QMW25N120BF

1200V-25A Trench and Field Stop IGBT

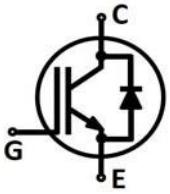
Features

- Easy parallel switching capability due to Positive temperature coefficient in V_{CEsat}
- Built- in fast recovery diode
- High reliability and thermal stability, good parameter consistency

Applications

- General inverter
- UPS

Type	Marking	Package Code
QMW25N120BF	QM25N120BF	TO-247



TO-247

Maximum Rated Values

Parameter	Symbol	Value	Unit
Collector- emitter voltage	V_{CE}	1200	V
DC collector current, limited by T_{vjmax} T_C=25°C T_C=100°C	I_C	50 25	A
Pulsed collector current, t_p limitedbyT_{vjmax} 1)	I_{Cpuls}	100	
RBSOA current V_{CE}≤ 600V, T_j ≤ 150°C, t_p=1μs	-	100	
Diode forward current, limited by T_{vjmax} T_C=25°C T_C=100°C	I_F	50 25	
Diode pulsed current, t_p limited by T_{vjmax} 1)	I_{Fpuls}	100	
Gate- emitter voltage	V_{GE}	±20	V
Short circuit withstand time 4 V_{GE}=15V, V_{CC}=600V, T_j ≤ 150°C	t_{SC}	10	μs
Power dissipation T_C=25°C T_C=100°C	P_{tot}	348 174	W
Operating junction temperature	T_j	-40~175	°C
Storage temperature	T_{stg}	-55~150	

1 :Reference standard : JESD-022 2 : limited by Tjmax 3 :Tp limited by Tjmax 4 :Allowed short circuit times : <1000 ; short circuit interval : >1s

Electrical Characteristics （at T_{vj}=25℃，unless otherwise specified）

Static Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector- emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=0.25mA	1200	-	-	V
Collector- emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=25A				
		T_j=25°C	-	1.9	2.4	
		T_j=150°C	-	2.5	-	
		T_j=175°C	-	2.6	-	
Diode forward voltage	V_F	V_{GE}=0V, I_F=25A				
		T_j=25°C	-	2.2	-	
		T_j=150°C	-	1.7	-	
		T_j=175°C		1.6	-	
G-E threshold voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	5.0	6.0	7.0	
C-E leakage current	I_{CES}	V_{CE}=1200V, V_{GE}=0V				mA
		T_j=25°C	-	-	0.1	
		T_j=175°C	-	-	4.0	
G-E leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	200	nA
Transconductance	g_{FS}	V_{CE}=20V, I_C=25A	-	15	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	V_{CE}=25V,	-	1767	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	116	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	62	-	
Gate charge	Q_G	V_{CC}=960V, I_C=25A, V_{GE}=15V	-	171	-	nC
Short-circuit current	$I_{C(SC)}$	V_{GE}=15V, t_{SC}≤10μs V_{CC}=600V, $T_{j,start}$=175°C	-	90	-	A

IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	T_j=25℃, V_{CC}=600V, I_C=25A, V_{GE}=0/15V, R_G=16Ω, Inductive load	-	32	-	ns
Rise time	t_r		-	52	-	
Turn-off delay time	$t_{d(off)}$		-	266	-	
Fall time	t_f		-	246	-	
Turn-on energy	E_{on}		-	1.6	-	mJ
Turn-off energy	E_{off}		-	1.9	-	
Total switching energy	E_{ts}		-	3.5	-	
Turn-on delay time	$t_{d(on)}$	T_j=175℃, V_{CC}=600V, I_C=25A, V_{GE}=0/15V, R_G=16Ω, Inductive load	-	30	-	ns
Rise time	t_r		-	50	-	
Turn-off delay time	$t_{d(off)}$		-	322	-	
Fall time	t_f		-	378	-	
Turn-on energy	E_{on}		-	1.7	-	mJ
Turn-off energy	E_{off}		-	2.5	-	
Total switching energy	E_{ts}		-	4.2	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode reverse recovery time	t_{rr}	T_j=25℃, V_R=600V, I_F=25A, di_F/dt=400A/μs	-	256	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.35	-	μC
Diode peak reverse recovery current	I_{rrm}		-	12.4	-	A
Diode reverse recovery time	t_{rr}	T_j=175℃, V_R=600V, I_F=25A, di_F/dt=400A/μs	-	350	-	ns
Diode reverse recovery charge	Q_{rr}		-	4.28	-	μC
Diode peak reverse recovery current	I_{rrm}		-	26.2	-	A

Thermal Characteristic

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IGBT thermal resistance, junction-case	R_{thJC}	-	-	-	0.43	K/W
Diode thermal resistance, junction-case	R_{thJCD}	-	-	-	0.80	
Thermal Resistance, junction-ambient	R_{thJA}	-	-	-	40	

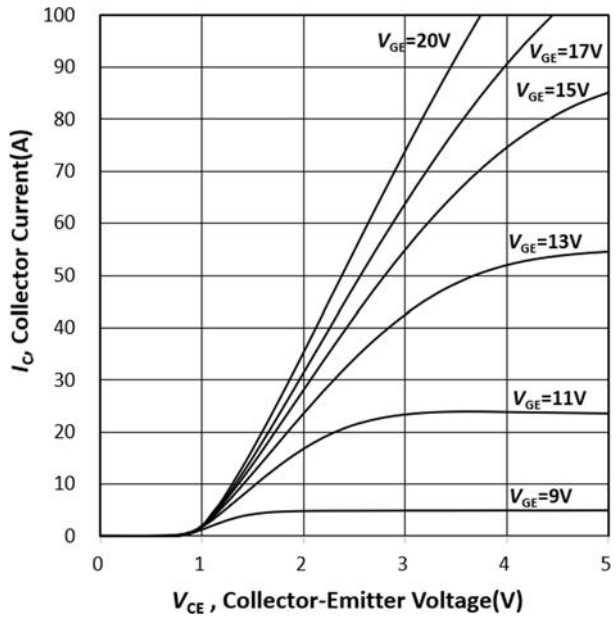


Figure 1 Normal temperature output characteristics (T_j =25°C)

