IKW40N65H5-VB Datasheet

650V Trench and Fieldstop IGBT

PRODUCT SUMMARY		
V_{CE} (V)	650	
I_C (A)	120 (TC=25°C)	60 (TC=100°C)
VCE (sat) (V)	1.7	
ICM (A)	180	

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)

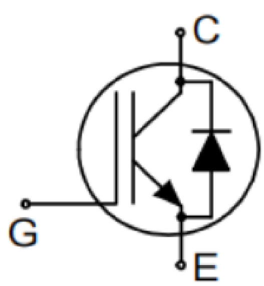
RoHS COMPLIANT
HALOGEN FREE

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)

TO-247

Top View



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}	650	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	120	A
		T_C = 100 °C		60	
Pulsed Collector Current [a]			I_{CM}	180	
Diode Forward Current [b]			I_F	60	A
Maximum Power Dissipation		T_C = 25 °C	P_D	450	W
		T_C = 100 °C		200	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}	-	0.5	

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	650	-	-	V
		V_{GE} = 0 V, I_C = 1 mA	650	-	-	
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} = 650 V, V_{GE} = 0 V, T_J = 25 °C	-	1	20	μA
		V_{CE} = 650 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 = 60 A	-	1.8	2.1	V
Forward Transconductance	g_{fs}	V_{CE} = 20 V, I_C = 60 A	-	40	-	S
Dynamic						
Input Capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 25 V, f = 500 KHz	-	6210	-	pF
Output Capacitance	C_{oes}		-	228	-	
Reverse Transfer Capacitance	C_{res}		-	60	-	
Turn-on Energy	E_{on}	V_{CE} = 400 V , V_{GE} = 0 /15V, I_C = 60 A, R_g = 10Ω	-	0.76	-	nJ
Turn-off Energy	E_{off}		-	0.26	-	
Total Gate Charge	Q_g	V_{GE} = 15 V, I_C = 60 A, V_{CE} = 400 V	-	165	-	nC
Gate-Emitter Charge	Q_{ge}		-	18	-	
Gate to Collector Charge	Q_{gc}		-	23	-	
Turn-On Delay Time	$t_{d(on)}$	V_{CE} = 400 V , V_{GE} = 0 /15V, I_C = 60 A, R_g = 10Ω	-	72	-	ns
Rise Time	t_r		-	42	-	
Turn-Off Delay Time	$t_{d(off)}$		-	170	-	
Fall Time	t_f		-	26	-	
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	-	-	60	A
Pulsed Diode Forward Current	I_{FM}		-	-	180	
Diode Forward Voltage	V_F	I_F = 60 A	-	1.50	2.0	V
Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 60 A, dI_F/dt = 200 A/μs, V_R = 400 V	-	60	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.3	-	μC
Reverse Recovery Current	I_{RRM}		-	11	-	A

