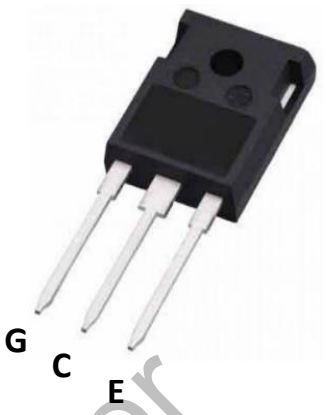
IKW50N1200DH

1200V 50A TRENCH IGBT

Features

V_{CE}=1200V
I_C=50A
Fast switching
Trench FS technology
10µsec short circuit withstand time

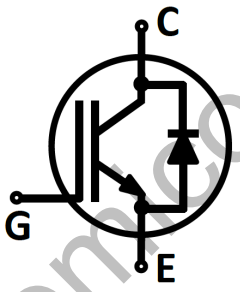
TO-247



Potential applications

UPS
Power Supplies
Industrial Drives

Description



1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Storage temperature	T_{stg}		-55		150	˚C
Soldering temperature	T_{sold}				260	˚C
Mounting torque , M3 screw	M				0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25$ °C		1200	V
DC collector current, limited by T_{vjmax}	I_C	T_C =100 °C		50	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			150	A
Gate-emitter voltage	V_{GE}			±20	V
Short circuit withstand time	t_{SC}	$V_{CC} \leq$ 600 V, V_{GE} = 15 V, T_{vj} = 150 °C		10	µs
Power dissipation	P_{tot}	$T_{vj} \leq$ 175 °C	T_C = 25 °C	520	W
			T_C =100 °C	260	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	I_C = 50A, V_{GE} = 15 V	T_C = 25 °C		1.7		V
			T_C =175 °C		2.1		
Gate-emitter threshold voltage	V_{GEth}	I_C = 0.5mA, V_{CE} = V_{GE}			6.5		V

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Zero gate-voltage collector current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_C = 25 °C			20	µA
			T_C =175 °C			5	mA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				200	nA
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			6200		pF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			220		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			60		pF
Gate charge	Q_G	I_C = 50 A, V_{GE} = 15 V, V_{CC} = 960V			280		nC
Turn-on delay time (inductive load)	$t_{d(on)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		32		ns
			T_{vj} = 175 °C, I_C = 50 A		35		
Rise time (inductive load)	t_r	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		30		ns
			T_{vj} = 175 °C, I_C = 50 A		36		
Turn-off delay time (inductive load)	$t_{d(off)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		210		ns
			T_{vj} = 175 °C, I_C = 50 A		265		
Fall time (inductive load)	t_f	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		85		ns
			T_{vj} = 175 °C, I_C = 50 A		135		
Turn-on energy (inductive load)	E_{on}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		2.9		mJ
			T_{vj} = 175 °C, I_C = 50 A		4.0		
Turn-off energy (inductive load)	E_{off}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		2.0		mJ
			T_{vj} = 175 °C, I_C = 50 A		4.3		

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Total switching energy (inductive load)	E_{ts}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 50 A		4.9		mJ
			T_{vj} = 175 °C, I_C = 50 A		8.3		
Operating junction temperature	T_{vj}			-40		175	°C

Note： Electrical Characteristic, at T_{vj} = 25°C, unless otherwise specified.

3 Diode

Table 4 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj} ≥ 25 °C		1200	V
Diode forward current, limited by T_{vjmax}	I_F	T_C =100 °C		50	A
Power dissipation	P_{tot}	T_{vj} ≤ 175 °C	T_C = 25 °C	270	W
			T_C =100 °C	135	

Table 5 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode forward voltage	V_F	I_F = 50A	T_C = 25 °C		2.1		V
			T_C =175 °C		1.9		
Diode reverse recovery time	t_{rr}	V_R = 600 V, $R_{G(on)}$ = 10 Ω	T_C = 25 °C		180		ns
			T_C =175 °C		230		
Diode reverse recovery charge	Q_{rr}	V_R = 600 V, $R_{G(on)}$ = 10 Ω	T_C = 25 °C		3.6		µC
			T_C =175 °C		7.5		
Diode peak reverse recovery current	I_{rrm}	V_R = 600 V, $R_{G(on)}$ = 10 Ω	T_C = 25 °C		30		A
			T_C =175 °C		48		
Operating junction temperature	T_{vj}			-40		175	°C