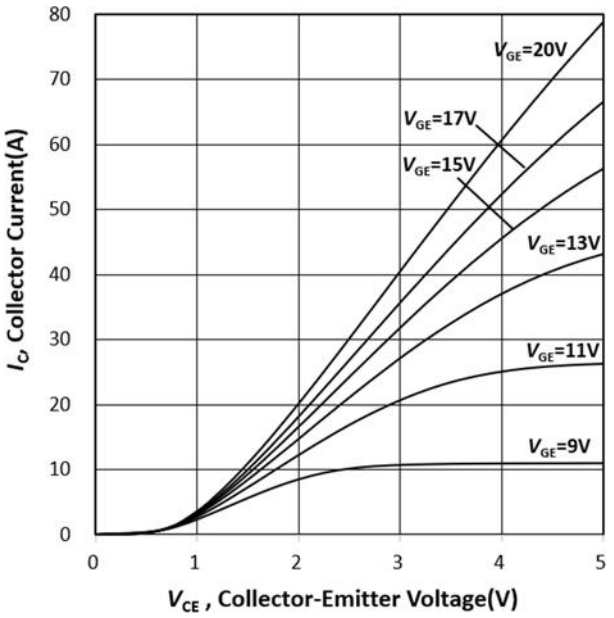


Figure 2 High temperature output characteristics (T_j =175°C)

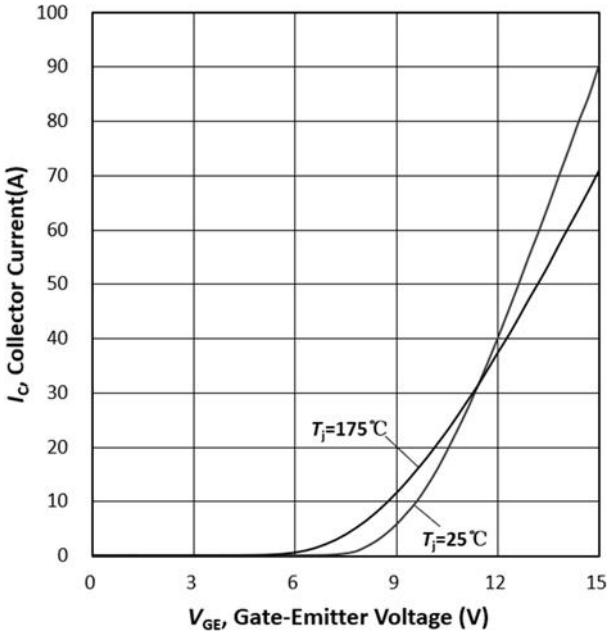


Figure 3 Transfer characteristics (V_{CE}=25V)

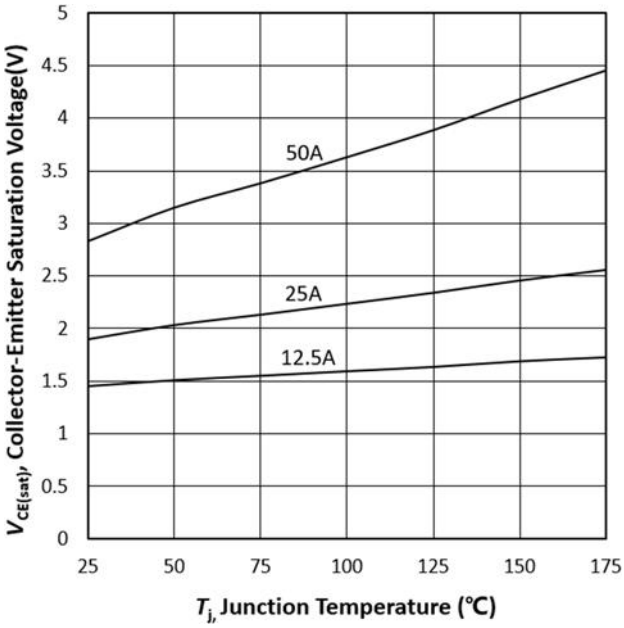


Figure 4 Saturation pressure drop temperature characteristics (V_{GE}=15V)

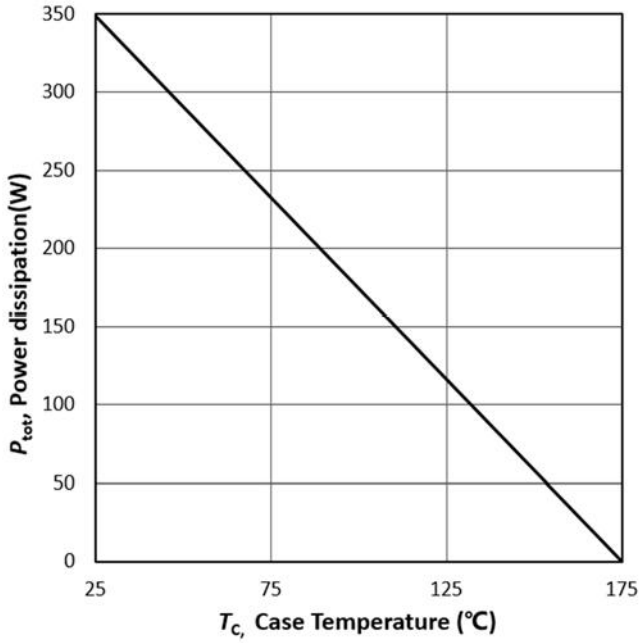


Figure 5 Dissipated power vs. shell temperature (T_j≤175°C)

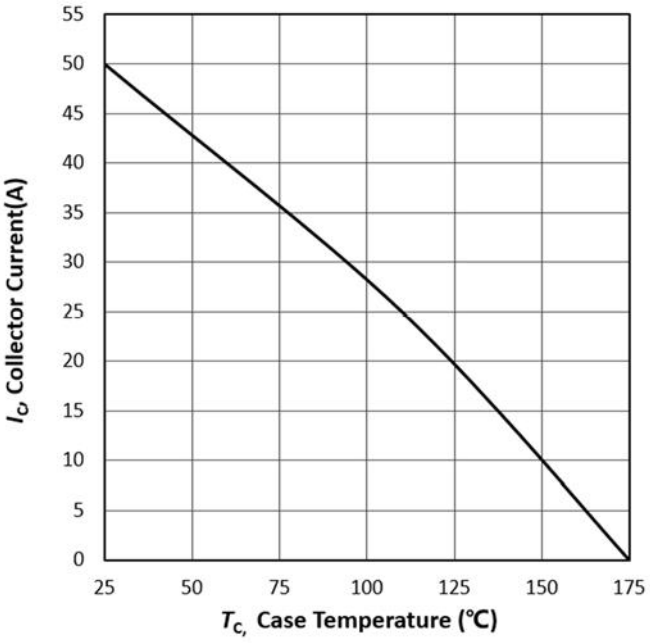


Figure 6 Collector current vs. case temperature (V_{GE}≥15V, T_j≤175°C)

