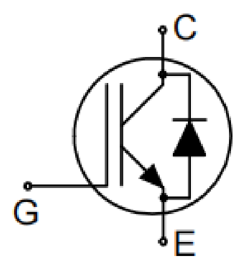
STGF20M65DF2-VB Datasheet

600V Trench and Fieldstop IGBT

PRODUCT SUMMARY		
V_{CE} (V)	600	
I_C (A)	40 (TC=25°C)	20 (TC=100°C)
V_{CE} (sat) (V)	1.7	
I_{CM} (A)	60	

TO-220F

Top View



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

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Collector-Emitter Voltage			V_{CE}	600	V
Gate-Emitter Voltage			V_{GE}	±30	V
Continuous Collector Current (T_J = 150 °C)	V_{GE} at 15 V	T_C = 25 °C	I_C	40	A
		T_C = 100 °C		20	
Pulsed Collector Current [a]			I_{CM}	60	
Diode Forward Current [b]			I_F	20	A
Maximum Power Dissipation		T_C = 25 °C	P_D	35	W
		T_C = 100 °C		15.6	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}	-	78	°C/W
Maximum Junction-to-Case	R_{thJC}	-	3.6	

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	600	-	-	V
		V_{GE} = 0 V, I_C = 1 mA	600	-	-	
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} = 600 V, V_{GE} = 0 V, T_J = 25 °C	-	1	20	μA
		V_{CE} = 600 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 = 20 A	-	1.7	2.1	V
Forward Transconductance	g_{fs}	V_{CE} = 20 V, I_C = 20 A	-	16	-	S
Dynamic						
Input Capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 25 V, f = 500 KHz	-	2600	-	pF
Output Capacitance	C_{oes}		-	46	-	
Reverse Transfer Capacitance	C_{res}		-	32	-	
Turn-on Energy	E_{on}	V_{CE} = 400 V , V_{GE} = 0 /15V, I_C = 20 A, R_g = 10Ω	-	0.43	-	nJ
Turn-off Energy	E_{off}		-	0.16	-	
Total Gate Charge	Q_g	V_{GE} = 20 V; I_C = 20 A, V_{CE} = 400 V	-	9 7	-	nC
Gate-Emitter Charge	Q_{ge}		-	17	-	
Gate to Collector Charge	Q_{gc}		-	37	-	
Turn-On Delay Time	$t_{d(on)}$	V_{CE} = 400 V , V_{GE} = 0 /15V, I_C = 20 A, R_g = 10Ω	-	18	-	ns
Rise Time	t_r		-	32	-	
Turn-Off Delay Time	$t_{d(off)}$		-	105	-	
Fall Time	t_f		-	31	-	
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	-	-	20	A
Pulsed Diode Forward Current	I_{FM}		-	-	60	
Diode Forward Voltage	V_F	I_F = 20 A	-	1.65	2.0	V
Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 20 A, dI_F/dt = 200 A/μs, V_R = 400 V	-	70	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.48	-	μC
Reverse Recovery Current	I_{RRM}		-	8	-	A

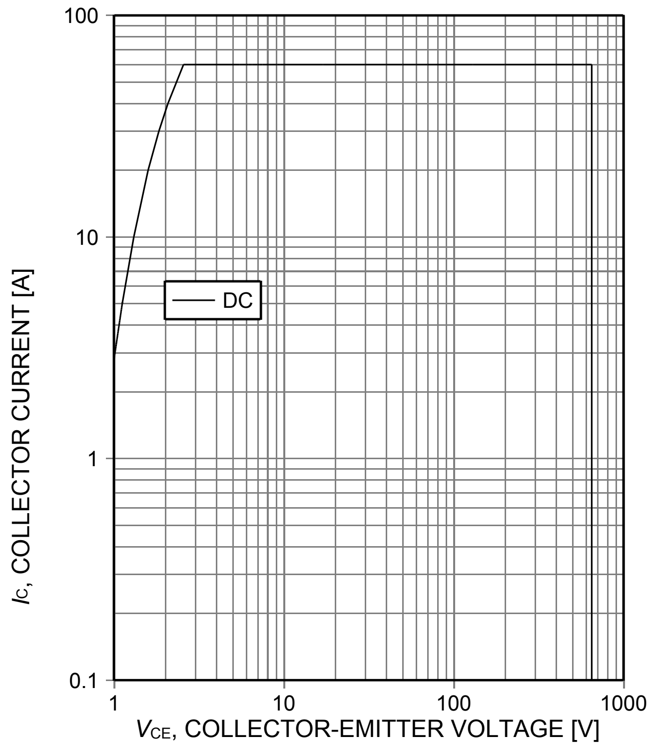


Figure 1. **Forward bias safe operating area**
(D=0, T_C=25°C, T_{vj}≤175°C; V_{GE}=15V. Recommended use at V_{GE}≥7.5V)

