

650V IGBT BLG80T65FDL7

1. Product Features

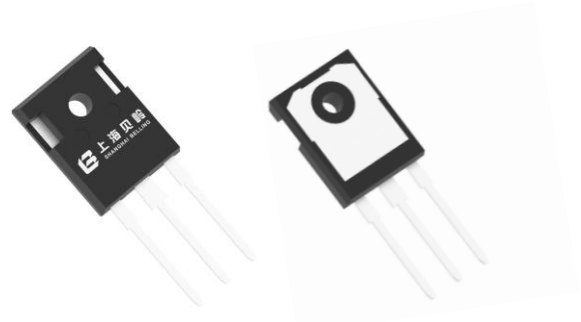
- Fast Switching
- Low $V_{CE(sat)}$
- Positive temperature coefficient
- Fast recovery anti-parallel diode
- RoHS product

Key characteristics

Parameter	Value	Unit
V_{CES}	650	V
I_C	80	A
$V_{CE(sat).typ}$	1.50	V

2. Product Applications

- PFC
- UPS
- Solar



TO247

3. Description

BLG80T65FDL7 is obtained by advanced Trench Field Stop (T-FS) technology which is characteristic with low $V_{CE(sat)}$, optimized switching performance and low gate charge Q_g . The IGBT is suitable device for PFC, UPS, and high switching frequency applications.

4. Ordering Guide

Product Number	Package	Operating Temp.	Eco Status	MSL	Minimum Pack Qty
BLG80T65FDL7-F	TO247	-40~175°C	Green	NA	30/Tube

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5. Pin Description

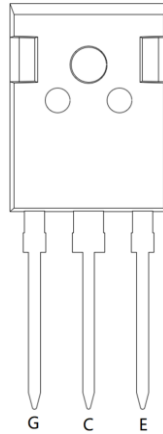


Figure 1 Pin Description

6. Specifications

6.1 Absolute Ratings

At $T_C = 25^\circ\text{C}$, unless otherwise specified.

Table 1 Absolute Ratings

Symbol	Parameter	Rating	Units
V_{CES}	Collector-Emitter Voltage	650	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	160	A
	Collector Current @ $T_C=100^\circ\text{C}$	80	A
I_{CM}	Pulsed Collector Current, t_p limited by T_{Jmax}	320	A
I_F	Diode Continuous Forward Current @ $T_C=25^\circ\text{C}$	160	A
	Diode Continuous Forward Current @ $T_C=100^\circ\text{C}$	80	A
I_{FM}	Diode Maximum Forward Current, limited by T_{Jmax}	320	A
V_{GS}	Gate-Source Voltage	± 20	V
T_{SC}	Short circuit withstand time $V_{GE}=15\text{V}$, $V_{CC}\leq 400\text{V}$, Allowed number of short circuits < 1000, Times between short circuits: $\geq 1.0\text{s}$, $T_{VJ} \leq 150^\circ\text{C}$	3	μs
P_D	Power Dissipation @ $T_C=25^\circ\text{C}$	468	W
T_{VJ}	Operating Junction Temperature Range	-40 to 175	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering	260	$^\circ\text{C}$

6.2 Thermal Characteristics

Table 2 Thermal Characteristics

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	0.32	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Junction-to-Case (Diode)	0.65	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	thermal resistance, Junction-Ambient	62.5	$^\circ\text{C}/\text{W}$

6.3 Electrical Characteristics

At $T_C = 25^\circ\text{C}$, unless otherwise specified.

6.3.1 Static Characteristics

Table 3 Static Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V$, $I_C = 250\mu A$	650	--	--	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 80A$ $T_{VJ} = 25^\circ C$ $T_{VJ} = 125^\circ C$ $T_{VJ} = 175^\circ C$		1.50 1.75 1.90	1.90	V
$V_{GE(TH)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 1mA$	4.2	5.0	5.7	V
V_F	Diode Forward Voltage	$I_F = 80A$ $T_{VJ} = 25^\circ C$ $T_{VJ} = 125^\circ C$ $T_{VJ} = 175^\circ C$	-- -- --	1.65 1.45 1.30	2.15	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE} = 650V$, $V_{GE} = 0V$	--	--	55	μA
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	$V_{GE} = +30V$	--	--	200	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	$V_{GE} = -30V$	--	--	-200	nA

Pulse width $t_p \leq 300\mu s$, $\delta \leq 2\%$

6.3.2 Dynamic Characteristics

Table 4 Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
C_{ies}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1.0MHz$	--	5034	--	pF
C_{oes}	Output Capacitance		--	176	--	
C_{res}	Reverse Transfer Capacitance		--	22	--	
Q_G	Gate charge	$V_{CC} = 520V$ $I_{CE} = 80A$ $V_{GE} = 15V$	--	214	--	nC
Q_{GE}	Gate-emitter charge		--	18	--	
Q_{GC}	Gate-collector charge		--	124	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits: $\geq 1.0s$	$V_{GE} = 15.0V, V_{CC} \leq 400V$, $t_{sc} \leq 3\mu s, T_{VJ} \leq 150^\circ C$		320		A

6.3.3 IGBT Switching Characteristics, at $T_{VJ} = 25^\circ C$

Table 5 Switching Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$I_C = 80A$ $V_{CE} = 400V$ $V_{GE} = 15V$ $R_G = 5\Omega$ $T_{VJ} = 25^\circ C$ Inductive Load Energy losses include collector	--	36	--	ns
t_r	Rise Time			48		
$t_{d(off)}$	Turn-Off Delay Time			181		
t_f	Fall Time			75		
E_{on}	Turn-On Switching Loss			--	2.23	--
E_{off}	Turn-Off Switching Loss		--	1.30	--	

E_{ts}	Total Switching Loss	current tail and diode reverse recovery	--	3.53	--	
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6.3.4 IGBT Switching Characteristics, at $T_{VJ}=175^{\circ}\text{C}$

Table 6 Switching Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$I_C = 80\text{A}$ $V_{CE} = 400\text{V}$ $V_{GE} = 15\text{V}$ $R_G = 5\Omega$ $T_J = 25^{\circ}\text{C}$ Inductive Load Energy losses include collector current tail and diode reverse recovery	--	36	--	ns
t_r	Rise Time			42	--	
$t_{d(off)}$	Turn-Off Delay Time			230	--	
t_f	Fall Time			132	--	
E_{on}	Turn-On Switching Loss		--	2.46	--	mJ
E_{off}	Turn-Off Switching Loss			2.00	--	
E_{ts}	Total Switching Loss			4.46		

