FGY60T120SWD-VB Datasheet

1200V Trench and Fieldstop IGBT

PRODUCT SUMMARY		
V_{CE} (V)	1200	
I_C (A)	150 (TC=25°C)	75 (TC=100°C)
V_{CE} (sat) (V)	1.8	
I_{CM} (A)	225	

FEATURES

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

RoHS COMPLIANT

HALOGEN FREE

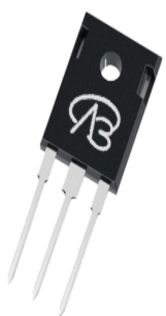
APPLICATIONS

- 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)

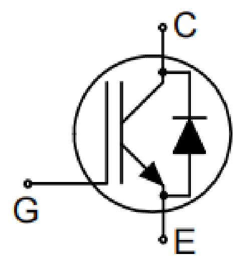
Package pin definition

- 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	90	A
		T_C = 100 °C		75	
Pulsed Collector Current [a]			I_{CM}	225	
Diode Forward Current [b]			I_F	90	A
Maximum Power Dissipation		T_C = 25 °C	P_D	880	W
		T_C = 100 °C		440	W
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +175	°C
Short Circuit Withstand Time TC=150°C	VGE= 15V, VCE≤ 400V		tsc	3	µs
Short Circuit Withstand Time TC=100°C	VGE= 15V, VCE≤330V			5	
Soldering Recommendations (Peak Temperature) [c]	for 10 s			260	°C

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature.

b. Current limited by maximum junction temperature.

c. 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 °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	1200	-	-	V
		V_{GE} = 0 V, Ic = 1 mA	1200	-	-	
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 = 75 A	-	1.8	2.1	V
Forward Transconductance	g_{fs}	V_{CE} = 20 V, I_C = 75 A	-	40	-	S
Dynamic						
Input Capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 25 V, f = 500 KHz	-	8000	-	pF
Output Capacitance	C_{oes}		-	230	-	
Reverse Transfer Capacitance	C_{res}		-	70	-	
Turn-on Energy	E_{on}	V_{CE} = 400 V , V_{GE} = 0 /15V, I_C = 75 A, R_g = 10Ω	-	0.68	-	nJ
Turn-off Energy	E_{off}		-	0.35	-	
Total Gate Charge	Q_g	V_{GE} = 15 V, I_C = 75 A, V_{CE} = 400 V	-	190	-	nC
Gate-Emitter Charge	Q_{ge}		-	18	-	
Gate to Collector Charge	Q_{gc}		-	45	-	
Turn-On Delay Time	$t_{d(on)}$	V_{CE} = 400 V , V_{GE} = 0 /15V, I_C = 75 A, R_g = 10Ω	-	68	-	ns
Rise Time	t_r		-	58	-	
Turn-Off Delay Time	$t_{d(off)}$		-	196	-	
Fall Time	t_f		-	38	-	
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	-	-	90	A
Pulsed Diode Forward Current	I_{FM}		-	-	225	
Diode Forward Voltage	V_F	I_F = 30 A	-	1.65	2.0	V
Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 30 A, dI_F/dt = 200 A/μs, V_R = 400 V	-	75	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.5	-	μC
Reverse Recovery Current	I_{RRM}		-	13	-	A