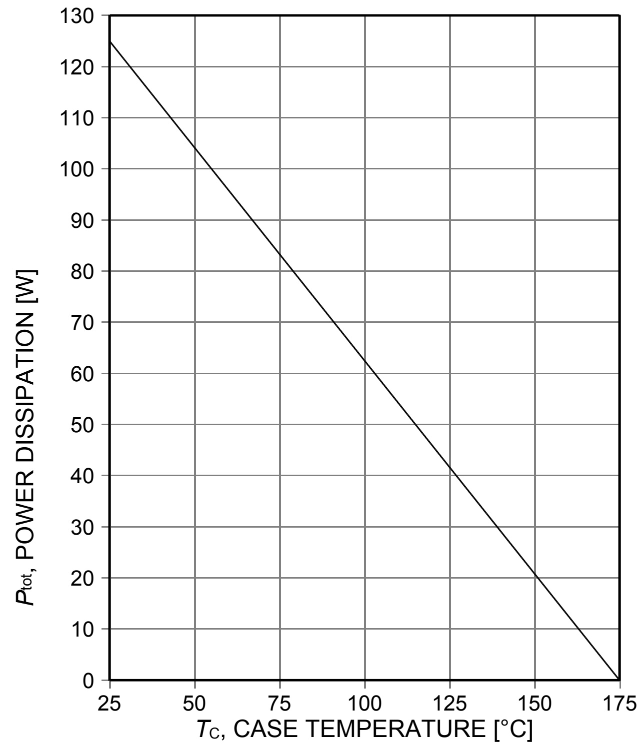


Figure 2. **Power dissipation as a function of case temperature**
(T_{vj}≤175°C)