6.3.5 Diode Characteristics, at $T_{VJ}=25^{\circ}\text{C}$

Table 7 Source-Drain Diode Characteristics

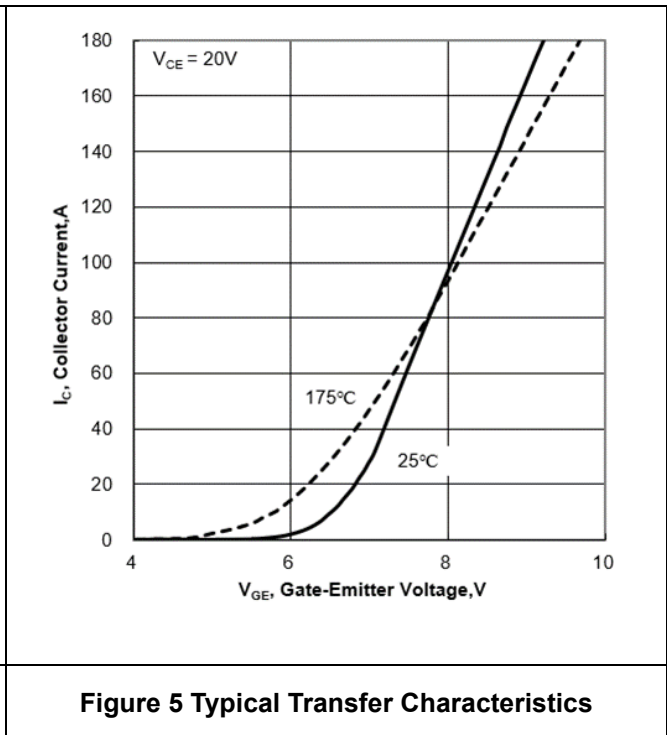
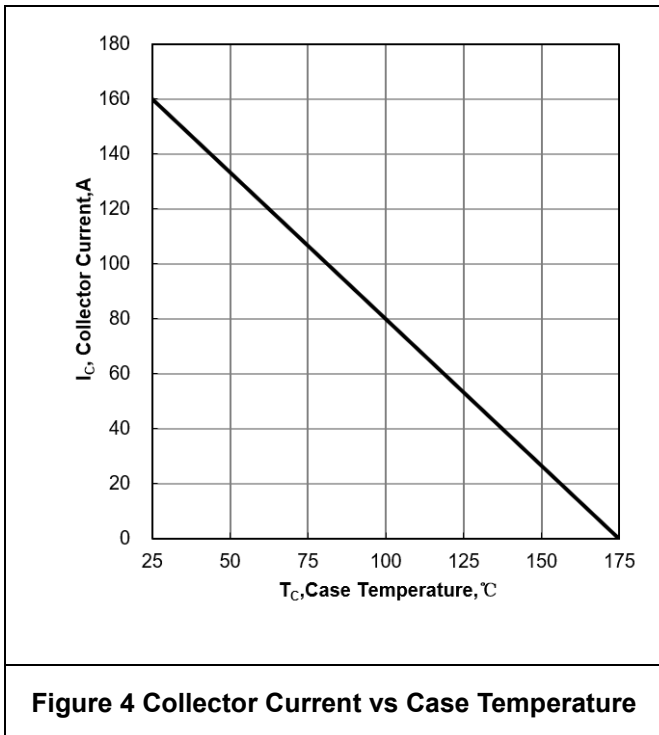
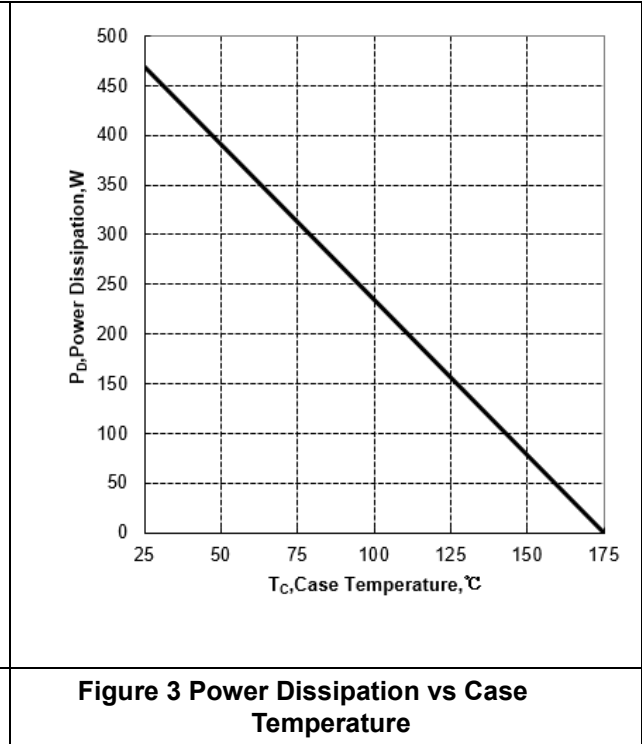
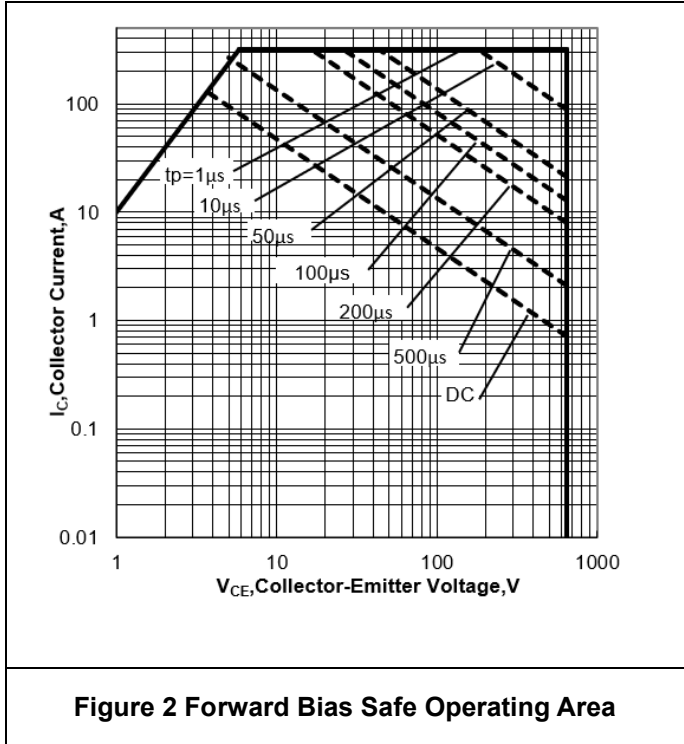
Symbol	Parameter	Test Conditions	Values			Units	
			Min.	Typ.	Max.		
T_{rr}	Reverse Recovery Time	$I_F = 40\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_{VJ} = 25^{\circ}\text{C}$	--	76	--	ns	
Q_{rr}	Reverse Recovery Charge			--	1.2	--	μC
I_{rrm}	Reverse Recovery Current			--	29	--	A
T_{rr}	Reverse Recovery Time	$I_F = 80\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_{VJ} = 25^{\circ}\text{C}$	--	98	--	ns	
Q_{rr}	Reverse Recovery Charge			--	1.7	--	μC
I_{rrm}	Reverse Recovery Current			--	31	--	A

