

主要参数 MAIN CHARACTERISTICS

I_c (100°C)	30 A
V_{CES}	650 V
$V_{cesat-typ}$ (@ $I_c=30A$)	1.66 V

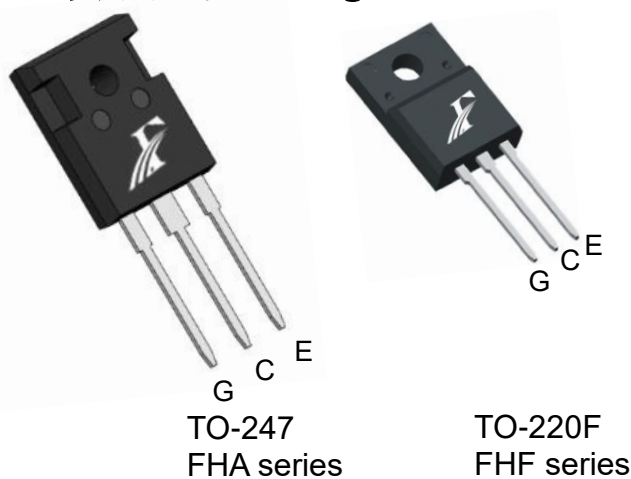
用途 APPLICATIONS

电机驱动	Motor drive
逆变器	Power management for inverter systems

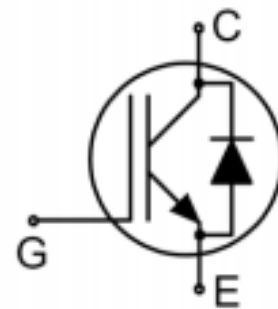
产品特性 FEATURES

Trench-FS 技术	Trench Field Stop technology
低栅极电荷	Low gate charge
低开关损耗	Low Switching losses
低 V_{CEsat}	Low V_{CEsat}
符合 RoHS 标准	ROHS compliant
带有反向并行快恢复二极管	With anti-parallel fast recovery diode
正温度系数	Positive temperature coefficient
高可靠性	High reliability

封装形式 Package



等效电路 Equivalent Circuit



绝对最大额定值 ABSOLUTE RATINGS ($T_c=25^\circ C$)

项目 parameter	符号 Symbol	数值 Value		单位 Unit
		FHF30T65AL	FHA30T65AL	
最高集电极-发射极直流电压 Collector-Emmitter Voltage	V_{CE}	650		V
连续集电极极电流 Collector Current-continuous	I_c	($T_c=25^\circ C$)	60	A
		($T_c=100^\circ C$)	30	
最大脉冲集电极极电流 (注1) Collector Current - pulse (note 1)	I_{CM}	90		A
二极管连续正向电流 Diode Continuous Forward Current	I_F	($T_c=25^\circ C$)	60	A
		($T_c=100^\circ C$)	30	
二极管最大正向电流 Diode Maximum Forward Current	I_{FM}	90		A
最高栅极发射极电压 Gate-Emmitter Voltage	V_{GE}	± 30		V
短路耐受时间 Short circuit withstand time $V_{GE}=15V, V_{CC}\leq 400V,$ Allowed number of short circuits<1000, Times between short circuits: $\geq 1.0s, T_J \leq 175^\circ C$	t_{sc}	5.0		us
耗散功率 Power Dissipation ($T_c=25^\circ C$)	P_D	48	187	W
最高结温及存储温度 Operating and Storage Temperature Range	T_J, T_{STG}	175, -55~+175		$^\circ C$
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T_L	260		$^\circ C$

注1: 集极电流由最高结温限制

Note1: Collector current limited by maximum junction temperature

电特性 ELECTRICAL CHARACTERISTICS(at T_c= 25°C, unless otherwise specified)

