

IKQ50N120CH3-VB Datasheet

1200V Trench and Fieldstop IGBT

PRODUCT SUMMARY		
V_{CE} (V)	1200	
I_C (A)	100 ($T_C=25^\circ\text{C}$)	50 ($T_C=100^\circ\text{C}$)
$V_{CE(sat)}$ (V)	1.7	
I_{CM} (A)	150	

FEATURES

- Very Low V_{CEsat}
- Low turn-off losses
- High speed switching
- Maximum junction temperature 175°C
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



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HALOGEN
FREE

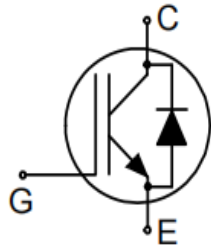
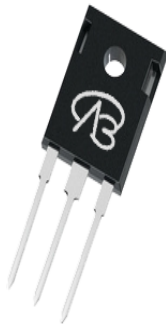
APPLICATIONS

- Telecommunications
 - Server and telecom power supplies
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Consumer and computing
 - ATX power supplies
- Industrial
 - Welding
 - Battery chargers
- Renewable energy
 - Solar (PV inverters)
- Switch mode power supplies (SMPS)

Package pin definition

- Pin1 G - Gate
- Pin2 C & backside - Collector
- Pin3 E - Emitter

TO-247



Top View

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Collector-Emitter Voltage			V _{CE}	1200	V
Gate-Emitter Voltage			V _{GE}	±30	
Continuous Collector Current (T _J = 150 °C)	V _{GE} at 15 V	T _C = 25 °C	I _C	100	A
		T _C = 100 °C		50	
Pulsed Collector Current ^a			I _{CM}	150	
Diode Forward Current ^b			I _F	50	A
Maximum Power Dissipation		T _C = 25 °C	P _D	800	W
		T _C = 100 °C		400	W
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +175	°C
Short Circuit Withstand Time ^{TC=150°C}	V _{GE} = 15V, V _{CE} ≤ 400V		t _{sc}	3	μs
Short Circuit Withstand Time ^{TC=100°C}	V _{GE} = 15V, V _{CE} ≤ 330V			5	
Soldering Recommendations (Peak Temperature) ^c		for 10 s		260	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- Current limited by maximum junction temperature.
- 1.6 mm from case.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	°C/W
Maximum Junction-to-Case	R_{thJC}	-	0.17	

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Collector-Emitter Breakdown Voltage	BV _{CE}	V _{GE} = 0 V, I _C = 250 μA V _{GE} = 0 V, I _C = 1 mA		1200 1200	- -	- -	V
Gate-Source Threshold Voltage (N)	V _{GE(th)}	V _{CE} = V _{GE} , I _D = 250 μA		4	5	6	V
Zero Gate Voltage Collector Current	I _{CES}	V _{CE} = 1200 V, V _{GE} = 0 V, T _J = 25 °C		-	1	20	μA
		V _{CE} = 1200 V, V _{GE} = 0 V, T _J = 150 °C		-	1000	-	μA
Gate-Emitter Leakage Current	I _{GES}	V _{CE} = 0 V, V _{GS} = ± 2 0 V		-	-	100	nA
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} = 15 V	I _C = 50 A	-	1.8	2.1	V
Forward Transconductance	g _{fs}	V _{CE} = 20 V, I _C = 50 A		-	40	-	S
Dynamic							
Input Capacitance	C _{ies}	V _{GE} = 0 V, V _{CE} = 25 V, f = 500 KHz		-	5500	-	pF
Output Capacitance	C _{oes}			-	210	-	
Reverse Transfer Capacitance	C _{res}			-	58	-	
Turn-on Energy	E _{on}	V _{CE} = 400 V , V _{GE} = 0 /15V, I _C = 50 A, R _g = 10Ω		-	0.41	-	nJ
Turn-off Energy	E _{off}			-	0.24	-	
Total Gate Charge	Q _g	V _{GE} = 15 V	I _C = 50 A, V _{CE} = 400 V	-	130	-	nC
Gate-Emitter Charge	Q _{ge}			-	14	-	
Gate to Collector Charge	Q _{gc}			-	31	-	
Turn-On Delay Time	t _{d(on)}	V _{CE} = 400 V , V _{GE} = 0 /15V, I _C = 50 A, R _g = 10Ω		-	46	-	ns
Rise Time	t _r			-	41	-	
Turn-Off Delay Time	t _{d(off)}			-	167	-	
Fall Time	t _f			-	36	-	
Internal emitter inductance measured 5 mm	L _E			-	13	-	nH
Diode Characteristics							
Diode Forward Current	I _F	IGBT symbol showing the integral reverse junction diode		-	-	50	A
Pulsed Diode Forward Current	I _{FM}			-	-	150	
Diode Forward Voltage	V _F	I _F = 50 A		-	1.85	2.0	V
Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 50 A, dI _F /dt = 200 A/μs, V _R = 400 V		-	63	-	ns
Reverse Recovery Charge	Q _{rr}			-	0.3	-	μC
Reverse Recovery Current	I _R RM			-	11	-	A