6.3.6 Diode Characteristics, at $T_{VJ}=175^{\circ}\text{C}$

Table 8 Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Values			Units	
			Min.	Typ.	Max.		
T_{rr}	Reverse Recovery Time	$I_F = 40\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_{VJ} = 175^{\circ}\text{C}$	--	121	--	ns	
Q_{rr}	Reverse Recovery Charge			--	3.5	--	μC
I_{rrm}	Reverse Recovery Current			--	56	--	A
T_{rr}	Reverse Recovery Time	$I_F = 80\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_{VJ} = 175^{\circ}\text{C}$	--	162	--	ns	
Q_{rr}	Reverse Recovery Charge			--	5.0	--	μC
I_{rrm}	Reverse Recovery Current			--	60	--	A

6.4 Characteristics Curves



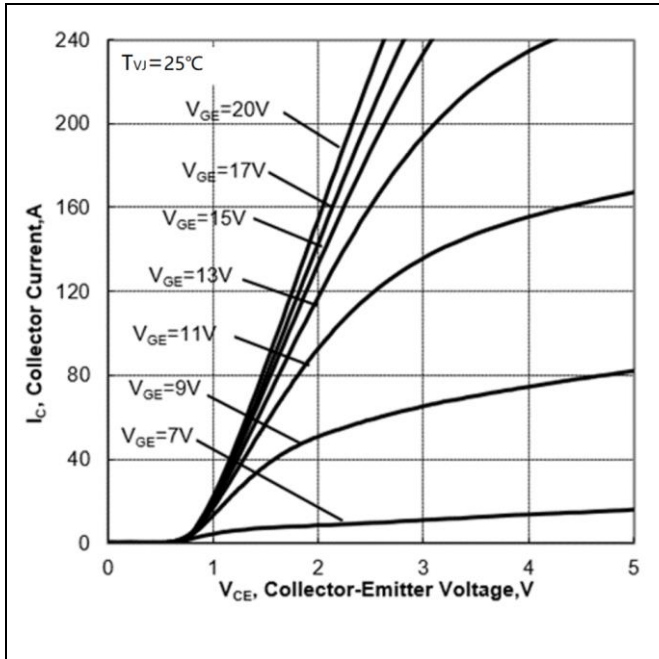


Figure 6 Typical Output Characteristics
($T_{vj}=25^{\circ}C$)

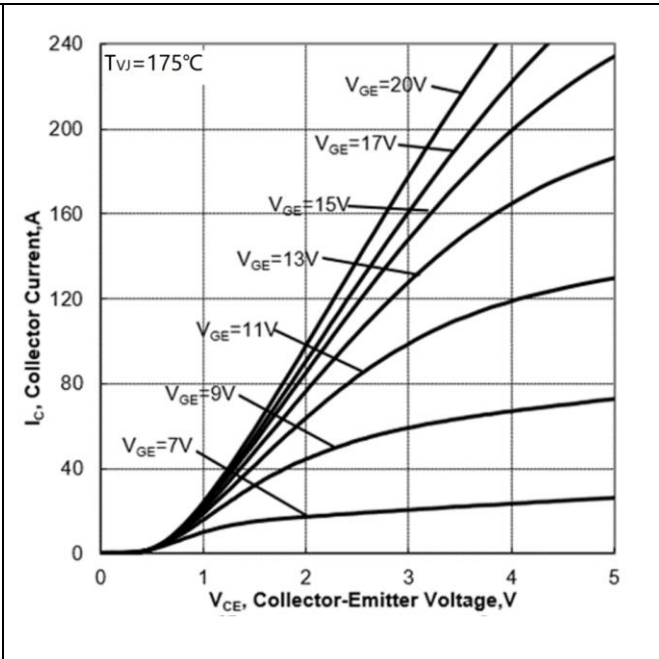


Figure 7 Typical Output Characteristics
($T_{vj}=175^{\circ}C$)

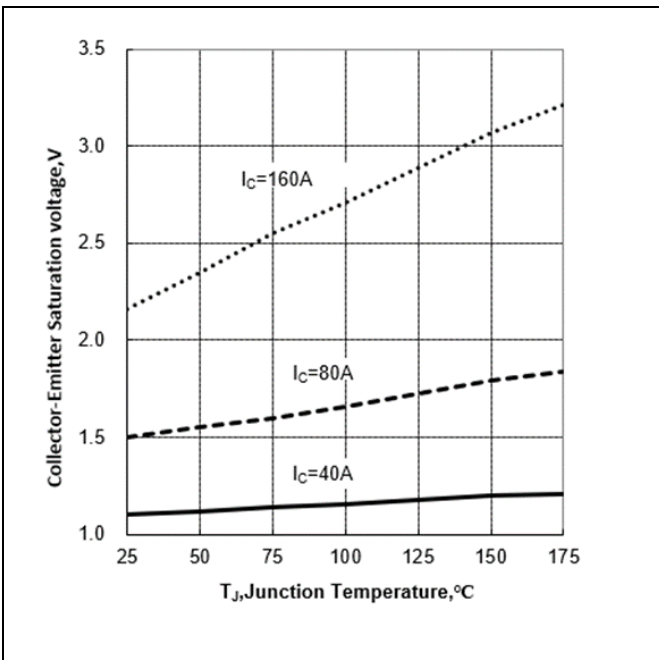


Figure 8 Typical Collector-Emitter Saturation Voltage vs Junction temperature
Junction temperature

