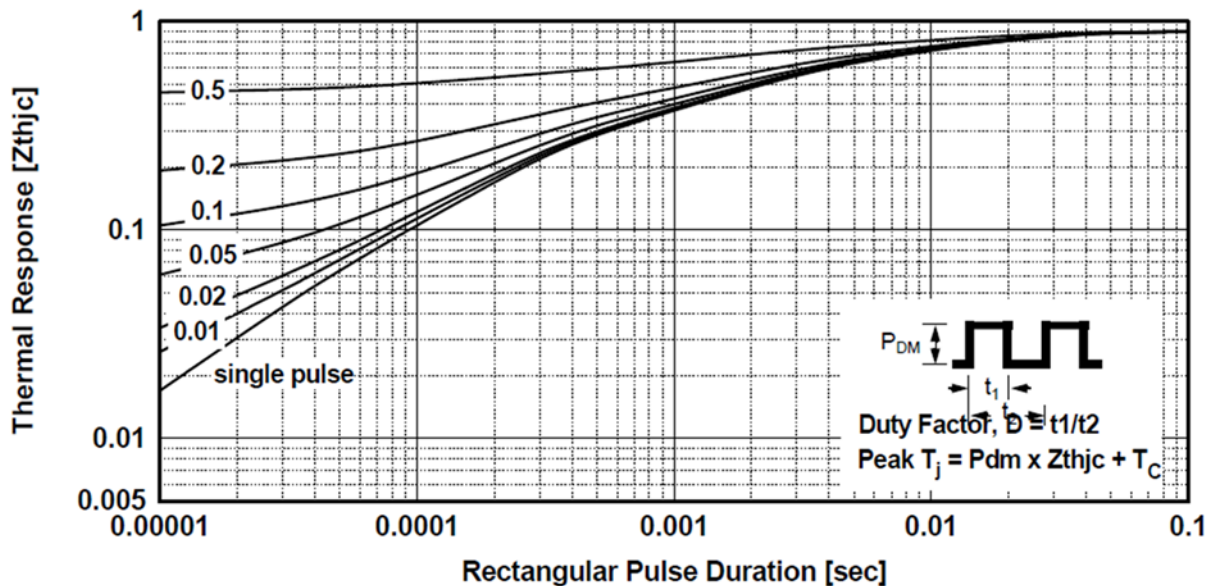
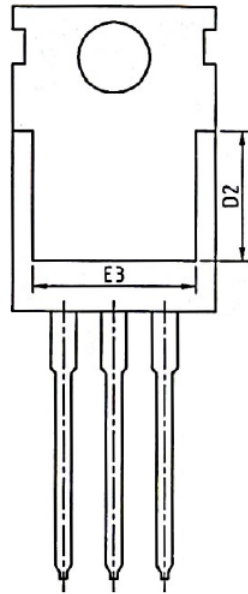
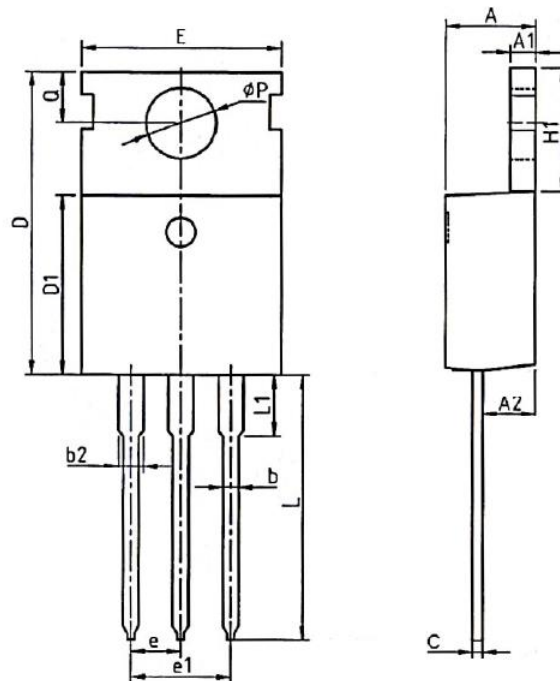


Figure19. normalized transient thermal impedance, junction-to-case

**Mechanical Dimensions**



SYMBOL	MIN	NOM	MAX
A	4.37	4.57	4.7
A1	1.25	1.3	1.4
A2	2.2	2.4	2.6
b	0.7	0.8	0.95
b2	1.17	1.27	1.47
c	0.45	0.5	0.6
D	15.1	15.6	16.1
D1	8.8	9.1	9.4
D2	5.5	-	-
E	9.7	10	10.3
E3	7	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.5	6.85
L	12.75	13.5	13.8
L1	-	3.1	3.4
φP	3.4	3.6	3.8
Q	2.6	2.8	3





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