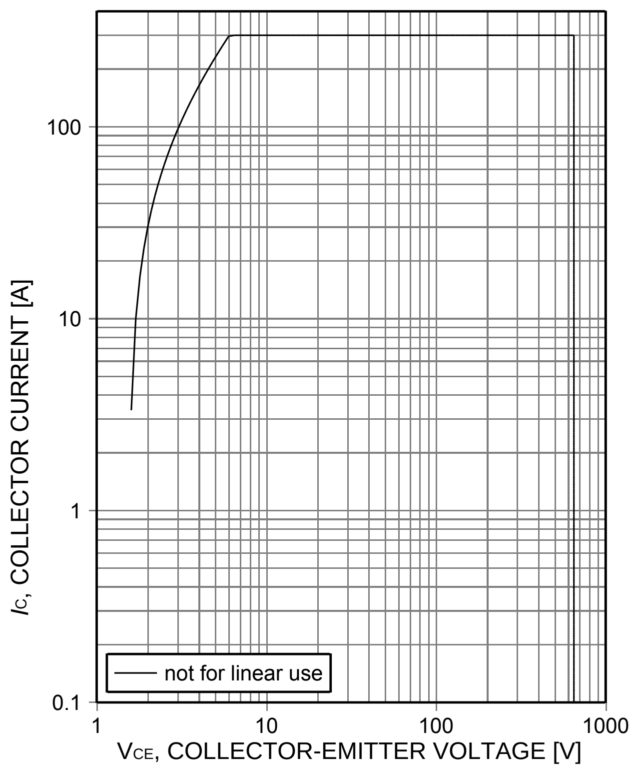


Figure 1.Forward bias safe operating area

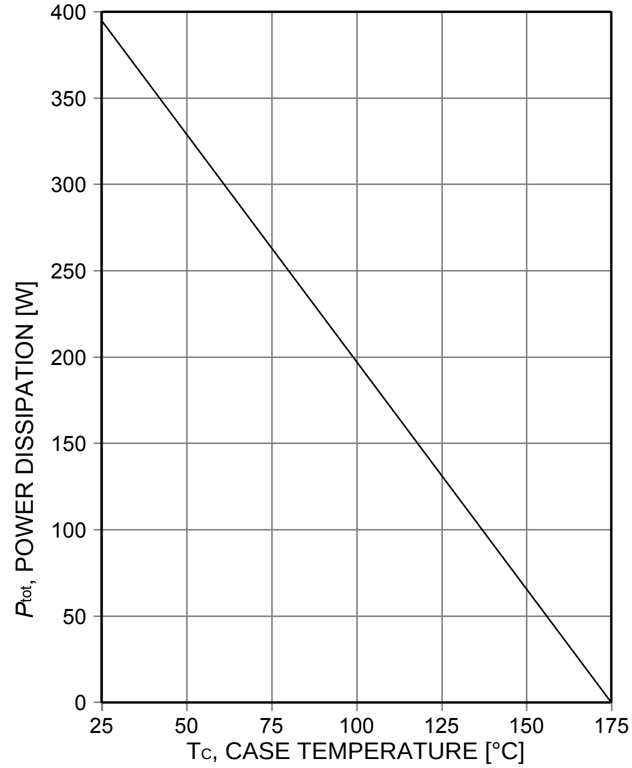


Figure 2.Power dissipation as a function of case

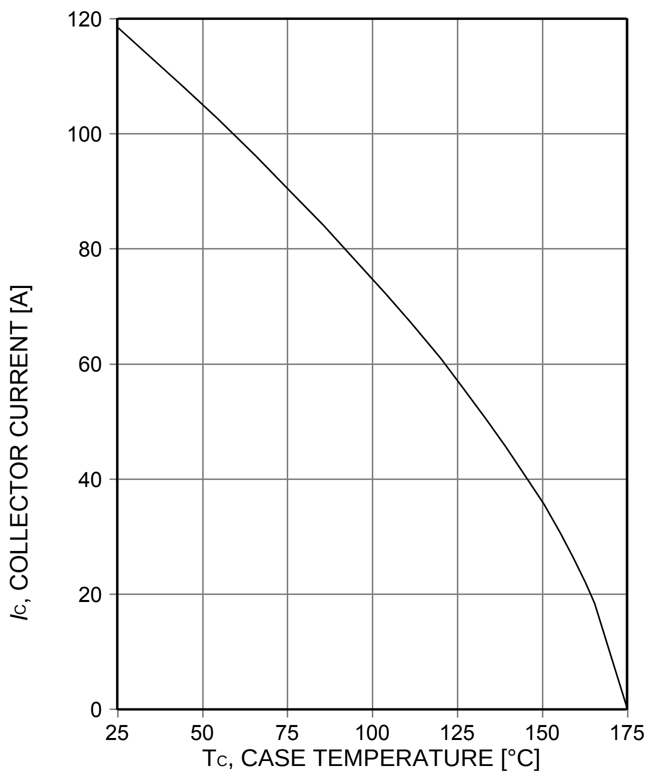


Figure 3.Collector current as a function of case temperature

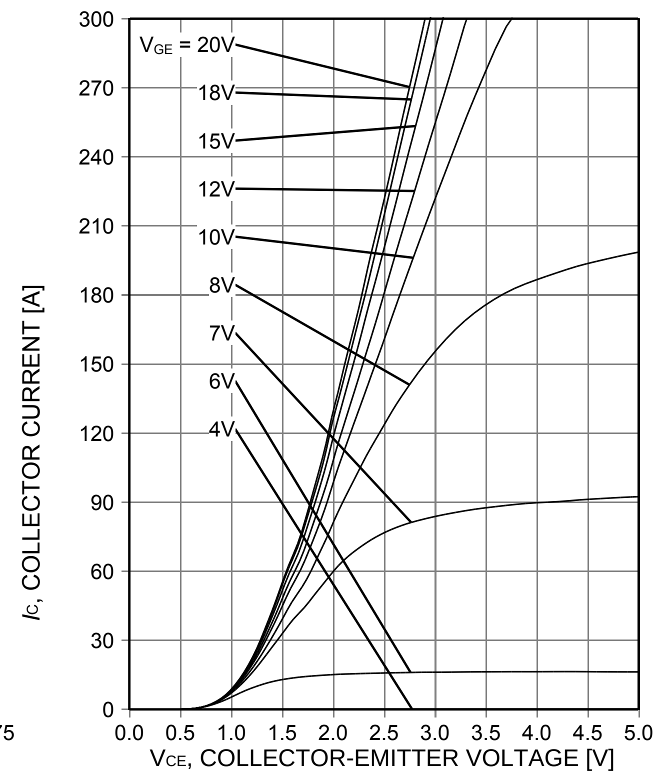