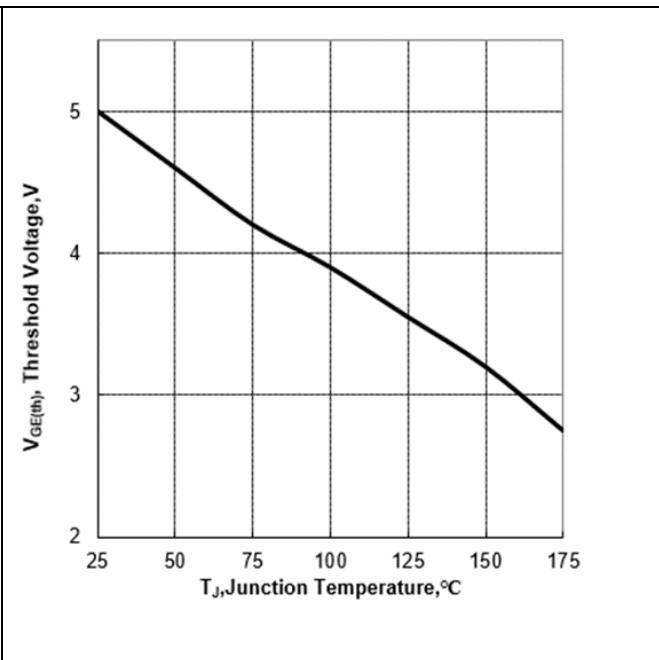


Figure 9 Threshold Voltage vs Junction Temperature

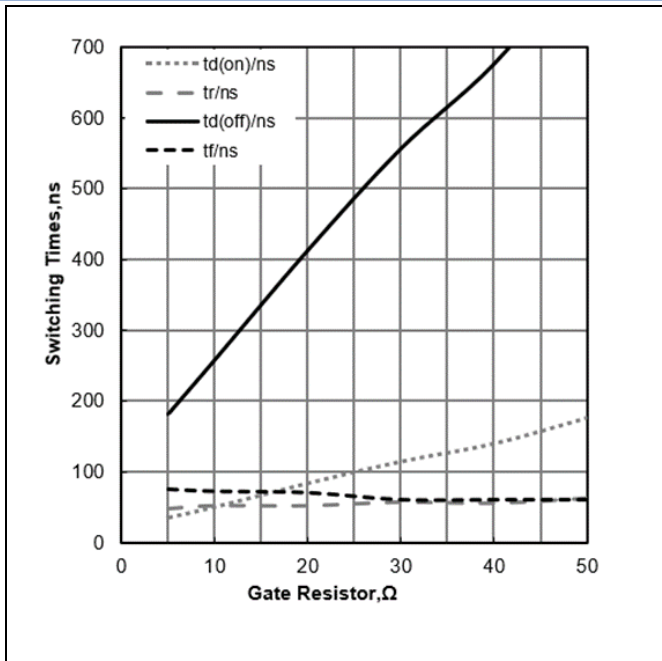


Figure 10 Typical Switching Times vs Gate Resistor ($T_{VJ}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=80\text{A}$)

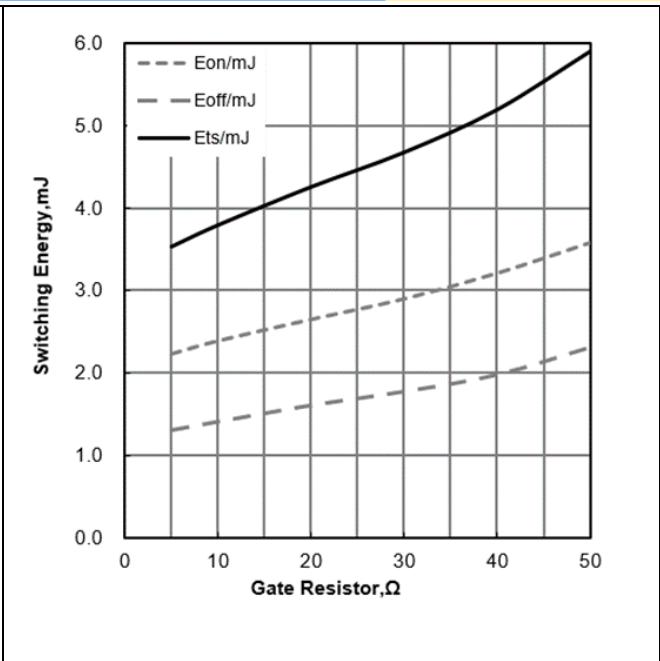


Figure 11 Typical Switching Energy vs Gate Resistor ($T_{VJ}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=80\text{A}$)

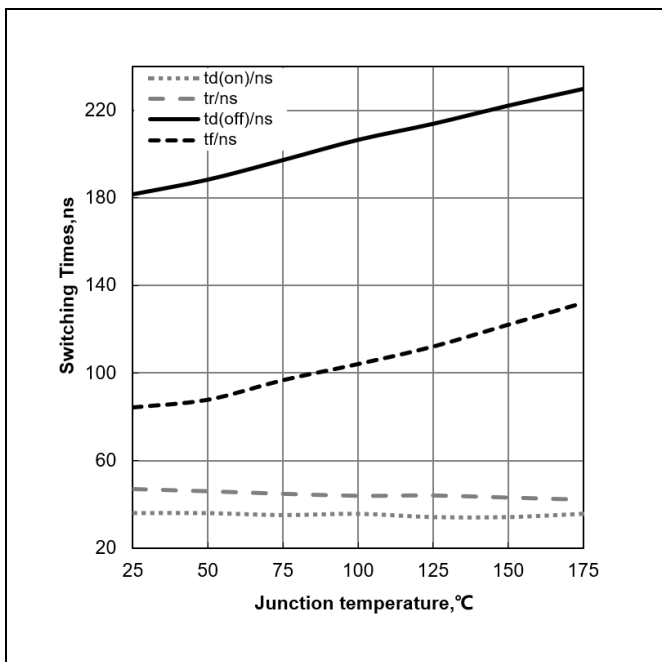


Figure 12 Typical Switching Times vs Junction Temperature ($V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=80\text{A}$)

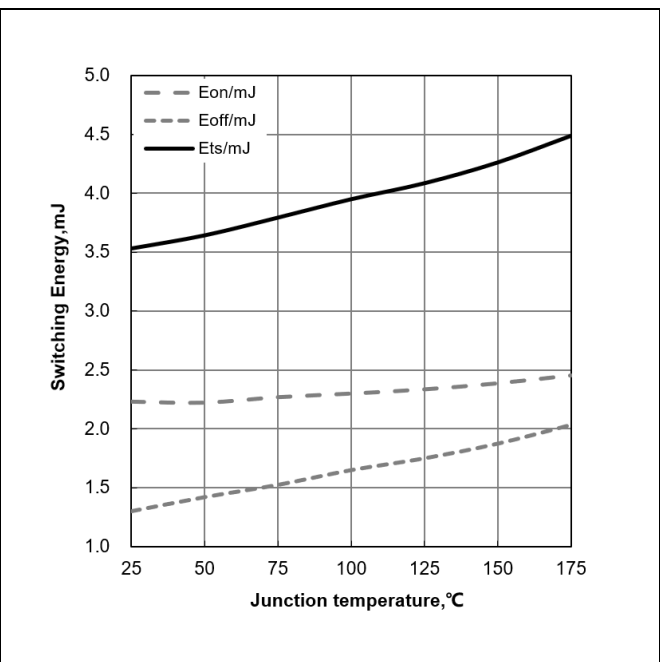


Figure 13 Typical Switching Energy vs Junction Temperature ($V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=80\text{A}$)