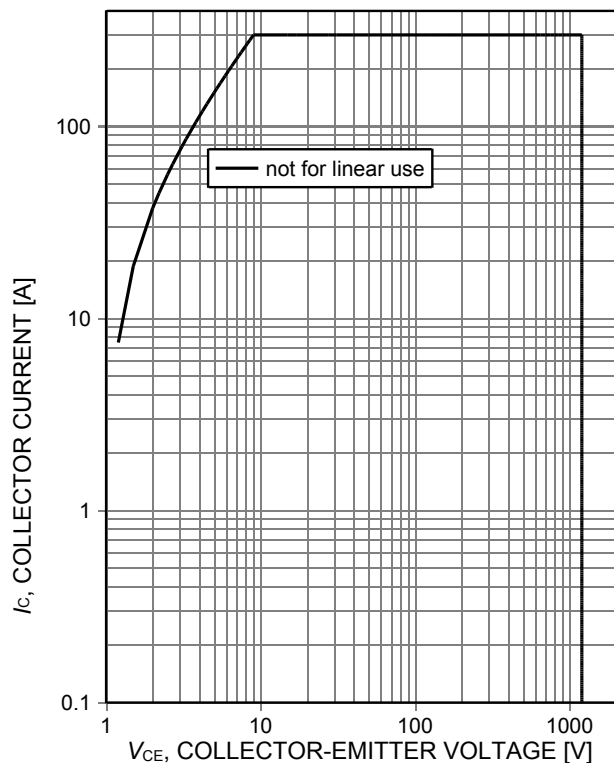


Figure 1. Forward bias safe operating area

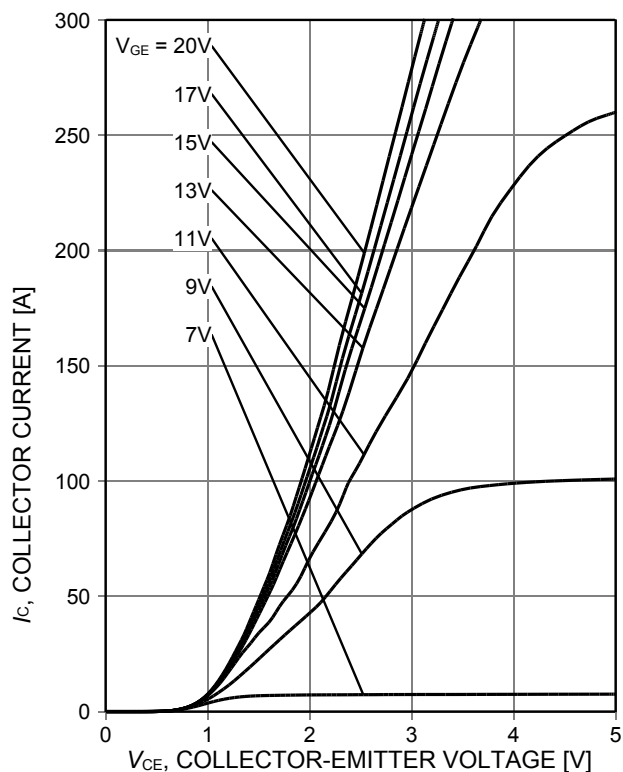


Figure 2. Typical output characteristic

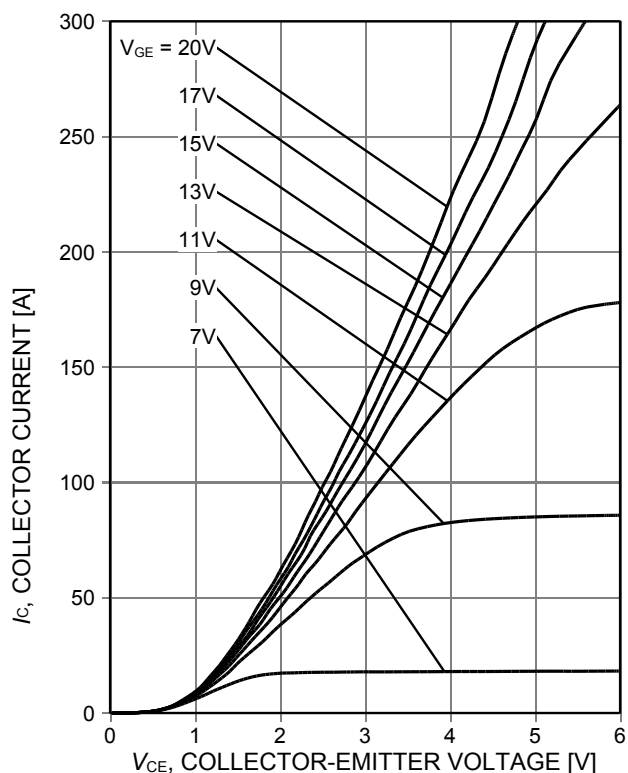


Figure 3. Typical output characteristic

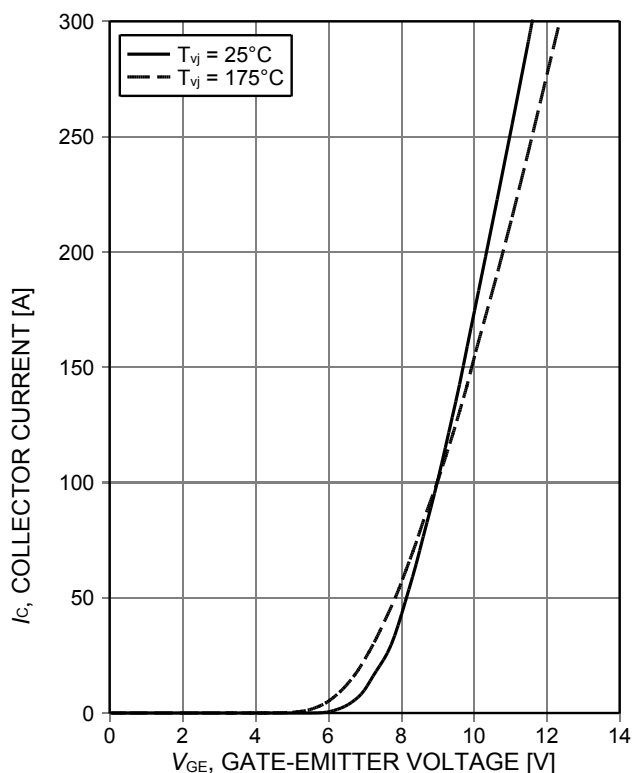


Figure 4. Typical transfer characteristic

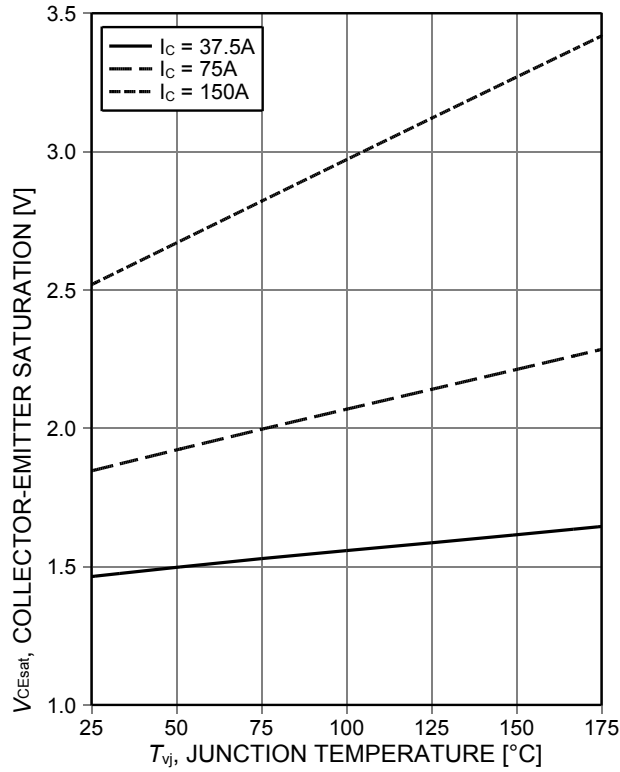


Figure 5. Typical collector-emitter saturation voltage as a function of junction temperature