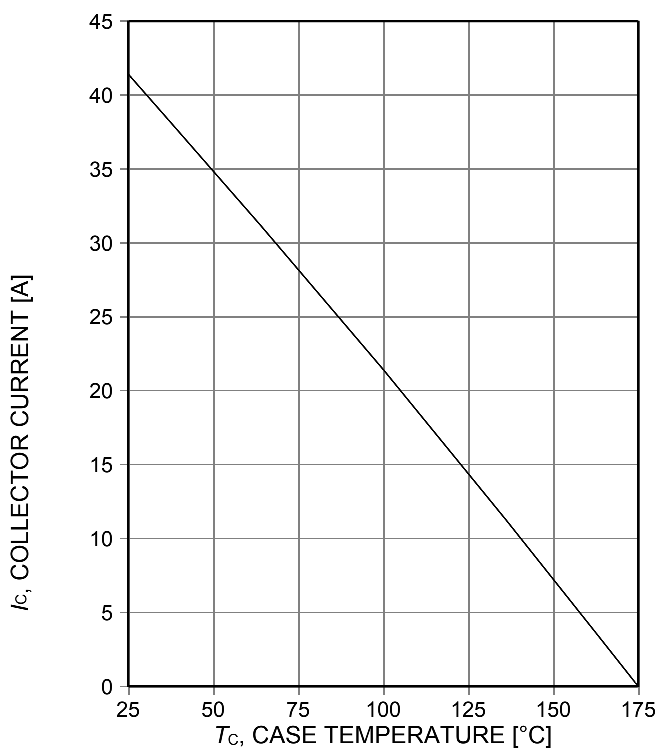


Figure 3. **Collector current as a function of case temperature**

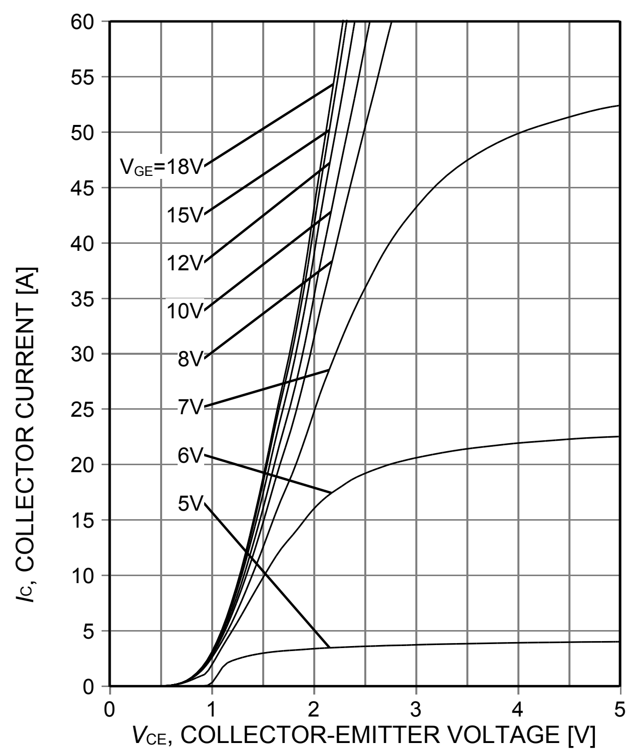


Figure 4. **Typical output characteristic**

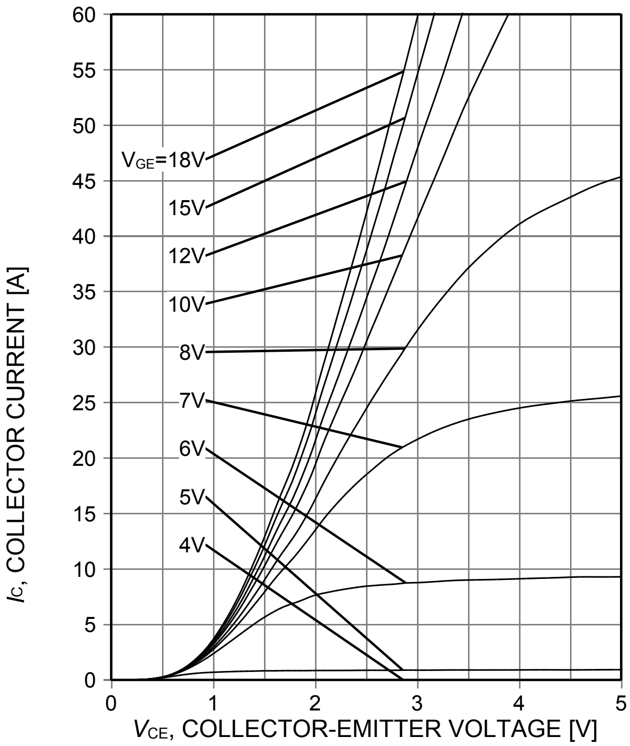


Figure 5. **Typical output characteristic**