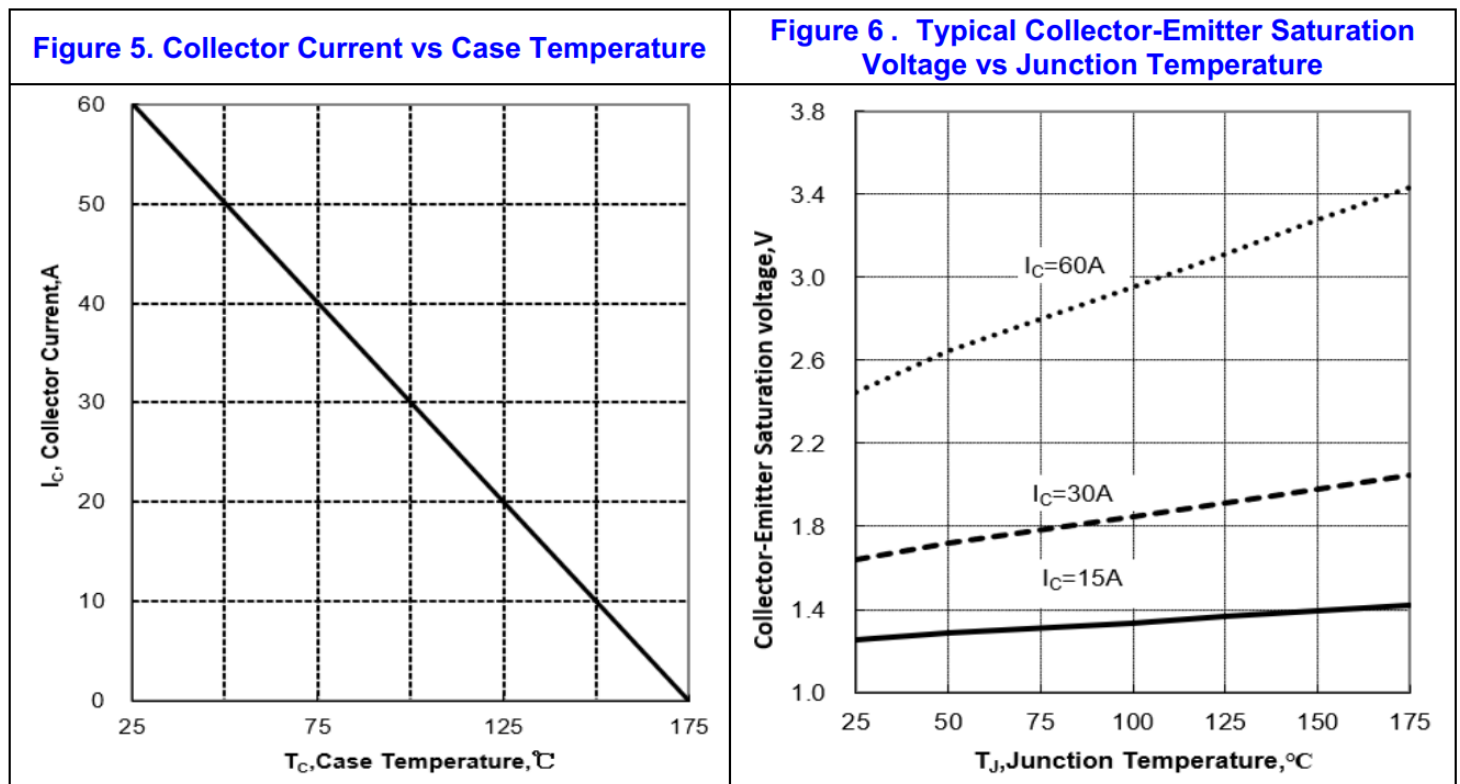
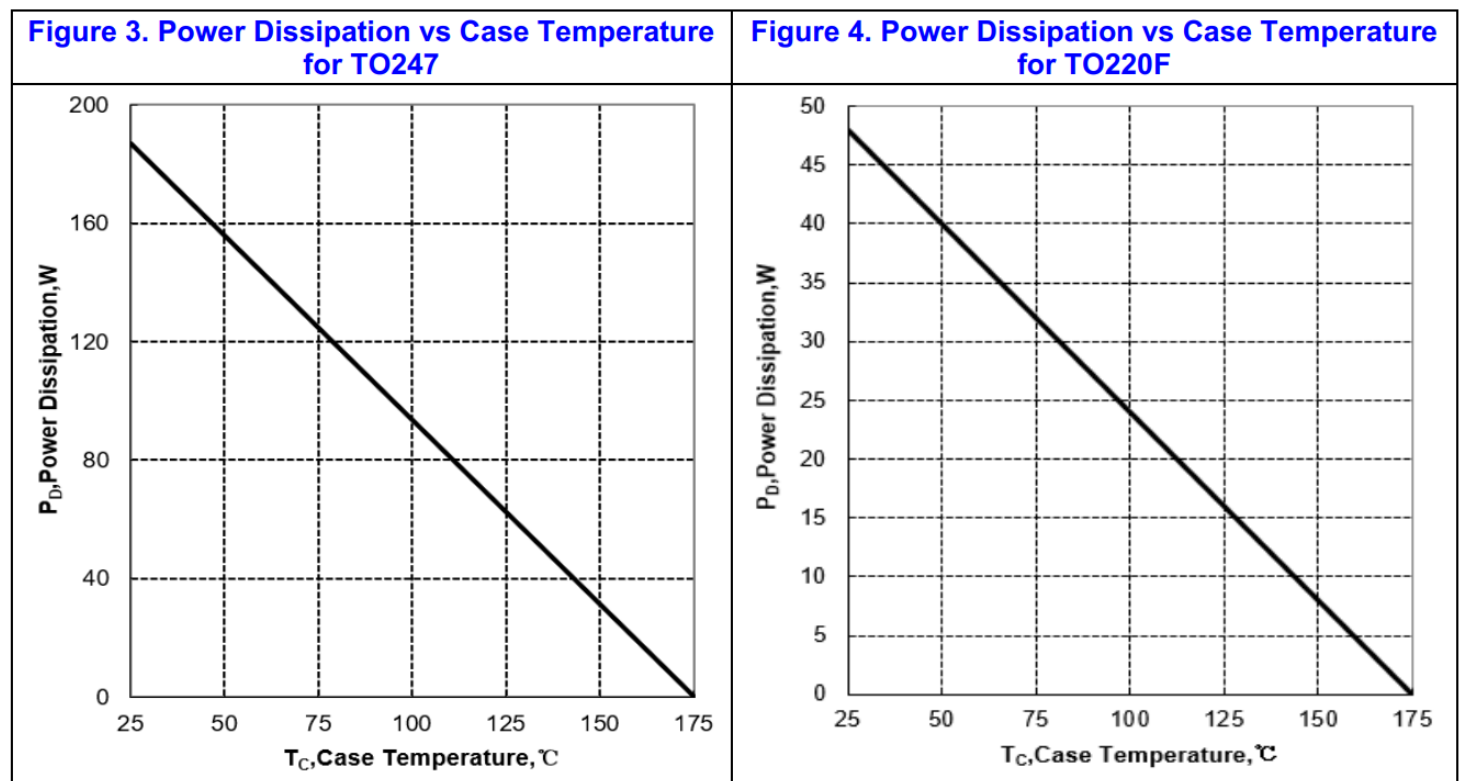
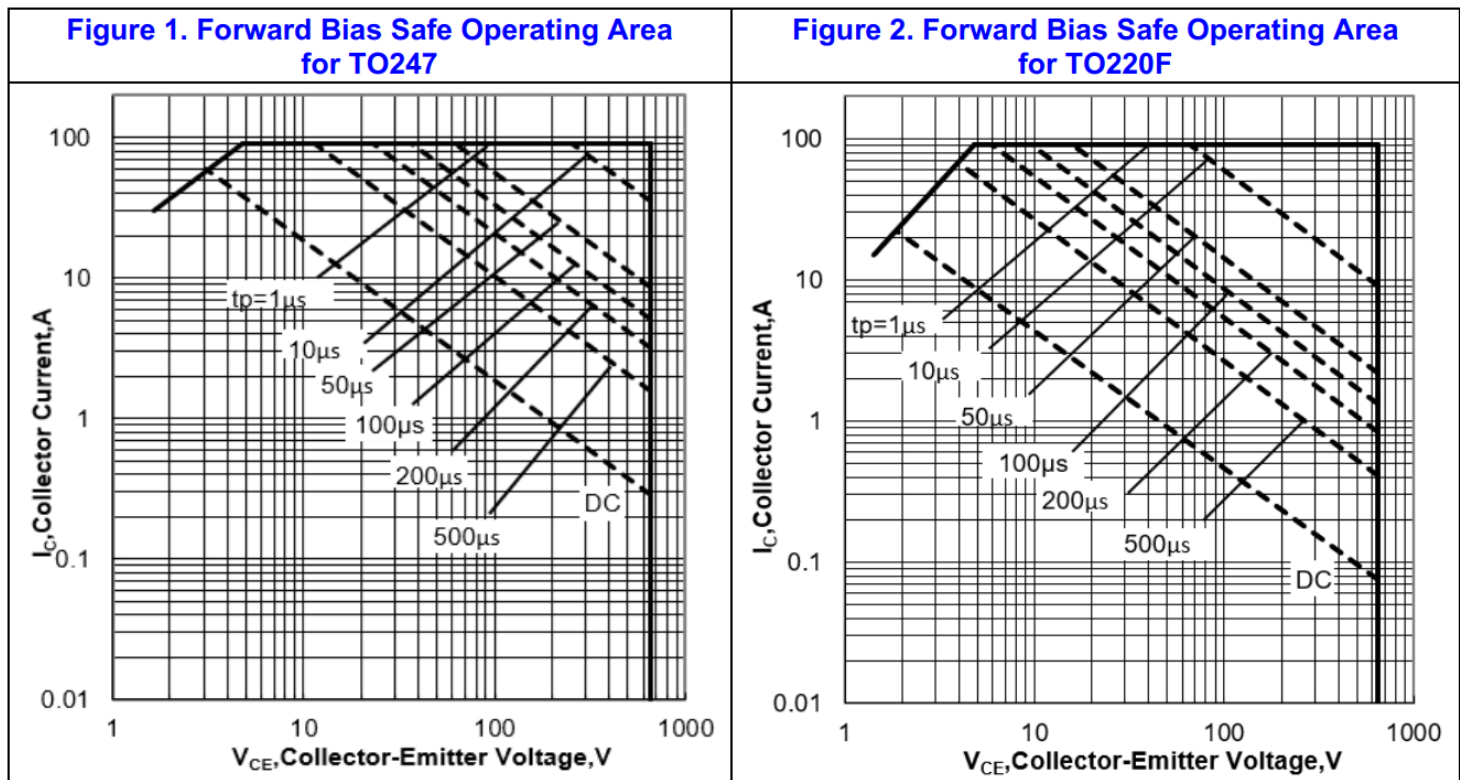
项目 Parameter	符号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
集电极-发射极击穿电压 Collector-Emmitter Voltage	BV _{CES}	V _{GE} =0V, I _C =250uA	650	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{CES} /ΔT _J	I _C =1mA, referenced to 25°C	-	0.65	-	V/°C
零栅压下集电极漏电流 Zero Gate Voltage Collector Current	I _{CES}	V _{CE} =650V, V _{GE} =0V	-	-	4	uA
栅极体漏电流 Gate-Emitter leakage current	I _{GES(F/R)}	V _{CE} =0V, V _{GE} =±30V	-	-	±200	nA
通态特性 On-Characteristics						
阈值电压 Gate-Emmitter Threshold Voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C =1mA	4.8	5.4	6.1	V
饱和压降 Collector-Emmitter saturation Voltage	V _{CESAT}	V _{GE} =15V, I _C =30A, T _J =25°C T _J =125°C T _J =175°C	- - -	1.66 1.90 2.05	2.0 - -	V
动态特性 Dynamic Characteristics						
开启延迟时间 Turn-On delay time	td(on)	V _{GE} =15V, V _{CC} =400V, I _C =30A, R _G =5Ω, T _J =25°C, Inductive Load	-	13	-	ns
上升时间 Turn-On rise time	tr		-	9	-	ns
关断延迟时间 Turn-Off delay time	td(off)		-	68	-	ns