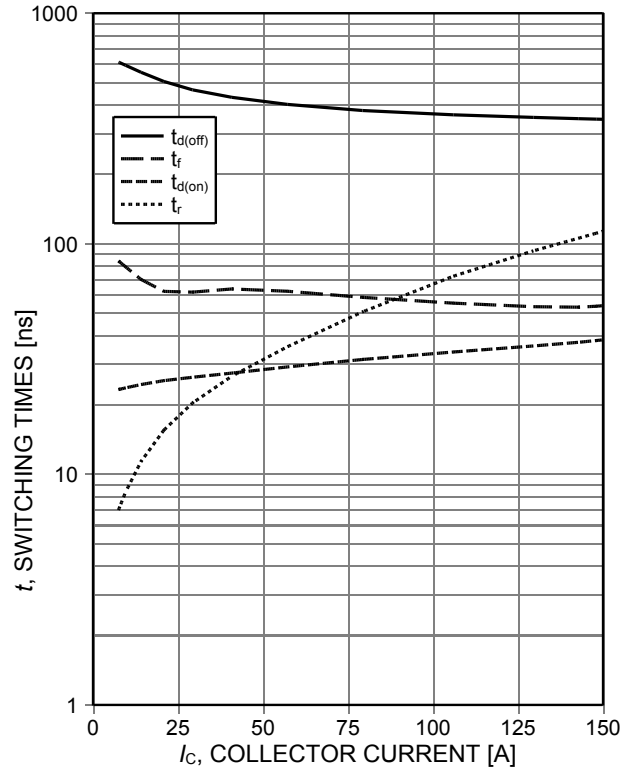


Figure 6. Typical switching times as a function of collector current

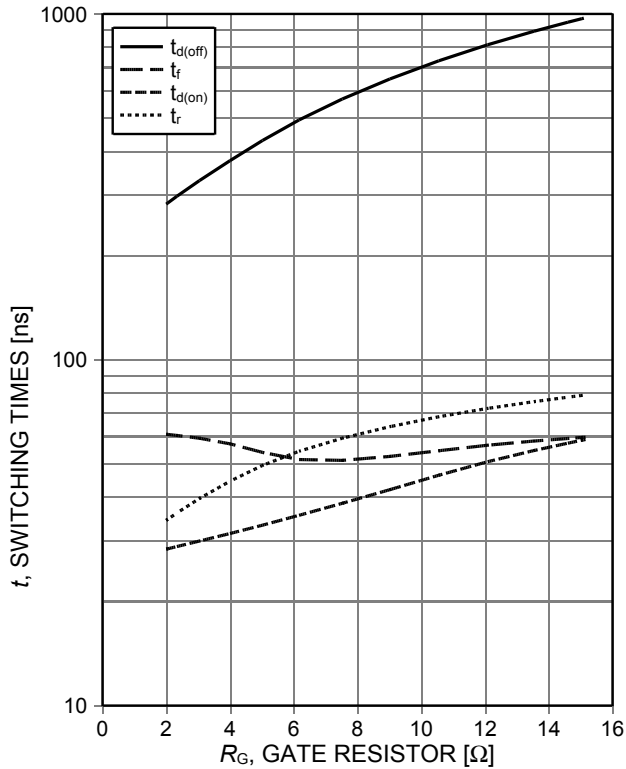


Figure 7. Typical switching times as a function of gate resistor

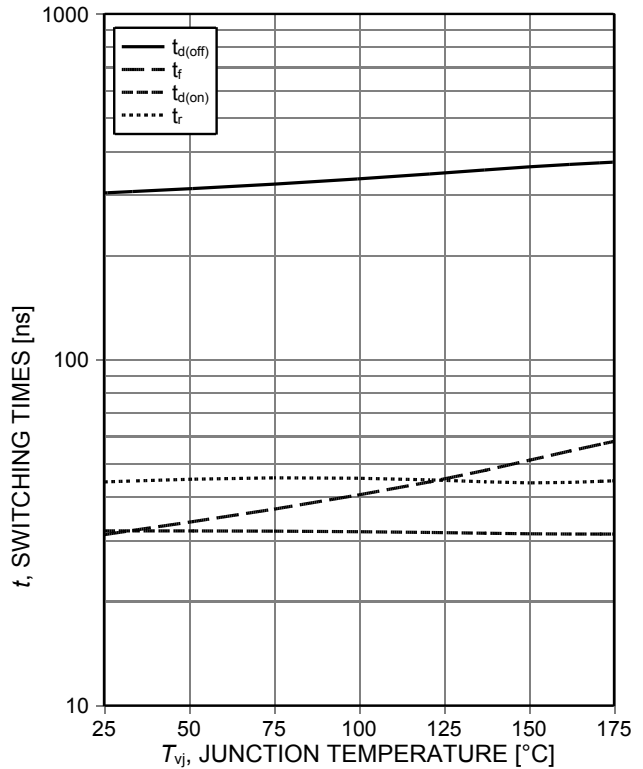


Figure 8. Typical switching times as a function of junction temperature

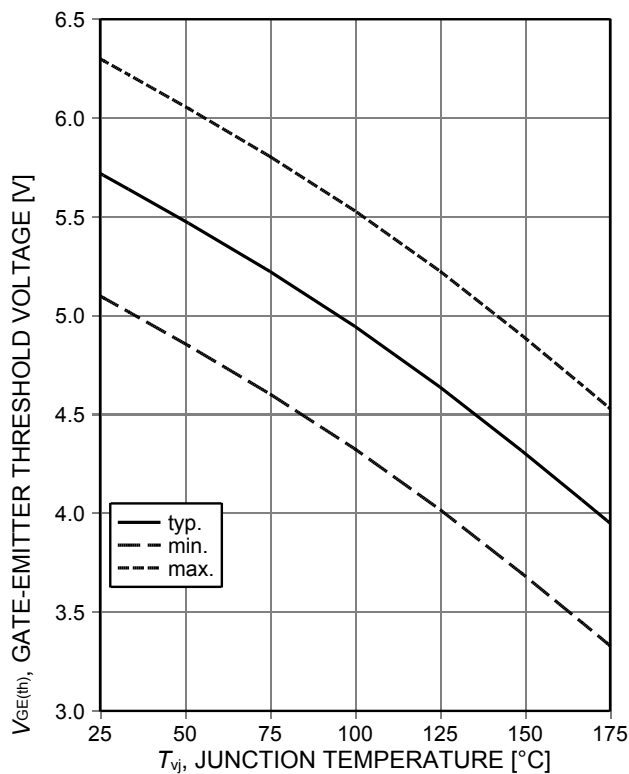


Figure 9. Gate-emitter threshold voltage as a function of junction temperature

