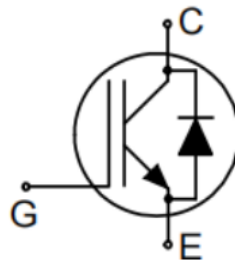


## 1200V Trench and Fieldstop IGBT

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  $V_{CEsat}$
- 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

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ °C}$ , unless otherwise noted)					
PARAMETER		SYMBOL	LIMIT	UNIT	
Collector-Emitter Voltage		$V_{CE}$	1200	V	
Gate-Emitter Voltage		$V_{GE}$	$\pm 30$		
Continuous Collector Current ( $T_J = 150\text{ °C}$ )	$V_{GE}$ at 15 V	$I_C$	$T_C = 25\text{ °C}$	90	A
			$T_C = 100\text{ °C}$	75	
Pulsed Collector Current <sup>a</sup>		$I_{CM}$	225		
Diode Forward Current <sup>b</sup>		$I_F$	90	A	
Maximum Power Dissipation		$P_D$	$T_C = 25\text{ °C}$	880	W
			$T_C = 100\text{ °C}$	440	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +175	°C	
Short Circuit Withstand Time $T_C=150$	$V_{GE}= 15V, V_{CE} = 400V$	tsc	3	$\mu s$	
Short Circuit Withstand Time $T_C=100$	$V_{GE}= 15V, V_{CE} = 330V$		5		
Soldering Recommendations (Peak Temperature) <sup>c</sup>			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
<b>Static</b>							
Collector-Emitter Breakdown Voltage	$BV_{CE}$	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$ $V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$		1200 1200	- -	- -	V
Gate-Source Threshold Voltage (N)	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_D = 250\text{ }\mu\text{A}$		4	5	6	V
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$		-	1	20	$\mu\text{A}$
		$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	1000	-	$\mu\text{A}$
Gate-Emitter Leakage Current	$I_{GES}$	$V_{CE} = 0\text{ V}, V_{GS} = \pm 2.0\text{ V}$		-	-	100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}$	$I_C = 75\text{ A}$	-	1.8	2.1	V
Forward Transconductance	$g_{fs}$	$V_{CE} = 20\text{ V}, I_C = 75\text{ A}$		-	40	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V},$ $f = 500\text{ KHz}$		-	8000	-	pF
Output Capacitance	$C_{oes}$			-	230	-	
Reverse Transfer Capacitance	$C_{res}$			-	70	-	
Turn-on Energy	$E_{on}$	$V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{V},$ $I_C = 75\text{ A}, R_g = 10\text{ }\Omega$		-	0.68	-	nJ
Turn-off Energy	$E_{off}$			-	0.35	-	
Total Gate Charge	$Q_g$	$V_{GE} = 15\text{ V}$	$I_C = 75\text{ A}, V_{CE} = 400\text{ V}$	-	190	-	nC
Gate-Emitter Charge	$Q_{ge}$			-	18	-	
Gate to Collector Charge	$Q_{gc}$			-	45	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{V},$ $I_C = 75\text{ A}, R_g = 10\text{ }\Omega$		-	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
<b>Diode Characteristics</b>							
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	$V_F$	$I_F = 30\text{ A}$		-	1.65	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 30\text{ A},$ $dI_F/dt = 200\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		-	75	-	ns
Reverse Recovery Charge	$Q_{rr}$			-	0.5	-	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$			-	13	-	A