下降时间 Turn-Off Fall time	tf		-	57	-	ns
开启损耗 Turn-on energy	E _{on}		-	0.53	-	mJ
关断损耗 Turn-off energy	E _{off}		-	0.48	-	
总的开关损耗 Total switching energy	E _{ts}		-	1.01	-	
开启延迟时间 Turn-On delay time	td(on)	V _{GE} =15V, V _{CC} =400V, I _C =30A, R _G =5Ω, T _J =175°C, Inductive Load	-	12	-	ns
上升时间 Turn-On rise time	tr		-	11	-	ns
关断延迟时间 Turn-Off delay time	td(off)		-	83	-	ns
下降时间 Turn-Off Fall time	tf		-	96	-	ns
开启损耗 Turn-on energy	E _{on}		-	0.60	-	mJ
关断损耗 Turn-off energy	E _{off}		-	0.70	-	
总的开关损耗 Total switching energy	E _{ts}		-	1.30	-	
栅极电荷总量 Total Gate Charge	Q _g	V _{CE} =520V, I _C =30A, V _{GE} =15V	-	66	-	nC
栅极-发射极电荷 Gate-emitter charge	Q _{ge}		-	27	-	
栅极-集电极电荷 Gate-collector charge	Q _{gc}		-	18	-	
集电极短路电流 Short circuit collector current (最大值100sc; 短路时间间隔: ≥1.0s)	I _{C(sc)}	V _{GE} =15V, V _{CC} ≤400V, t _{sc} ≤5us, T _J ≤175°C		120		A
栅极电阻 Gate Resistance	R _g	f=1.0MHz, V _{CE} OPEN	-	3.6	-	Ω
输入电容 Input capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f=1.0MHz	-	1446	-	pF
输出电容 Output capacitance	C _{oes}		-	64	-	
反向传输电容 Reverse transfer capacitance	C _{res}		-	15	-	

