WINSOURCE
ELECTRONICS

THE DATASHEET OF

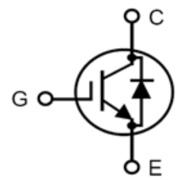
IXYP20N65C3D1

XPT™ 650V IGBT GenX3™ w/Diode

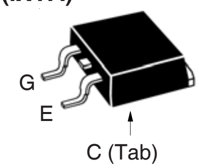
IXYA20N65C3D1
IXYP20N65C3D1

V_{CES} = 650V
I_{C110} = 20A
$V_{CE(sat)}$ ≤ 2.50V
$t_{fi(typ)}$ = 28ns

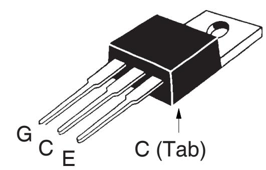
Extreme Light Punch Through
IGBT for 20-60kHz Switching



TO-263 AA (IXYA)



TO-220AB (IXYP)



G = Gate C = Collector
E = Emitter Tab = Collector

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	650	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	650	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	50	A
I_{C110}	T_C = 110°C	20	A
I_{F110}	T_C = 110°C	18	A
I_{CM}	T_C = 25°C, 1ms	105	A
I_A	T_C = 25°C	10	A
E_{AS}	T_C = 25°C	200	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 20Ω Clamped Inductive Load	I_{CM} = 40 $V_{CE} \le V_{CES}$	A
t_{sc} (SCSOA)	V_{GE} = 15V, V_{CE} = 360V, T_J = 150°C R_G = 82Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	200	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque (TO-220)	1.13/10	Nm/lb.in
F_C	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb
Weight	TO-263	2.5	g
	TO-220	3.0	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250μA, V_{GE} = 0V	650			V
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	3.5		6.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			10	μA
	T_J = 150°C			400	μA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15V, Note 1		2.27	2.50	V
	T_J = 150°C		2.44		V

Features

- Optimized for 20-60kHz Switching
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Fast Diode
- Short Circuit Capability
- International Standard Packages

Advantages

- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- High Frequency Power Inverters

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 20A, V_{CE} = 10V, Note 1	7	12		S
C_{ies}			822		pF
C_{oes}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		67		pF
C_{res}			19		pF
$Q_{g(on)}$			30		nC
Q_{ge}	I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		6		nC
Q_{gc}			15		nC
$t_{d(on)}$			19		ns
t_{ri}	**Inductive load, T_J = 25°C**		34		ns
E_{on}	I_C = 20A, V_{GE} = 15V		0.43		mJ
$t_{d(off)}$	V_{CE} = 400V, R_G = 20Ω		80		ns
t_{fi}	Note 2		28		ns
E_{off}			0.35	0.65	mJ
$t_{d(on)}$			18		ns
t_{ri}	**Inductive load, T_J = 150°C**		33		ns
E_{on}	I_C = 20A, V_{GE} = 15V		0.70		mJ
$t_{d(off)}$	V_{CE} = 400V, R_G = 20Ω		96		ns
t_{fi}	Note 2		36		ns
E_{off}			0.40		mJ
R_{thJC}				0.65	°C/W
R_{thCS}	TO-220		0.50		°C/W

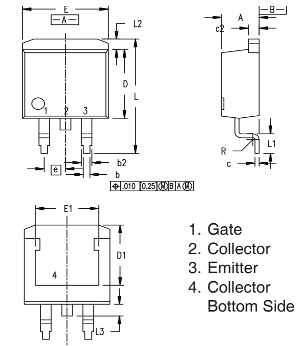
Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 20A, V_{GE} = 0V, Note 1			2.5	V
	T_J = 150°C		1.5		V
I_{RM}	I_F = 20A, V_{GE} = 0V,		11		A
t_{rr}	$-di_F/dt$ = 300A/μs, V_R = 400V, T_J = 150°C		135		ns
R_{thJC}				1.85	°C/W

Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G.

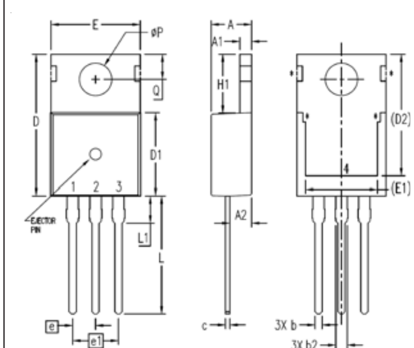
TO-263 Outline

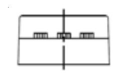


1. Gate
2. Collector
3. Emitter
4. Collector
   Bottom Side

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.06	4.83	.160	.190
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.40	0.74	.016	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	8.00	8.89	.280	.320
E	9.65	10.41	.380	.405
E1	6.22	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.13	0	.005