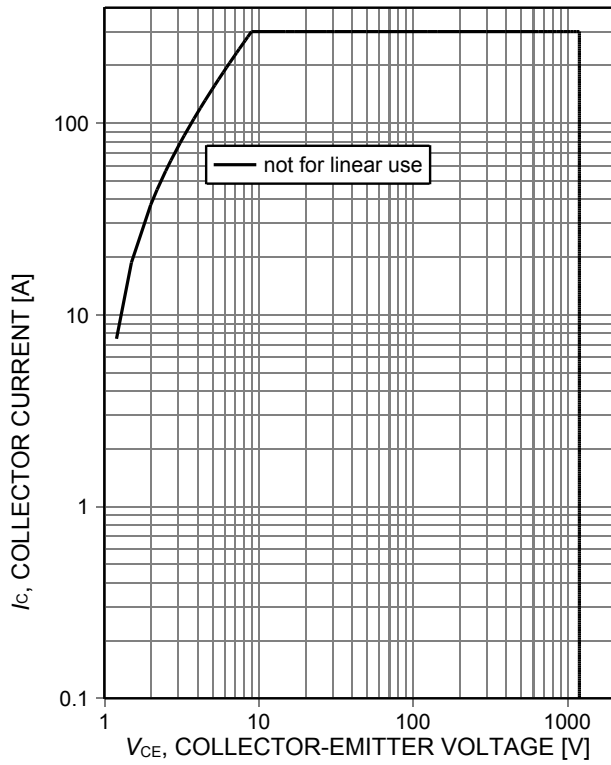


Figure 1. Forward bias safe operating area

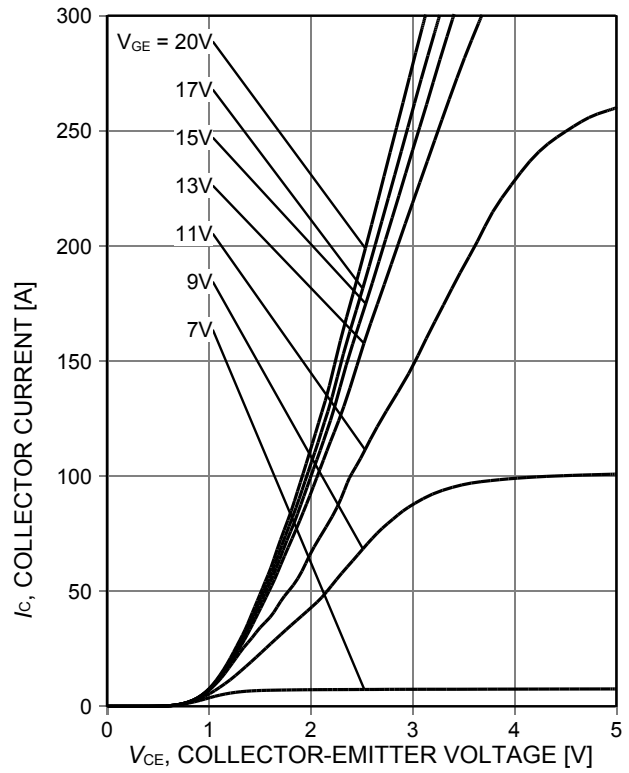


Figure 2. Typical output characteristic

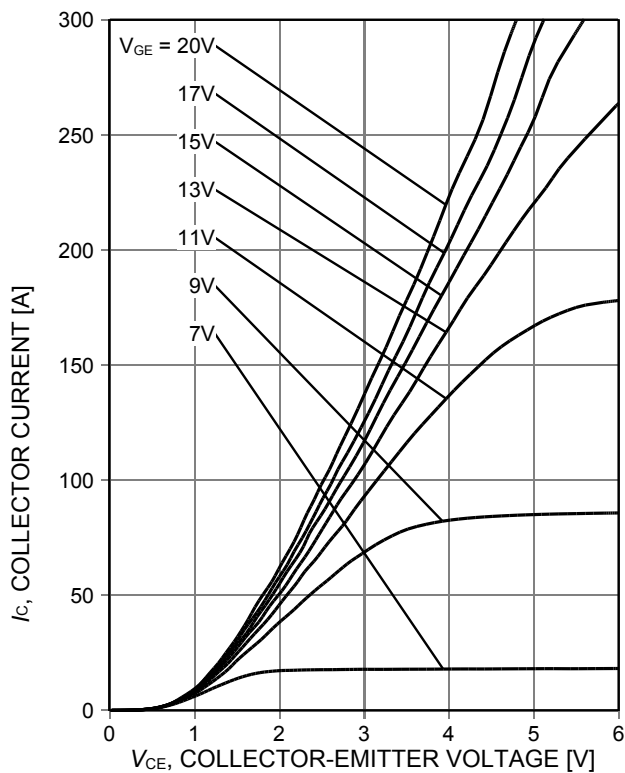


Figure 3. Typical output characteristic

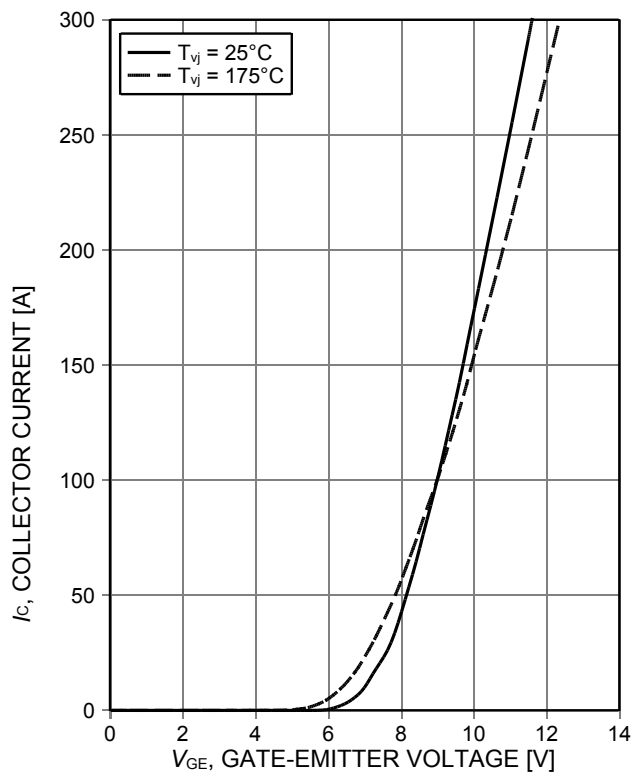


Figure 4. Typical transfer characteristic

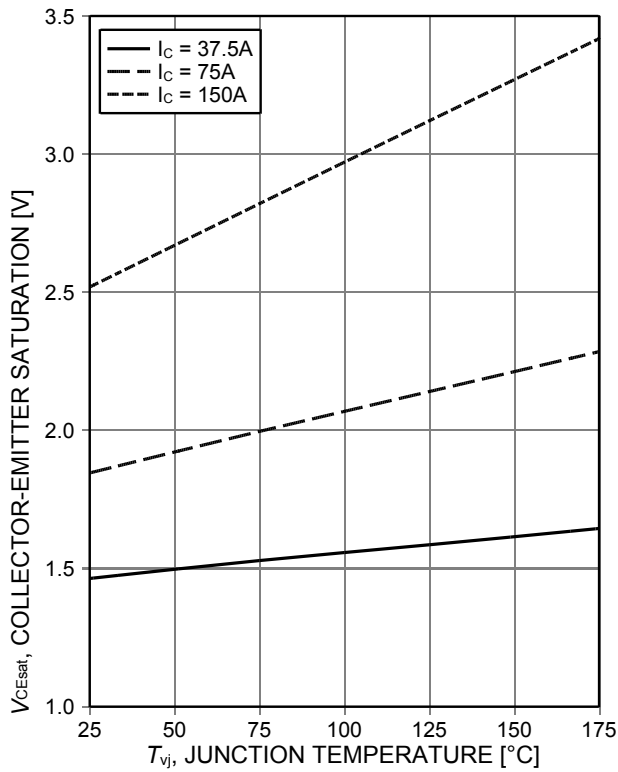


Figure 5. Typical collector-emitter saturation voltage as a function of junction temperature