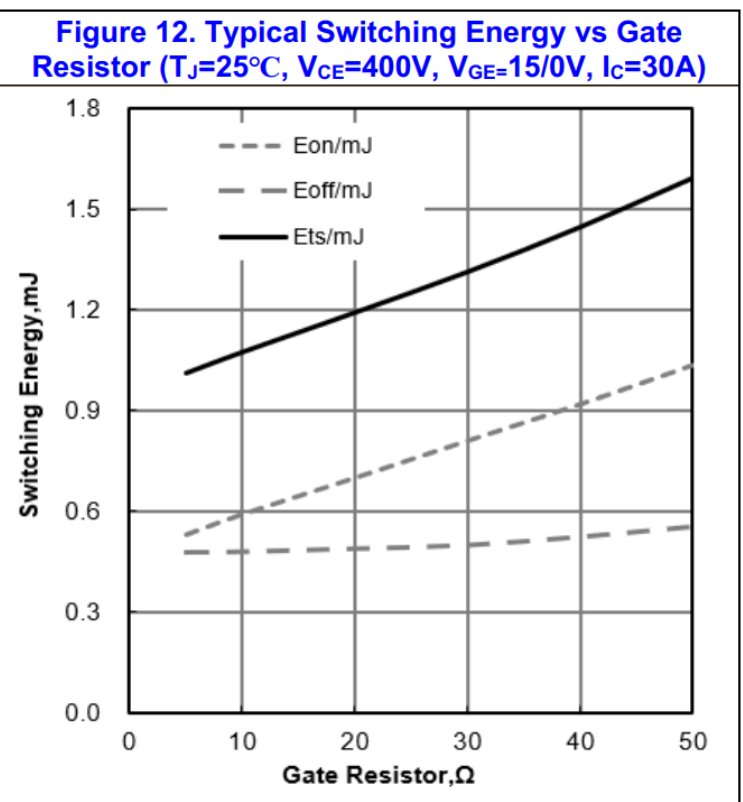
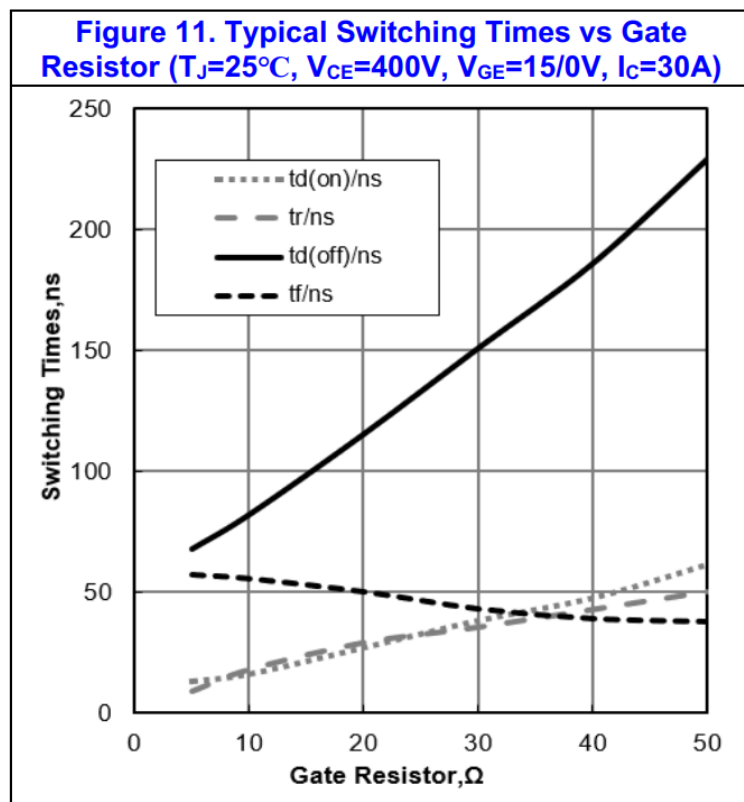
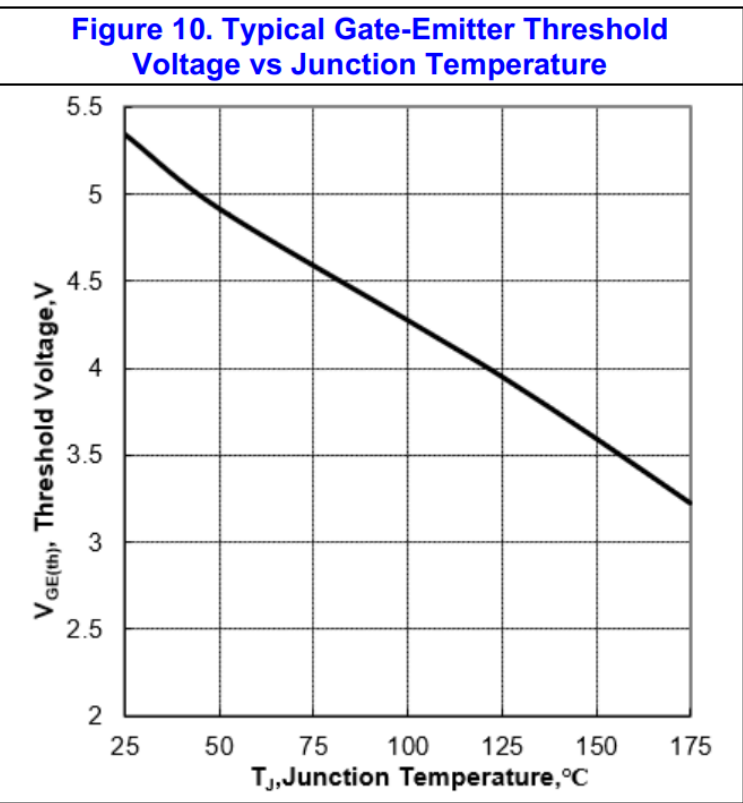
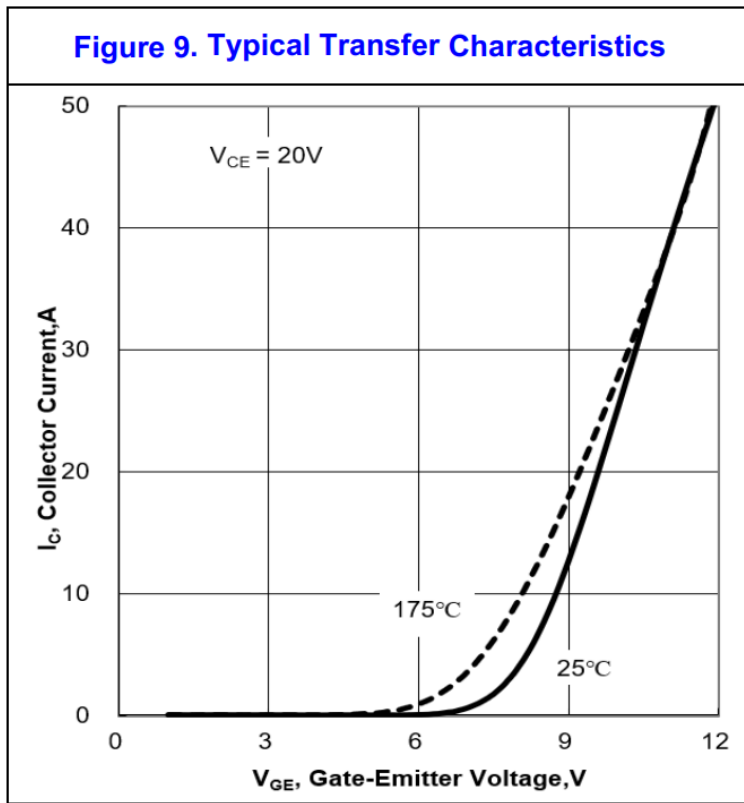
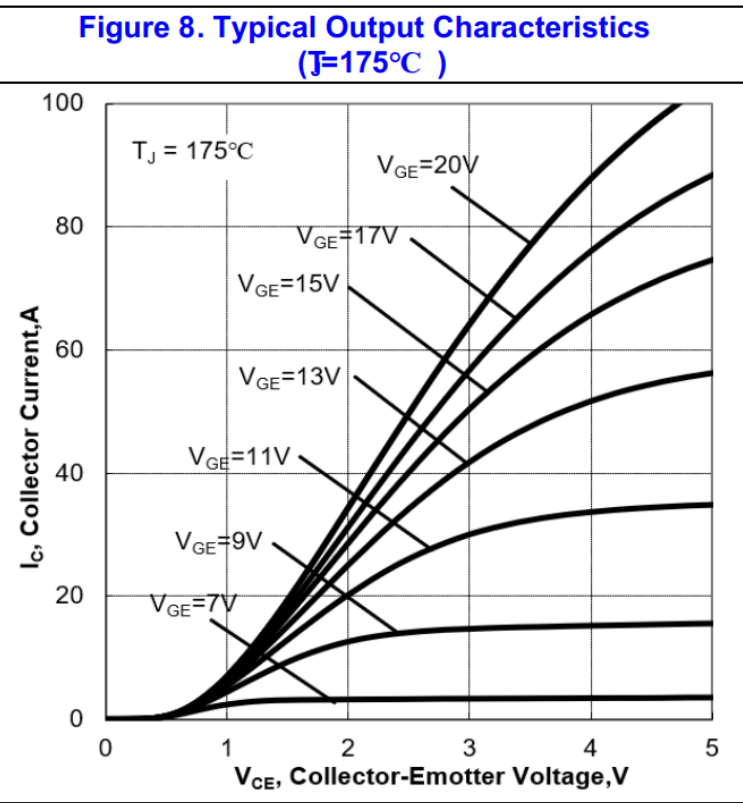
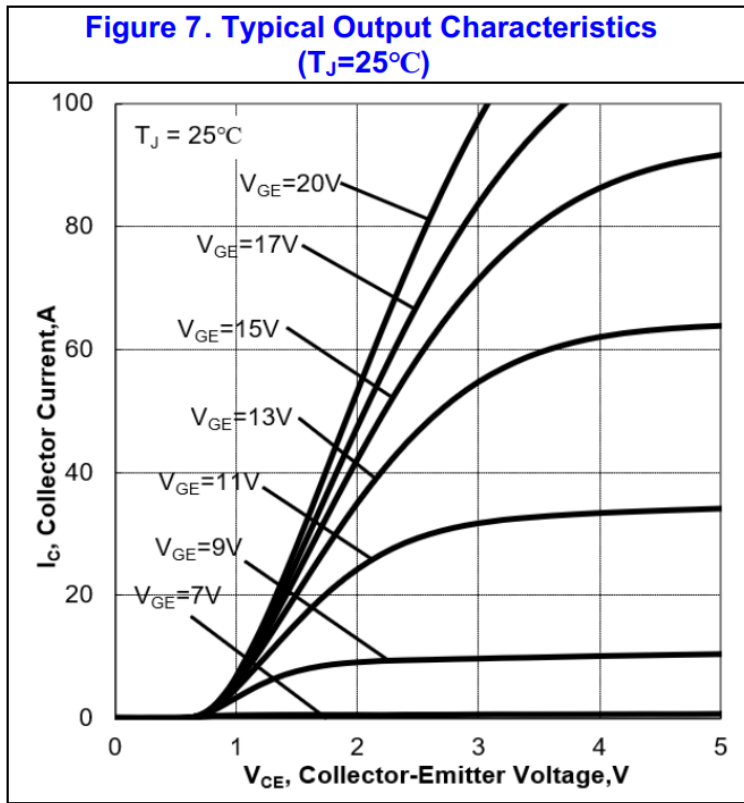
二极管特性 Diode characteristics						
项目 Parameter	符号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
正向压降 Diode Forward Voltage	V_{FM}	$I_F=30A$	-	1.64	2.0	V
反向恢复时间 Reverse recovery time	trr	$I_F=15A,$ $di/dt=200A/\mu s,$ $T_J=25^\circ$	-	145	-	ns
反向恢复电流 Reverse recovery current	Irr		-	4.2	-	A
反向恢复电荷 Reverse recovery charge	Qrr		-	326	-	nC
反向恢复时间 Reverse recovery time	trr	$I_F=30A,$ $di/dt=200A/\mu s,$ $T_J=25^\circ$	-	158	-	ns
反向恢复电流 Reverse recovery current	Irr		-	4.5	-	A
反向恢复电荷 Reverse recovery charge	Qrr		-	374	-	nC
反向恢复时间 Reverse recovery time	trr	$I_F=15A,$ $di/dt=200A/\mu s,$ $T_J=175^\circ$	-	193	-	ns
反向恢复电流 Reverse recovery current	Irr		-	8.5	-	A
反向恢复电荷 Reverse recovery charge	Qrr		-	916	-	nC
反向恢复时间 Reverse recovery time	trr	$I_F=30A,$ $di/dt=200A/\mu s,$ $T_J=175^\circ$	-	269	-	ns
反向恢复电流 Reverse recovery current	Irr		-	8.7	-	A
反向恢复电荷 Reverse recovery charge	Qrr		-	1126	-	nC