(T_{vj}=150°C)

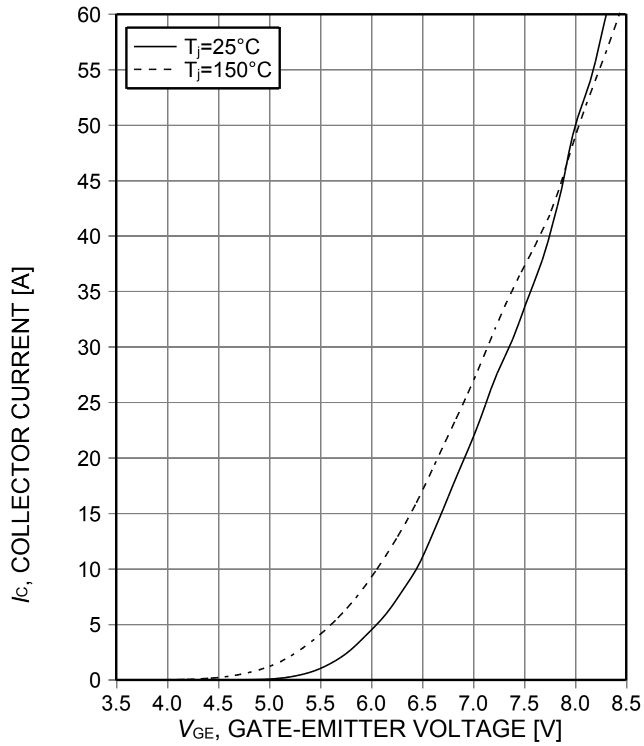


Figure 6. **Typical transfer characteristic**
(V_{CE}=20V)

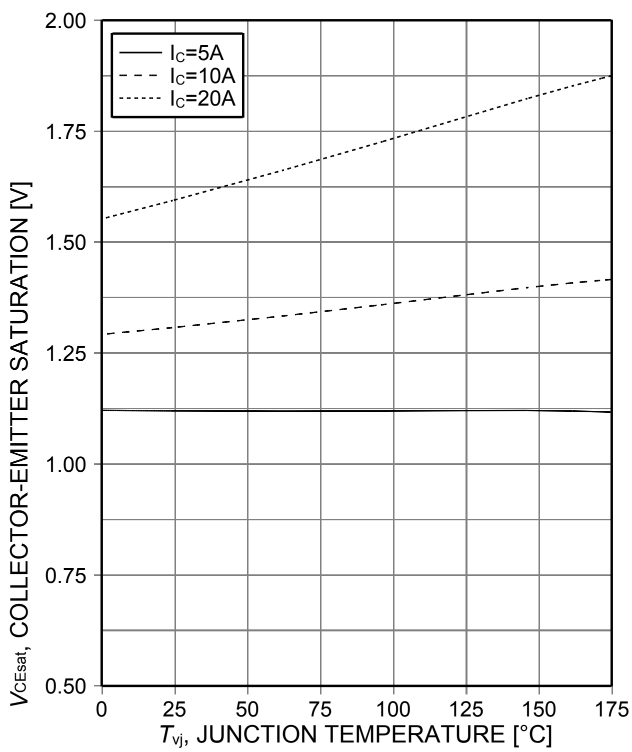


Figure 7. **Typical collector-emitter saturation voltage as a function of junction temperature**