TO-220 Outline





Pins: 1 - Gate
2,4 - Collector
3 - Emitter

SYM	INCHES MIN	MAX	MILLIMETERS MIN	MAX
A	.169	.185	4.30	4.70
A1	.047	.055	1.20	1.40
A2	.079	.106	2.00	2.70
b	.024	.039	0.60	1.00
b2	.045	.057	1.15	1.45
c	.014	.026	0.35	0.65
D	.587	.626	14.90	15.90
D1	.335	.370	8.50	9.40
(D2)	.500	.531	12.70	13.50
E	.382	.406	9.70	10.30
(E1)	.283	.323	7.20	8.20
e	.100 BSC		2.54 BSC	
e1	.200 BSC		5.08 BSC	
H1	.244	.268	6.20	6.80
L	.492	.547	12.50	13.90
L1	.110	.154	2.80	3.90
ØP	.134	.150	3.40	3.80
Q	.106	.126	2.70	3.20

Fig. 1. Output Characteristics @ T_J = 25ºC

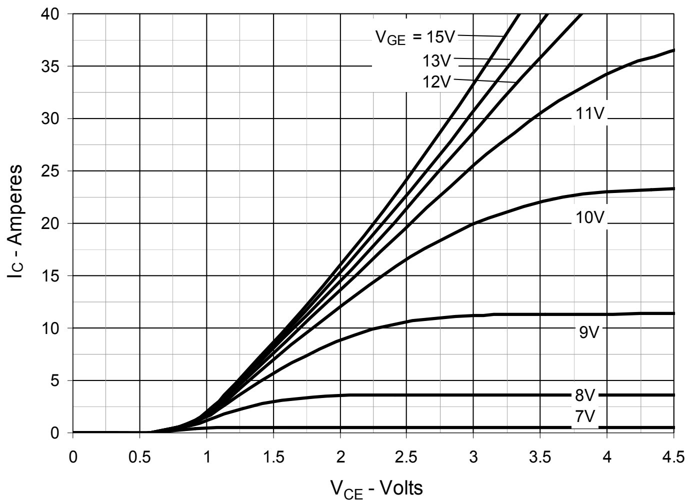


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

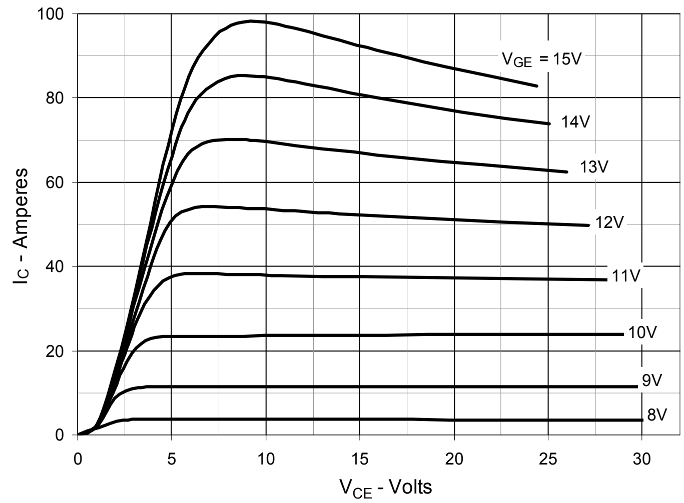