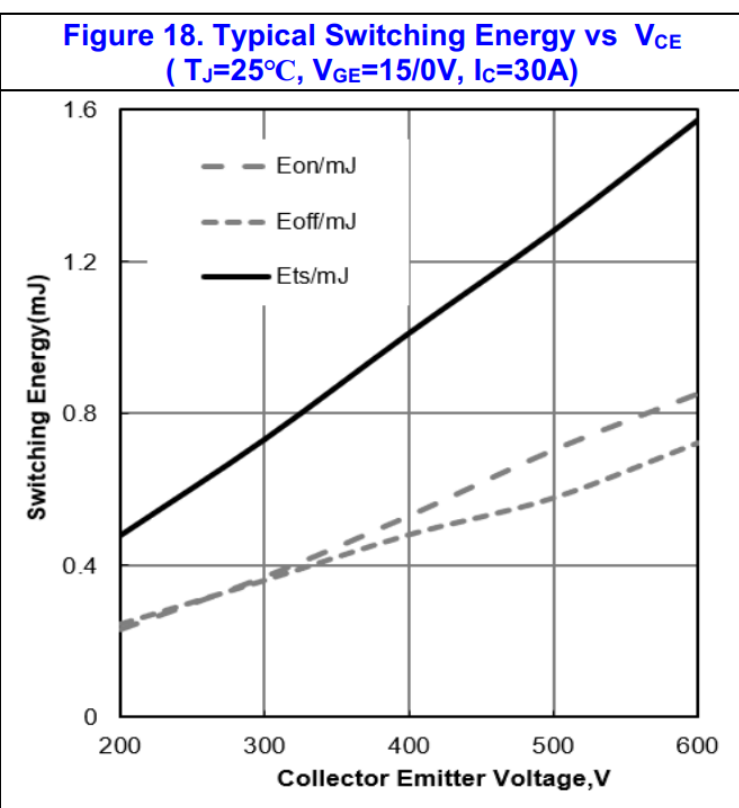
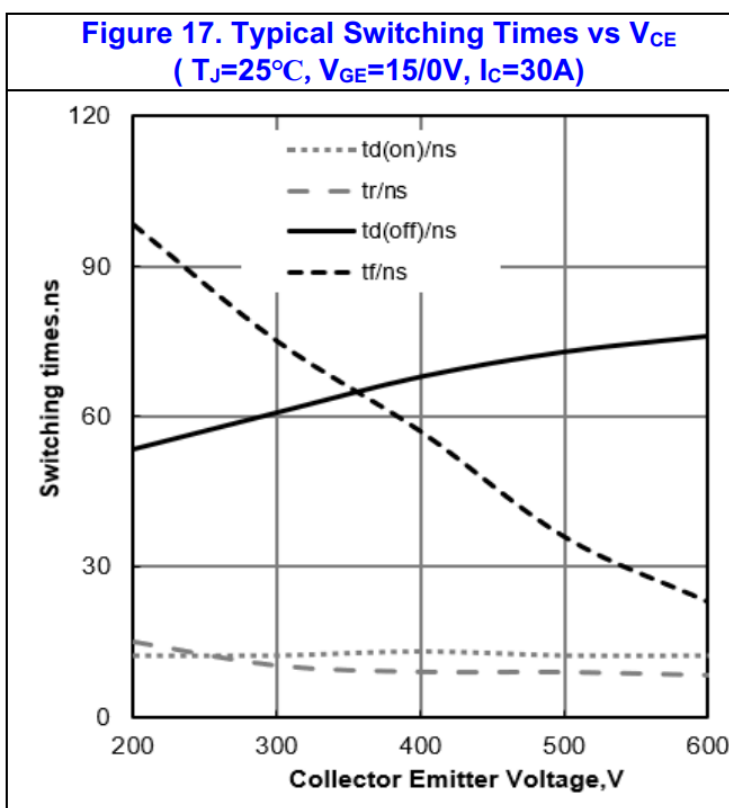
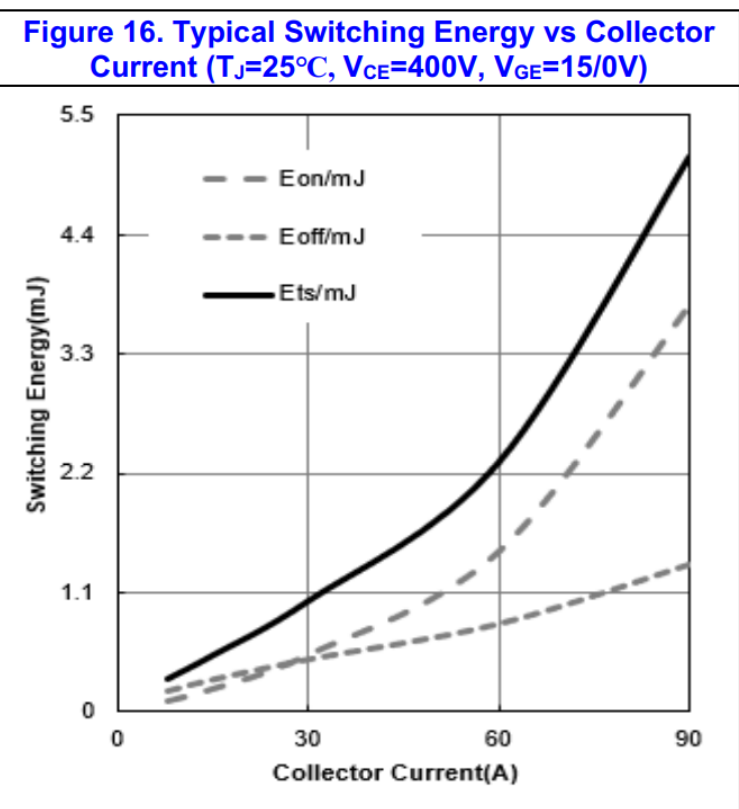