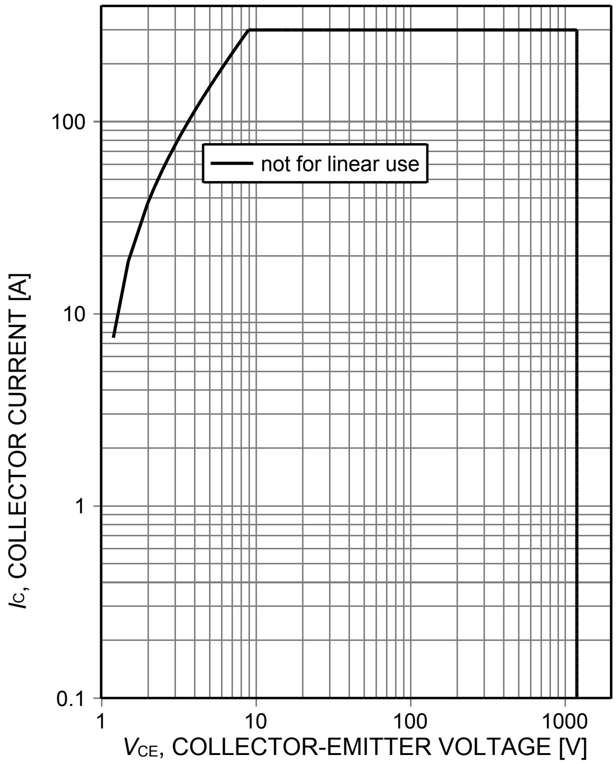


Figure 1. **Forward bias safe operating area**

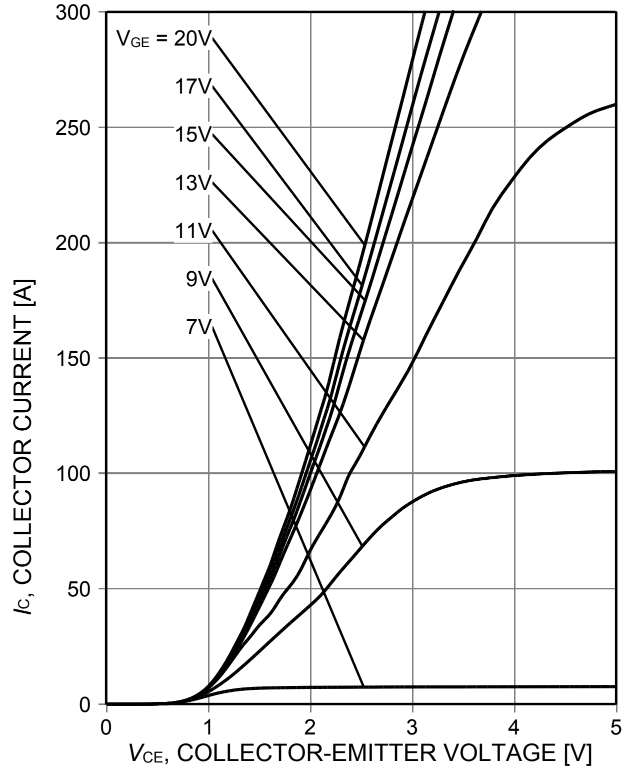


Figure 2. **Typical output characteristic**

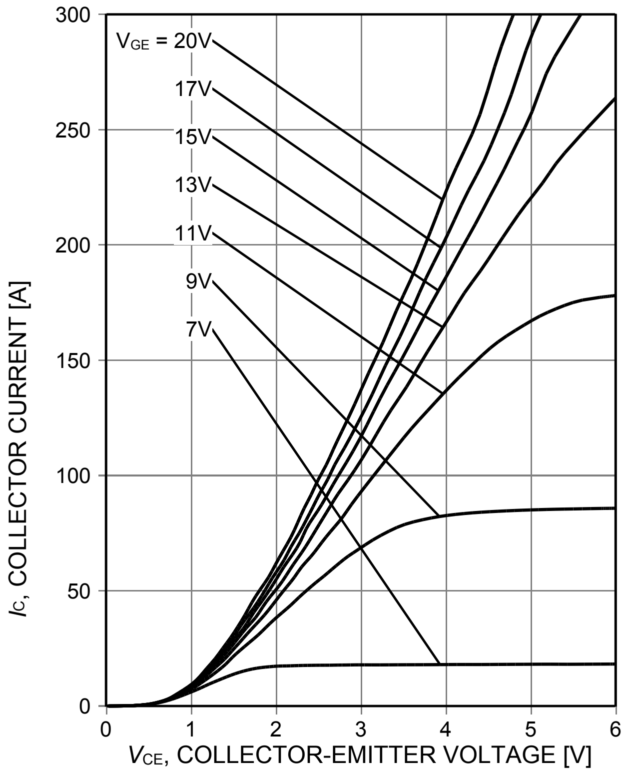


Figure 3. **Typical output characteristic**

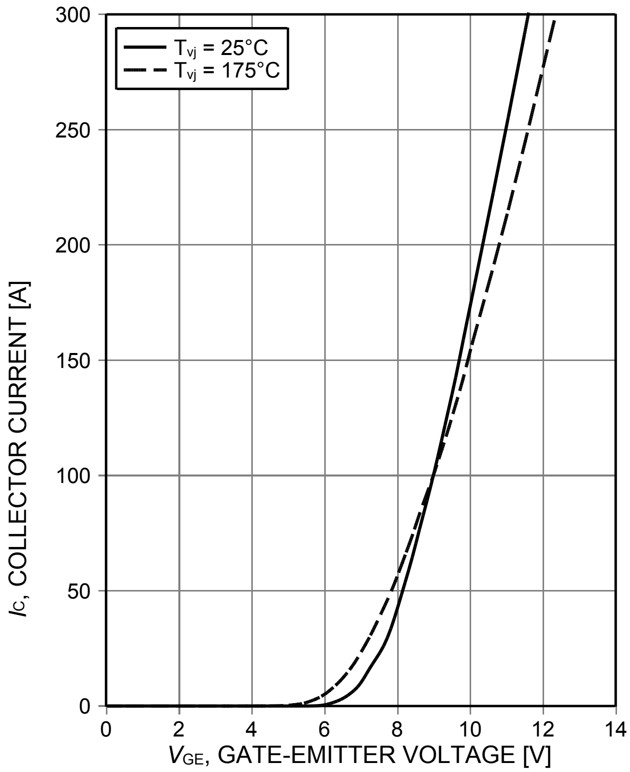


Figure 4. **Typical transfer characteristic**

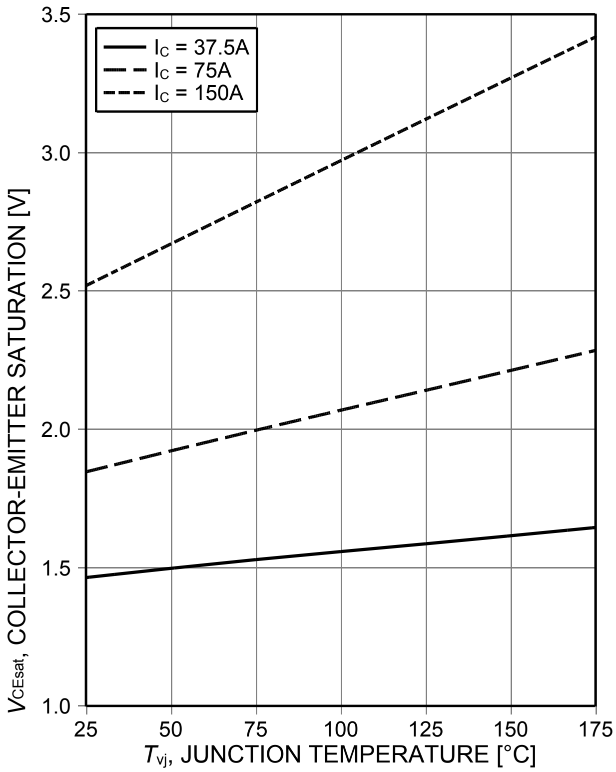


Figure 5. **Typical collector-emitter saturation voltage as a function of junction temperature**