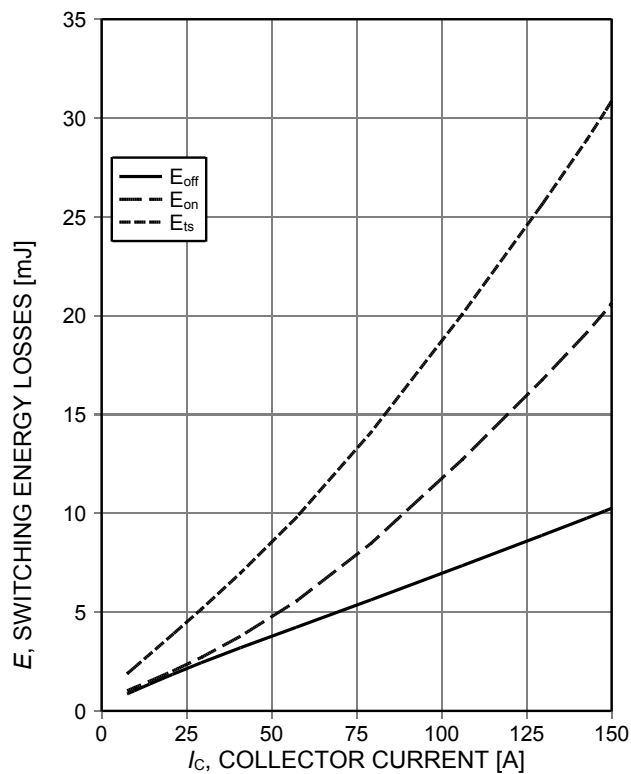


Figure 10. Typical switching energy losses as a function of collector current

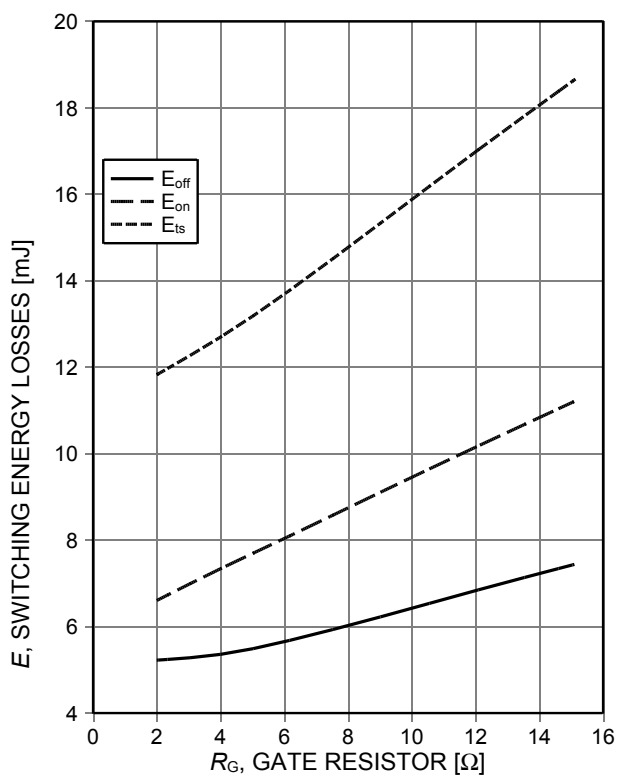


Figure 11. Typical switching energy losses as a function of gate resistor

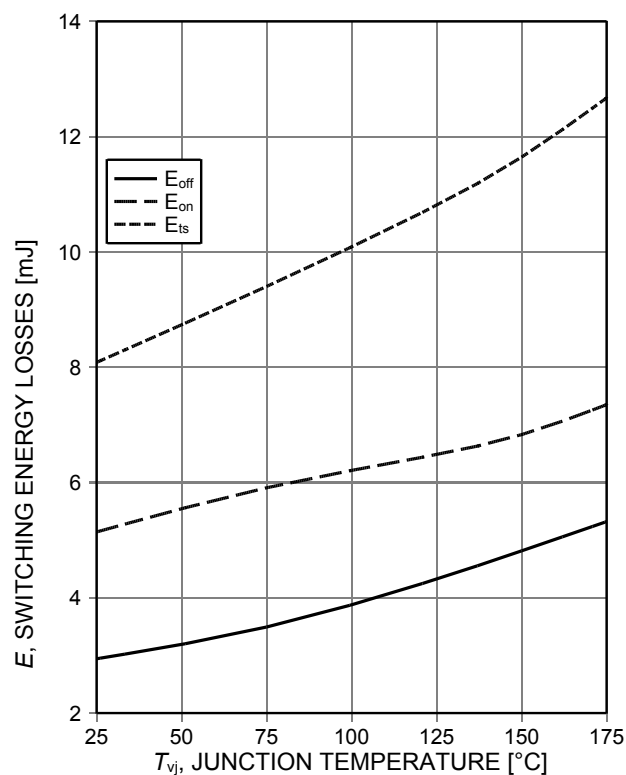


Figure 12. Typical switching energy losses as a function of junction temperature

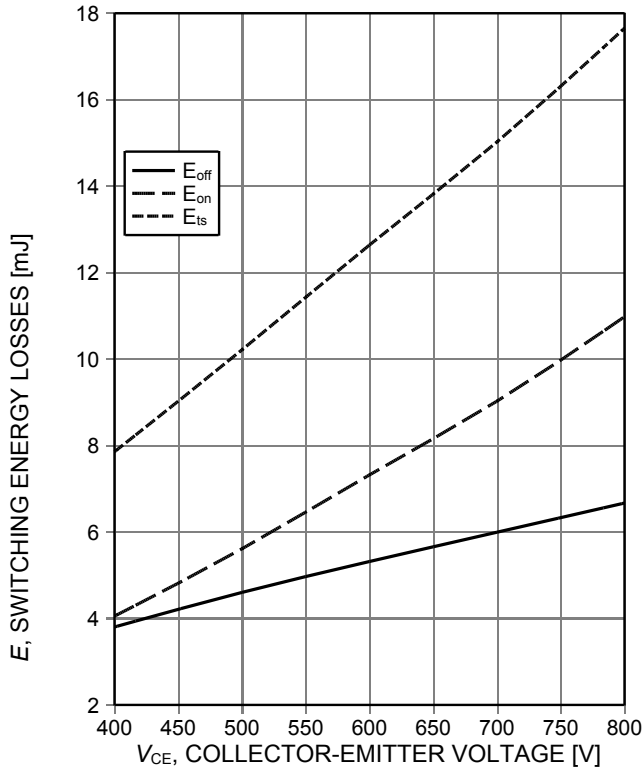


Figure 13. Typical switching energy losses as a function of collector emitter voltage