Fig. 3. Output Characteristics @ T_J = 150ºC

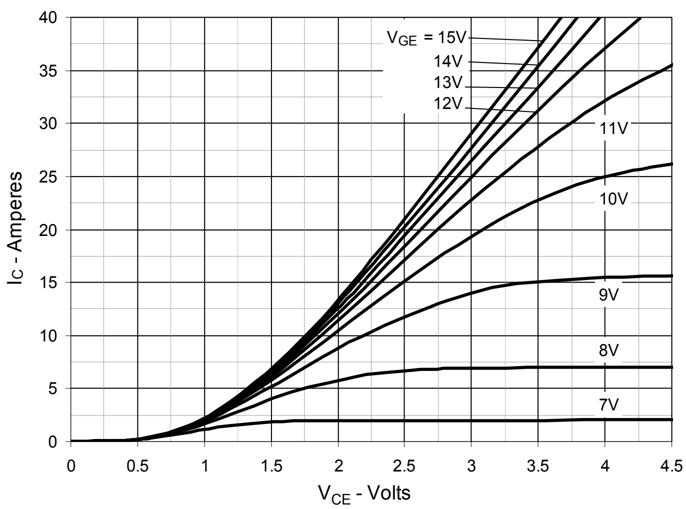


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

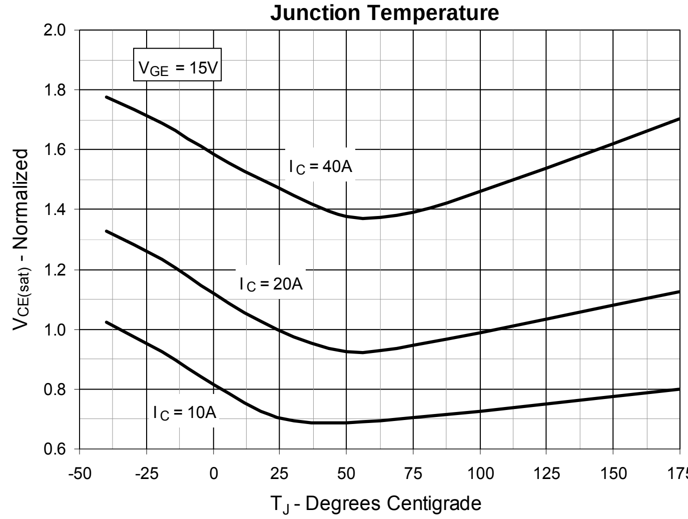


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

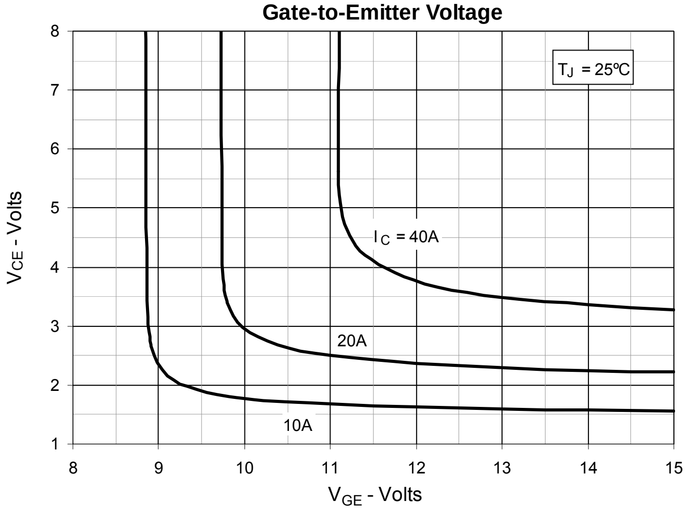
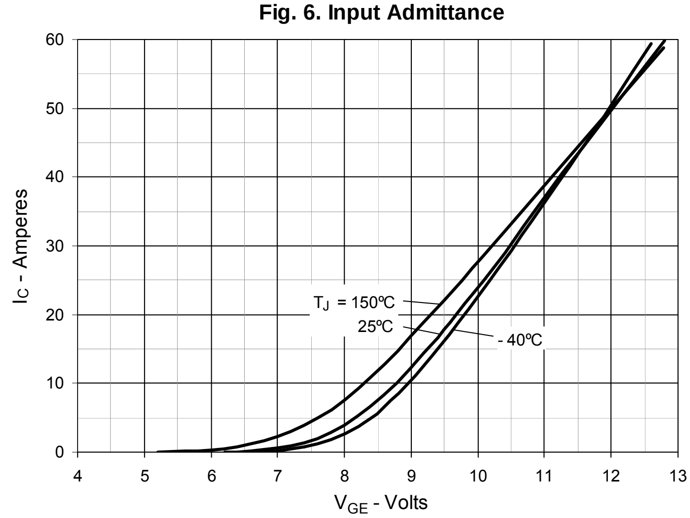


Fig. 6. Input Admittance



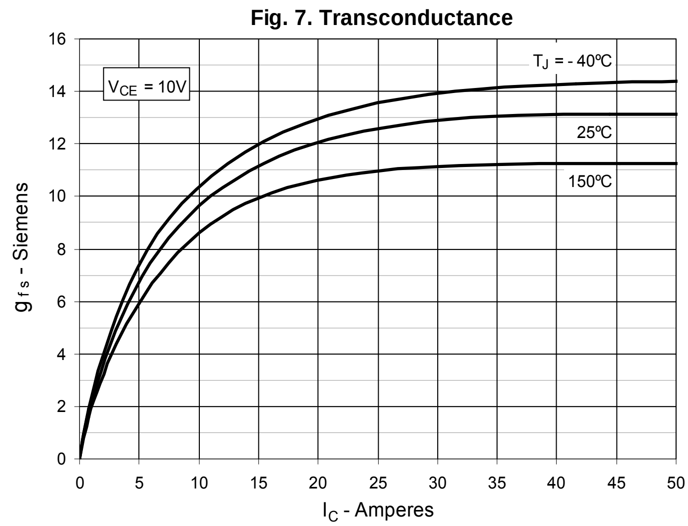


Fig. 7. Transconductance
V_{CE} = 10V
T_J = - 40ºC
25ºC
150ºC
g_{fs} - Siemens
I_C - Amperes
0
2
4
6
8
10
12
14
16
0
5
10
15
20
25
30
35
40
45
50

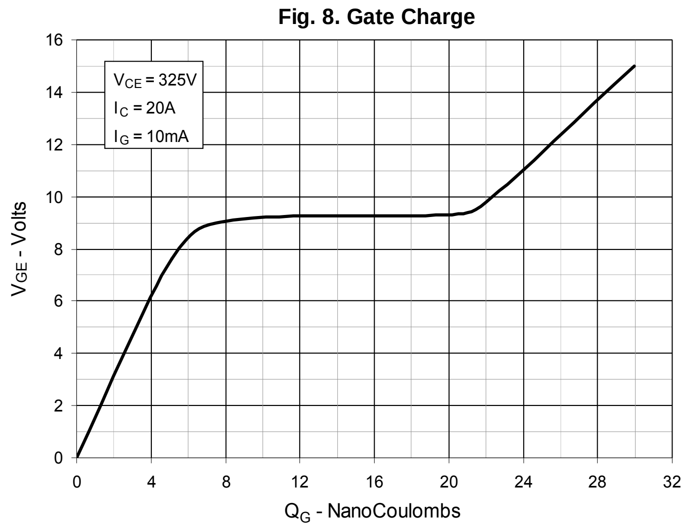


Fig. 8. Gate Charge
V_{CE} = 325V
I_C = 20A
I_G = 10mA
V_{GE} - Volts
Q_G - NanoCoulombs
0
2
4
6
8
10
12
14
16
0
4
8
12
16
20
24
28
32