Figure 1. Reverse bias safe operating area

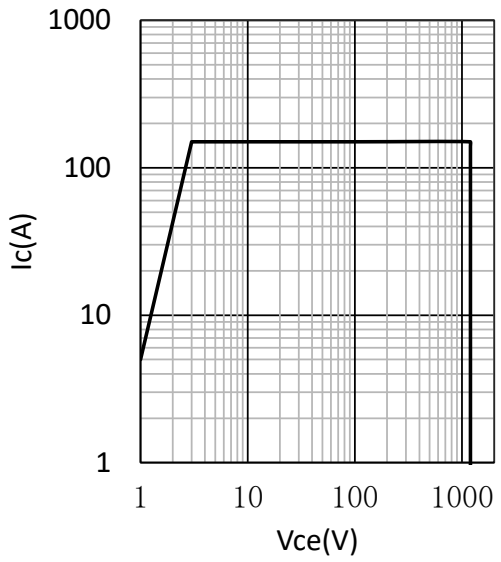


Figure 2. Maximum power dissipation as a function of case temperature (T_{Vj}≤175°C)

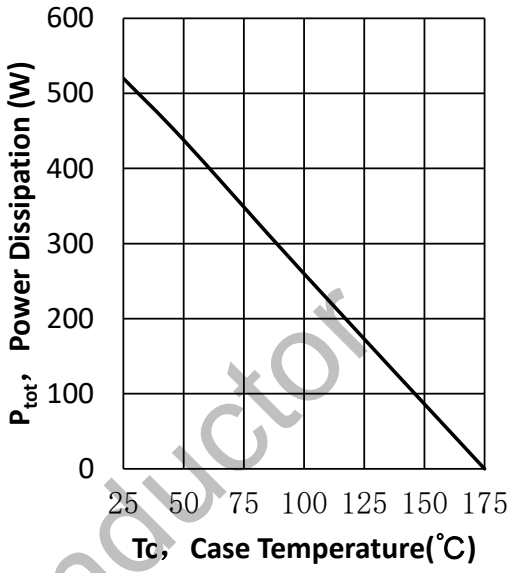


Figure 3. Typical output characteristic (V_{GE}=15V, T_{Vj}=25°C)

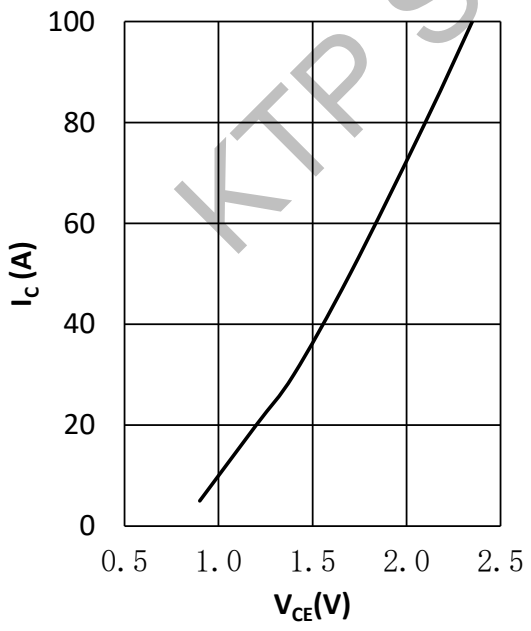


Figure 4. Typical output characteristic (V_{GE}=15V, T_{Vj}=175°C)