Figure 4.Typical output characteristic

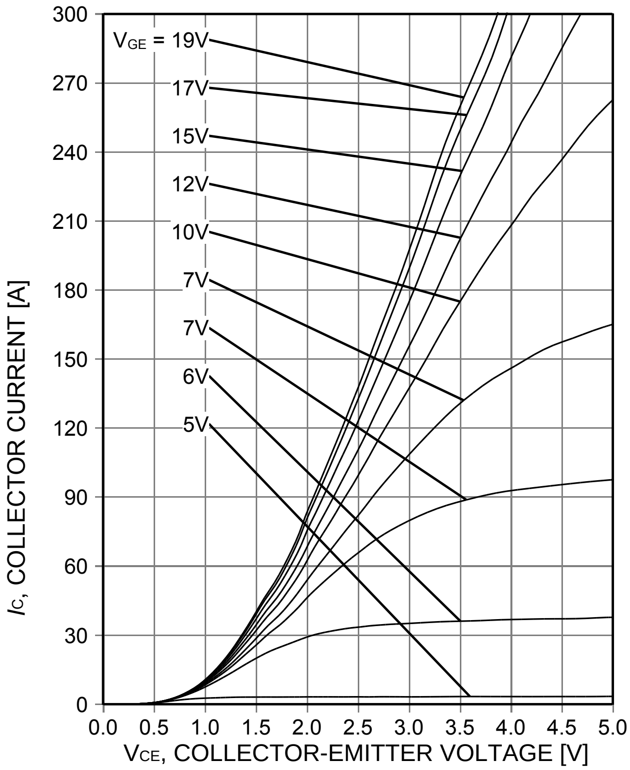


Figure 5.Typical output characteristic

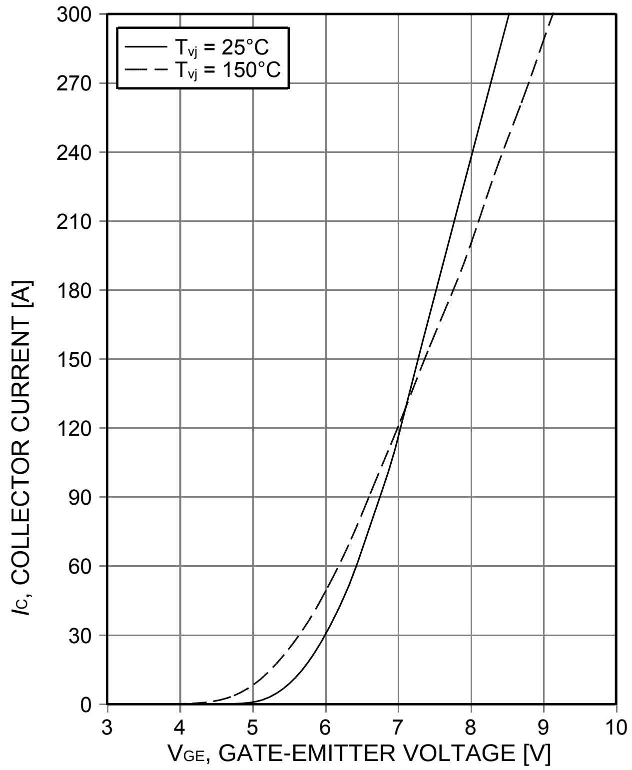


Figure 6.Typical transfer characteristic

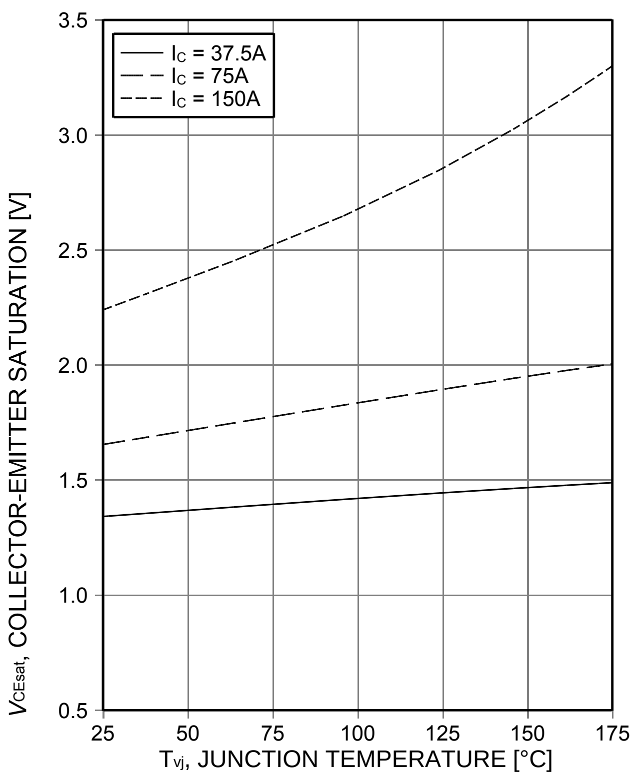


Figure 7. Typical collector-emitter saturation voltage as a function of junction temperature