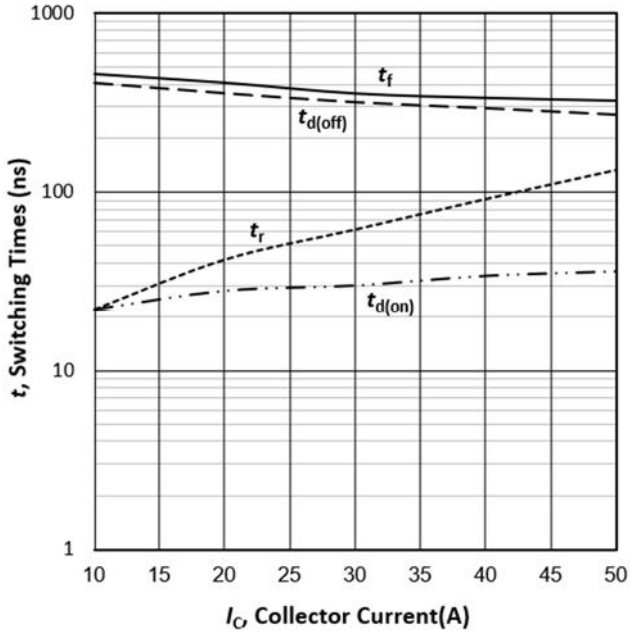


Figure 7 Switching time vs. collector current (Inductive load, T_j=175℃, V_{CE}=600V, V_{GE}=0/15V, R_G=16Ω, Test the circuit reference Figure E)

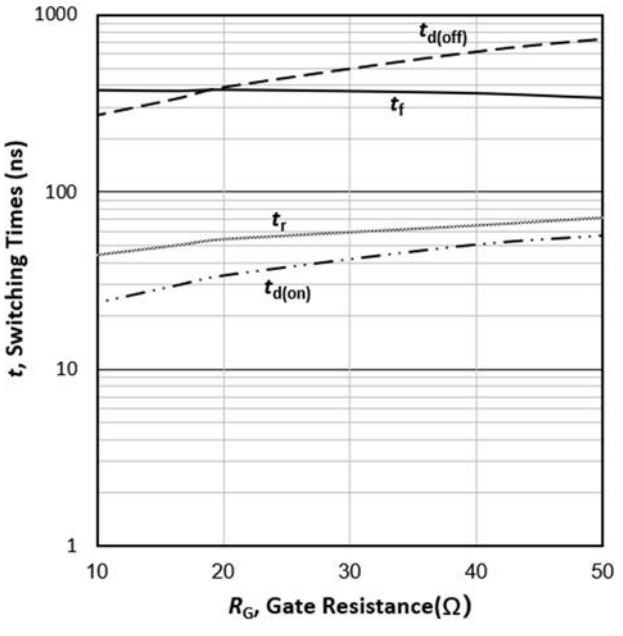


Figure 8 Switching time vs. gate resistance (Inductive load , T_j=175℃, V_{CE}=600V, V_{GE}=0/15V, I_C=25A, Test the circuit reference Figure E)

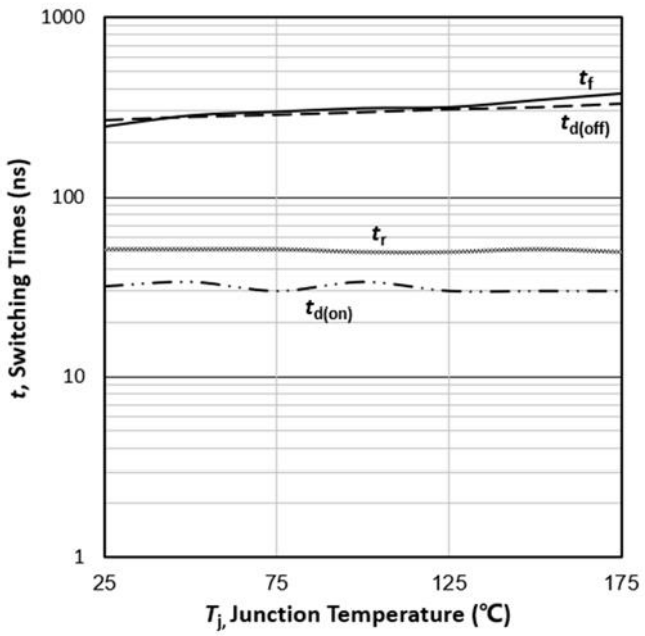


Figure 9 Switching time vs. junction temperature
(Inductive load , V_{CE}=600V,
V_{GE}=0/15V, I_C=25A, R_G=16Ω,
Test the circuit reference Figure E)

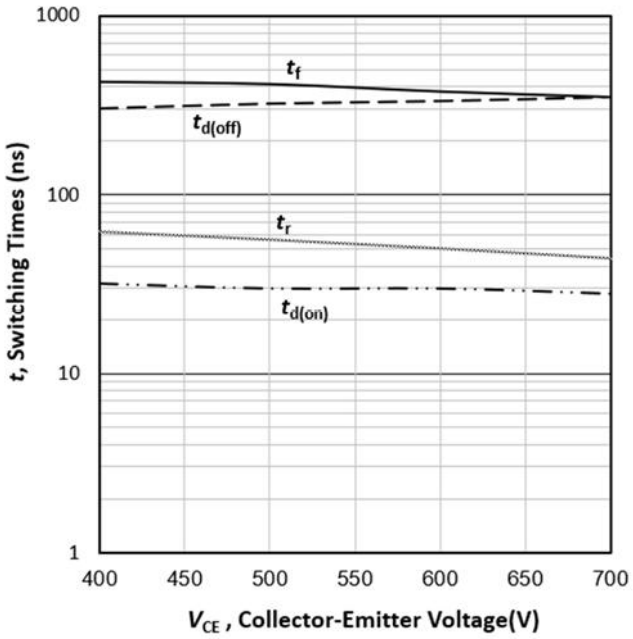


Figure 10 Switching time vs.collector-emitter voltage
(Inductive load, T_j=175℃,
V_{GE}=0/15V, I_C=25A, R_G=16Ω,
Test the circuit reference Figure E)