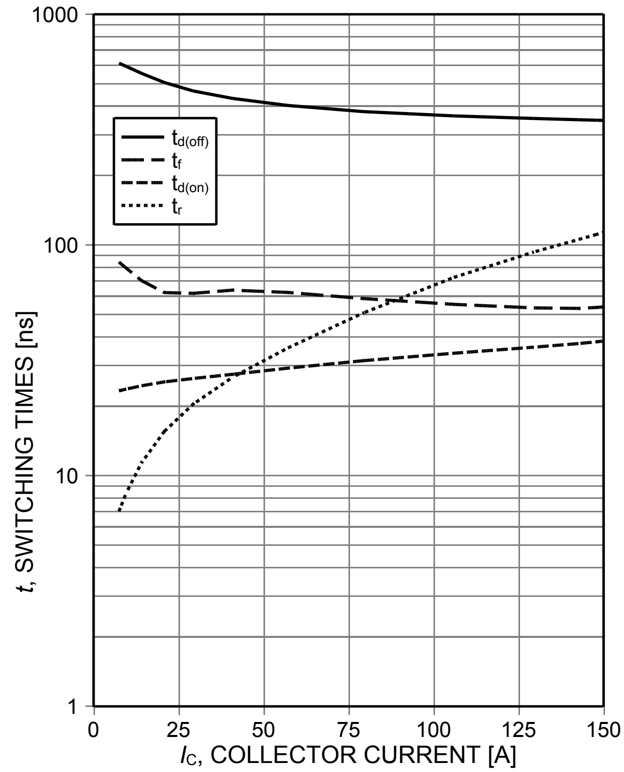


Figure 6. **Typical switching times as a function of collector current**

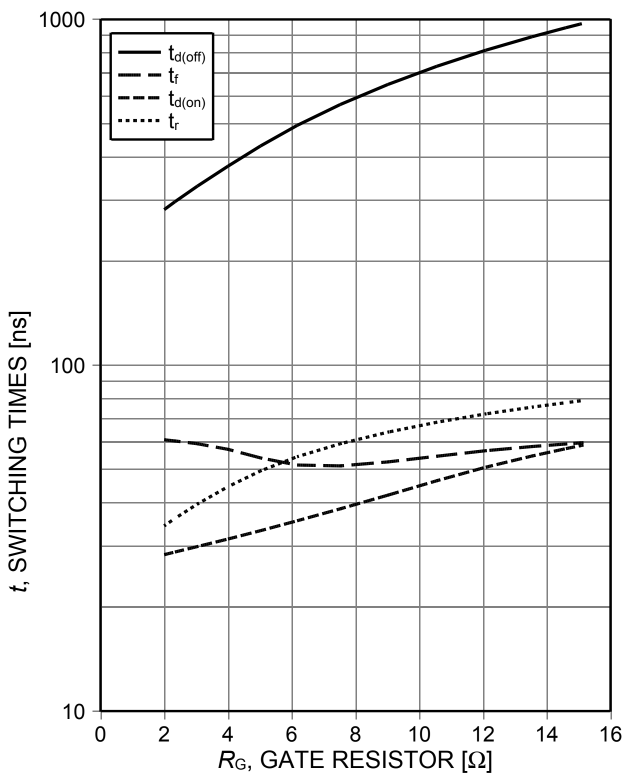


Figure 7. **Typical switching times as a function of gate resistor**

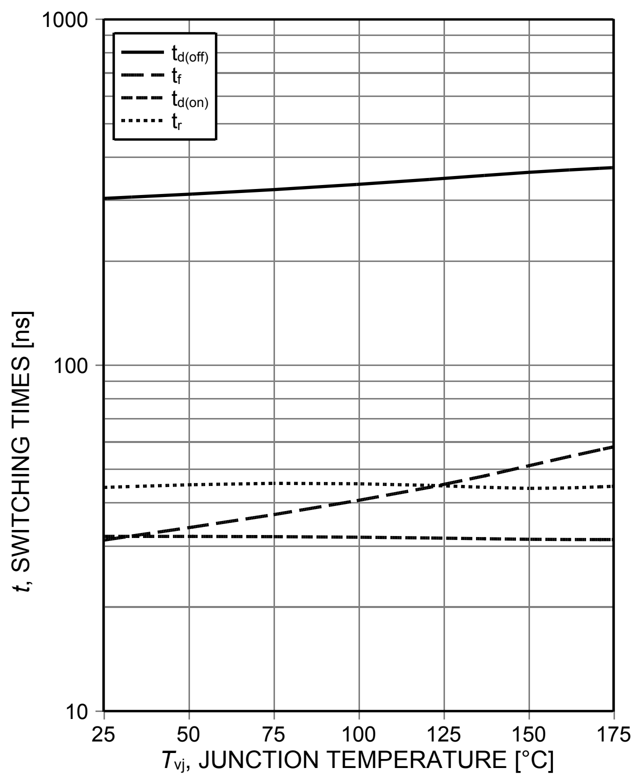


Figure 8. **Typical switching times as a function of junction temperature**

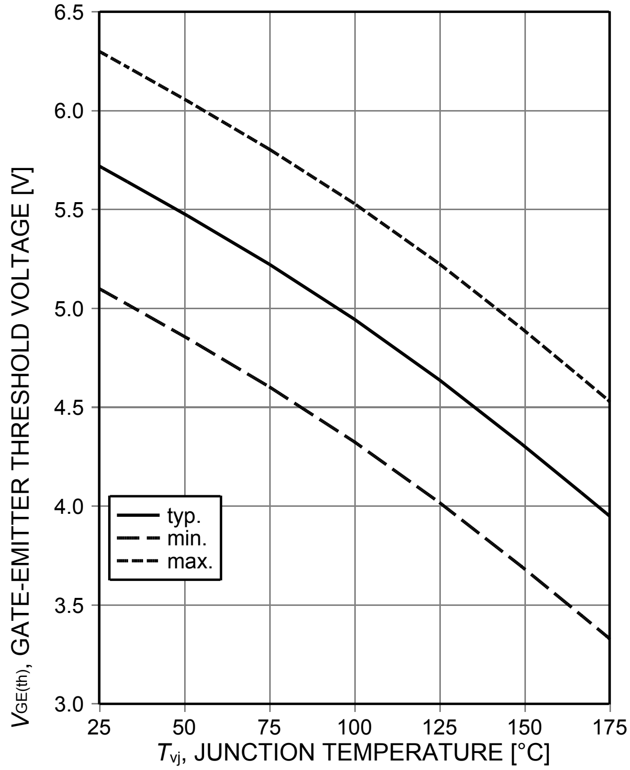


Figure 9. **Gate-emitter threshold voltage as a function of junction temperature**

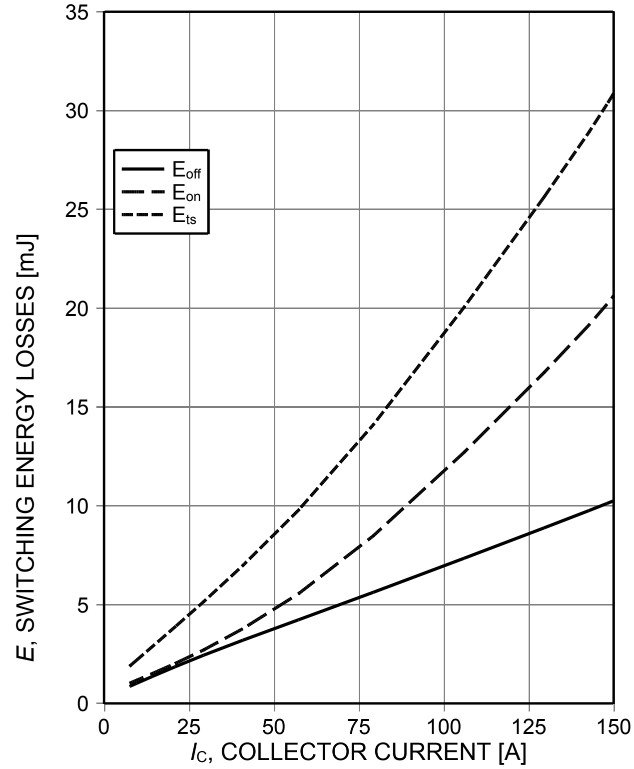


Figure 10. **Typical switching energy losses as a function of collector current**