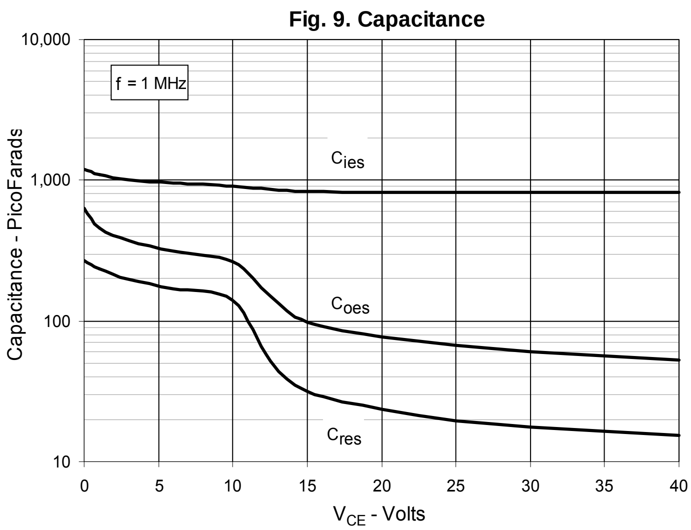


Fig. 9. Capacitance
f = 1 MHz
C_{ies}
C_{oes}
C_{res}
Capacitance - PicoFarads
V_{CE} - Volts
10,000
1,000
100
10
0
5
10
15
20
25
30
35
40

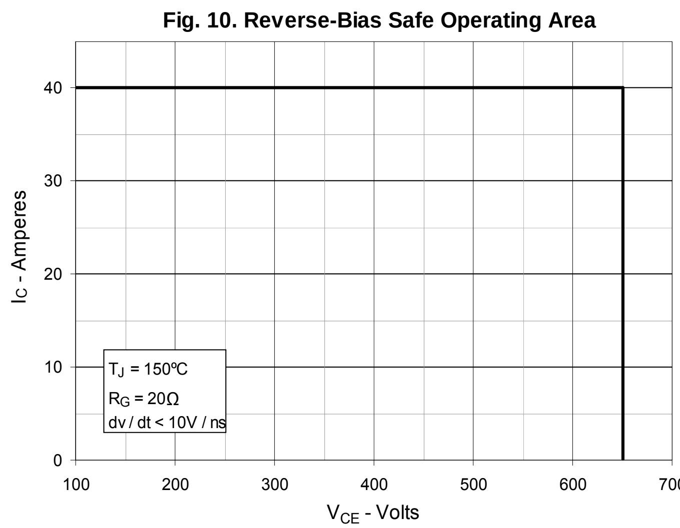


Fig. 10. Reverse-Bias Safe Operating Area
T_J = 150ºC
R_G = 20Ω
dv / dt < 10V / ns
I_C - Amperes
V_{CE} - Volts
0
10
20
30
40
100
200
300
400
500
600
700

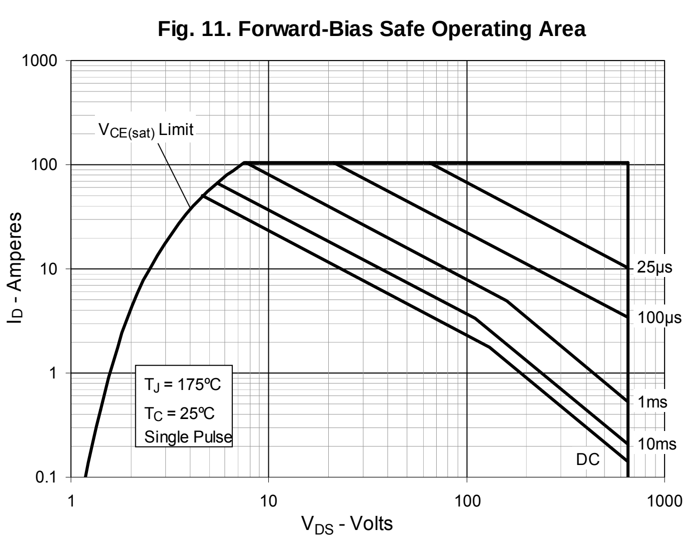


Fig. 11. Forward-Bias Safe Operating Area
$V_{CE(sat)}$ Limit
25µs
100µs
1ms
10ms
DC
T_J = 175ºC
T_C = 25ºC
Single Pulse
I_D - Amperes
V_{DS} - Volts
1000
100
10
1
0.1
1
10
100
1000