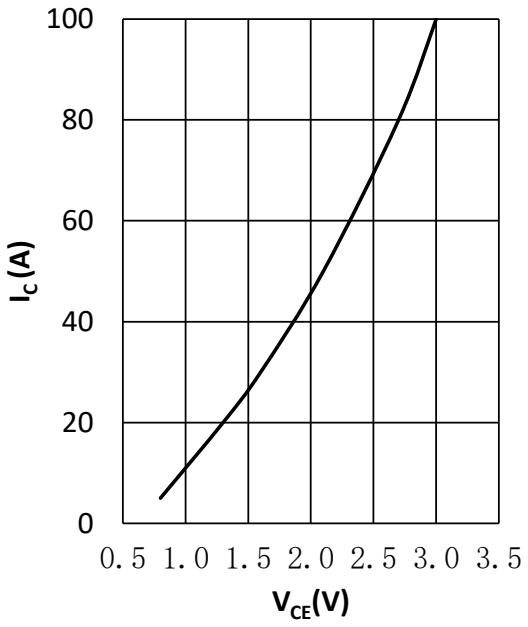


Figure 5. Typical $V_{CE(sat)}$-T_{Vj} characteristic (V_{GE}=15V)

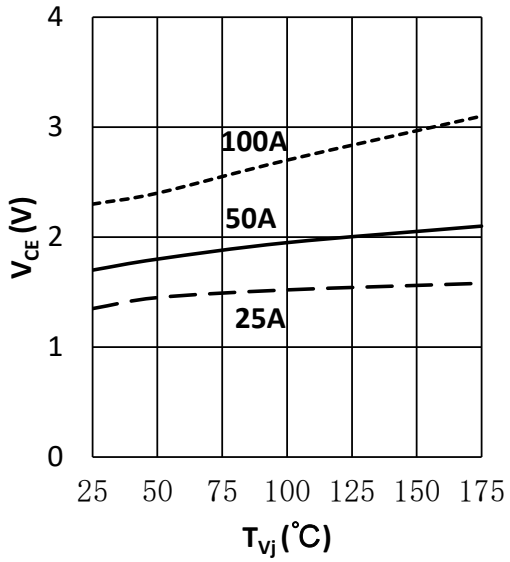


Figure 6. Typical $V_{GE(th)}$-T_{Vj} characteristic (I_C=0.5mA)

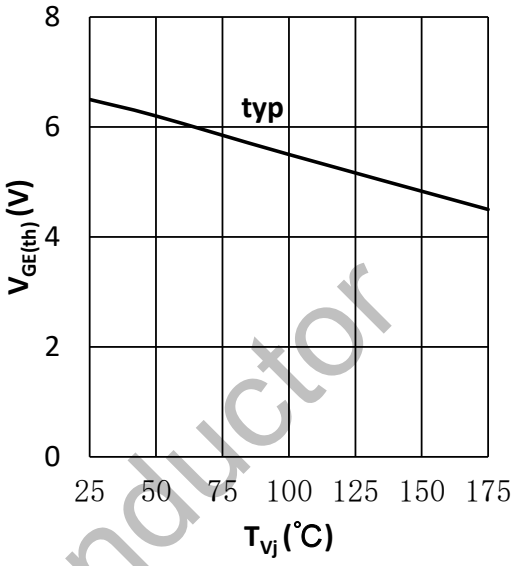


Figure 7. Typical gate charge V_{GE} = f(Q_G) (I_C=50A)

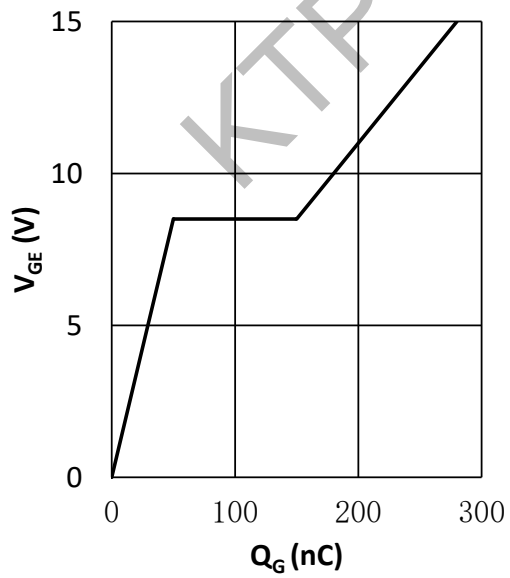


Figure 8. Typical capacitance as a function of collector-emitter voltage (V_{GE}=0V, f=100 kHz)