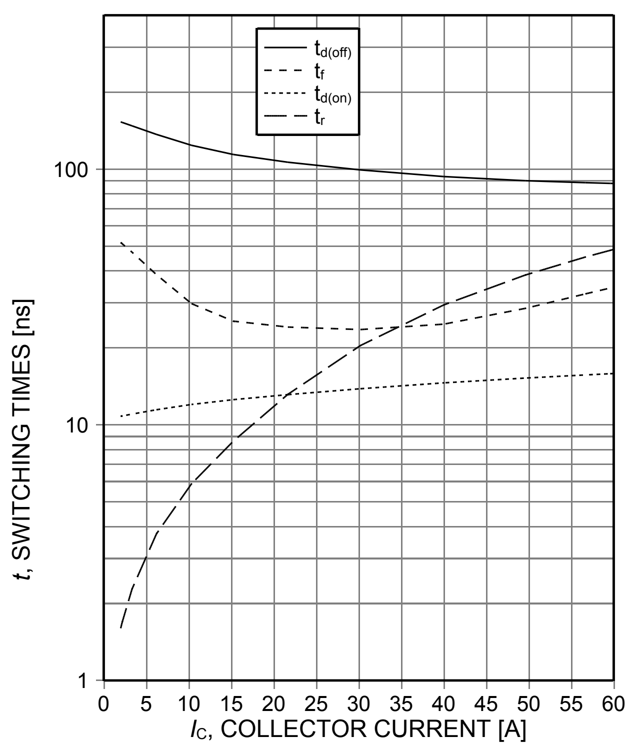


Figure 8. **Typical switching times as a function of collector current**

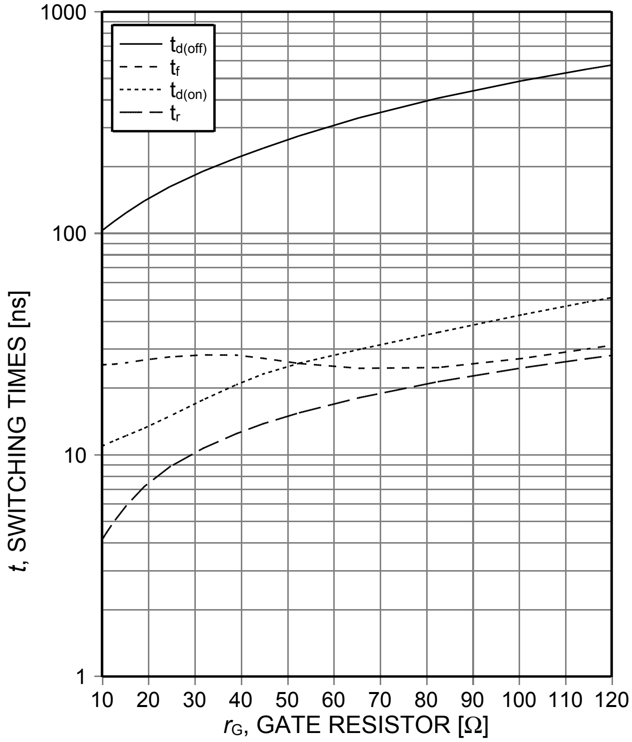


Figure 9. **Typical switching times as a function of gate resistor**

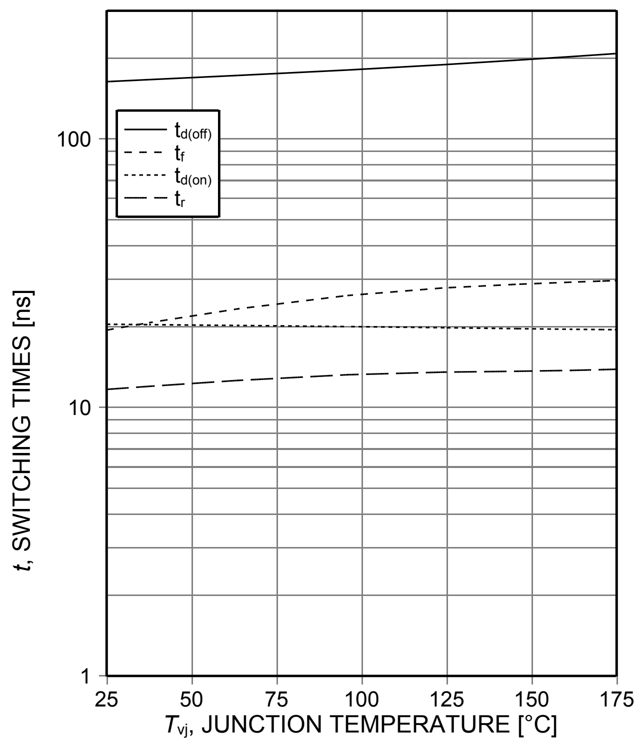


Figure 10. **Typical switching times as a function of junction temperature**

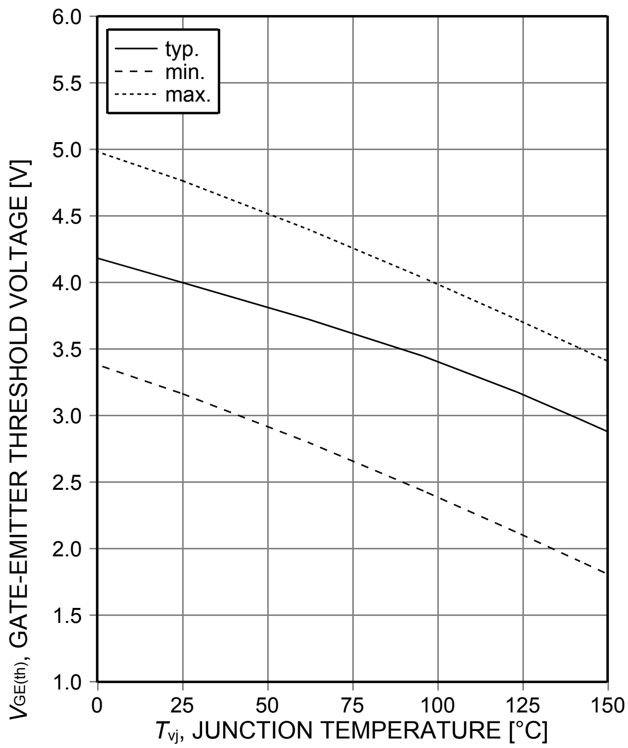


Figure 11. **Gate-emitter threshold voltage as a function of junction temperature**

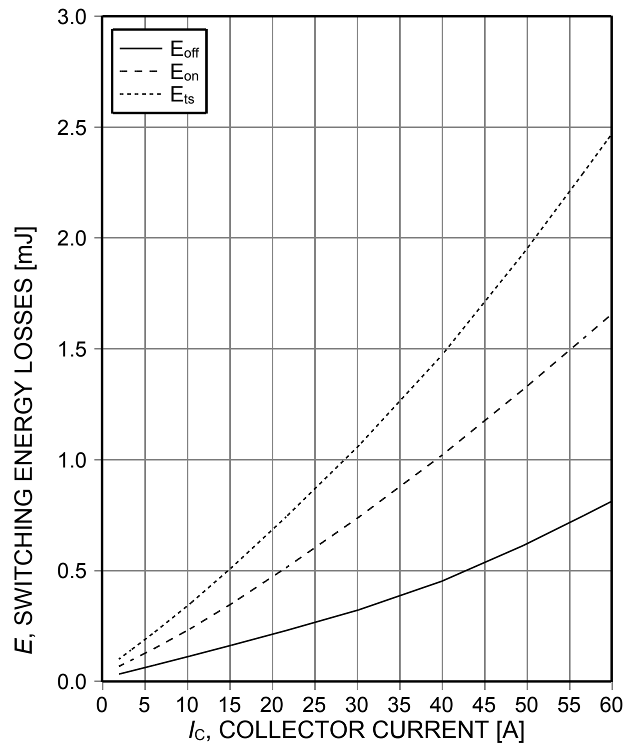


Figure 12. **Typical switching energy losses as a function of collector current**