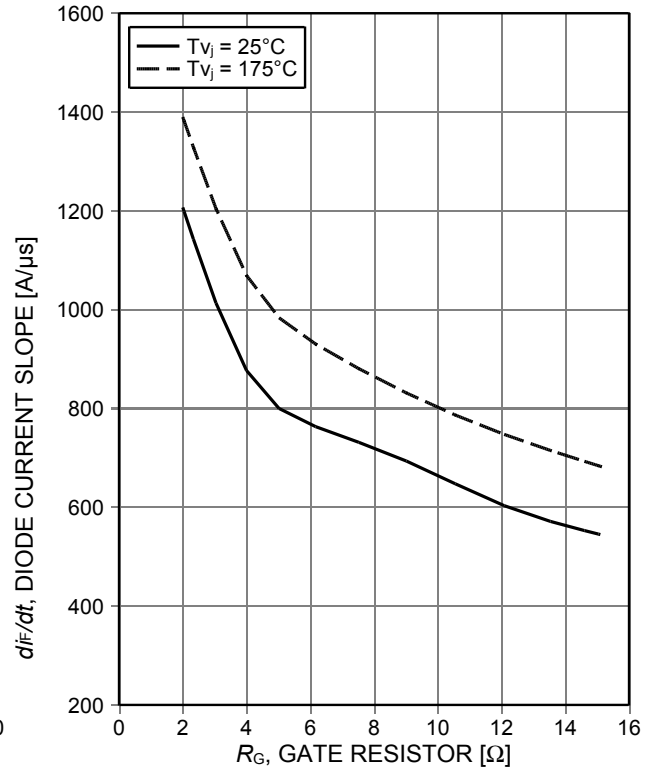


Figure 14. Typical diode current slope as a function of gate resistor

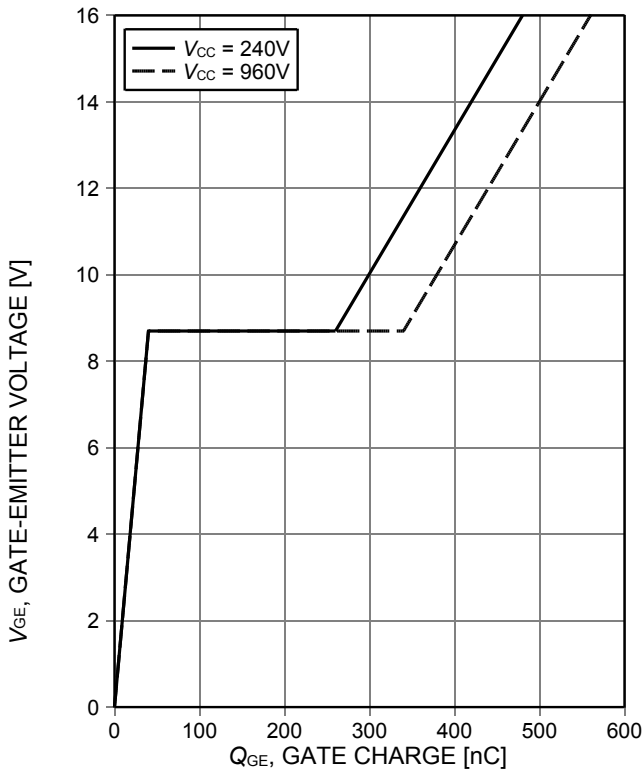


Figure 15. Typical gate charge

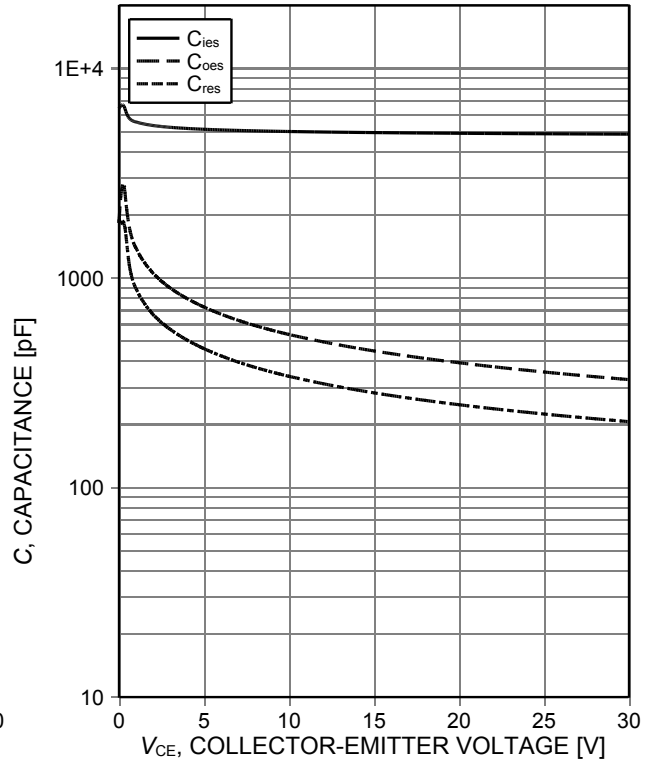


Figure 16. Typical capacitance as a function of collector-emitter voltage

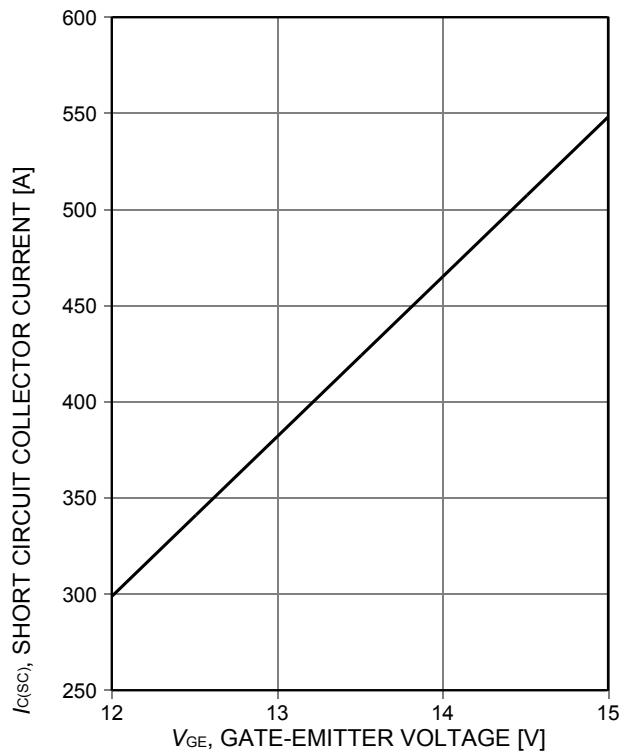


Figure 17. Typical short circuit collector current as a function of gate-emitter voltage