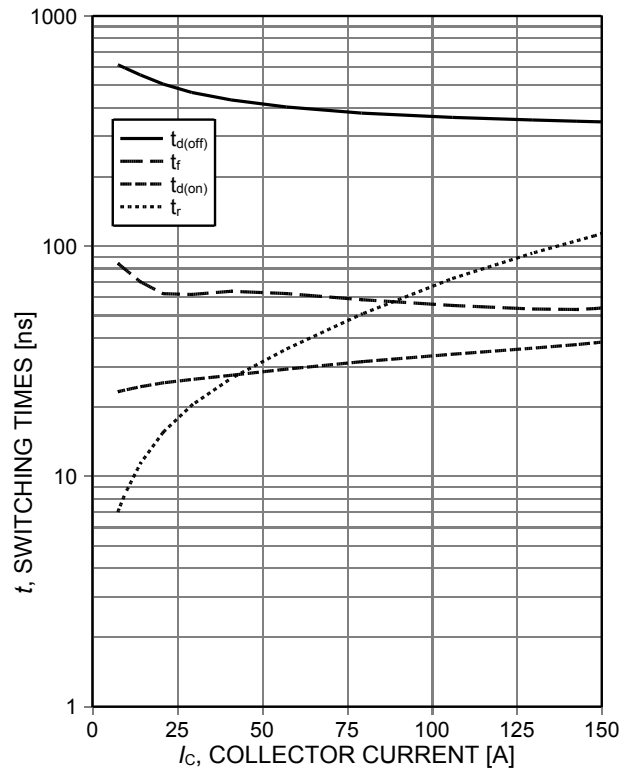


Figure 6. Typical switching times as a function of collector current

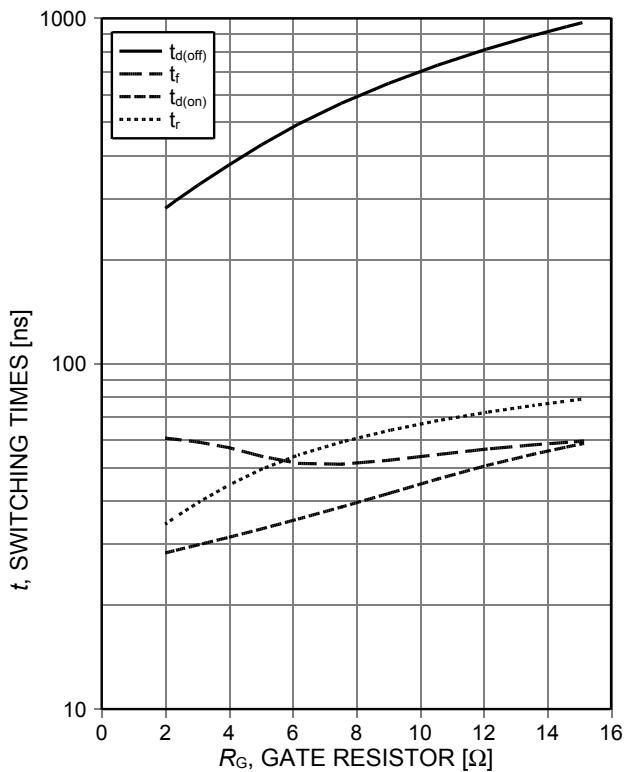


Figure 7. Typical switching times as a function of gate resistor

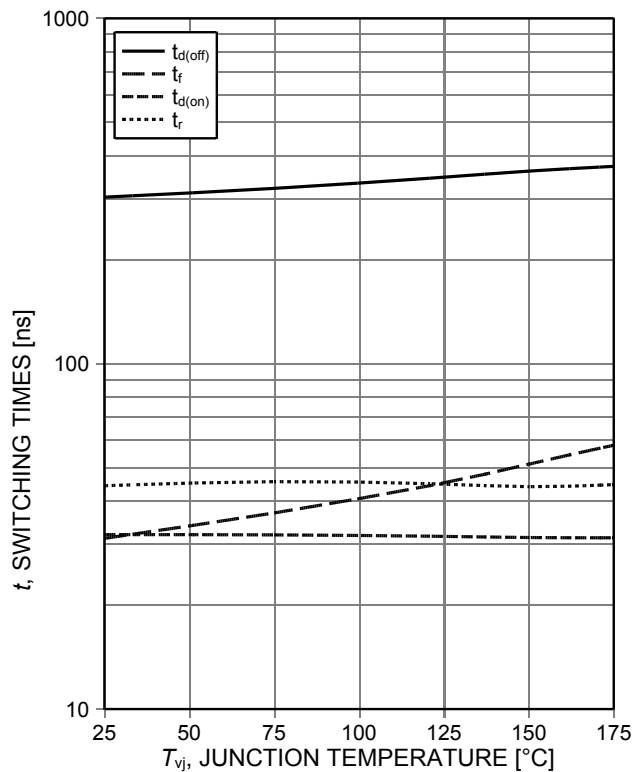


Figure 8. Typical switching times as a function of junction temperature

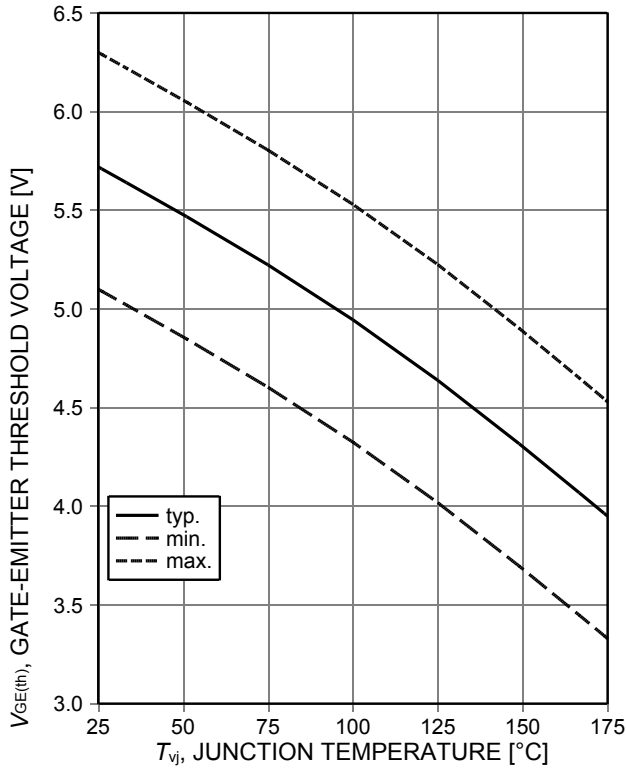


Figure 9. Gate-emitter threshold voltage as a function of junction temperature