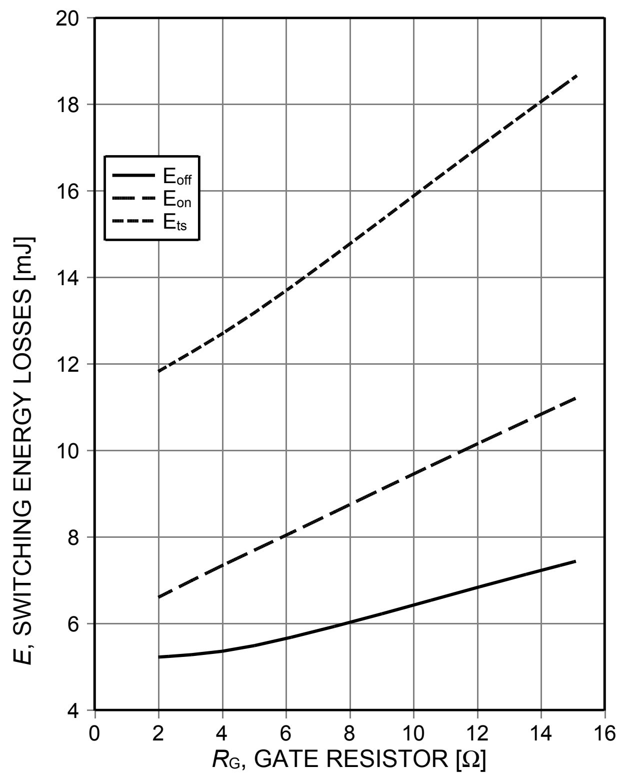


Figure 11. **Typical switching energy losses as a function of gate resistor**

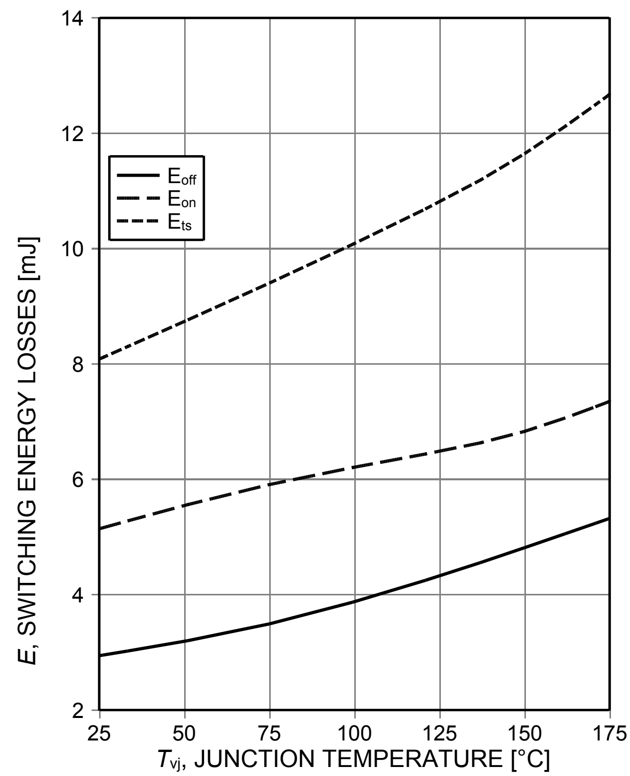


Figure 12. **Typical switching energy losses as a function of junction temperature**

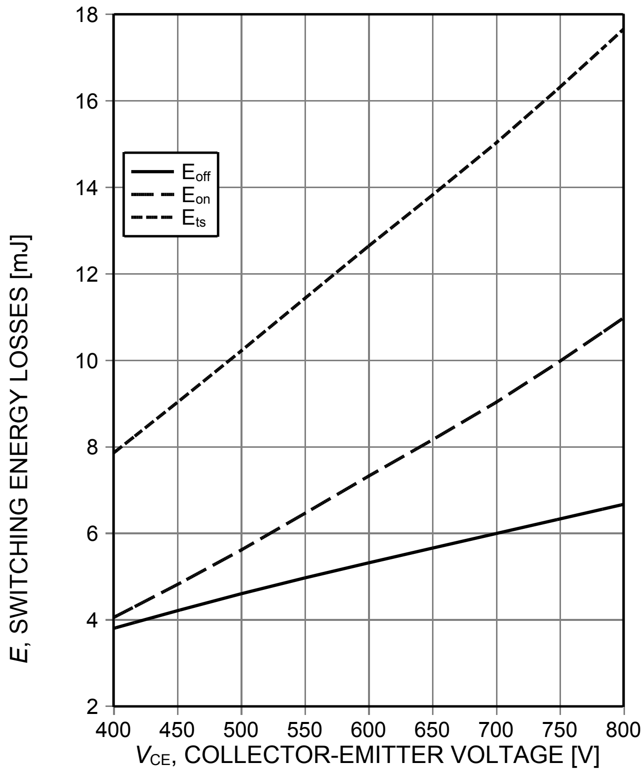


Figure 13. **Typical switching energy losses as a function of collector emitter voltage**