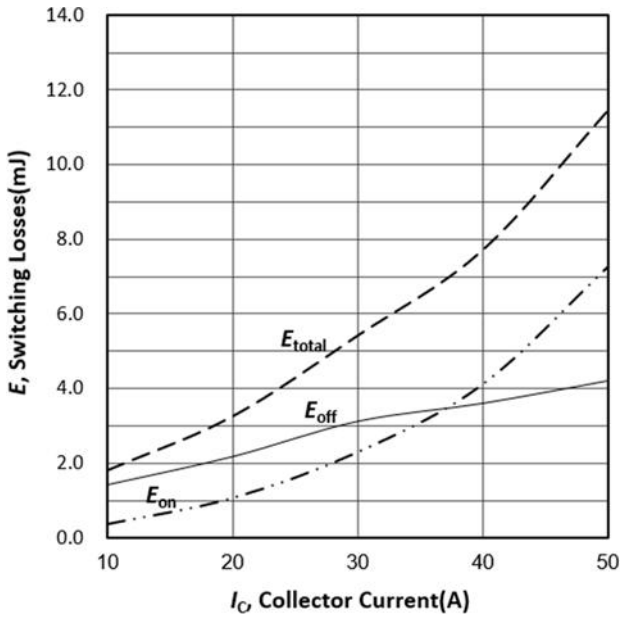


Figure 11 Switching loss vs. collector current
(Inductive load, T_j=175℃,
V_{CE}=600V, V_{GE}=0/15V, R_G=16Ω,
Test the circuit reference Figure E)

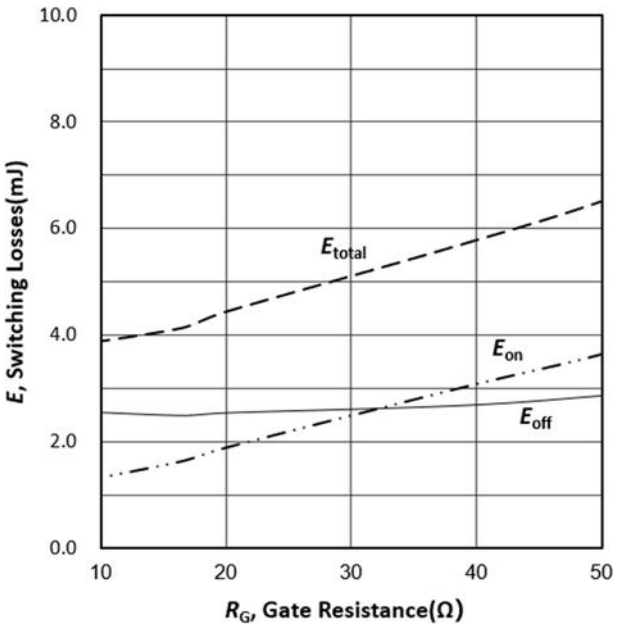


Figure 12 Switching loss vs. gate resistance
(Inductive load, T_j=175℃,
V_{CE}=600V, V_{GE}=0/15V, I_C=25A,
Test the circuit reference Figure E)

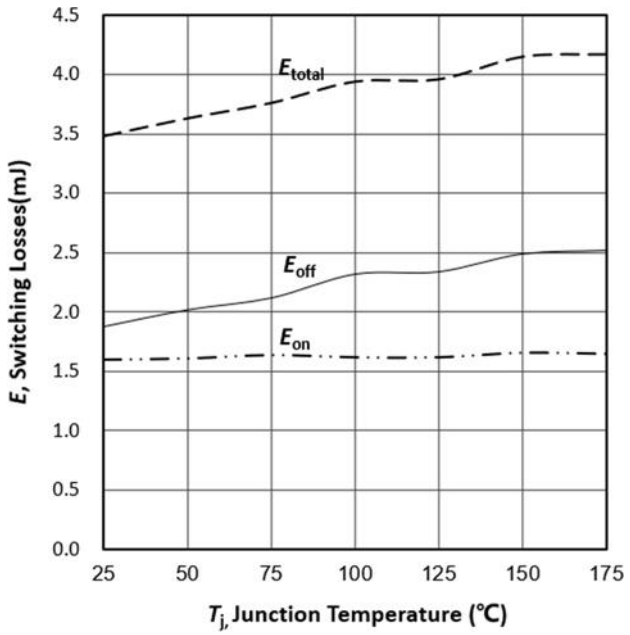


Figure 13 Switching losses vs. junction temperature

(Inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=25A, R_G=1 Ω,

Test the circuit reference Figure E)

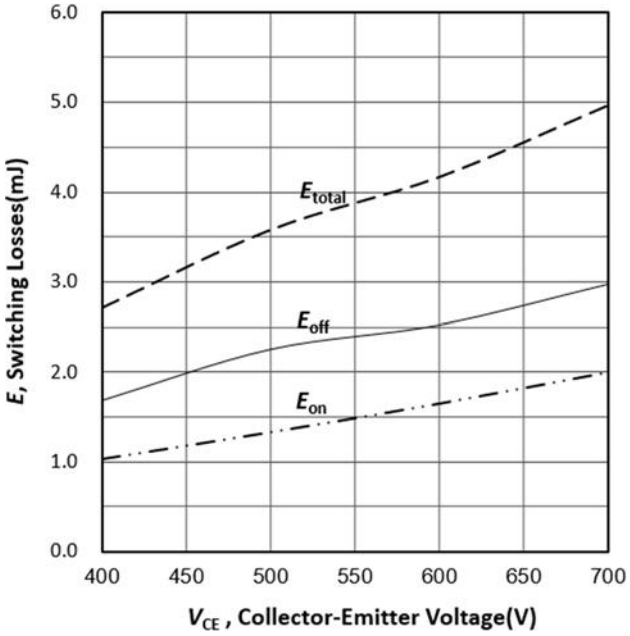


Figure 14 Switching losses vs. collector-emitter voltage

(Inductive load, T_j=175°C, V_{GE}=0/15V, I_C=25A, R_G=16Ω,

Test the circuit reference Figure E)