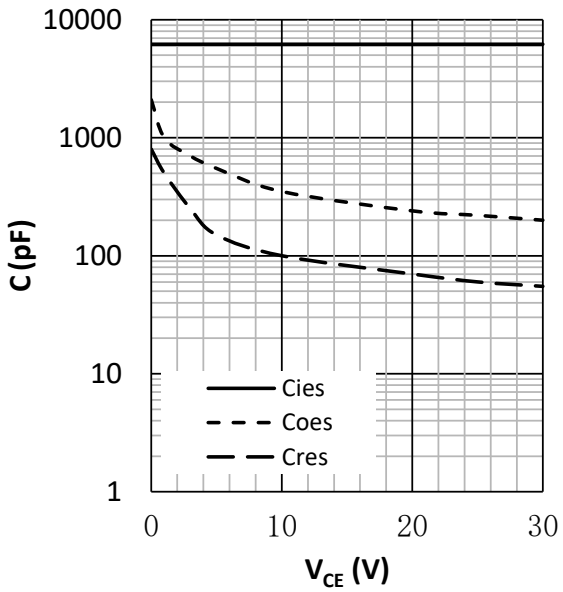


Figure 9. Typical switching energy losses as a function of junction temperature
$E=f(T_{Vj})$, V_{CC}=600V, I_C=50A

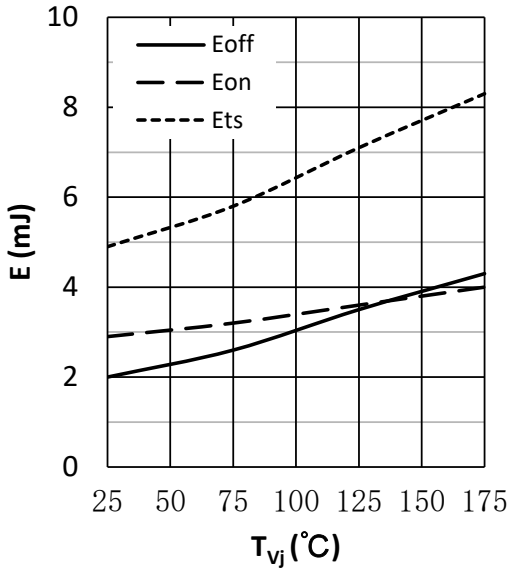


Figure 10. Typical switching energy losses as a function of collector current
$E=f(I_C)$, T_{Vj}=25℃

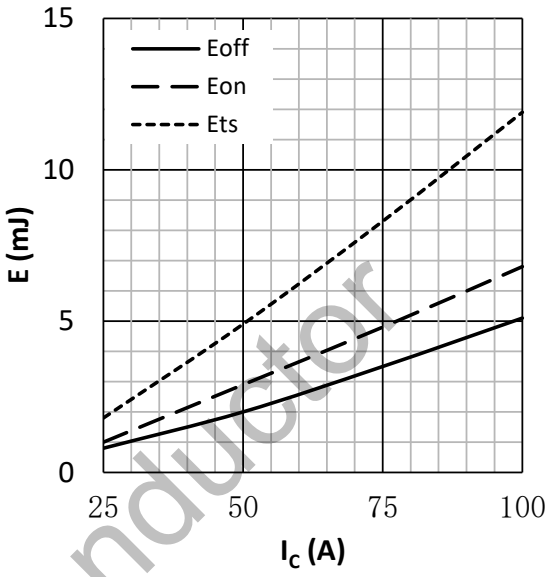


Figure 11. Typical diode forward voltage as a function of junction temperature
$V_F=f(T_{Vj})$