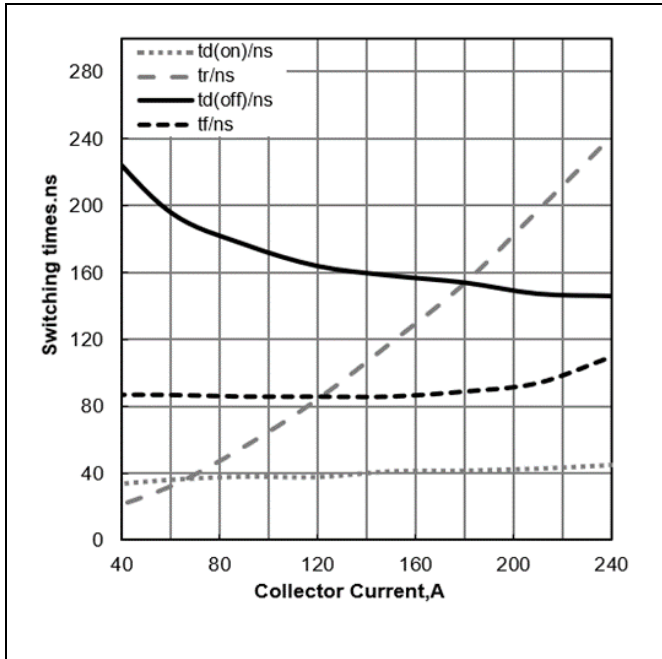


Figure 14 Typical Switching Times vs Collector Current ($T_{VJ}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$)

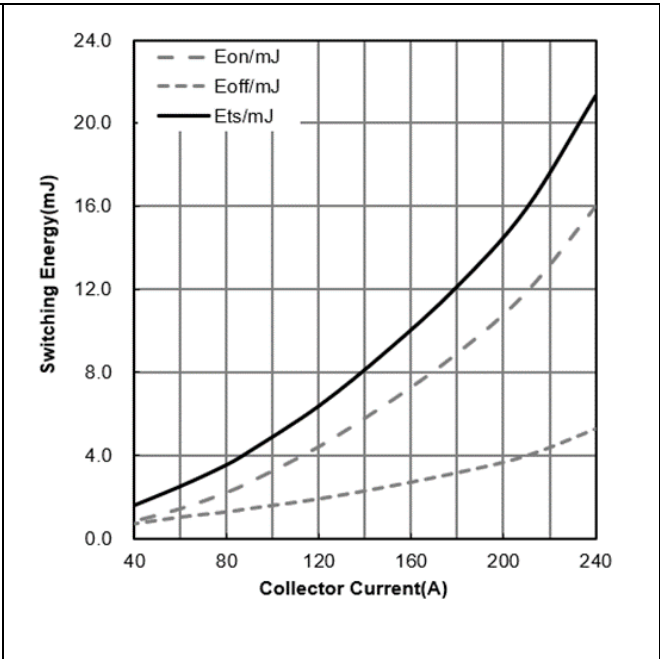


Figure 15 Typical Switching Energy vs Collector Current ($T_{VJ}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$)

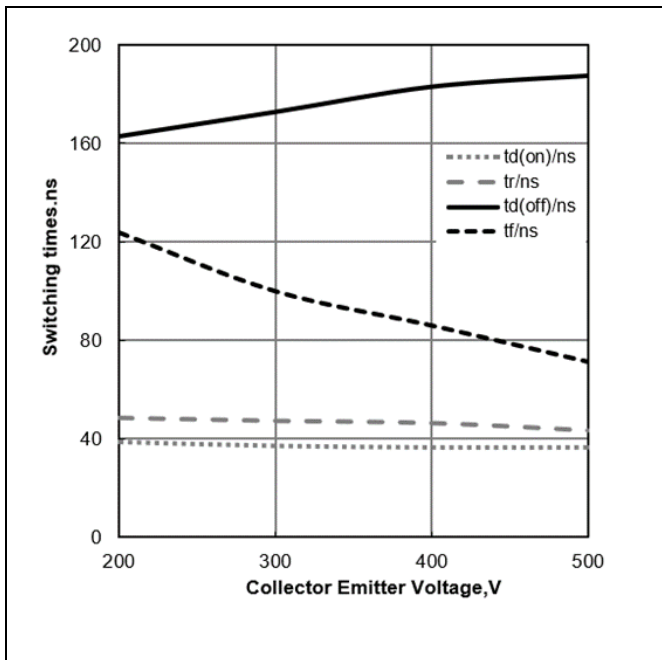


Figure 16 Typical Switching Times vs VCE ($T_{VJ}=25^{\circ}\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=80\text{A}$)

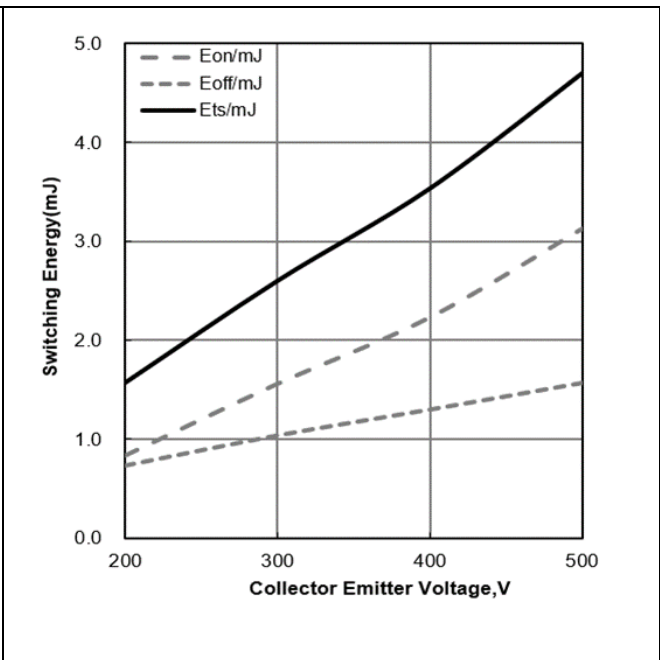


Figure 17 Typical Switching Energy vs VCE ($T_{VJ}=25^{\circ}\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=80\text{A}$)