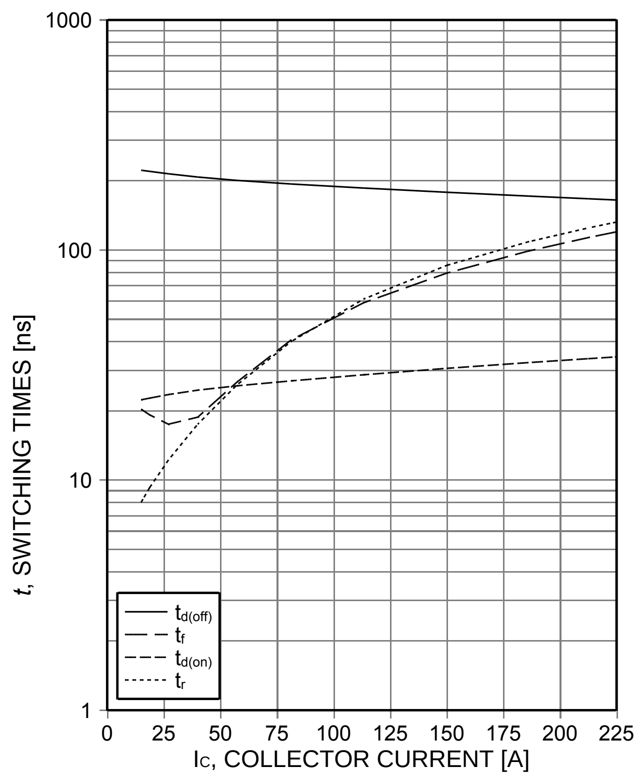


Figure 8.Typical switching times as a function of collector current

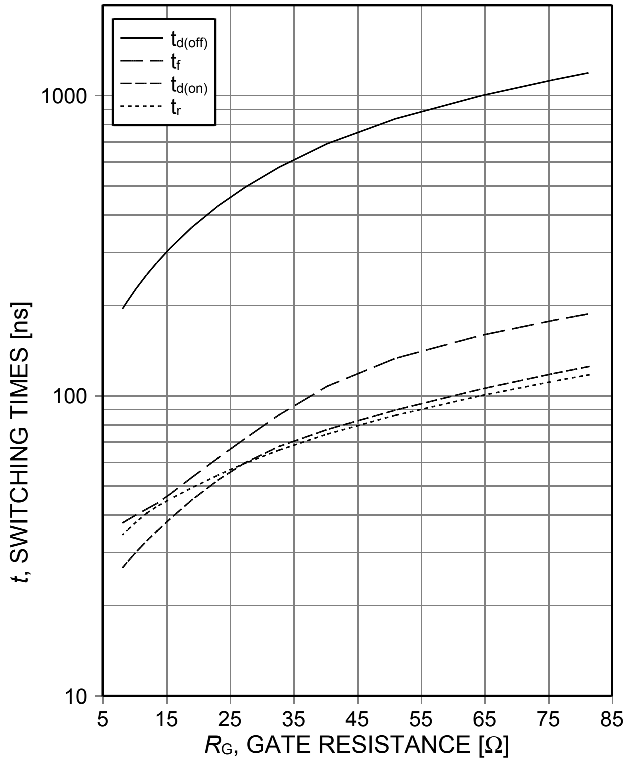


Figure 9. **Typical switching times as a function of gate resistance**

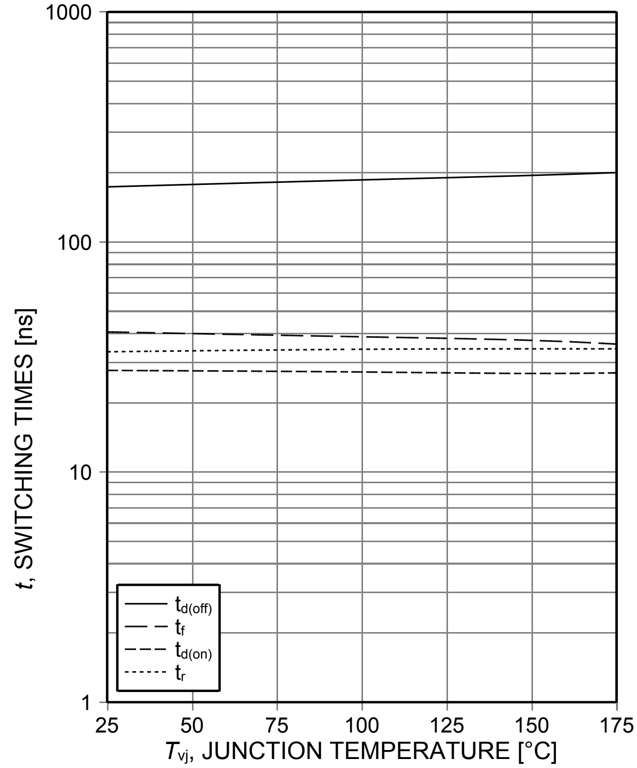