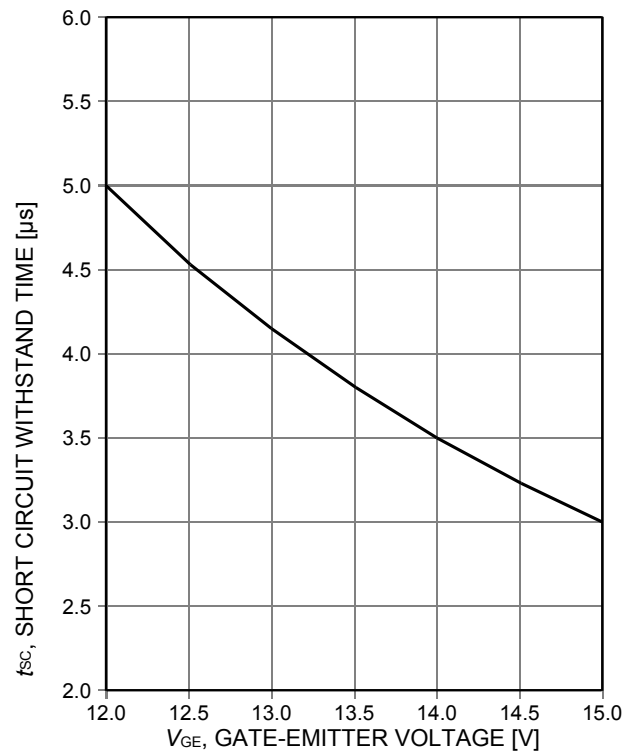


Figure 18. Short circuit withstand time as a function of gate-emitter voltage

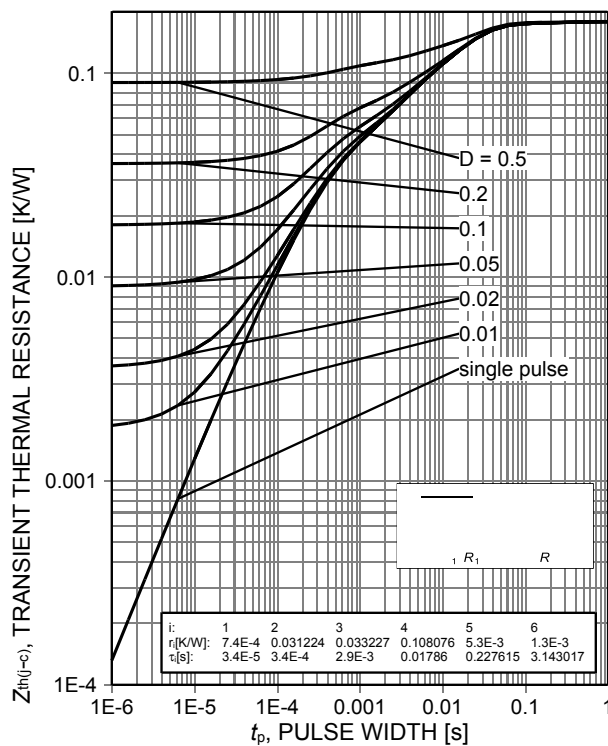


Figure 19. IGBT transient thermal resistance

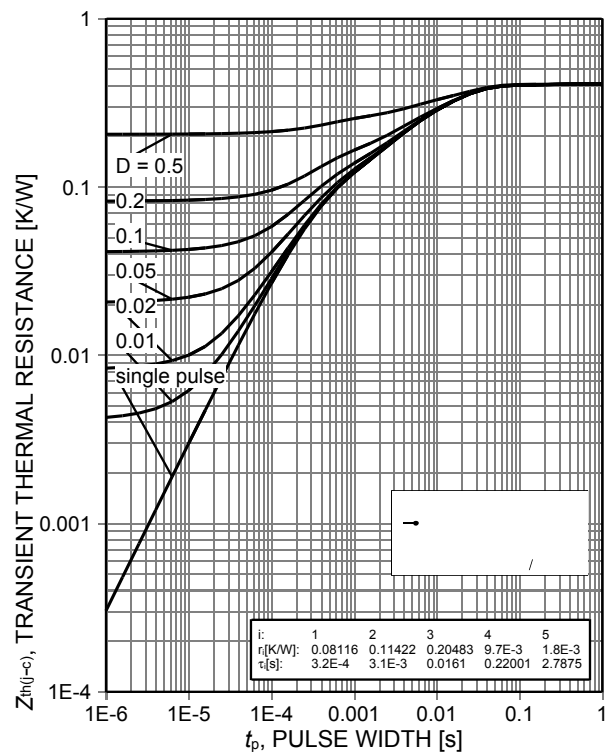


Figure 20. Diode transient thermal impedance as a function of pulse width

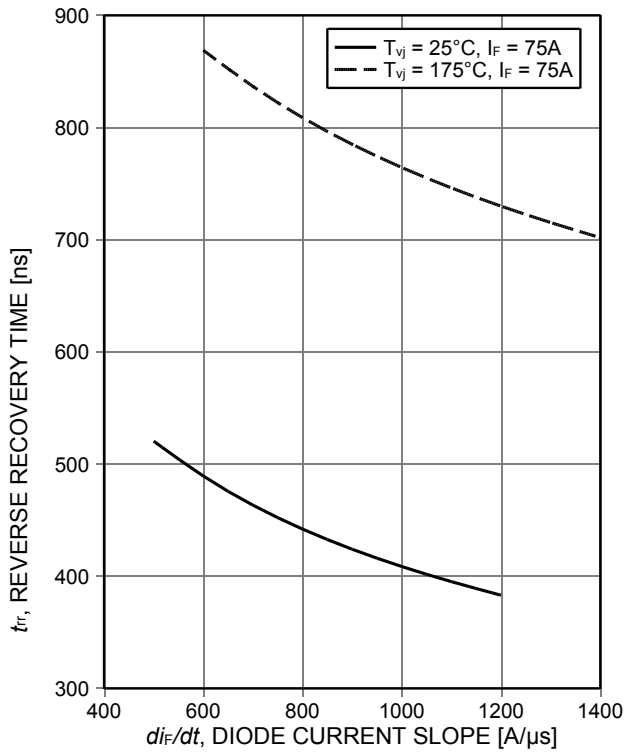


Figure 21. Typical reverse recovery time as a function of diode current slope