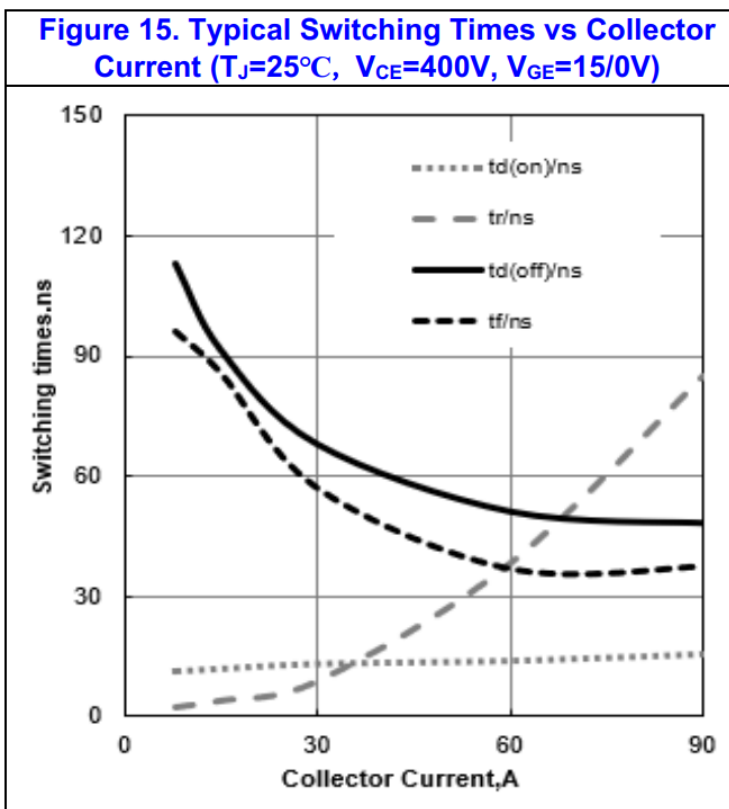
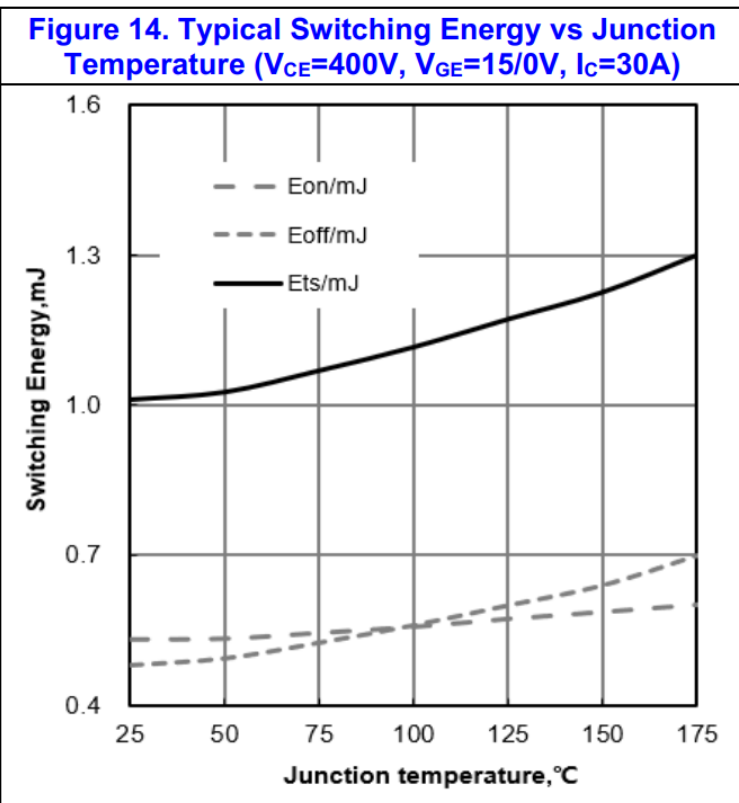
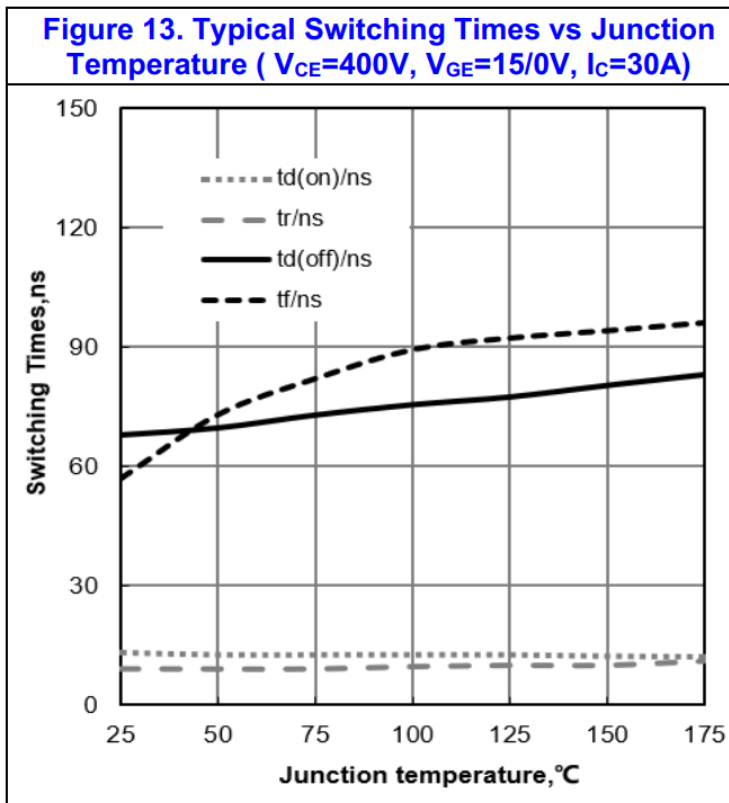
热特性 THERMAL CHARACTERISTIC