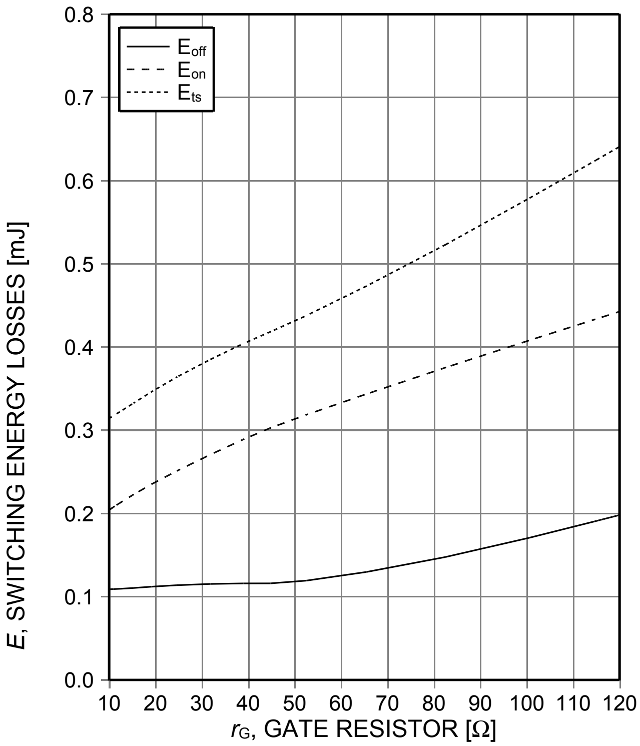


Figure 13. **Typical switching energy losses as a function of gate resistor**

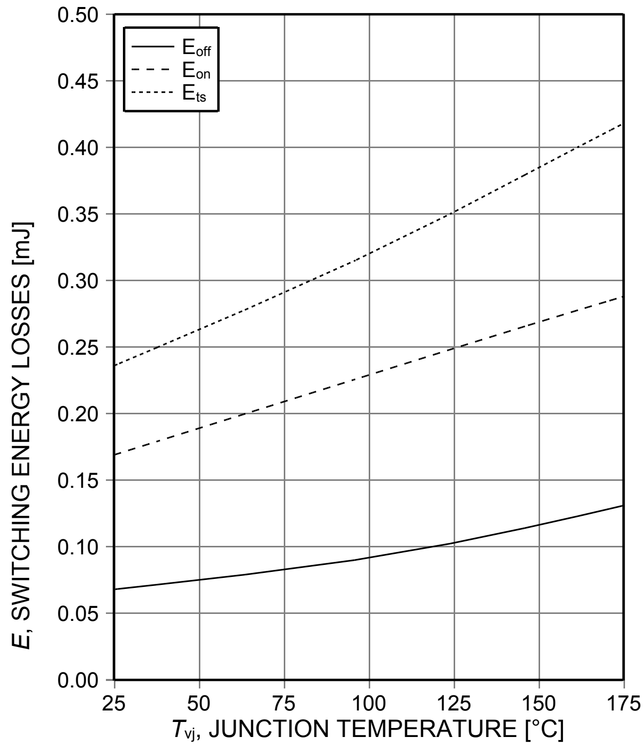


Figure 14. **Typical switching energy losses as a function of junction temperature**

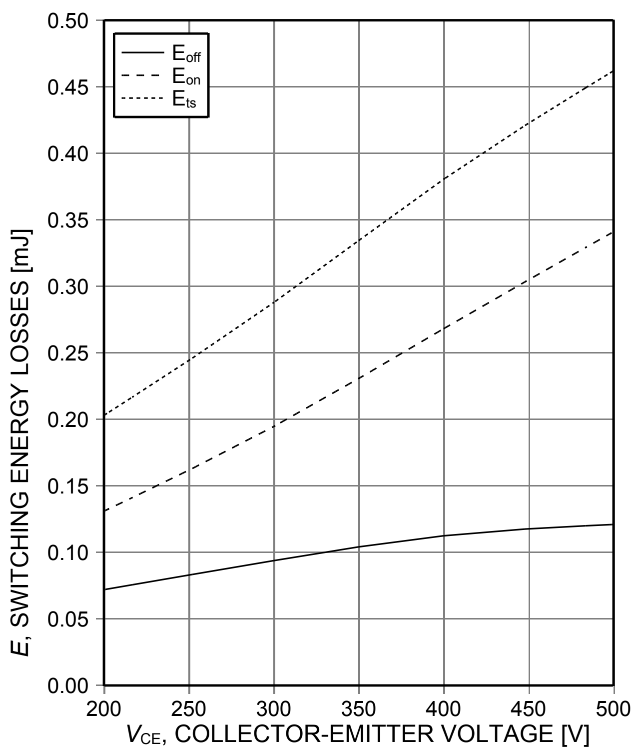


Figure 15. **Typical switching energy losses as a function of collector emitter voltage**