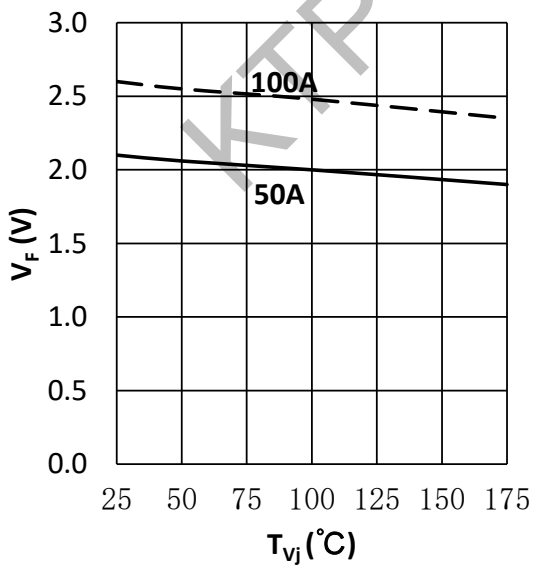
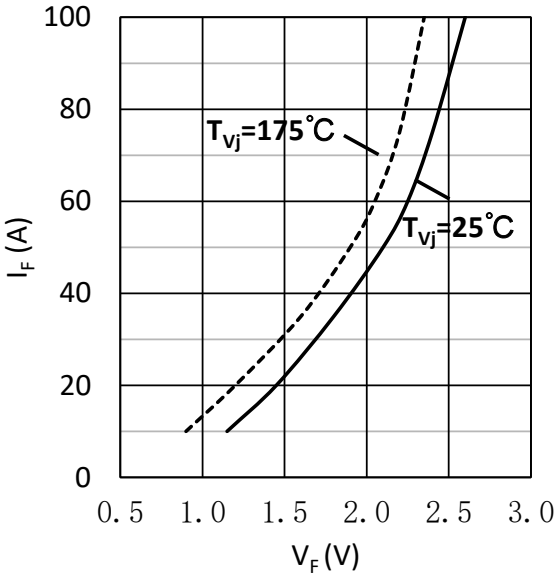
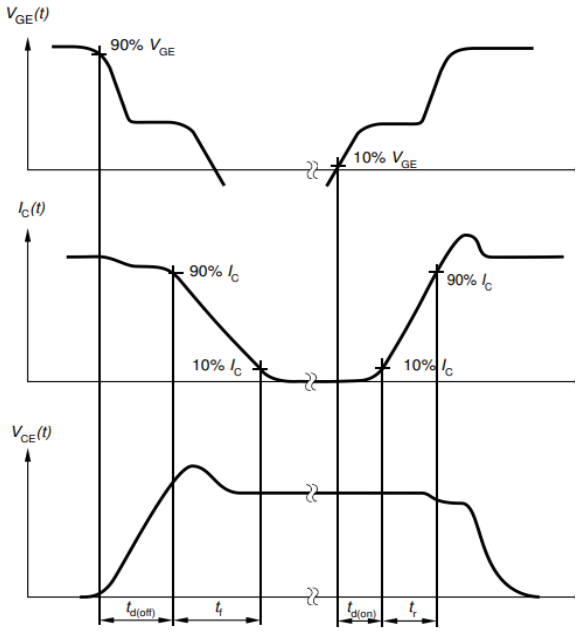
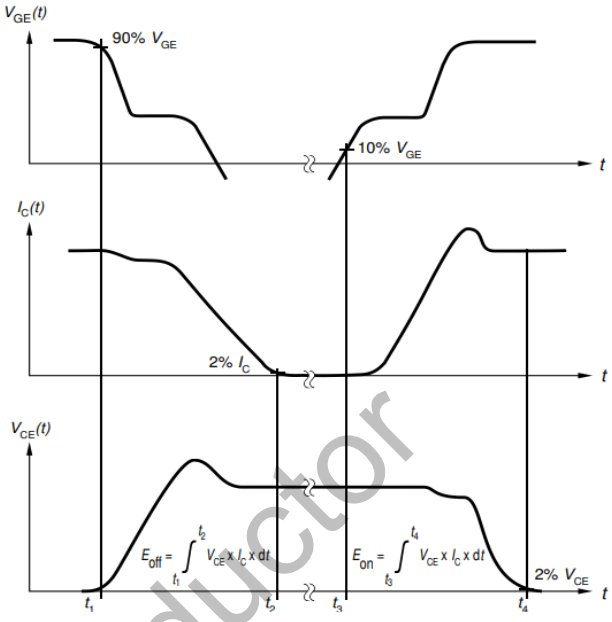