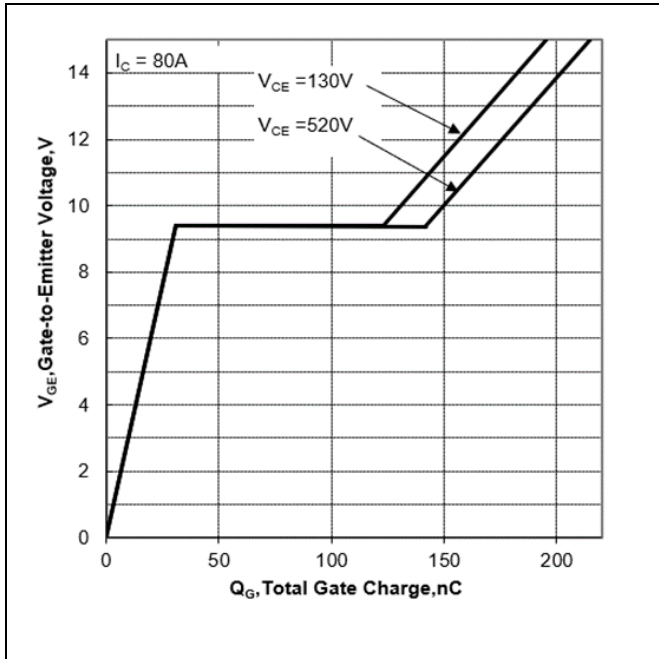


Figure 18 Typical Gate Charge

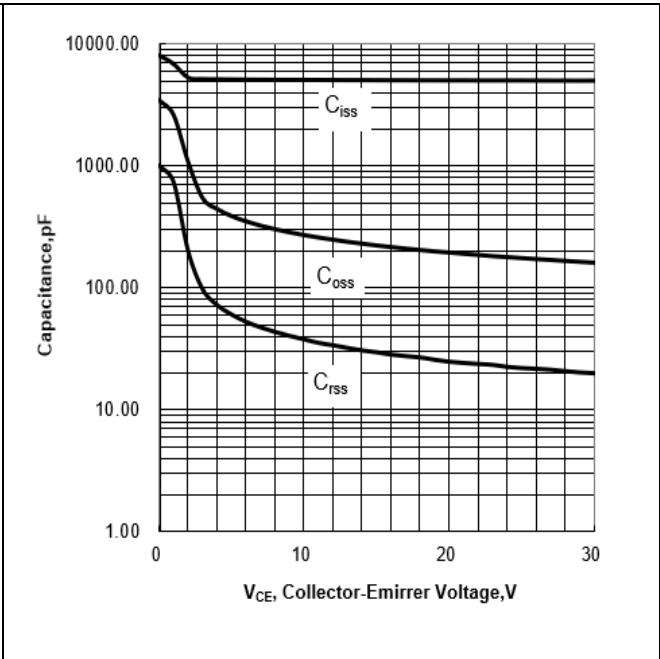


Figure 19 Typical Capacitance vs Collector-Emitter Voltage

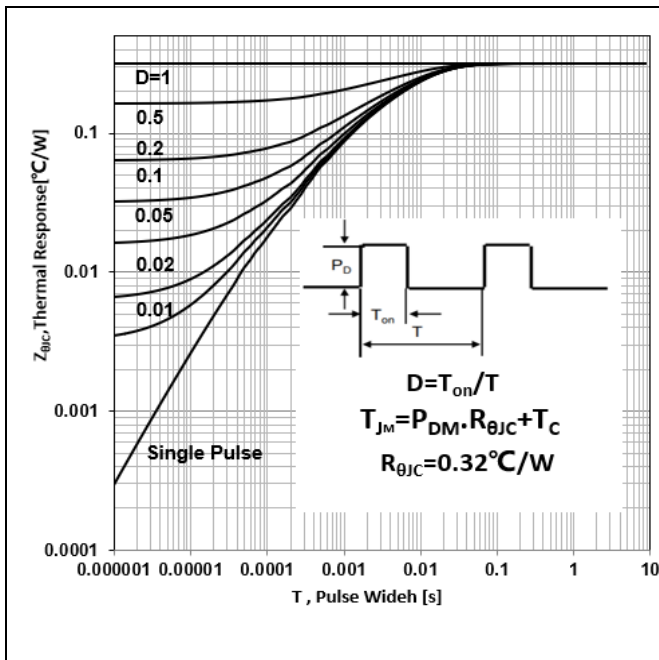


Figure 20 IGBT Transient Thermal Impedance vs Pulse Width