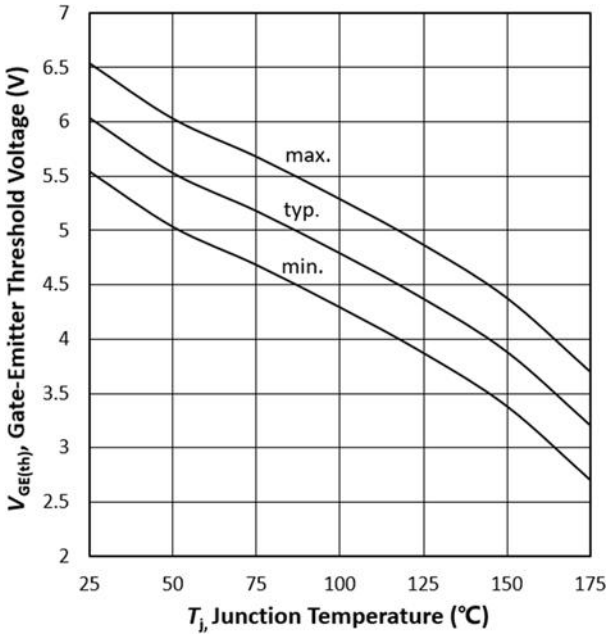


Figure 15 Threshold voltage vs. junction temperature

(I_C=1mA)

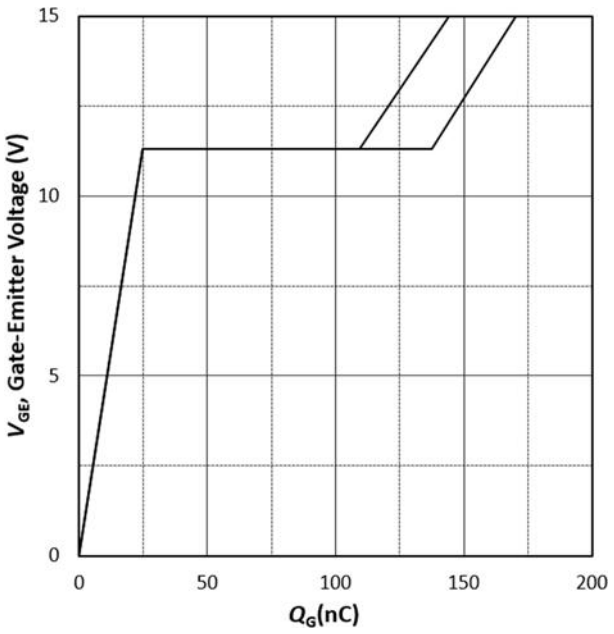


Figure 16 Gate charge characteristics

(I_C=25A)

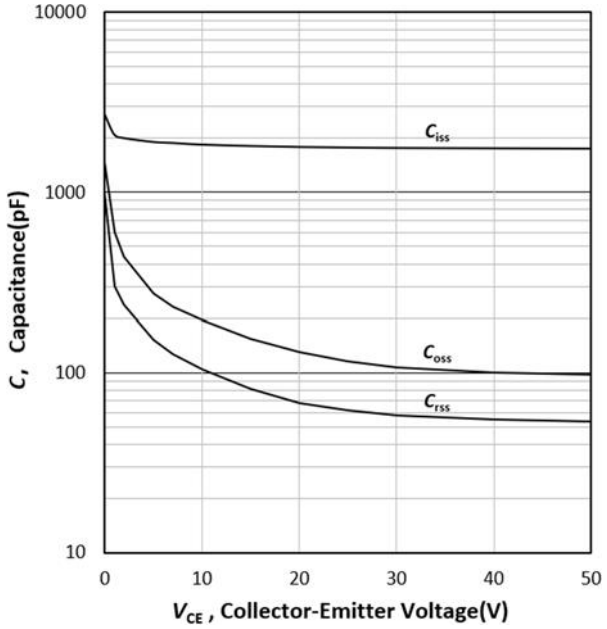


Figure 17 Capacitance vs. collector-emitter voltage (V_{GE}=0V, f=1MHz)

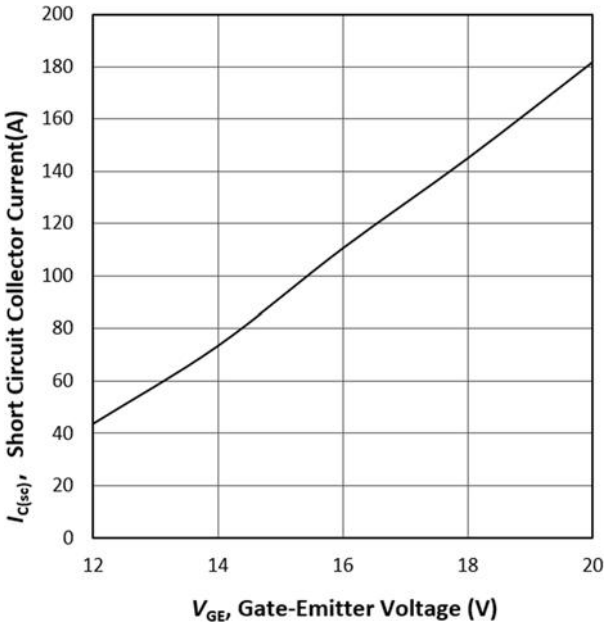


Figure 18 Short-circuit current vs. gate-emitter voltage (V_{CE}≤600V, T_j≤175°C)

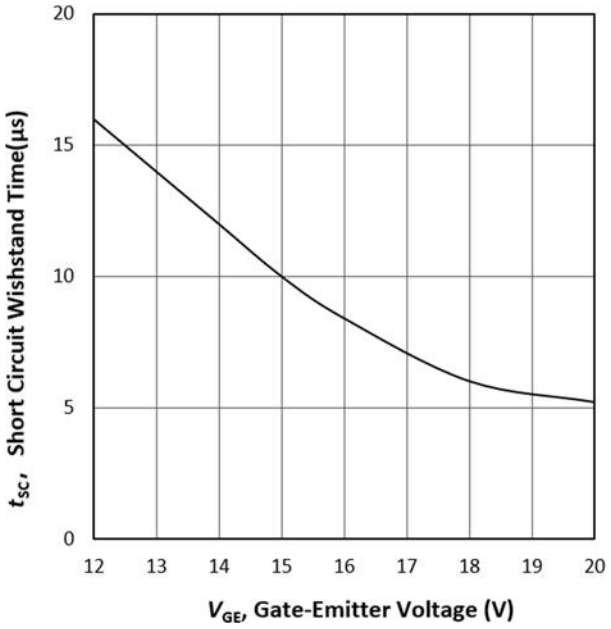


Figure 19 Short circuit withstand time vs. gate-emitter voltage (V_{CE}=600V, start at T_{jmax}≤175°C)