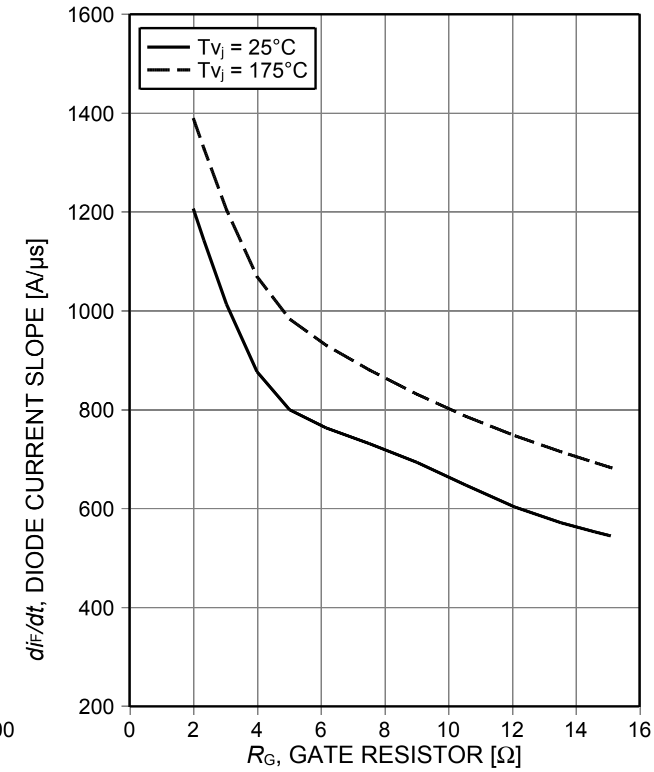


Figure 14. **Typical diode current slope as a function of gate resistor**

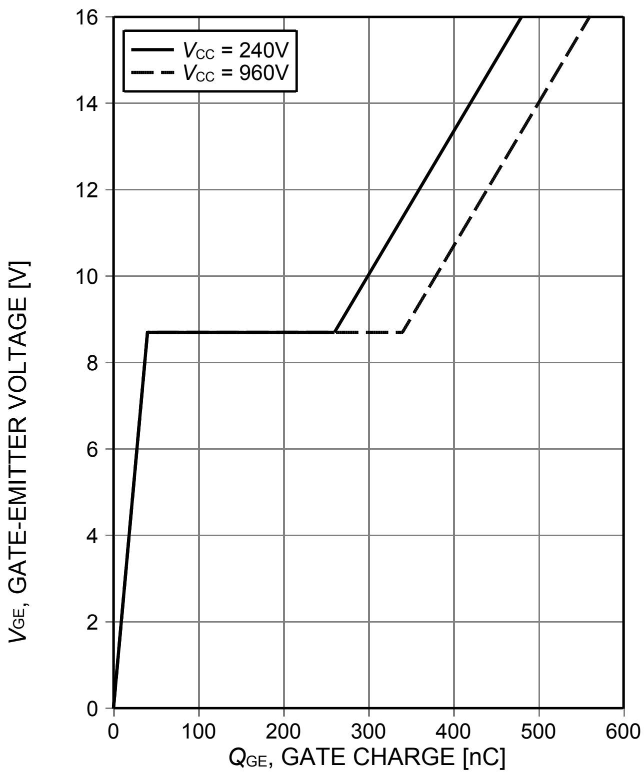


Figure 15. **Typical gate charge**

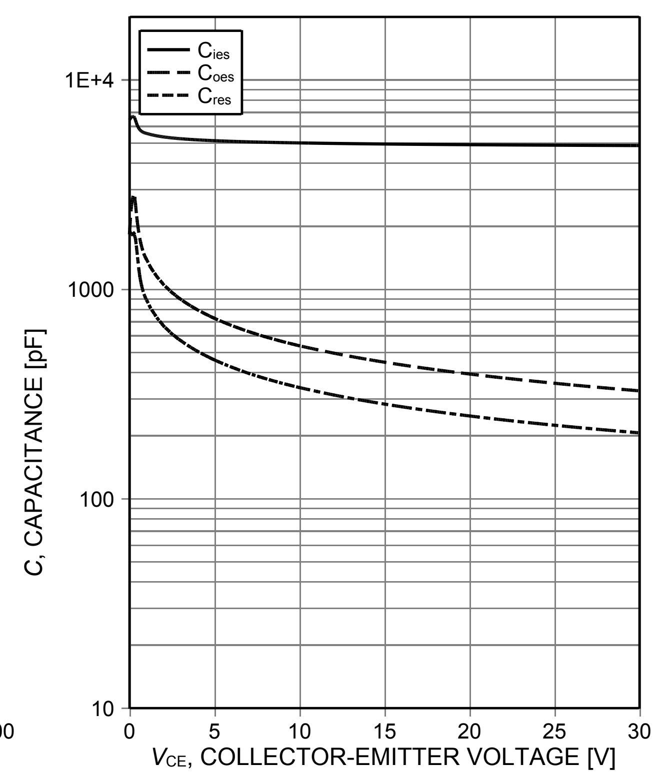


Figure 16. **Typical capacitance as a function of collector-emitter voltage**

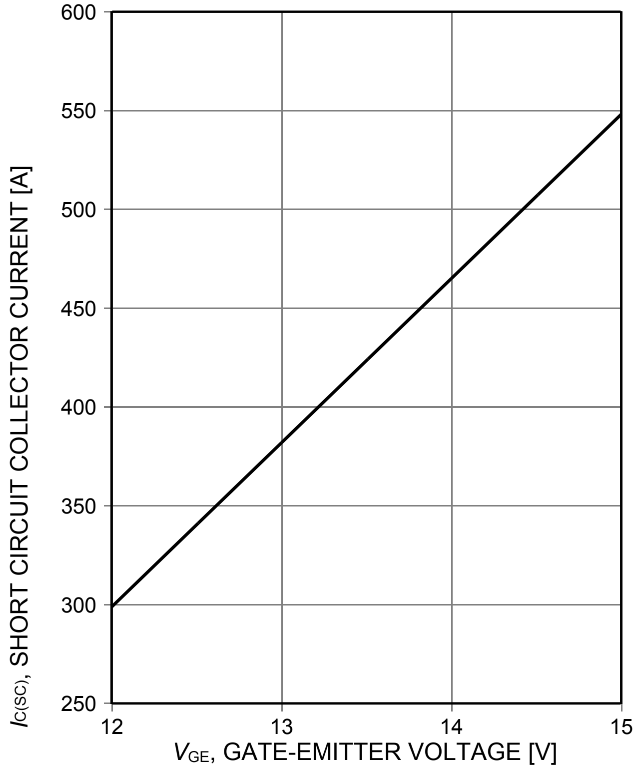


Figure 17. **Typical short circuit collector current as a function of gate-emitter voltage**