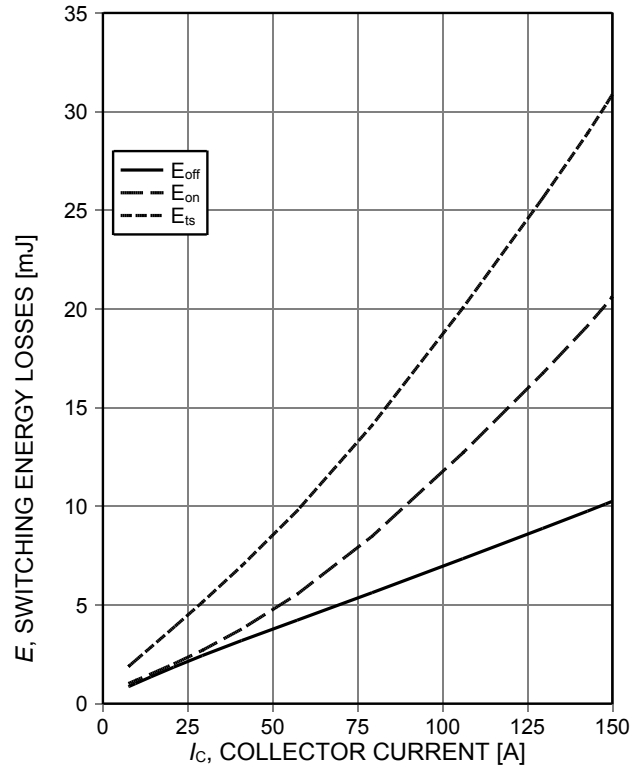


Figure 10. Typical switching energy losses as a function of collector current

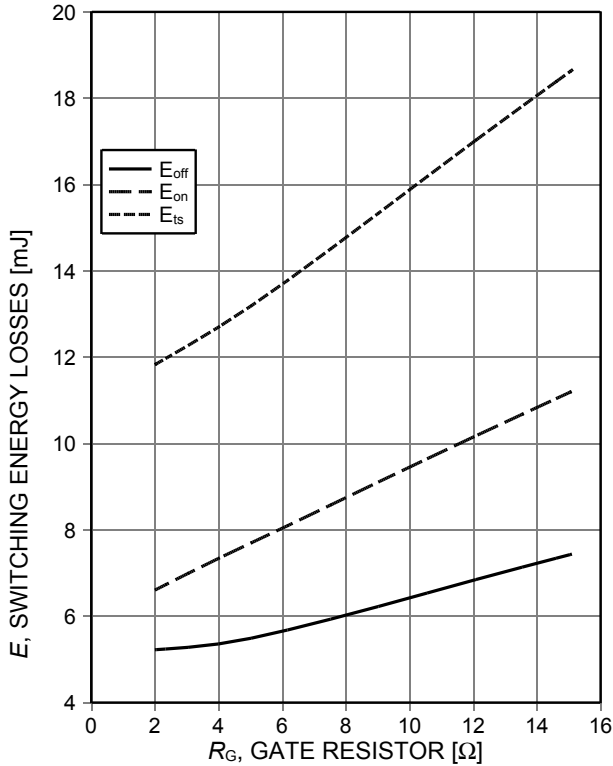


Figure 11. Typical switching energy losses as a function of gate resistor

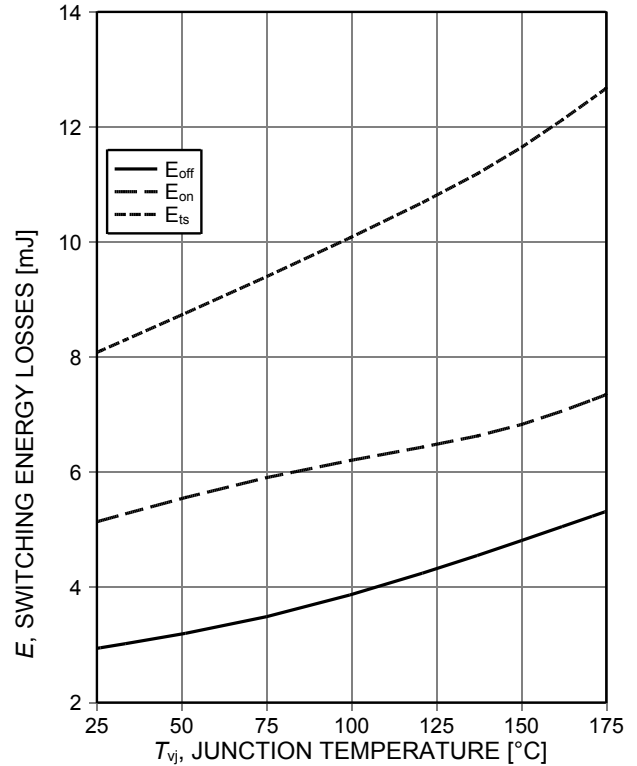


Figure 12. Typical switching energy losses as a function of junction temperature

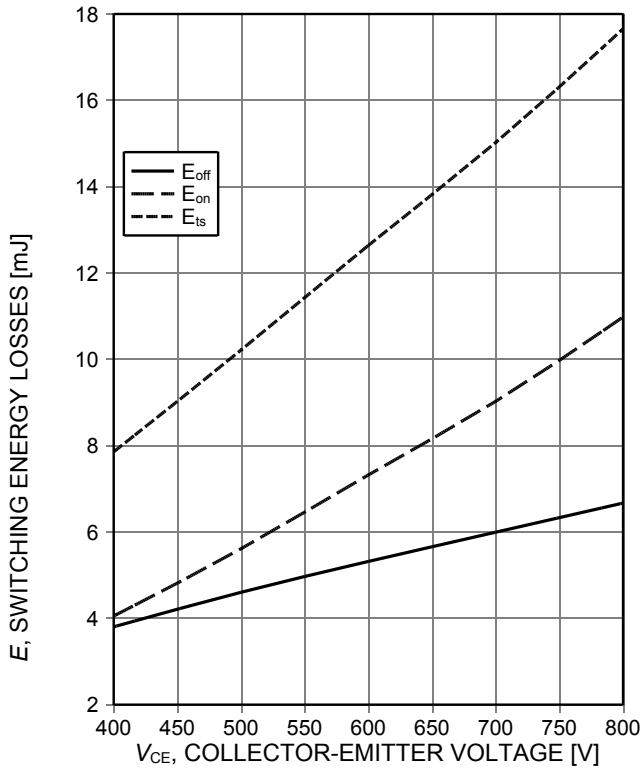


Figure 13. Typical switching energy losses as a function of collector emitter voltage