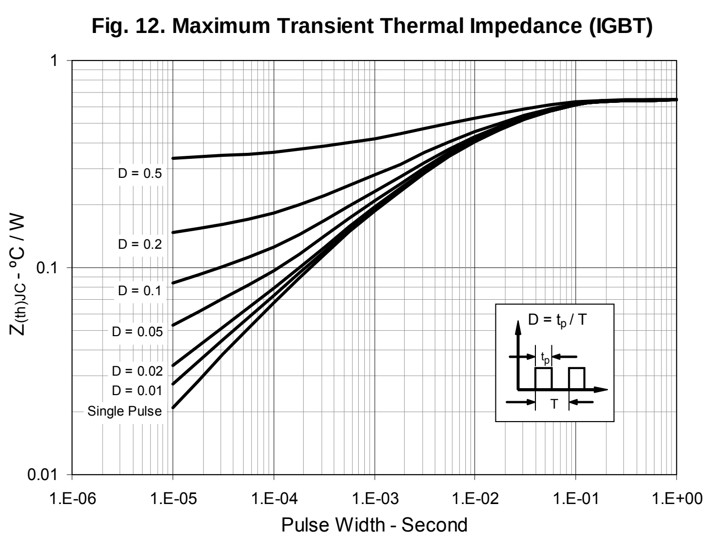


Fig. 12. Maximum Transient Thermal Impedance (IGBT)
D = 0.5
D = 0.2
D = 0.1
D = 0.05
D = 0.02
D = 0.01
Single Pulse
D = t_p / T
t_p
T
$Z_{(th)JC}$ - ºC / W
Pulse Width - Second
1
0.1
0.01
1.E-06
1.E-05
1.E-04
1.E-03
1.E-02
1.E-01
1.E+00

Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

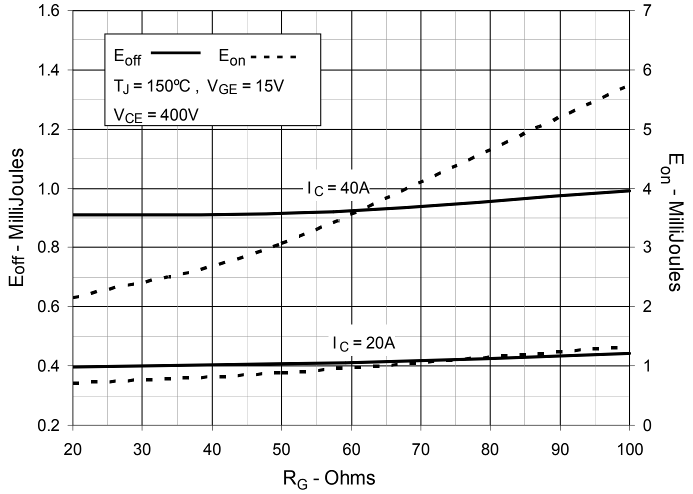


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

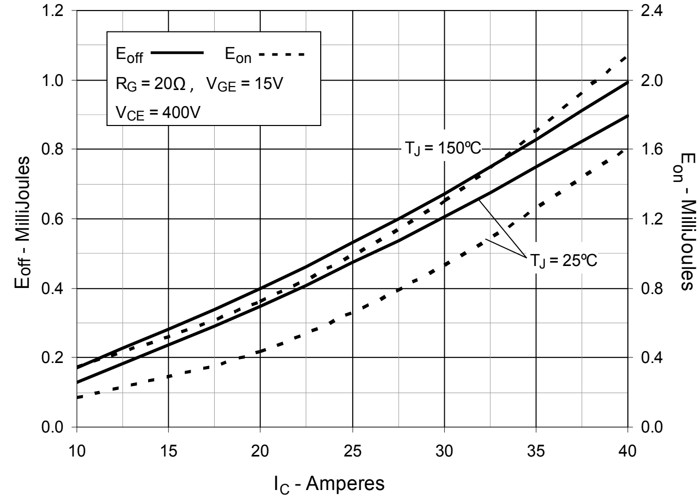


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

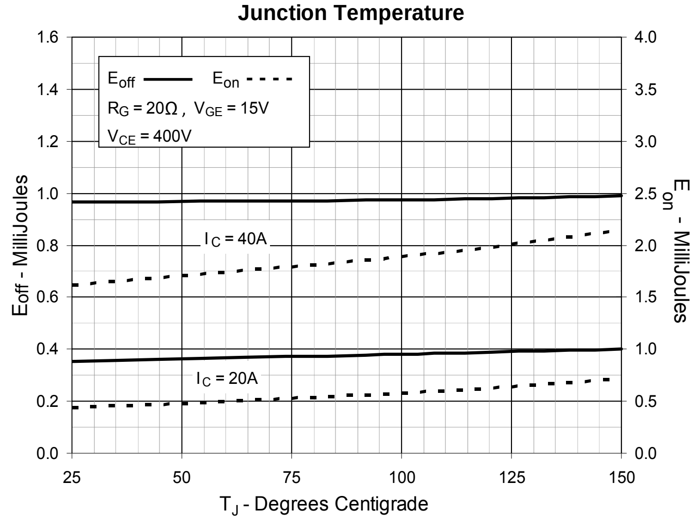


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

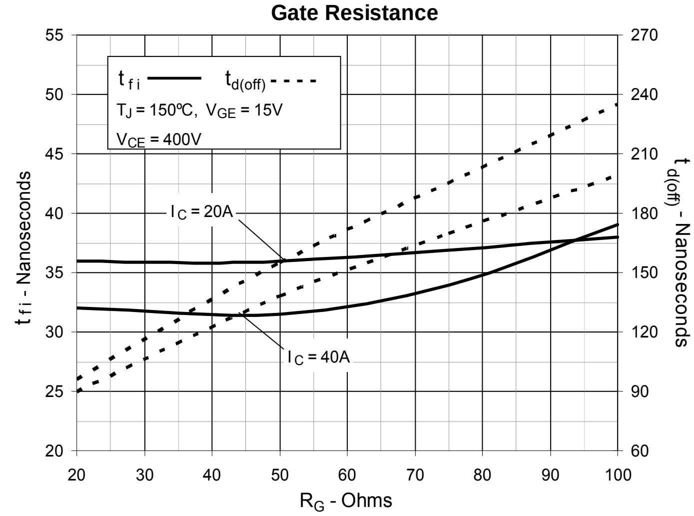


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

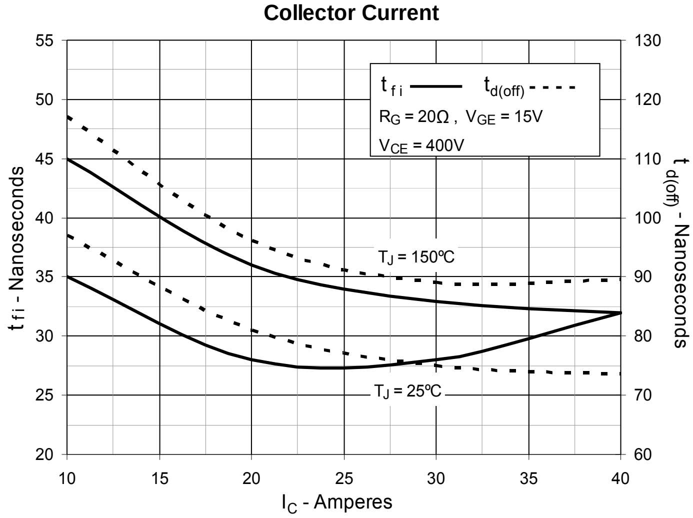


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

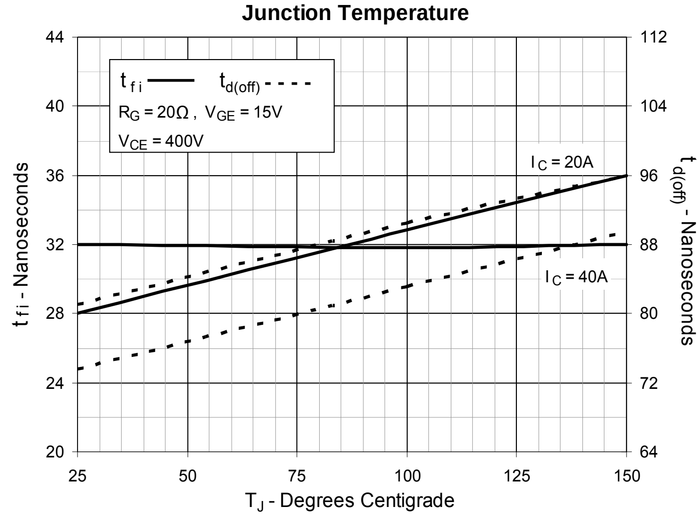


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

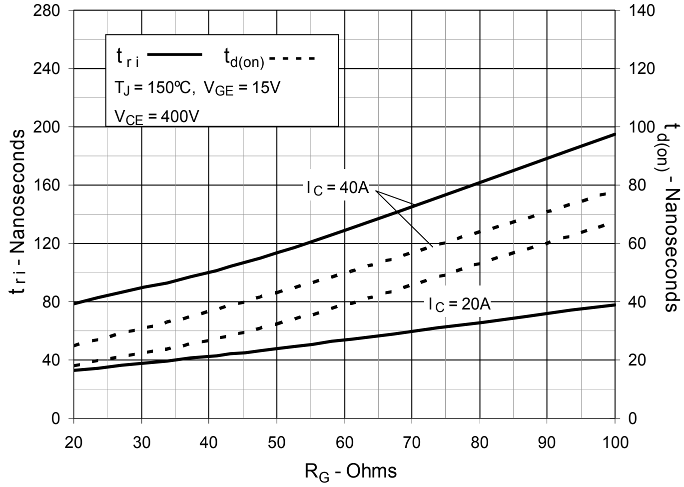