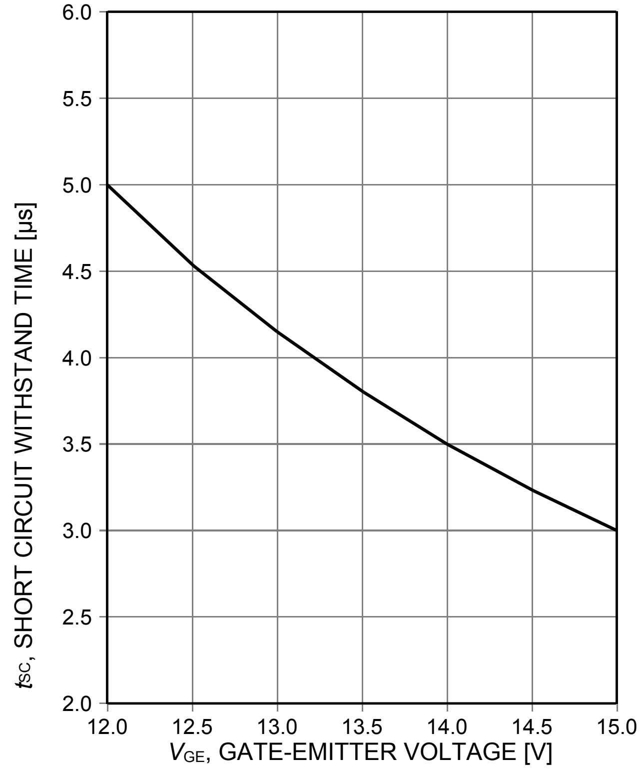


Figure 18. **Short circuit withstand time as a function of gate-emitter voltage**

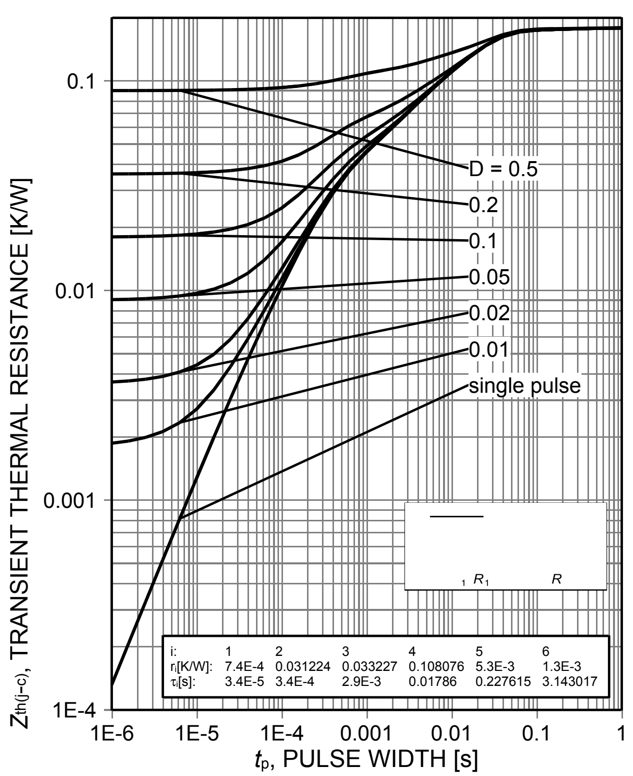


Figure 19. **IGBT transient thermal resistance**

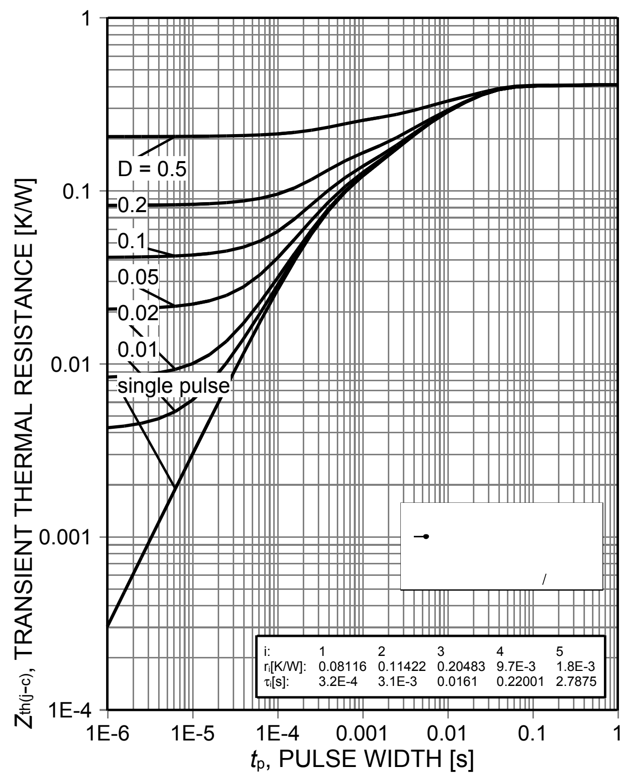


Figure 20. **Diode transient thermal impedance as a function of pulse width**

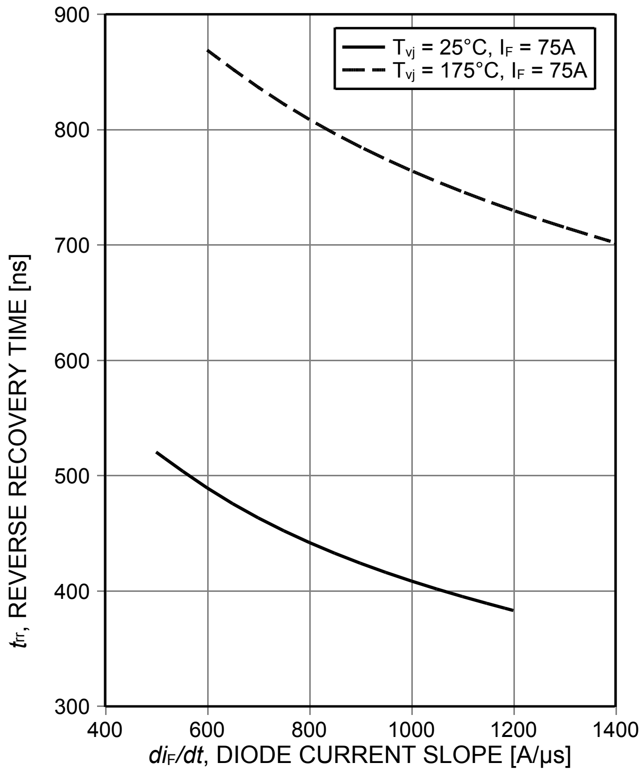


Figure 21. **Typical reverse recovery time as a function of diode current slope**