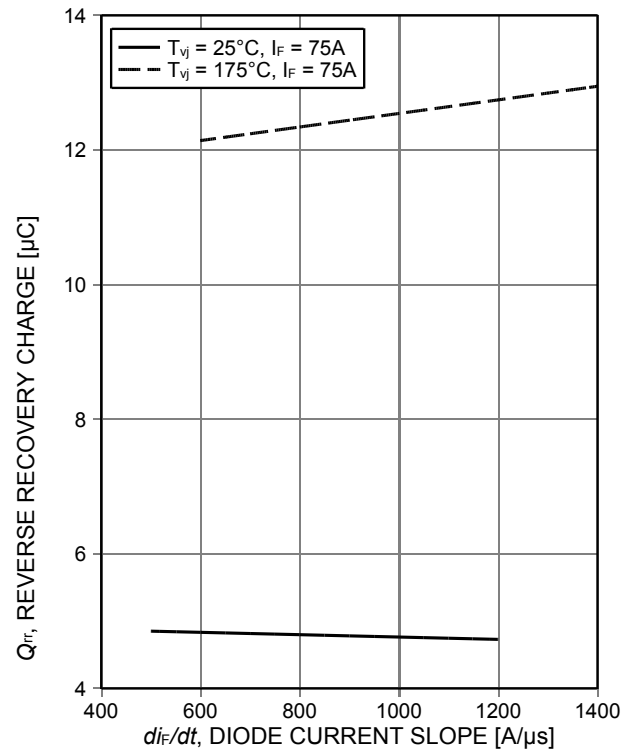


Figure 22. Typical reverse recovery charge as a function of diode current slope

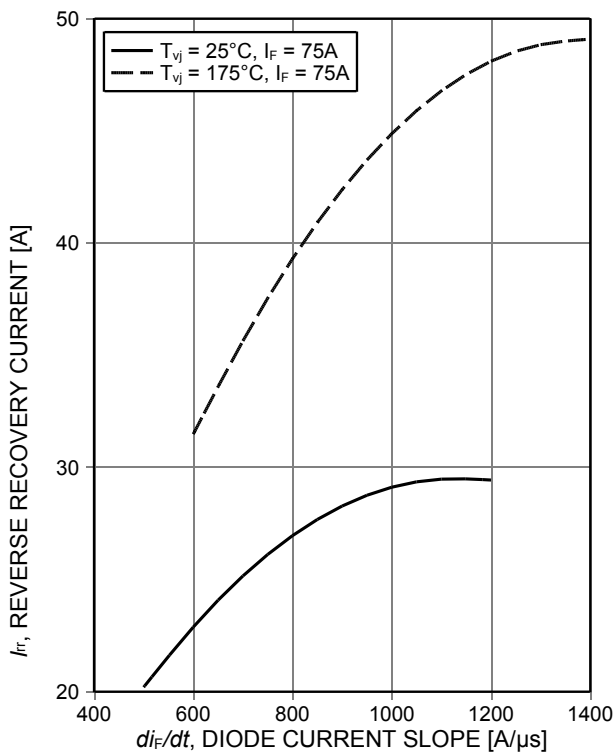


Figure 23. Typical reverse recovery current as a function of diode current slope

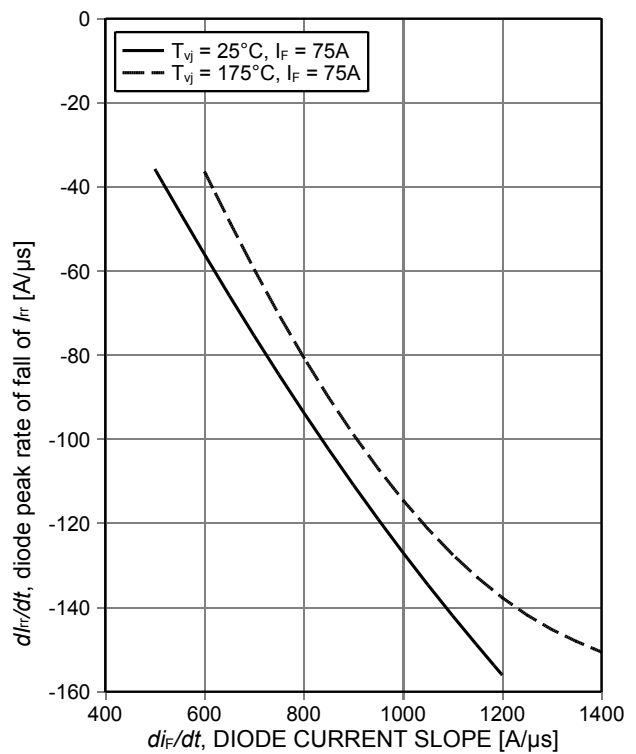


Figure 24. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope

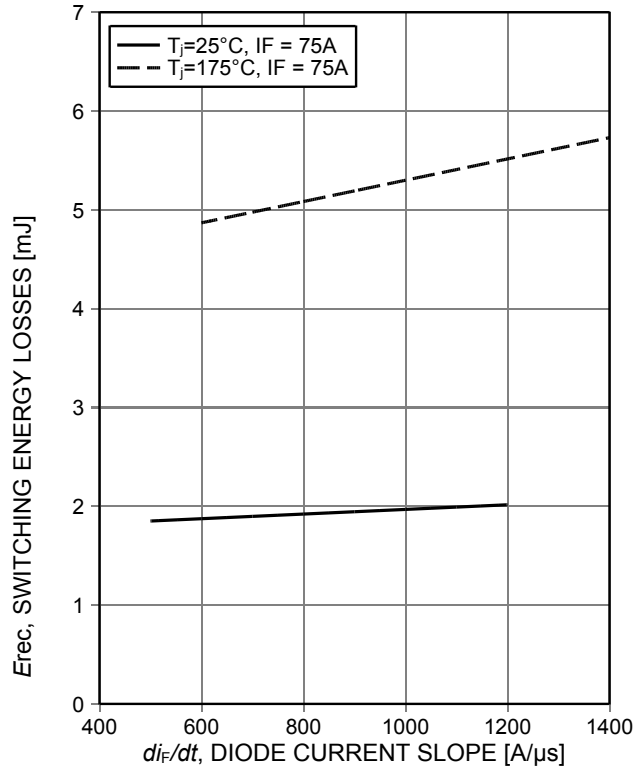


Figure 25. Typical reverse energy losses as a function of diode current slope