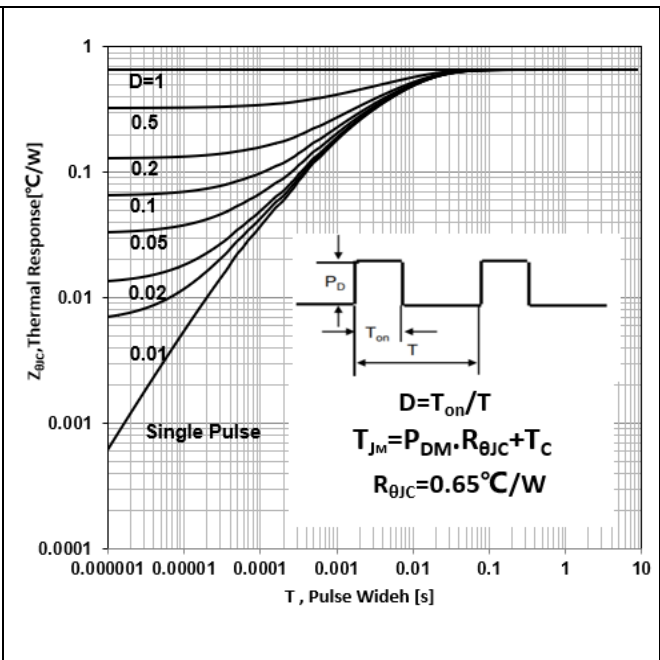


Figure 21 Diode Transient Thermal Impedance vs Pulse Width

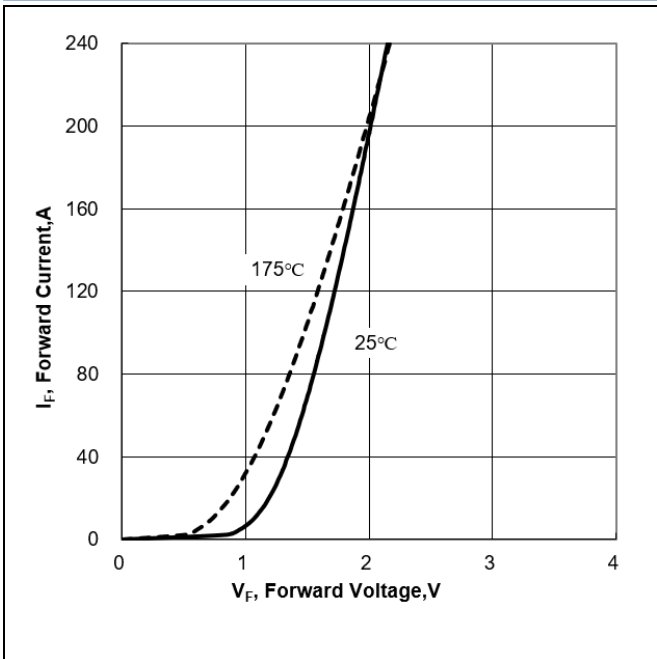
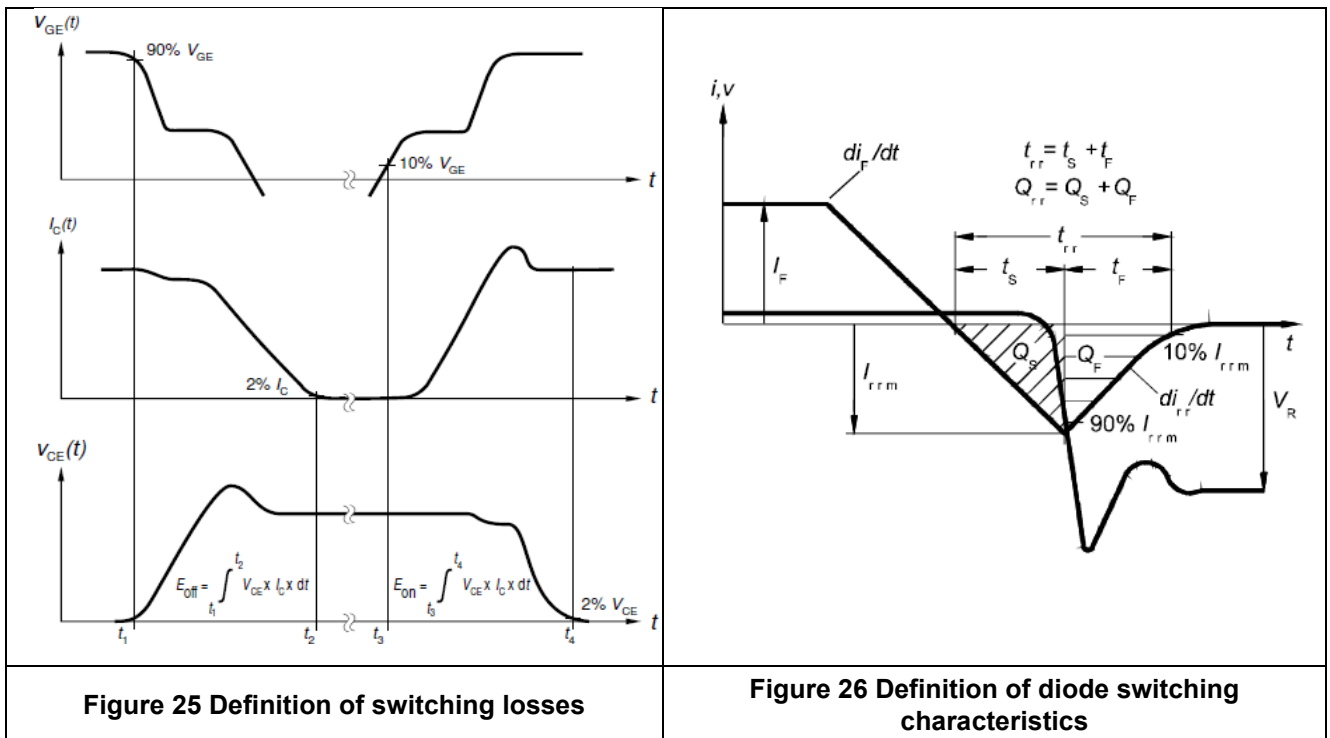
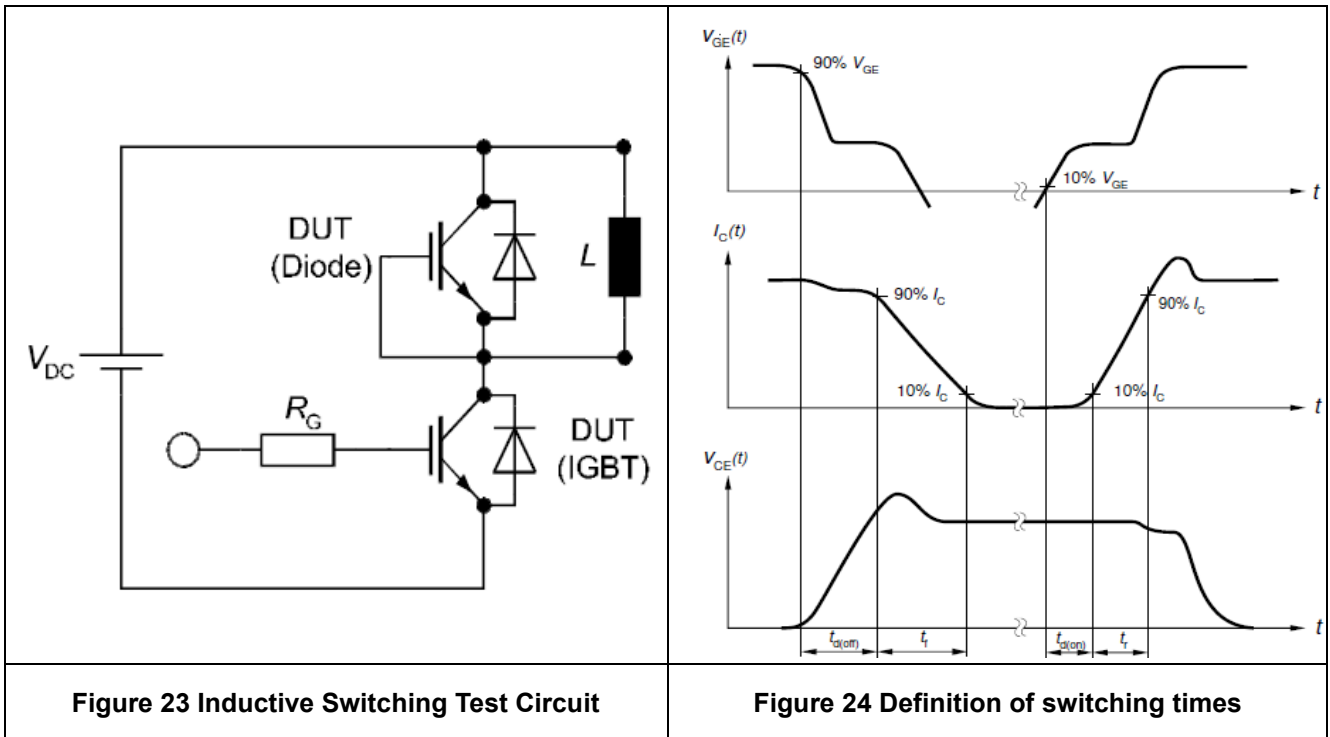