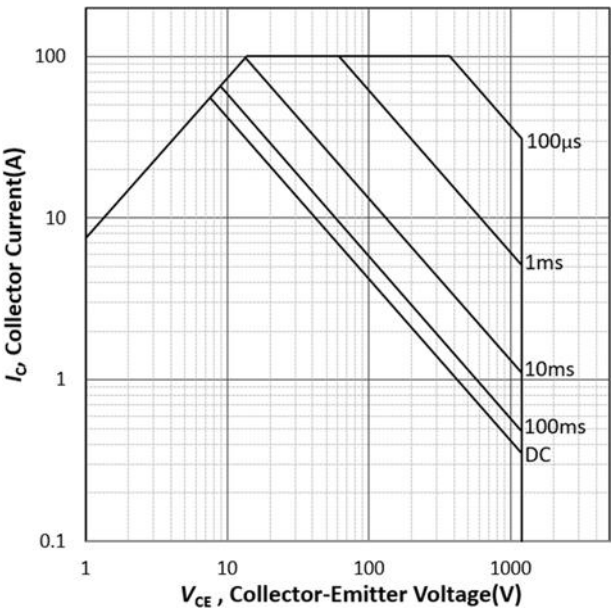


Figure 20 Safe operating area (D=0, T_C=25°C, T_j≤175°C, V_{GE}=15V)

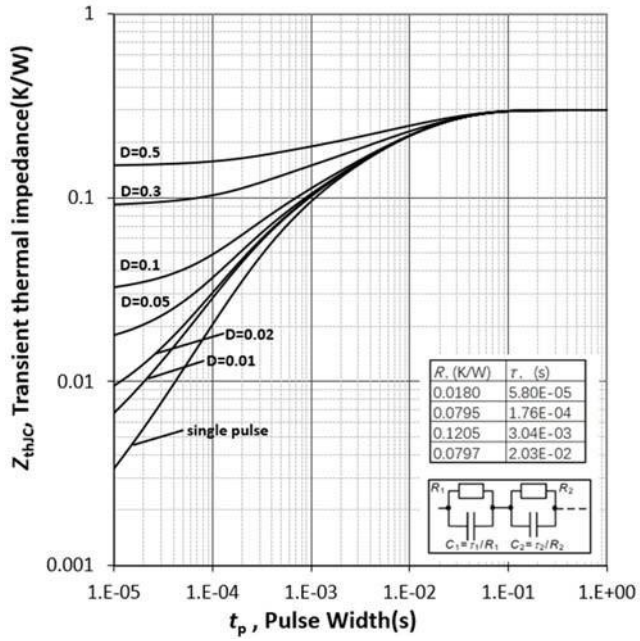


Figure 21 Transient thermal impedance of IGBT (Typ)
($D=t_p/T$)

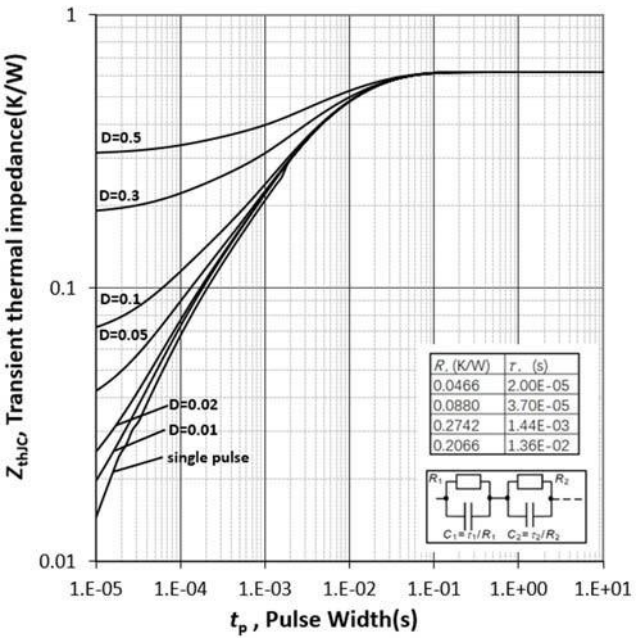


Figure 22 Diode transient thermal impedance (Typ)
($D=t_p/T$)