Figure 10. **Typical switching times as a function of junction temperature**

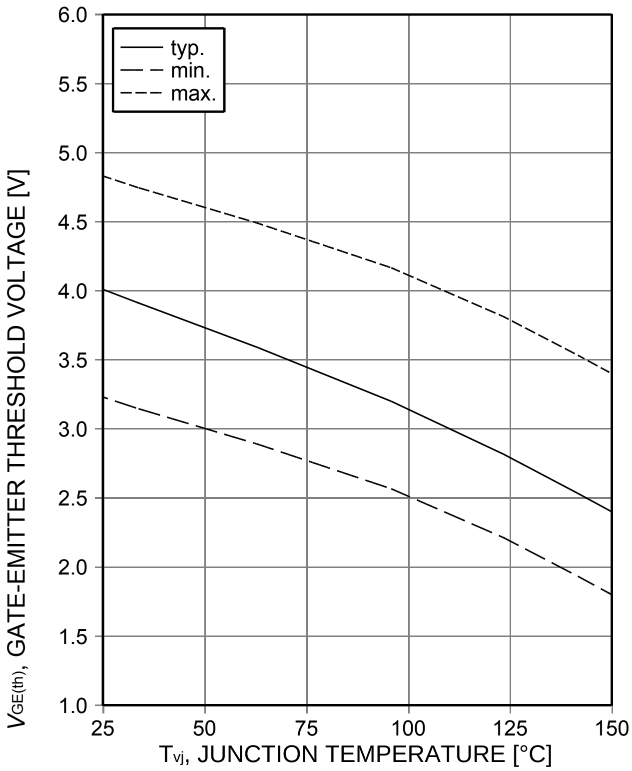


Figure 11.Gate-emitter threshold voltage as a function of junction temperature

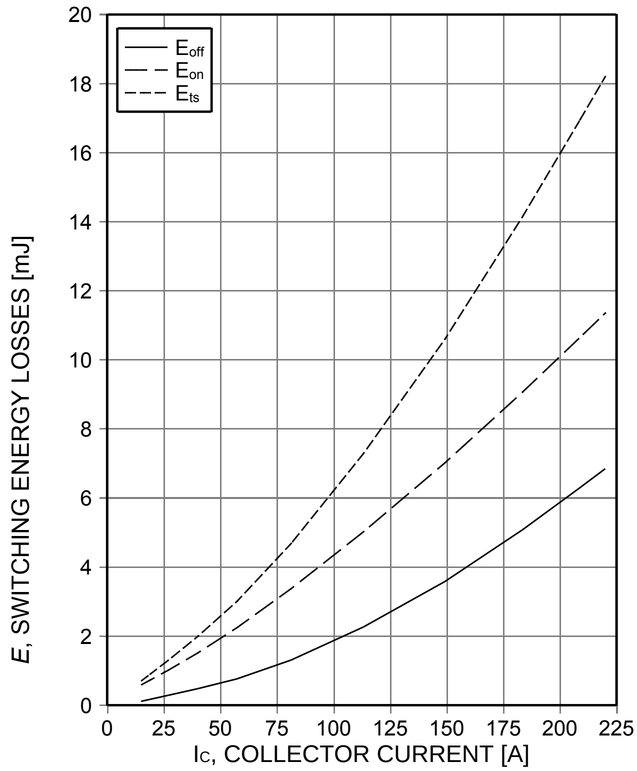