Figure 22 Typical Diode Forward Current vs Forward Voltage

7. Detailed Description

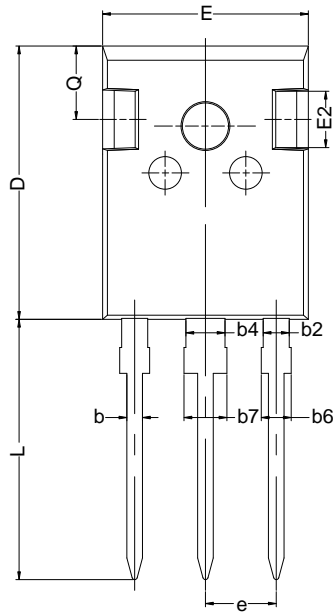
7.1 Test Circuit and Waveform



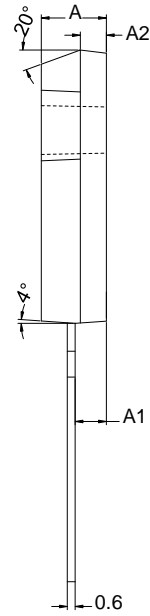
8. Package Information

8.1 Package Outline Dimensions

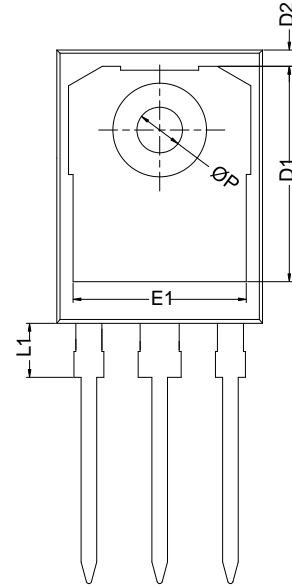
8.1.1 TO247



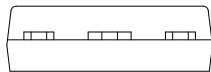
TOP VIEW



SIDE VIEW



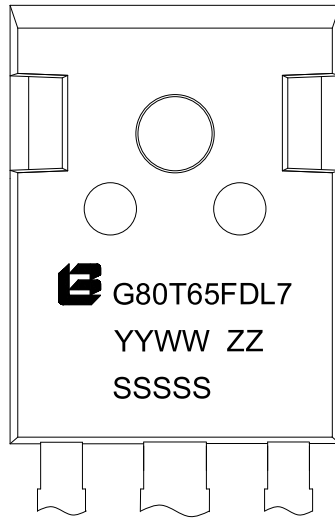
BOTTOM VIEW



SIDE VIEW

SYMBOL	ALL DIMENSION IN MILLIMETERS		
	MIN	MON	MAX
A	4.90	5.00	5.10
A1	2.30	2.40	2.50
A2	1.90	2.00	2.10
b	1.10	1.20	1.30
b2	---	2.00	2.20
b4	---	3.00	3.20
b6	---	2.20	2.35
b7	---	3.20	3.35
c	0.50	0.60	0.70
D	20.90	21.00	21.10
D1	16.55 REF.		
D2	1.20 REF.		
E	15.70	15.80	15.90
E1	13.30 REF.		
E2	4.23	---	5.10
L	19.80	20.00	20.20
L1	3.95	4.15	4.30
ØP	3.40	3.50	3.70
Q	5.54	---	6.00

8.2 Marking

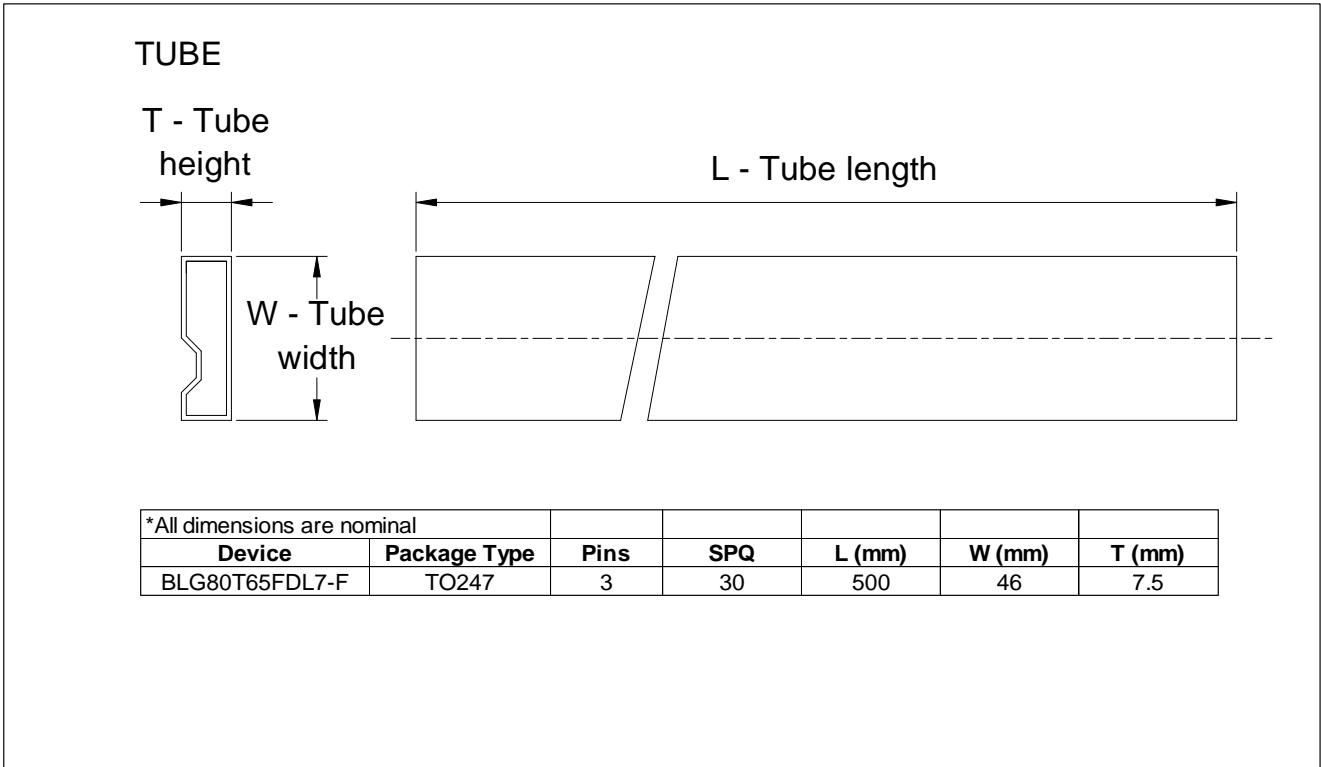


Marking Drawing

Content	Note
G80T65FDL7	Device mark
YY	Calendar year code
WW	Workweek date code
ZZ	Assembly factory code
SSSSS	Lot ID

9. Packing specifications

9.1 TO247 Tube Package



Revision History

Revision	Date	Changes
Version 01	2024.12	Initial Version
Version 02	2025.3	Add Low Operating Junction Temperature

Important Notice

- a. Exceeding Maximum Ratings: Operation beyond the device's maximum rated performance may result in damage to the device, including permanent failure, which could affect system reliability. Do not exceed the absolute maximum ratings during circuit design. Belling shall not be liable for any personal injury, property damage, or other adverse consequences arising from user misuse, including but not limited to incorrect operation, negligence, or similar circumstances.
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