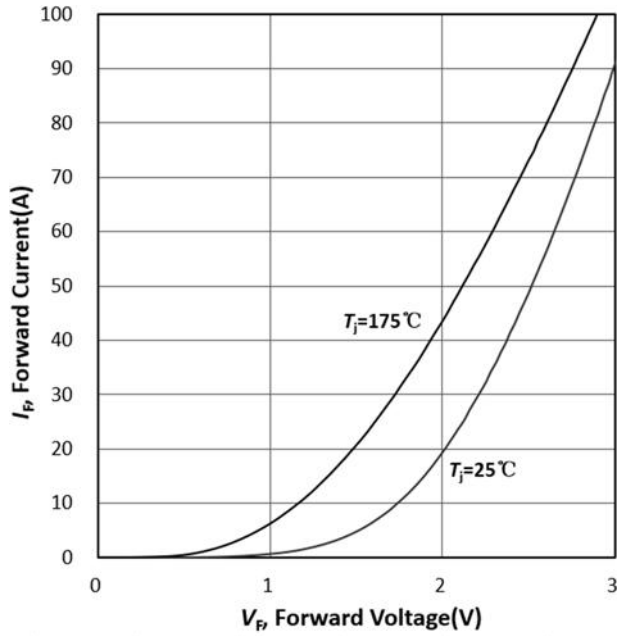


Figure 23 Diode forward characteristics

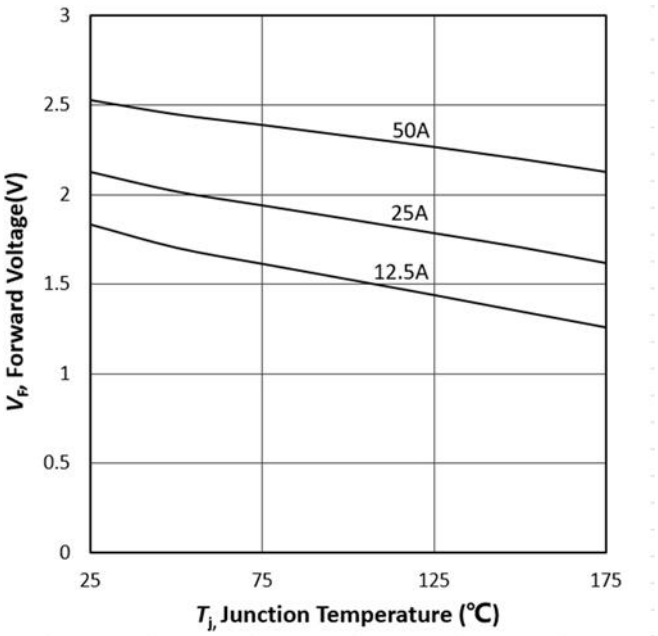


Figure 24 Diode forward voltage drop vs. junction temperature

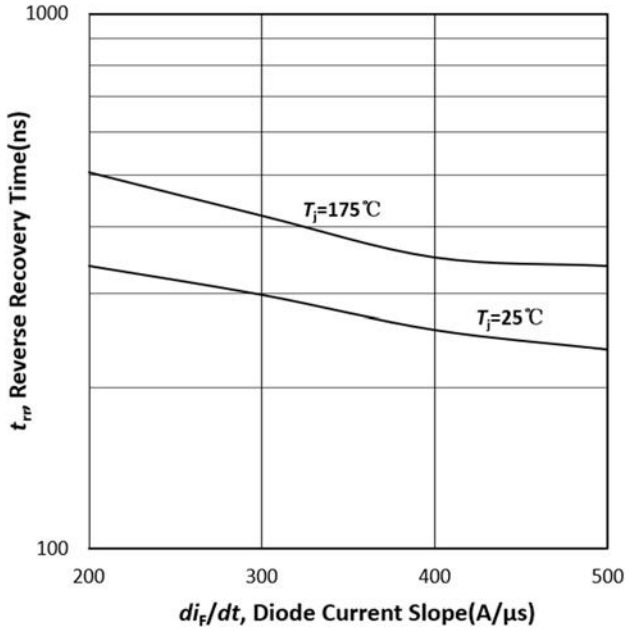


Figure 25 Reverse recovery time vs. rate of current change
(V_R=600V, I_F=25A, Test the circuit reference Figure E)

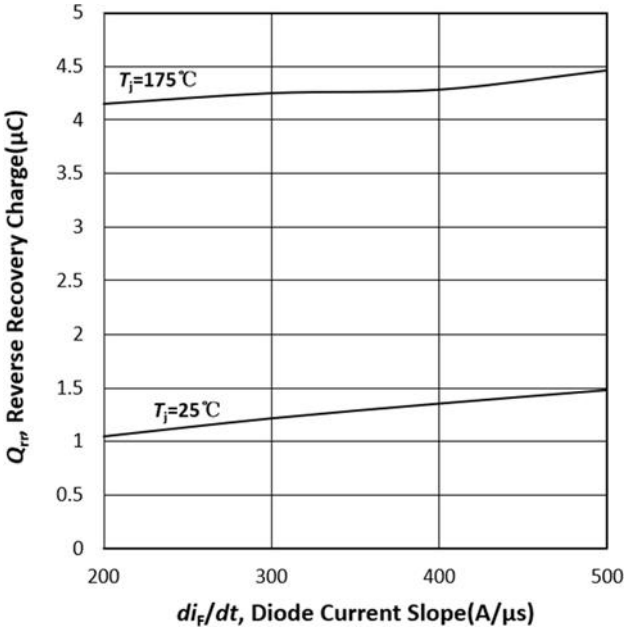


Figure 26 reverses the recovery charge vs. the rate of change of current
(V_R=600V, I_F=25A, Test the circuit reference Figure E)

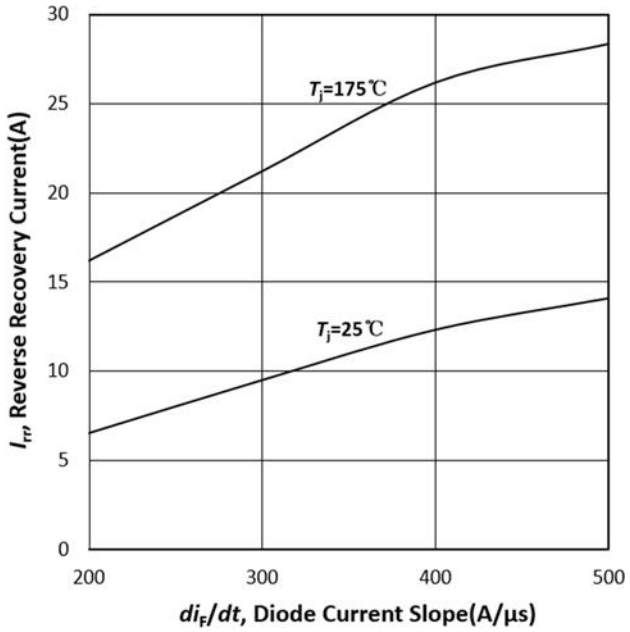


Figure 27 Reverse recovery current vs. rate of current change
(V_R=600V, I_F=25A, Test the circuit reference Figure E)