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

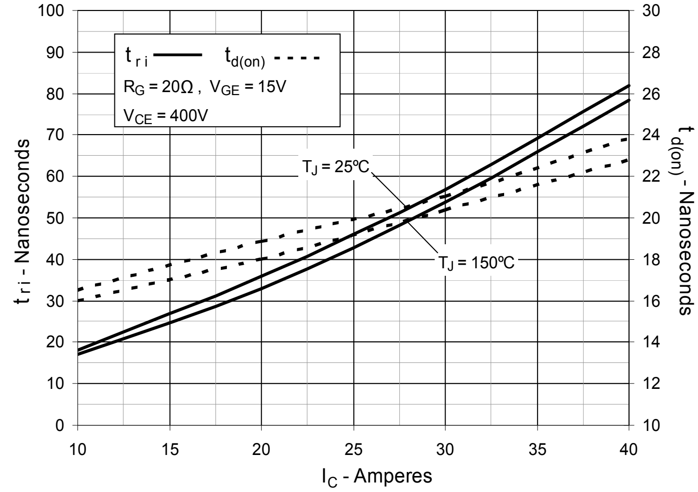


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature

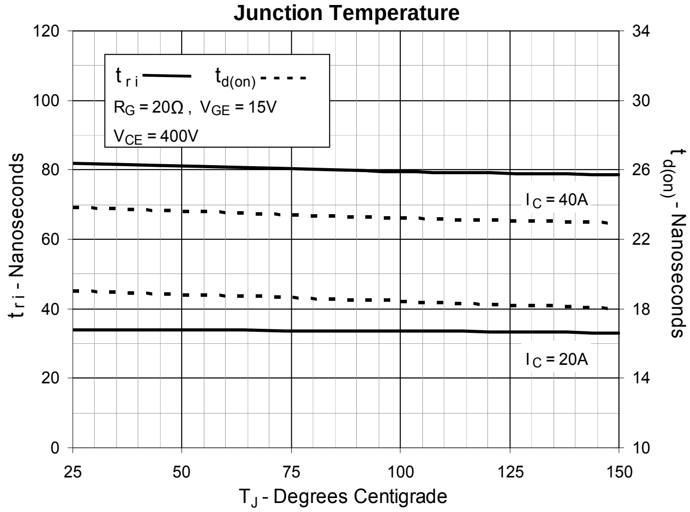


Fig. 22. Diode Forward Characteristics

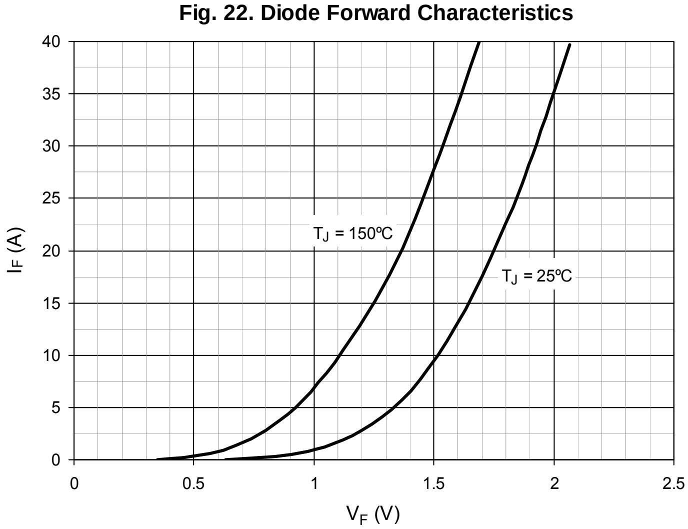


Fig. 23. Reverse Recovery Charge vs. -diF/dt

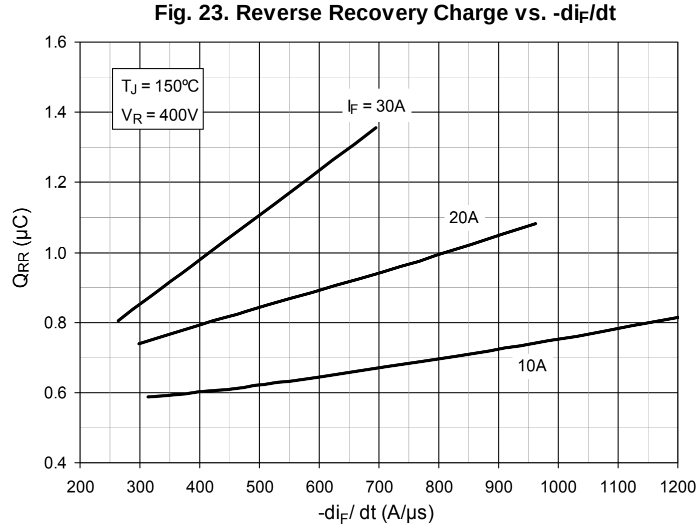


Fig. 24 Reverse Recovery Current vs. -di$_F$/dt

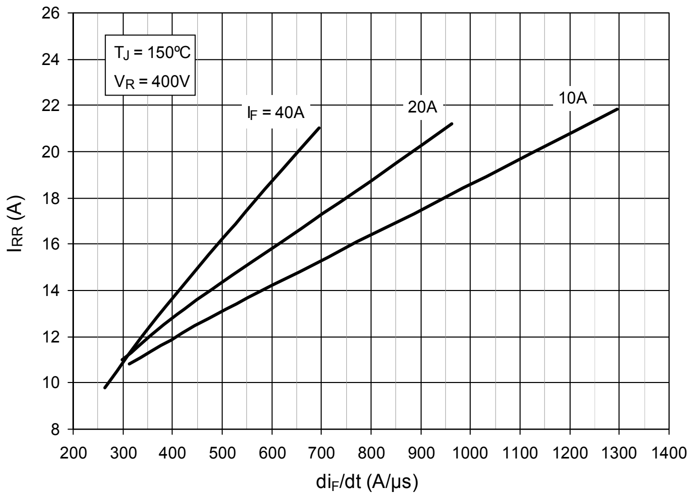


Fig. 25. Reverse Recovery Time vs. -di$_F$/dt

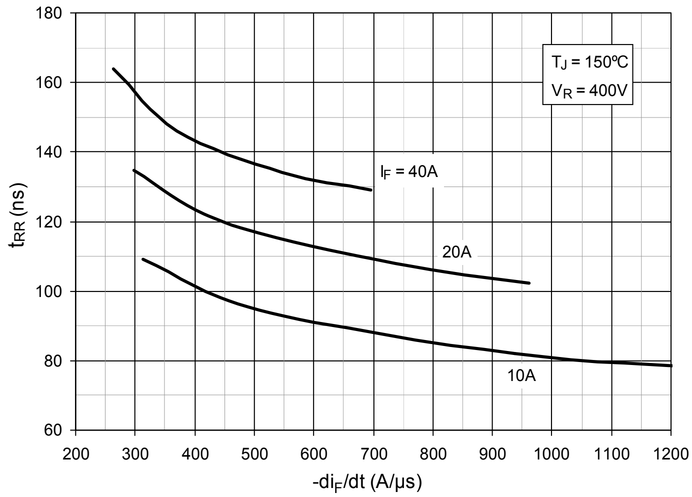


Fig. 26. Dynamic Parameters Q$_{RR}$, I$_{RR}$ vs. Junction Temperature

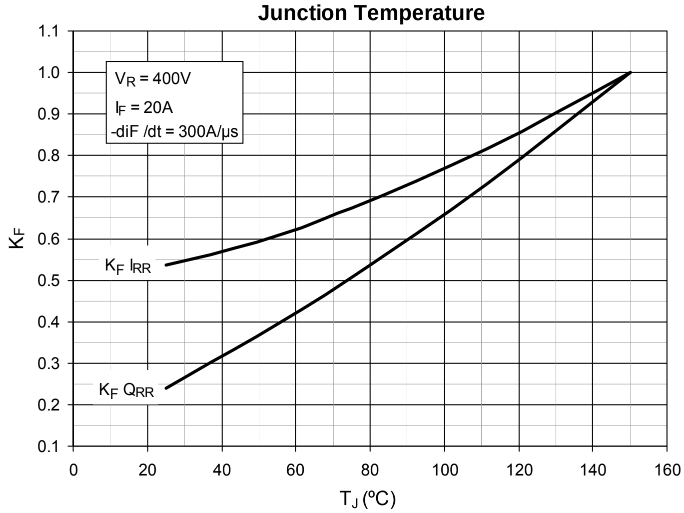