Figure 12.Typical switching energy losses as **a** function of collector current

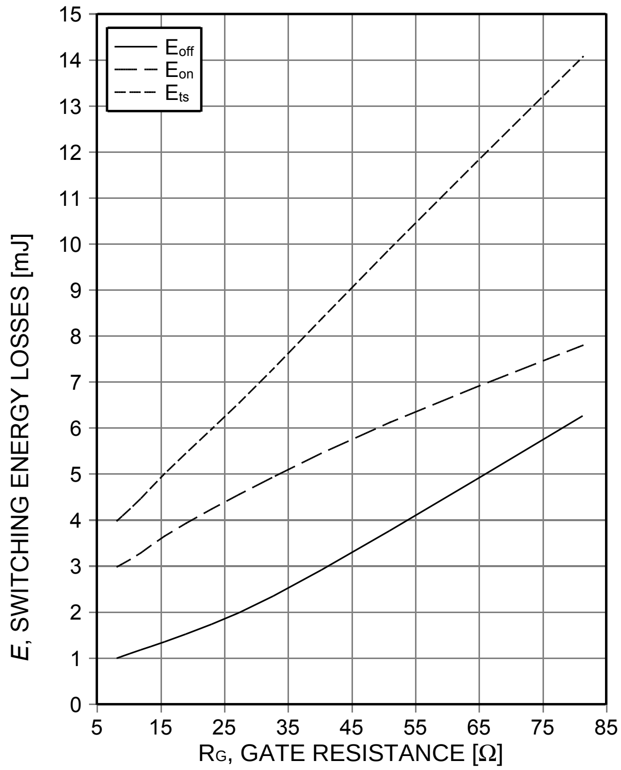


Figure 13.Typical switching energy losses as a function of gate resistance

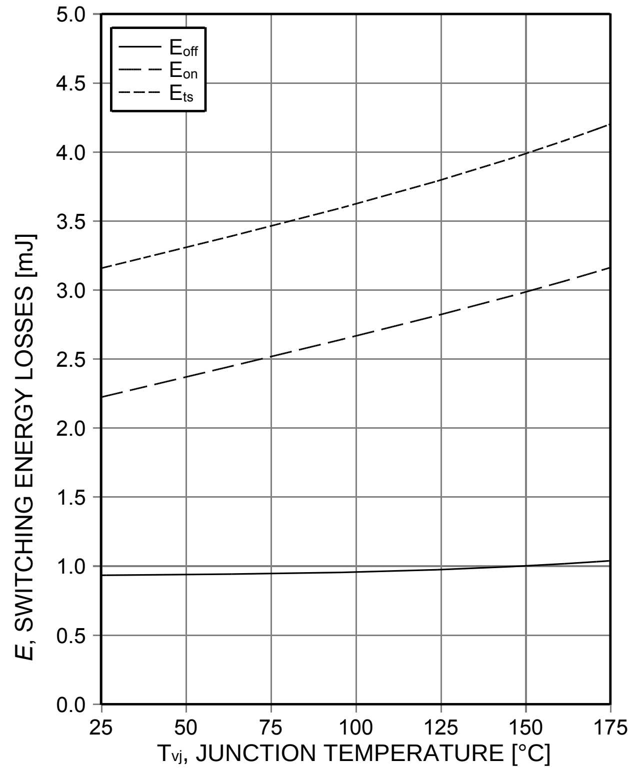