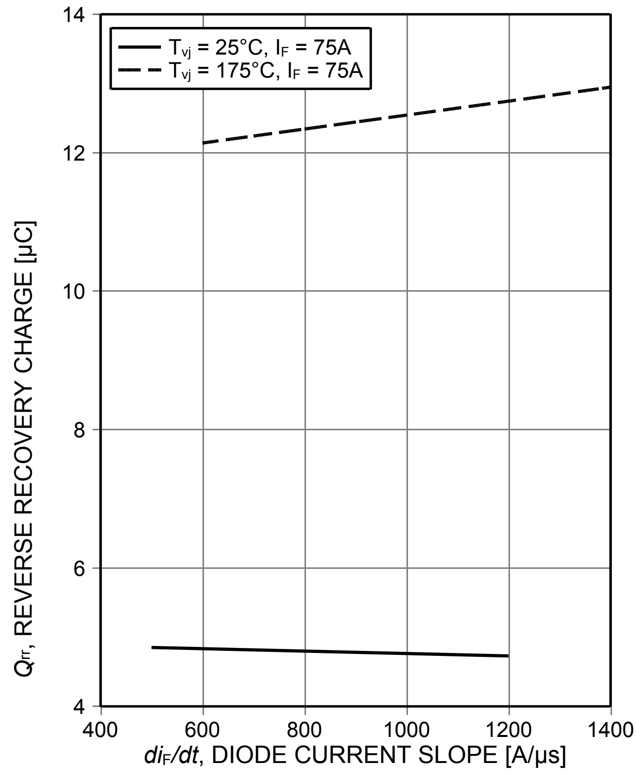


Figure 22. **Typical reverse recovery charge as a function of diode current slope**

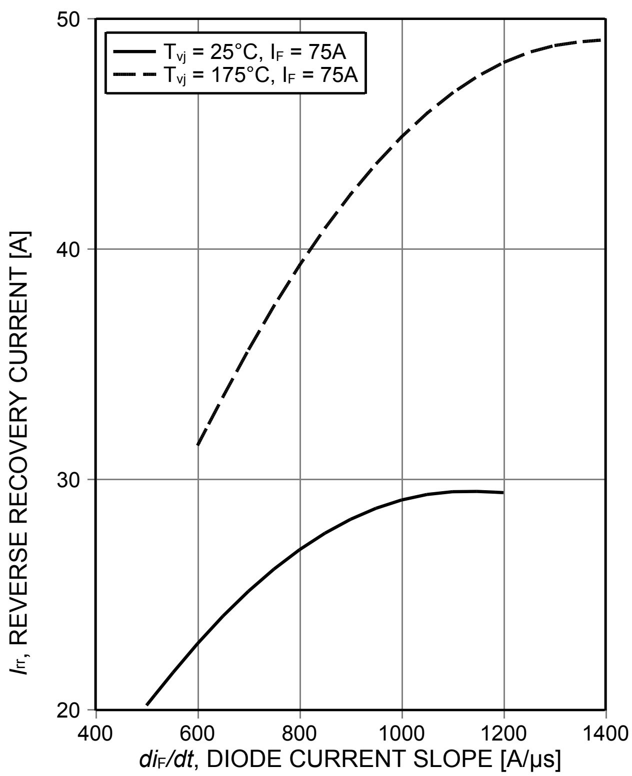


Figure 23. **Typical reverse recovery current as a function of diode current slope**

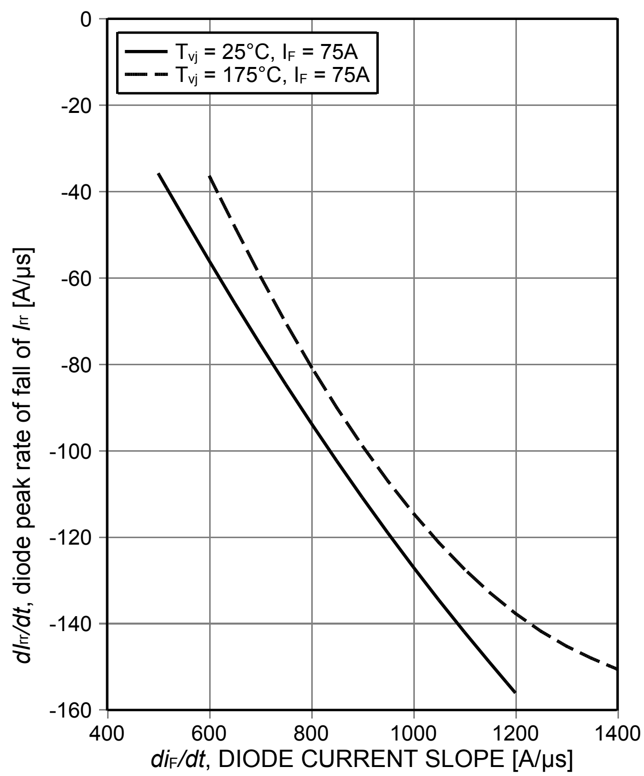


Figure 24. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**

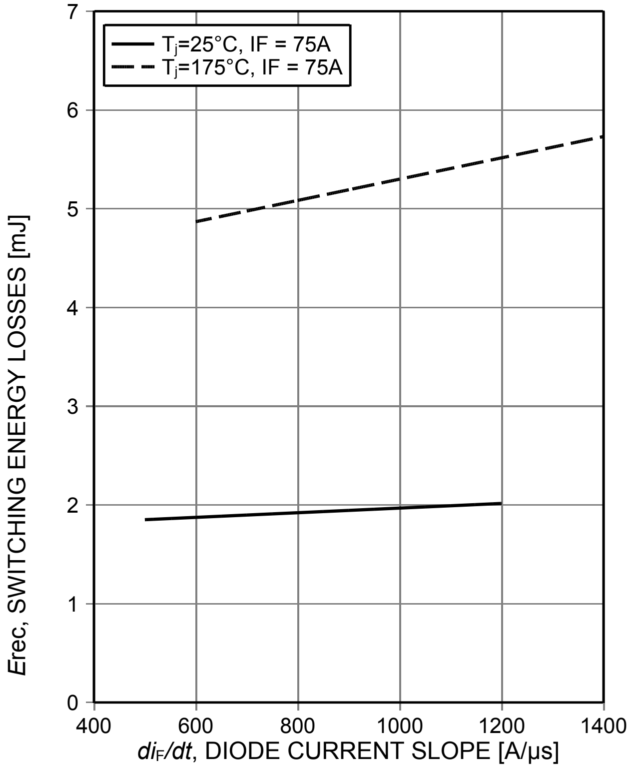


Figure 25. **Typical reverse energy losses as a function of diode current slope**