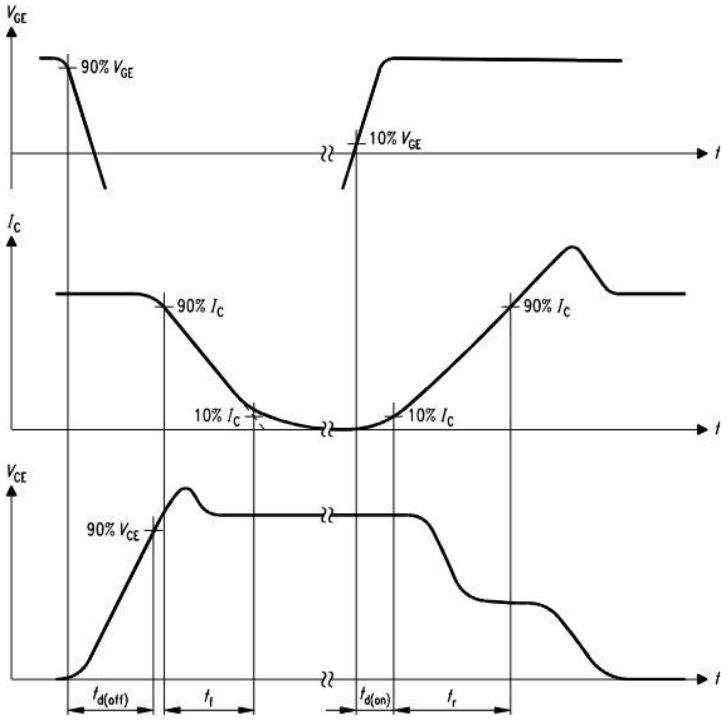


Figure A IGBT switching time definition

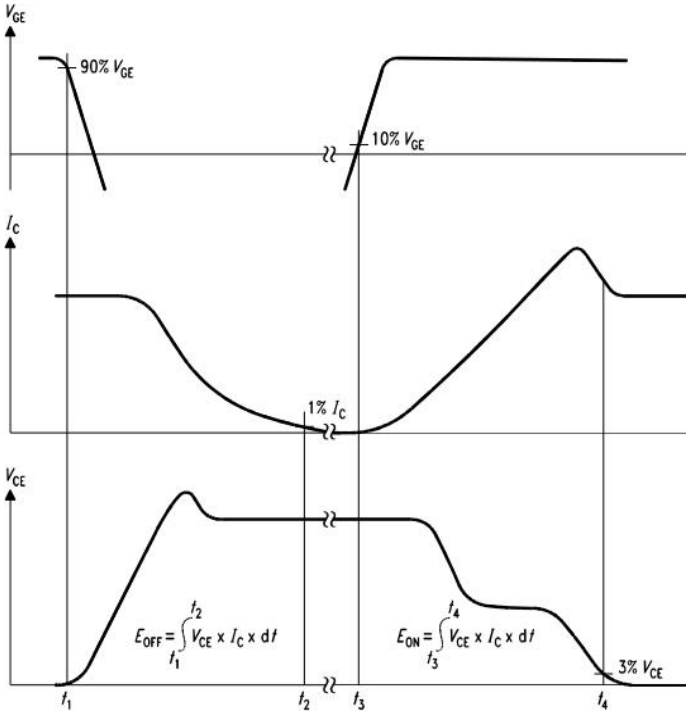


Figure B IGBT switching loss definition

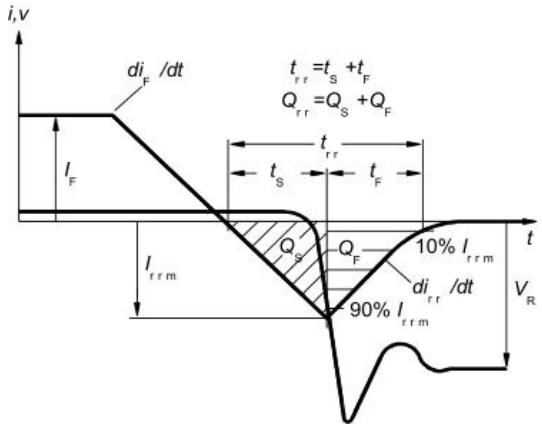


Figure C Diode reverse recovery parameter definition

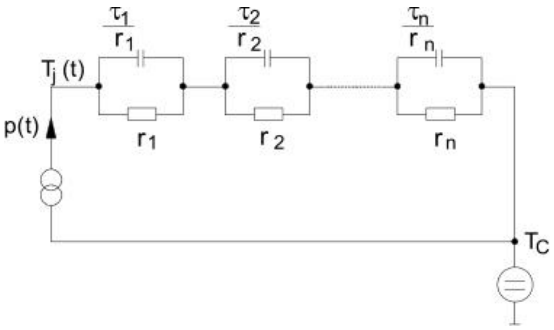


Figure D Thermally equivalent circuit

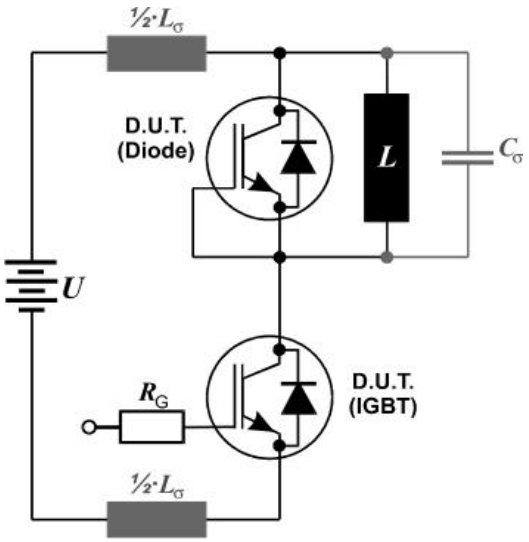
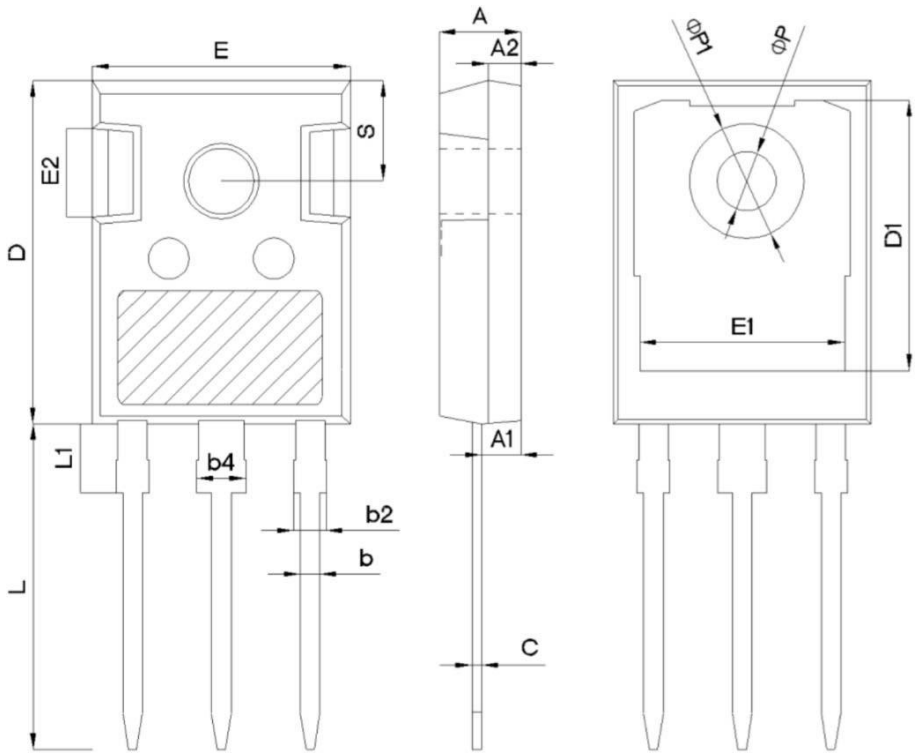


Figure E Switch Parameter test circuit

TO-247



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

Revision History：

Revision	Date	Subjects (major changes since last revision)
V1.0	2022.08	Initial Version

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