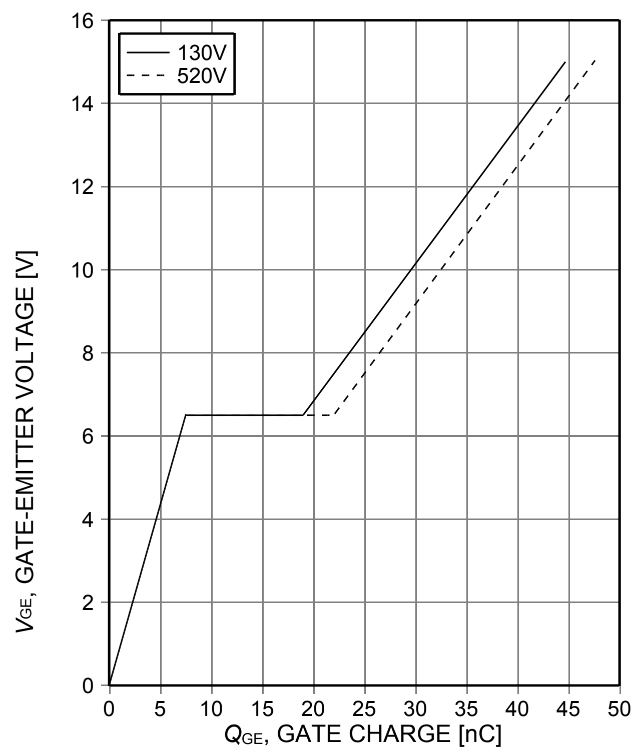


Figure 16. **Typical gate charge**

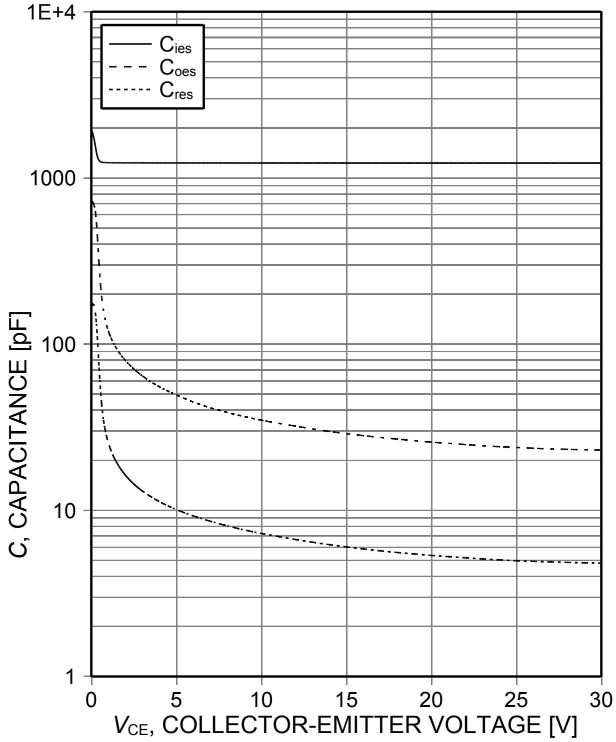


Figure 17. **Typical capacitance as a function of collector-emitter voltage**

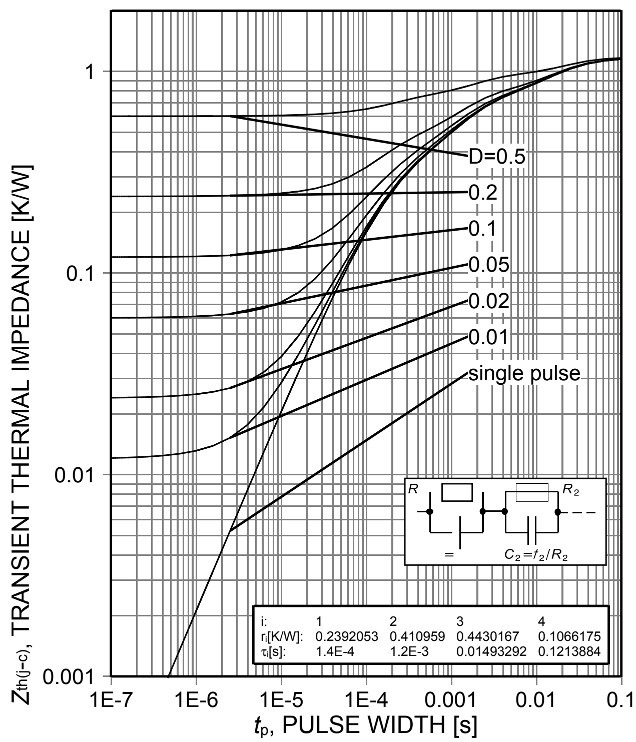


Figure 18. **IGBT transient thermal impedance**

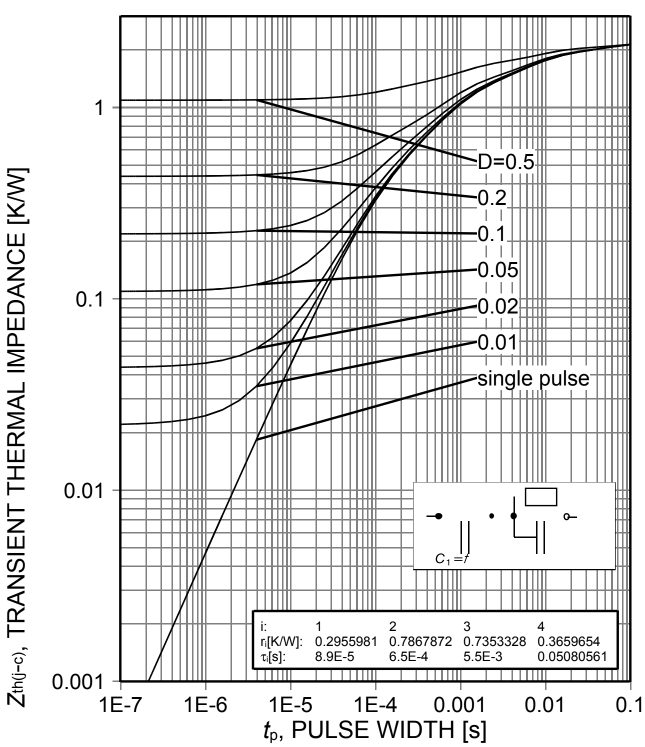


Figure 19. **Diode transient thermal impedance as a function of pulse width**

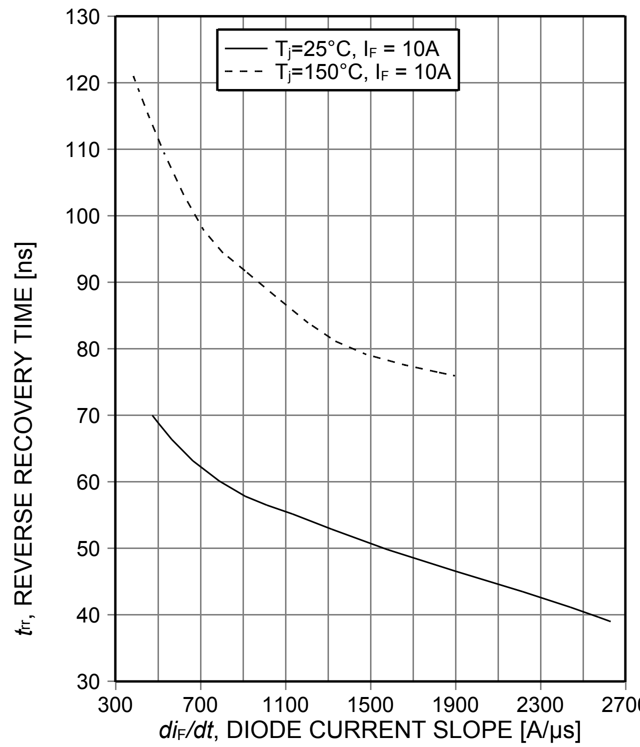
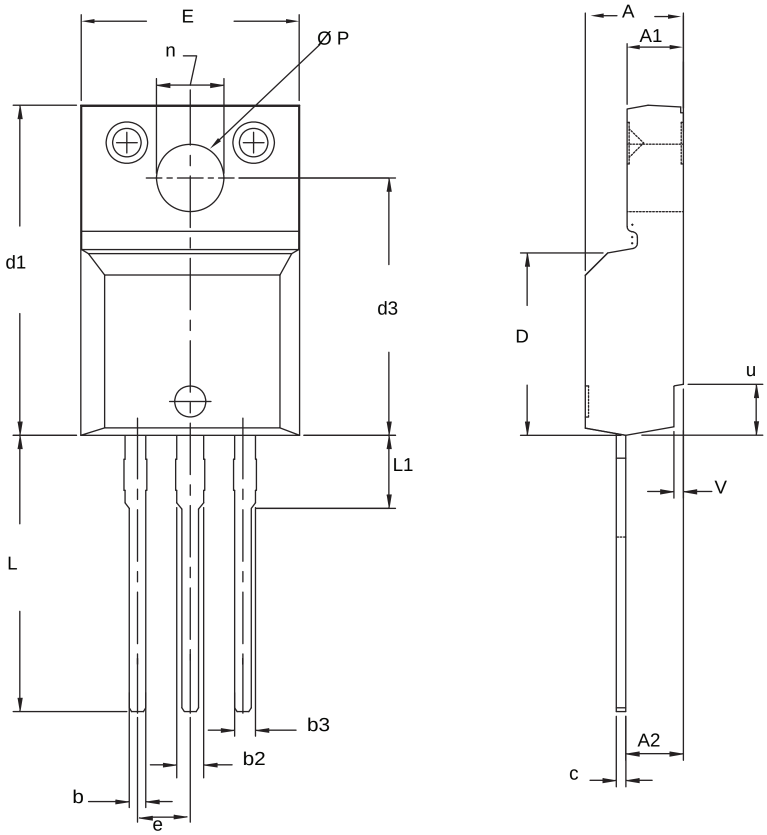


Figure 20. **Typical reverse recovery time as a function of diode current slope**

TO-220 FULLPAK (HIGH VOLTAGE)



	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.570	4.830	0.180	0.190
A1	2.570	2.830	0.101	0.111
A2	2.510	2.850	0.099	0.112
b	0.622	0.890	0.024	0.035
b2	1.229	1.400	0.048	0.055
b3	1.229	1.400	0.048	0.055
c	0.440	0.629	0.017	0.025
D	8.650	9.800	0.341	0.386
d1	15.88	16.120	0.622	0.635
d3	12.300	12.920	0.484	0.509
E	10.360	10.630	0.408	0.419
e	2.54 BSC		0.100 BSC	
L	13.200	13.730	0.520	0.541
L1	3.100	3.500	0.122	0.138
n	6.050	6.150	0.238	0.242
Ø P	3.050	3.450	0.120	0.136
u	2.400	2.500	0.094	0.098
v	0.400	0.500	0.016	0.020

ECN: X09-0126-Rev. B, DWG: 5972

Notes

1. To be used only for process drawing.
2. These dimensions apply to all TO-220, FULLPAK leadframe versions 3 leads.3
. All critical dimensions should C meet C_{pk} > 1.33.
4. All dimensions include burrs and plating thickness.
5. No chipping or package damage.

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