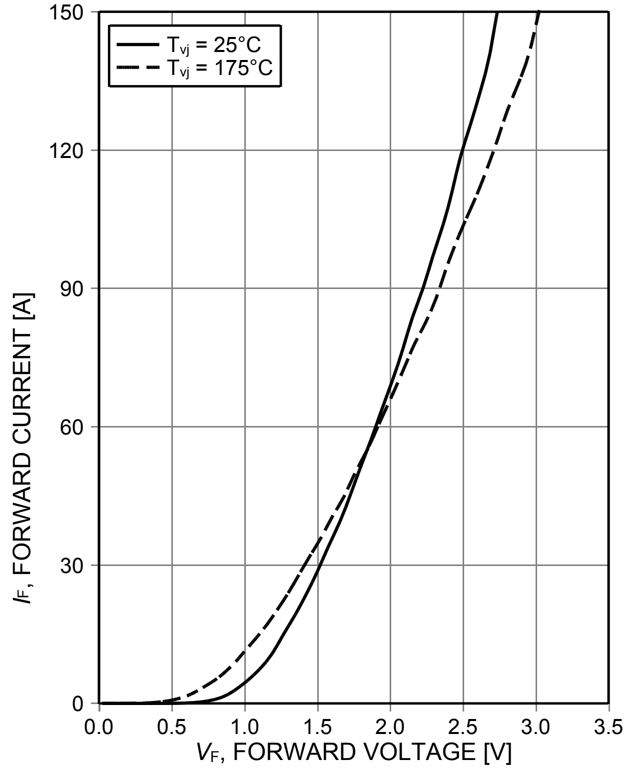


Figure 26. **Typical diode forward current as a function of forward voltage**

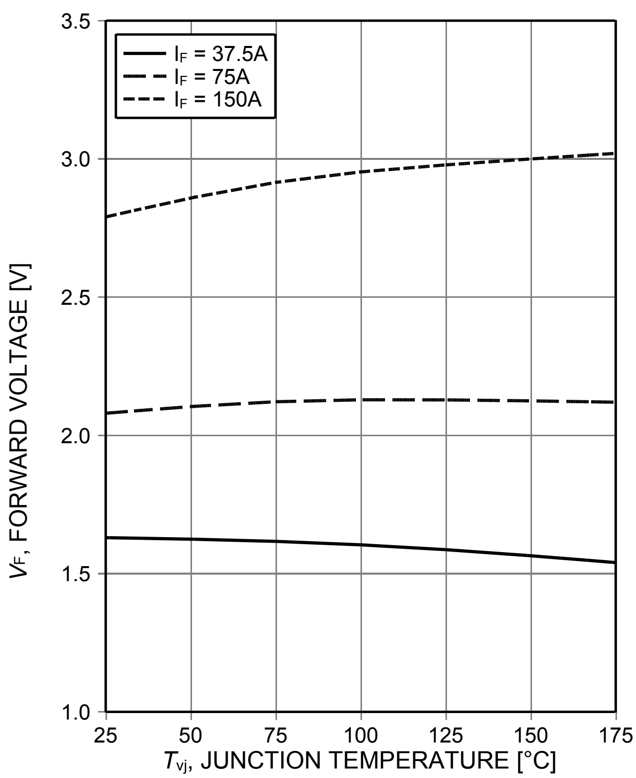
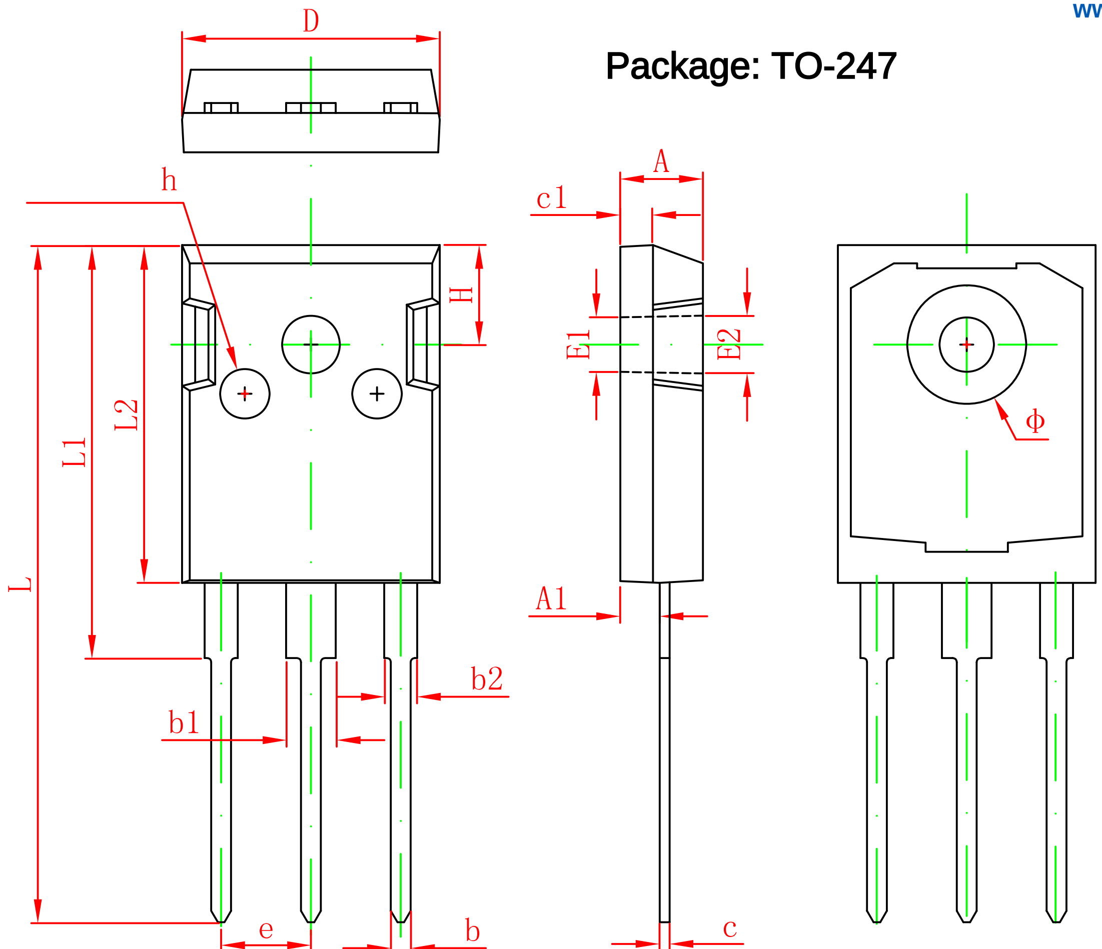


Figure 27. **Typical diode forward voltage as a function of junction temperature**

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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