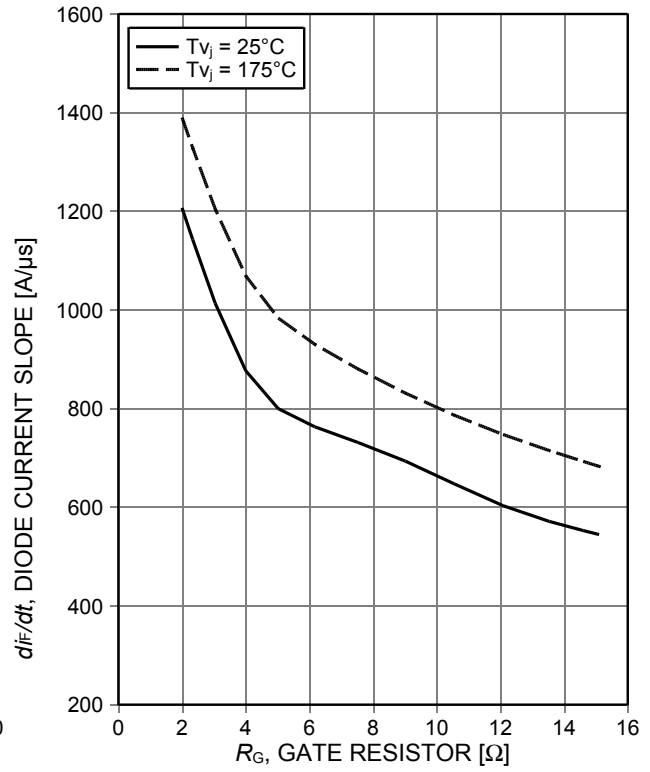


Figure 14. Typical diode current slope as a function of gate resistor

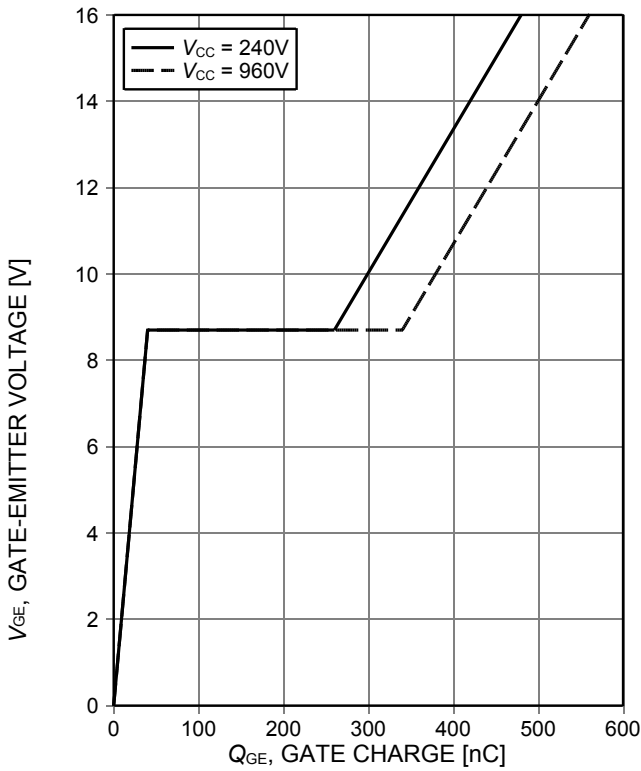


Figure 15. Typical gate charge

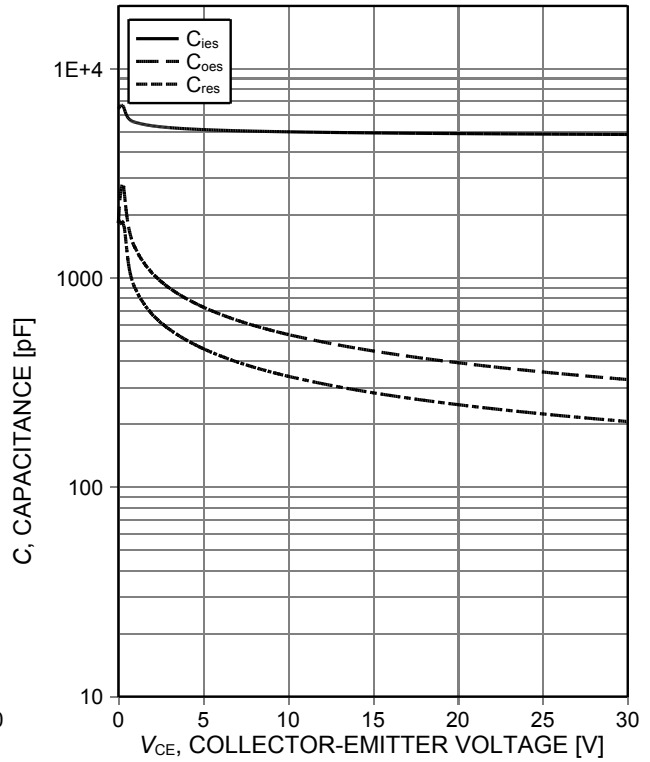


Figure 16. Typical capacitance as a function of collector-emitter voltage

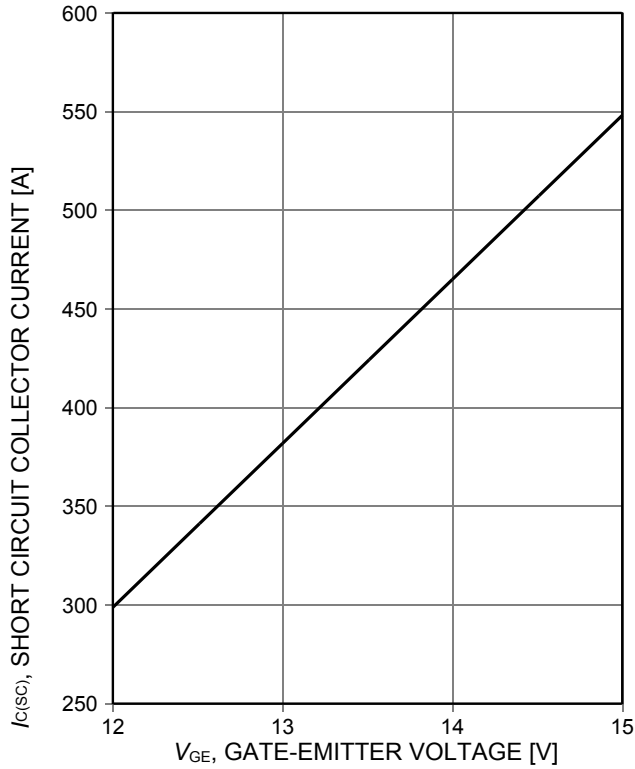


Figure 17. Typical short circuit collector current as a function of gate-emitter voltage