Fig. 27. Maximum Transient Thermal Impedance (Diode)

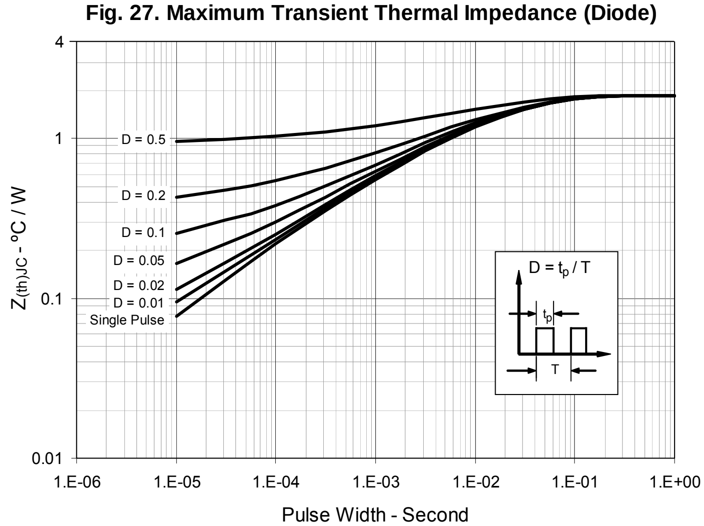
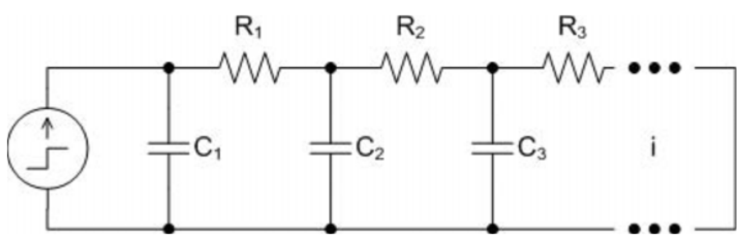


Fig. 28. Cauer Thermal Network



IGBT

i	Ri (°C/W)	Ci (J/°C)
1	0.170320	0.0017715
2	0.136990	0.0166820
3	0.090011	0.0391660

DIODE

i	Ri (°C/W)	Ci (J/°C)
1	0.331730	0.0002858
2	0.768860	0.0037423
3	0.285550	0.0432130

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- View IXYP20N65C3D1 on WIN SOURCE
- IXYS Information

Optimize Your Supply Chain with WIN SOURCE Solutions

- Global Sourcing Solution
- Obsolete Management
- Cost Control Management
- Shortage Management
- Alternative Solution
- Excess Inventory Management