Figure 14.Typical switching energy losses as a function of junction temperature

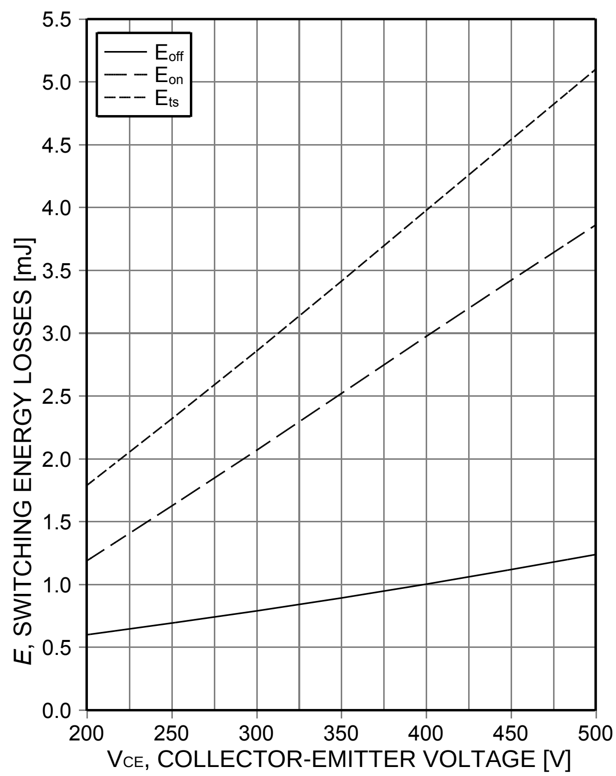


Figure 15.Typical switching energy losses as a function of collector emitter voltage

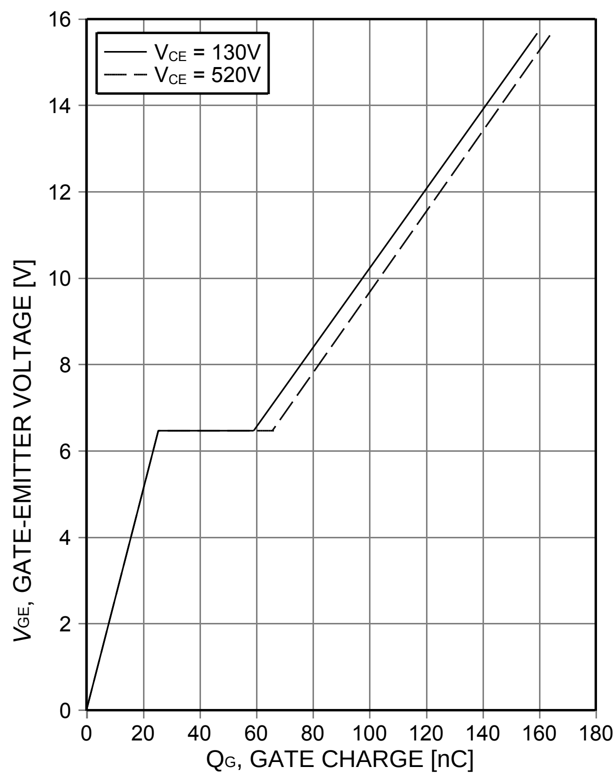
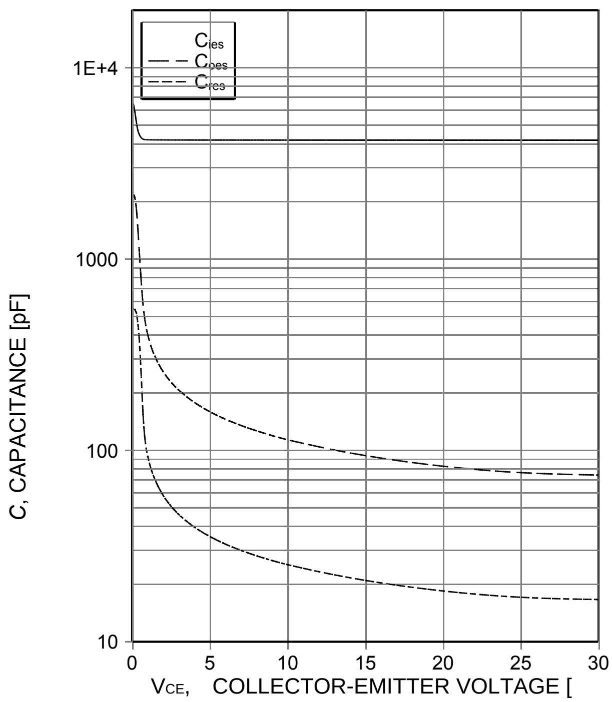