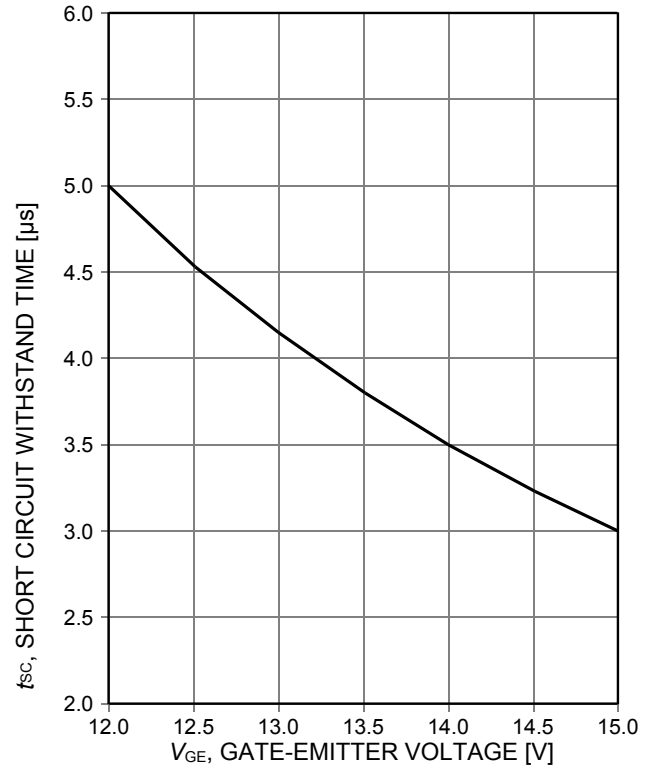


Figure 18. Short circuit withstand time as a function of gate-emitter voltage

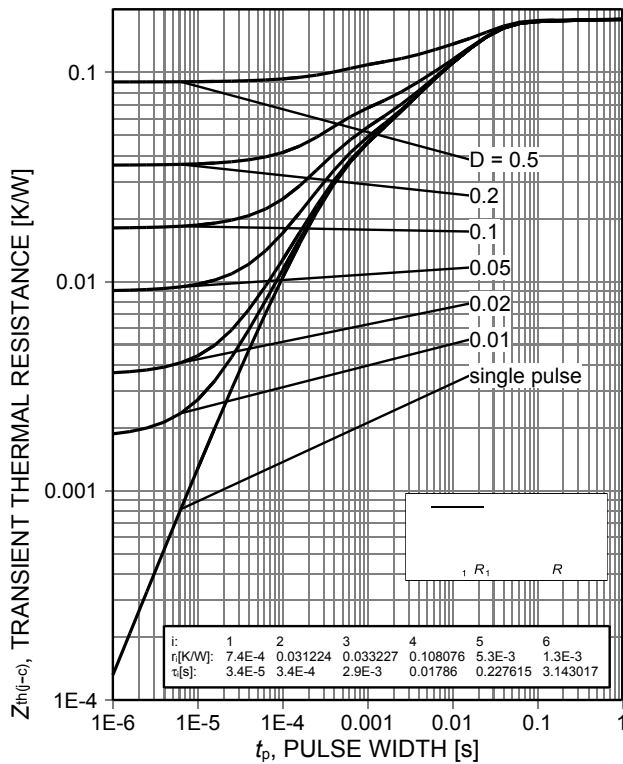


Figure 19. IGBT transient thermal resistance

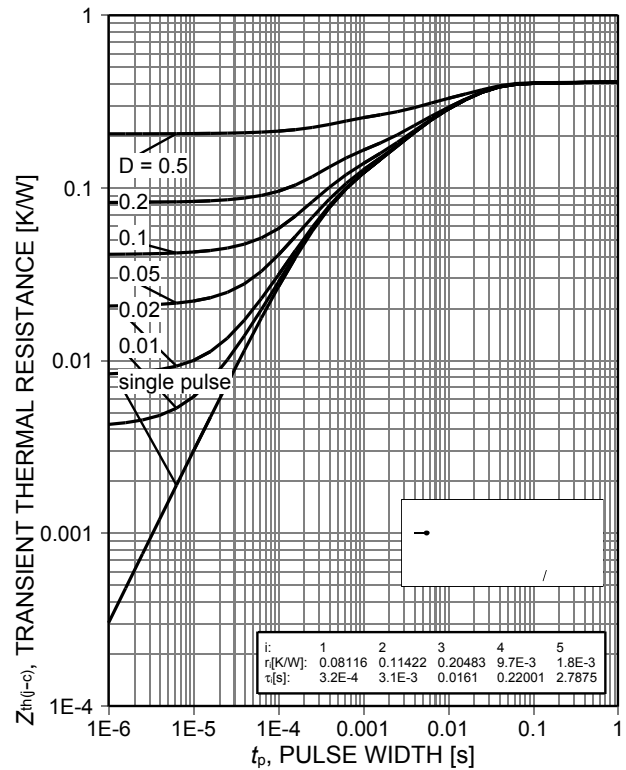


Figure 20. Diode transient thermal impedance as a function of pulse width

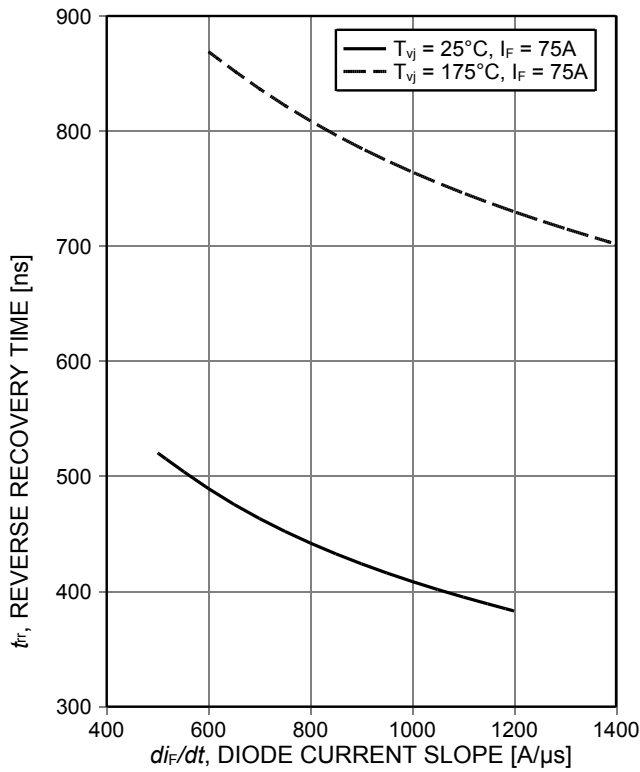


Figure 21. Typical reverse recovery time as a function of diode current slope

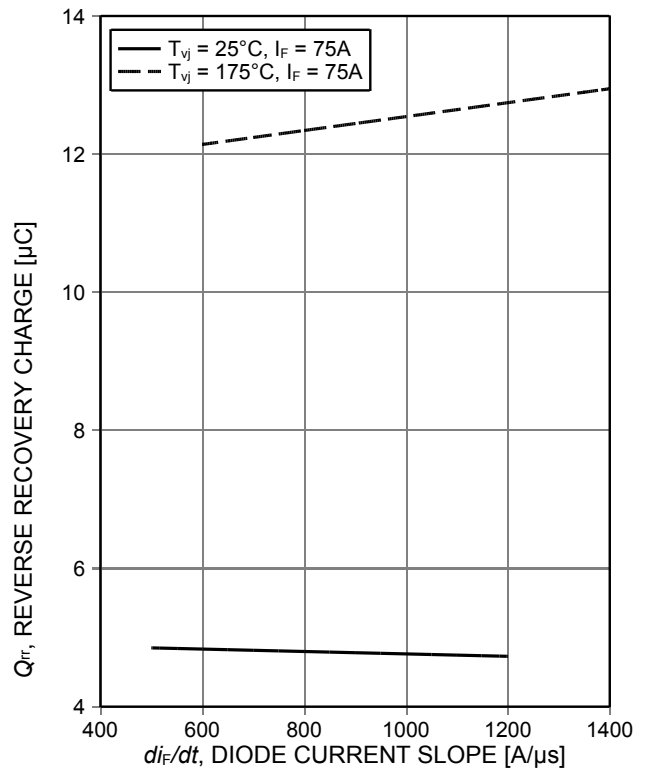


Figure 22. Typical reverse recovery charge as a function of diode current slope