Figure 12. Forward characteristic of Diode

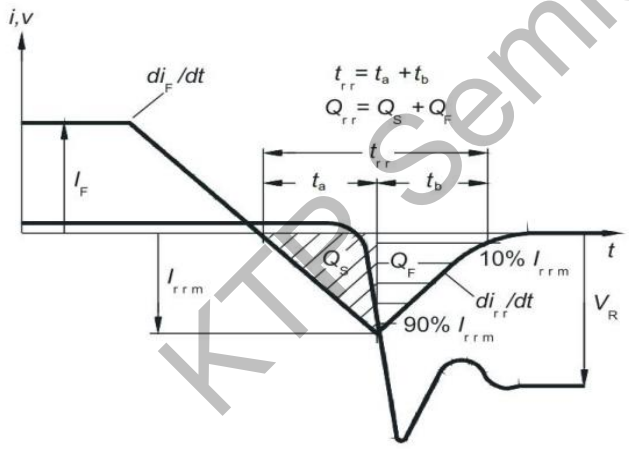




A.Definition of switching times



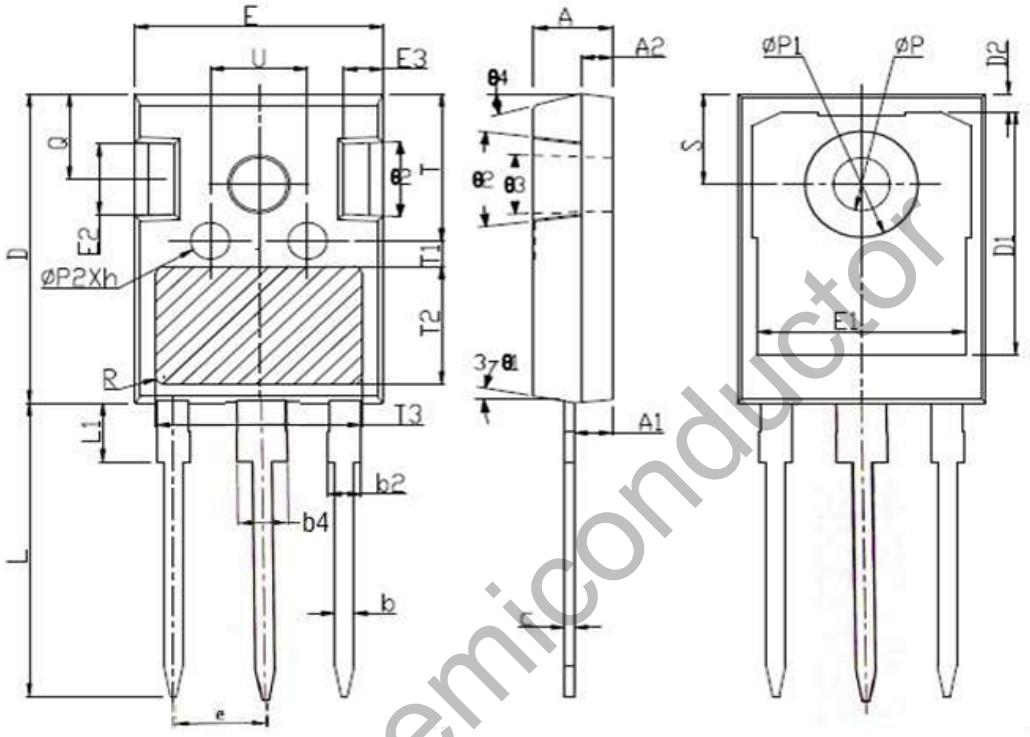
B.Definition of switching losse



C.Definition of diode switching characteris

4 Package outlines

TO-247-3L



Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.9	5.0	5.1	e		5.44BSC	
A1	2.3	2.4	2.5	h	0.05	0.10	0.15
A2	1.9	2.0	2.1	L	19.6	19.9	20.2
b	1.10	1.20	1.25	L1			4.3
b2	1.90	2.00	2.25	Φp	3.5	3.6	3.75
b4	2.90	3.00	3.25	Φp1			7.3
c	0.50	0.60	0.70	Φp2	2.4	2.5	2.6
D	20.8	21.0	21.2	Q	5.3		5.9
D1	16.25	16.55	16.85	S		6.15BSC	
D2	1.05	1.20	1.35	T	9.8		10.2
E	15.6	15.8	16.0	T1		1.65REF	
E1	13.1	13.3	13.5	T2		8.0REF	
E2	4.9	5.0	5.1	T3		12.8REF	
E3	2.4	2.5	2.6	U	6.0		6.4

Unit: mm