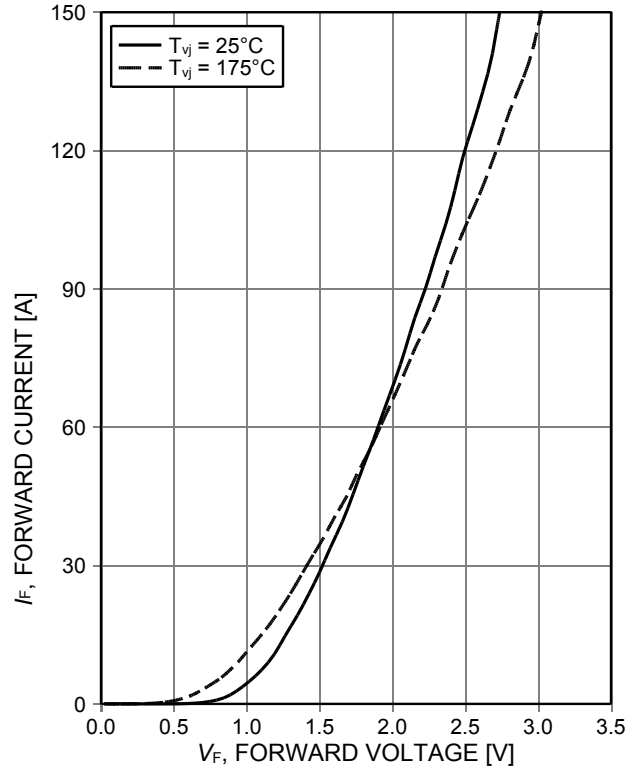


Figure 26. Typical diode forward current as a function of forward voltage

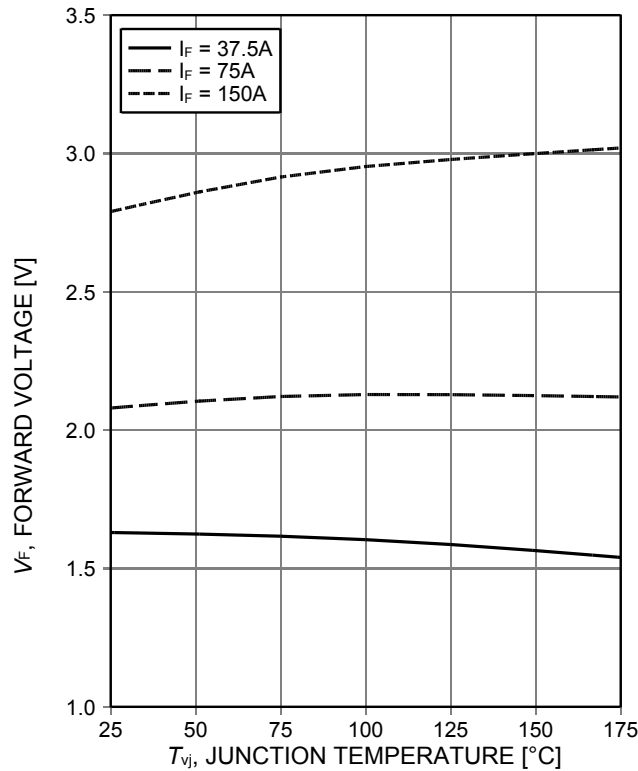
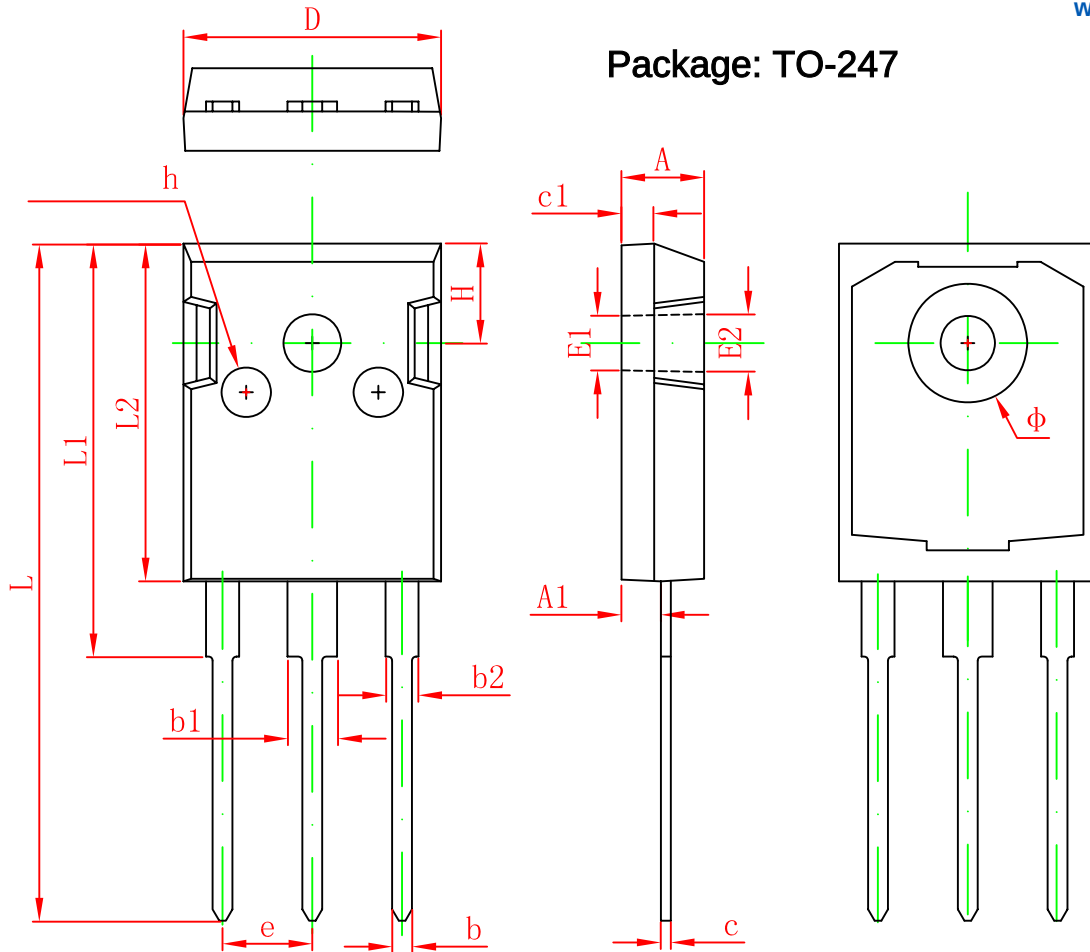


Figure 27. Typical diode forward voltage as a function of junction temperature

Package: TO-247



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	
h	0.000	0.300	0.000	0.012

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