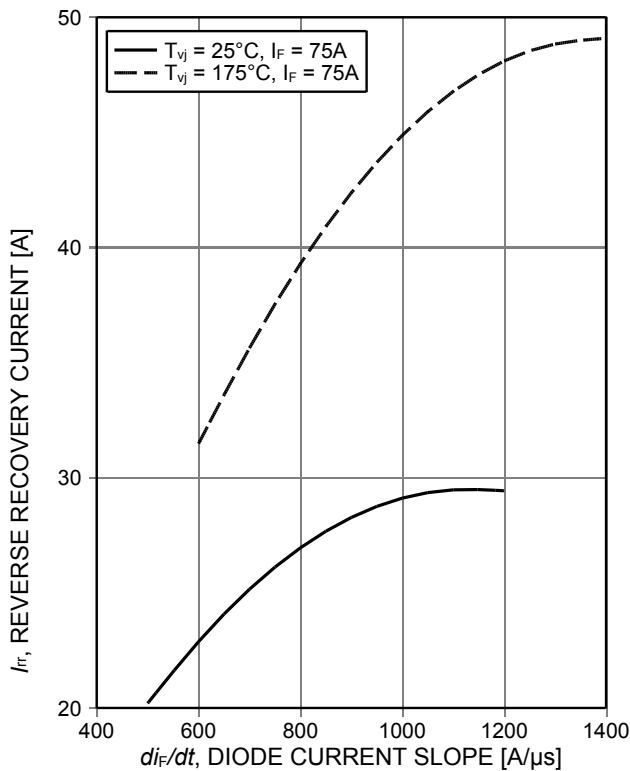


Figure 23. Typical reverse recovery current as a function of diode current slope

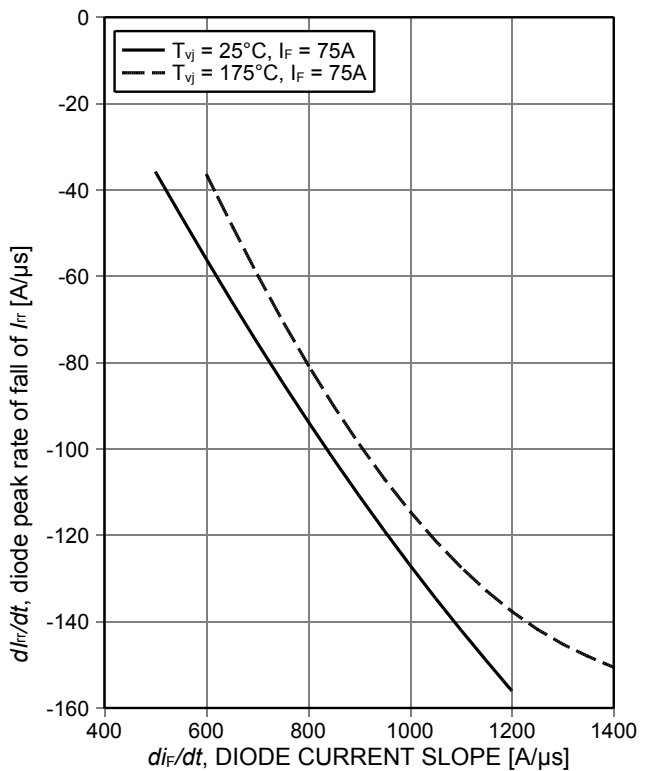


Figure 24. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope

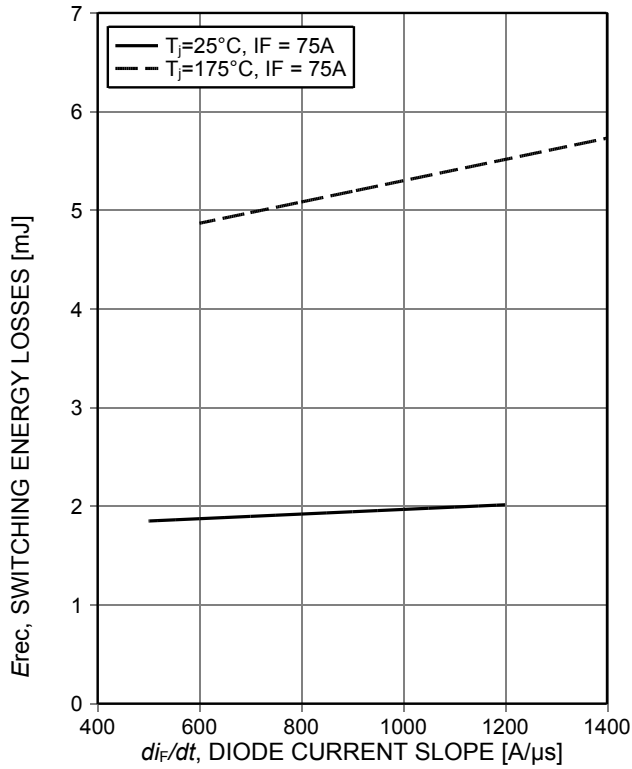


Figure 25. Typical reverse energy losses as a function of diode current slope

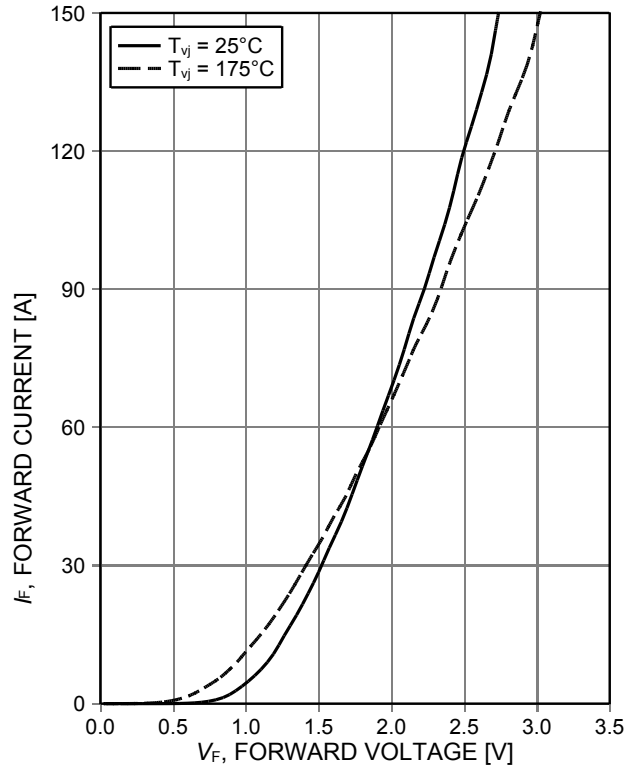


Figure 26. Typical diode forward current as a function of forward voltage

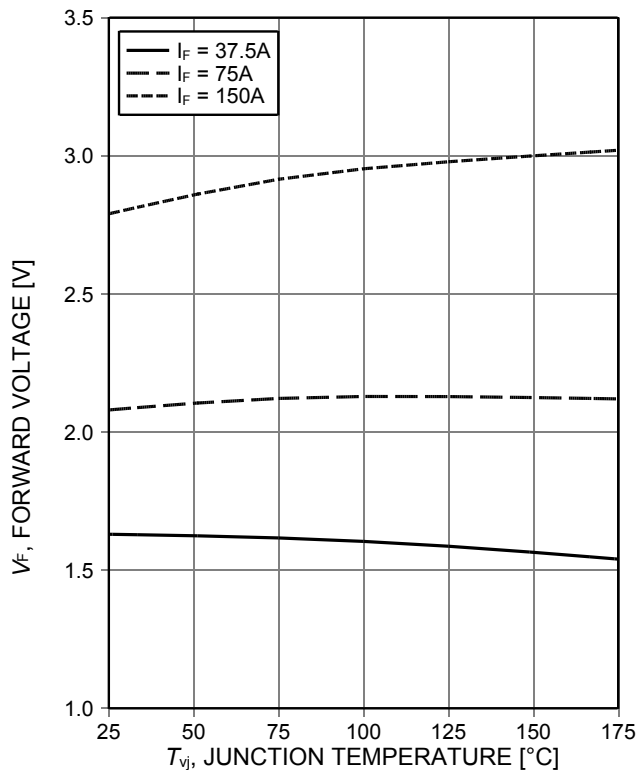
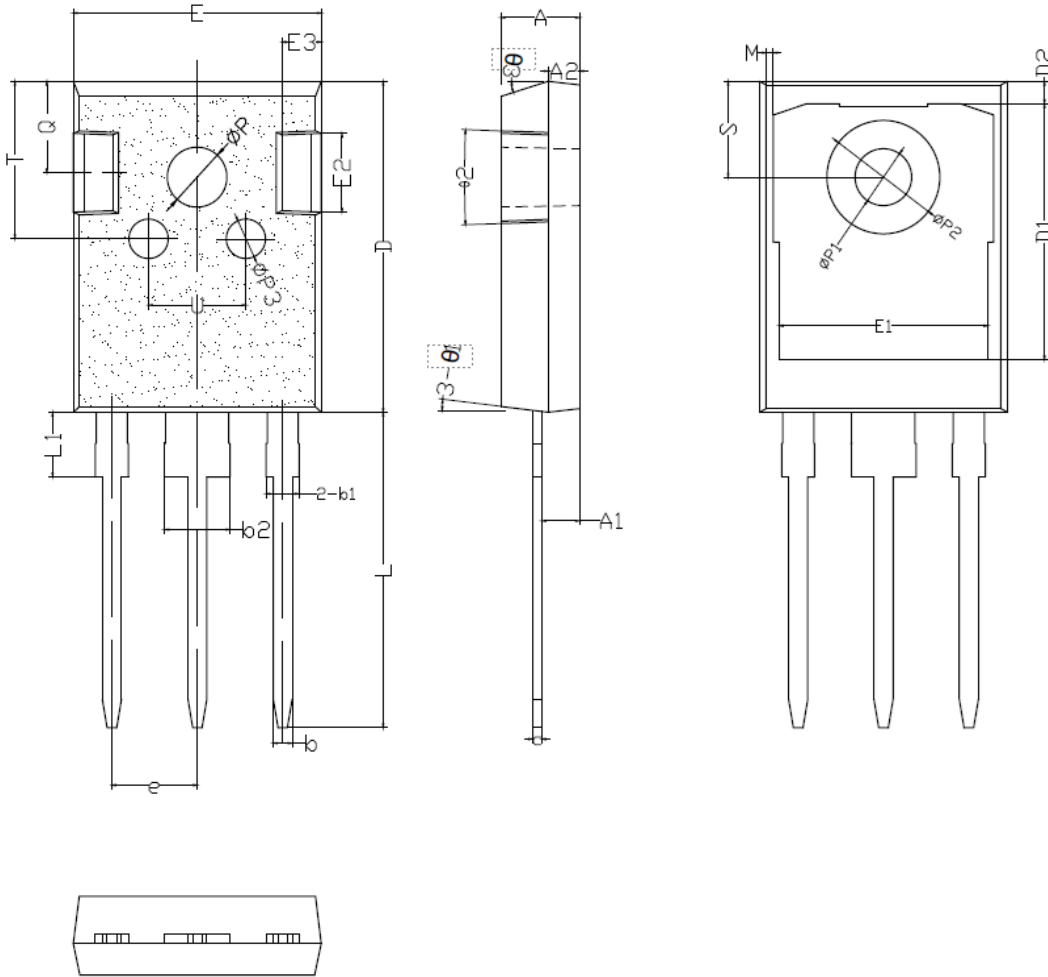


Figure 27. Typical diode forward voltage as a function of junction temperature

TO-247 PACKAGE OUTLINE DIMENSIONS



SYMBOL	mm		
	MIN	NOM	MAX
*A	4.90	5.00	5.10
*A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
*b	1.15	1.20	1.25
*b1	1.95	2.10	2.25
*b2	2.95	3.10	3.25
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35

*E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.85	4.95	5.10
E3	2.40	2.50	2.60
*e	5.40	5.44	5.48
*L	19.80	19.98	20.15
*L1	-	-	4.30
*ΦP	3.40	3.50	3.60
*ΦP1	6.90	7.10	7.30
ΦP2	2.40	2.50	2.60
ΦP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°

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