Figure 16.Typical gate charge



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

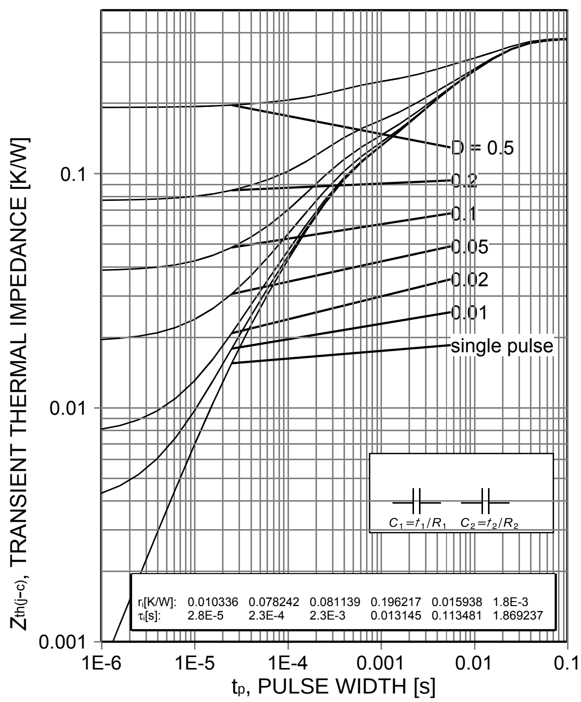
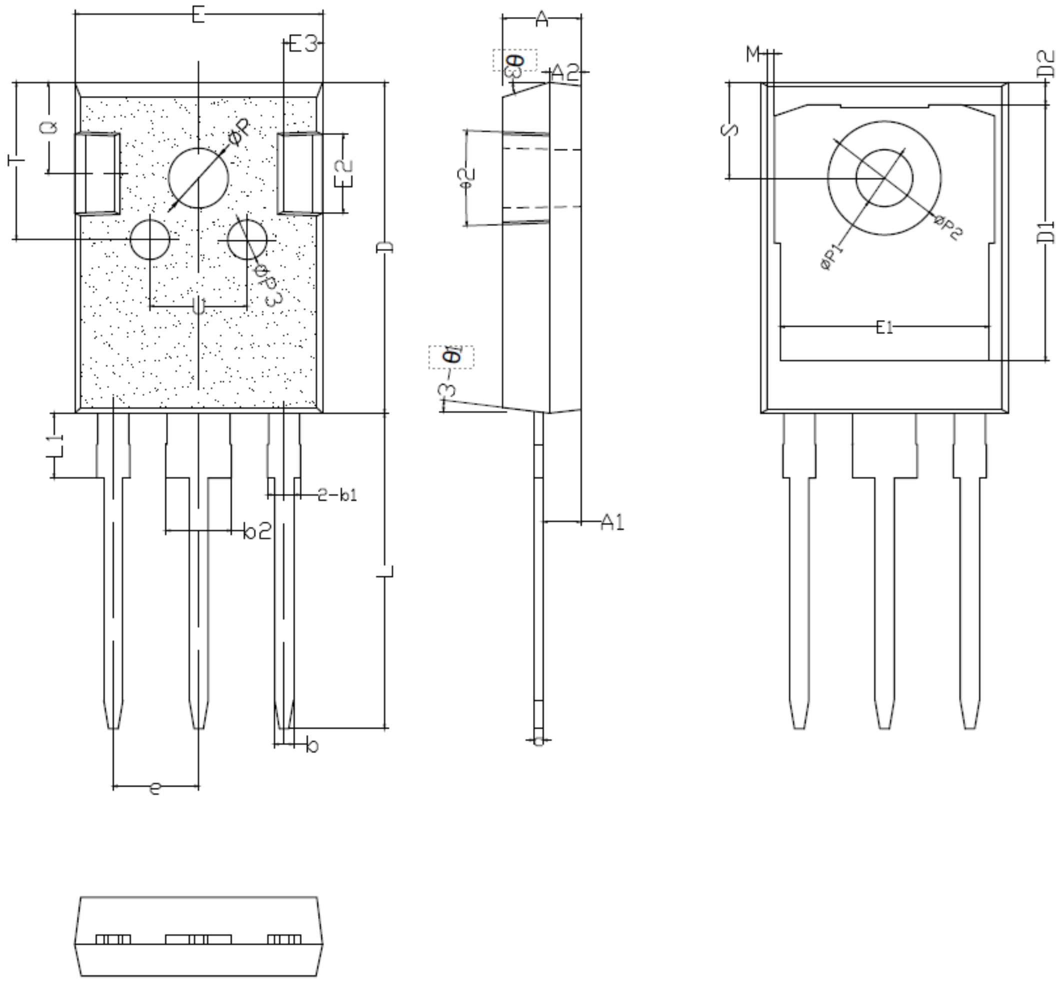


Figure 18.IGBT transient thermal impedance

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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