项目 Parameter	符号 Symbol	FHF30T65AL	FHA30T65AL	单位 Unit
结到管壳的热阻 (IGBT) Thermal Resistance, Junction to Case (IGBT)	Rth(j-c)	3.1	0.8	°C/W
结到管壳的热阻 (Diode) Thermal Resistance, Junction to Case (Diode)	Rth(j-c)	4.4	0.8	°C/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	78	40	°C/W

特性曲线
(ELECTRICAL CHARACTERISTICS (curves))







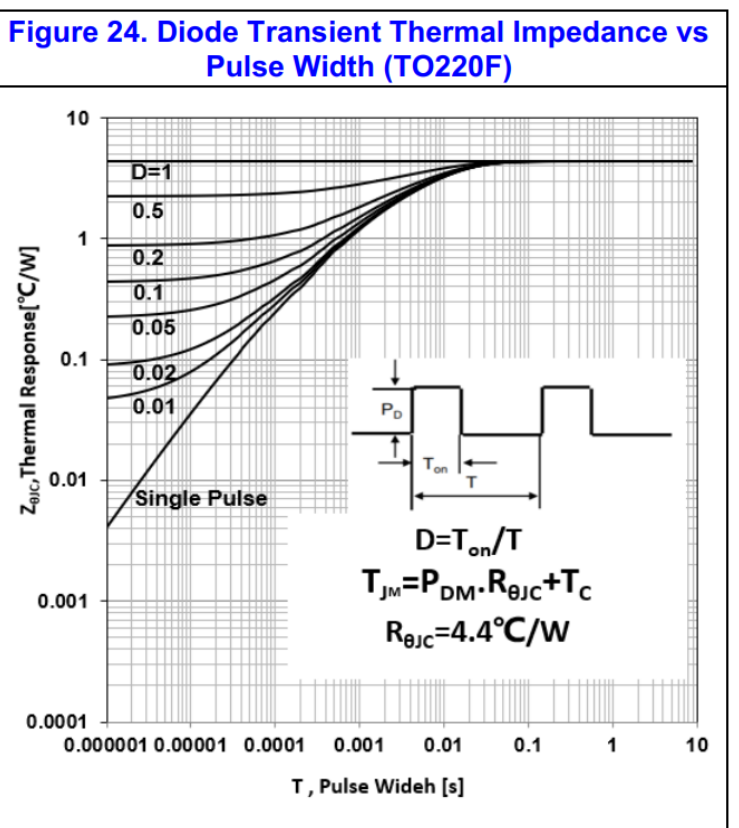
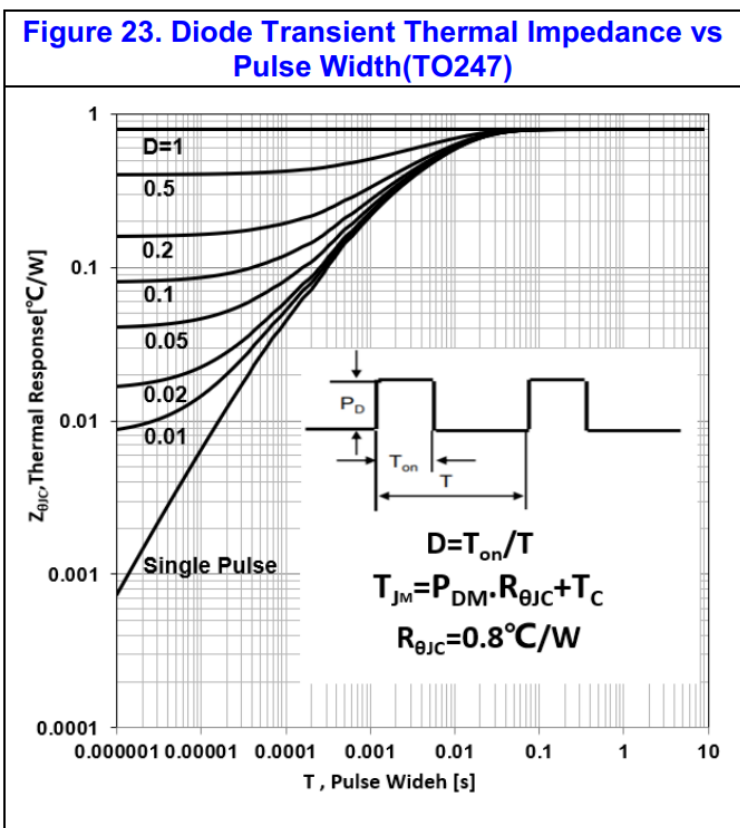
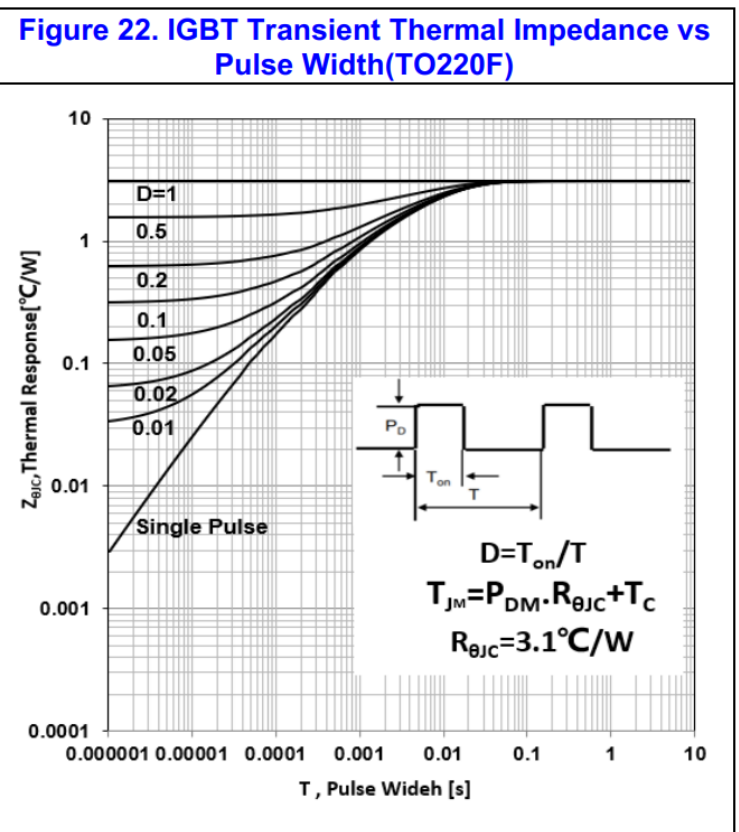
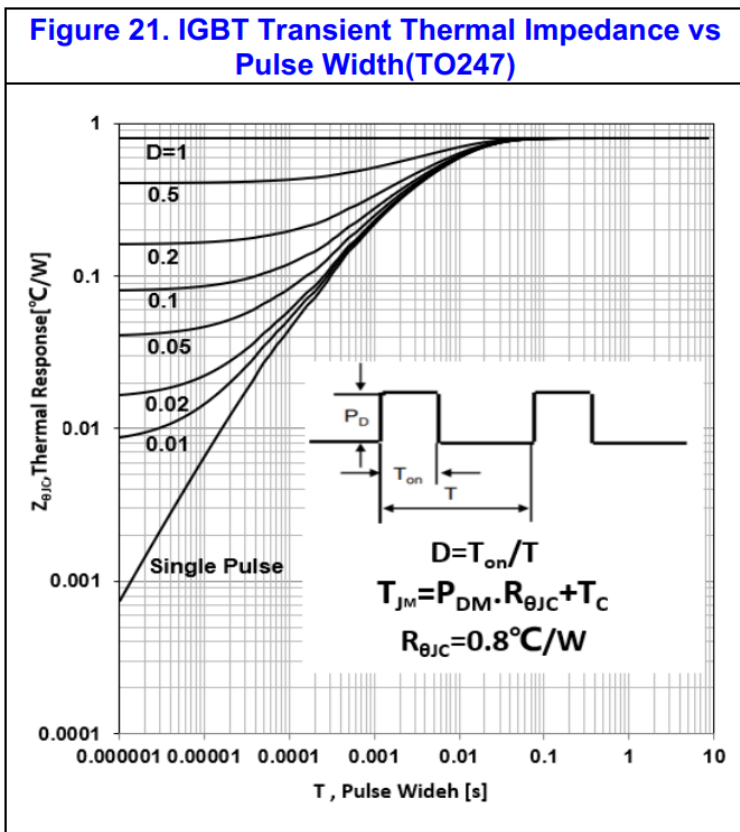
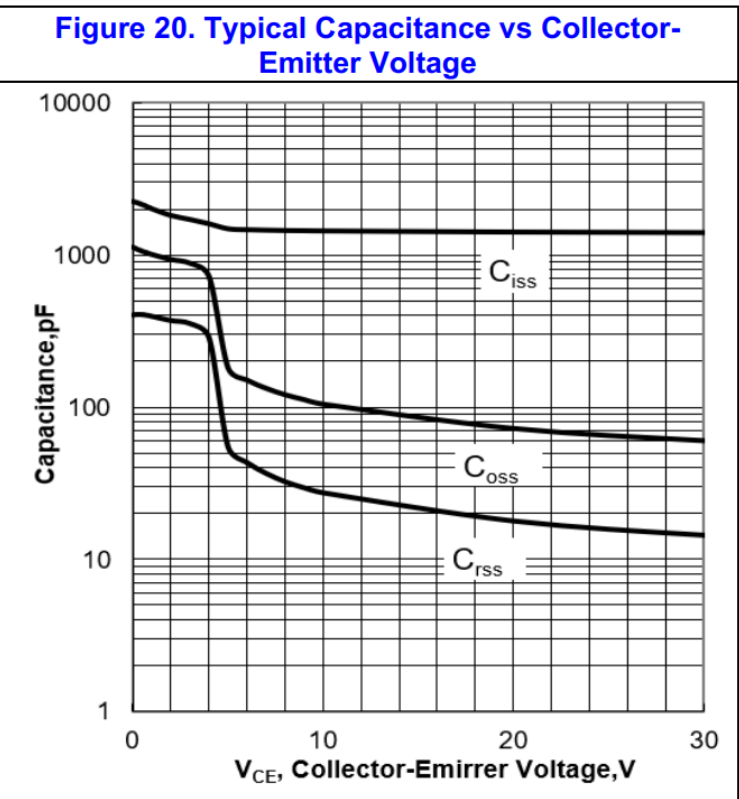
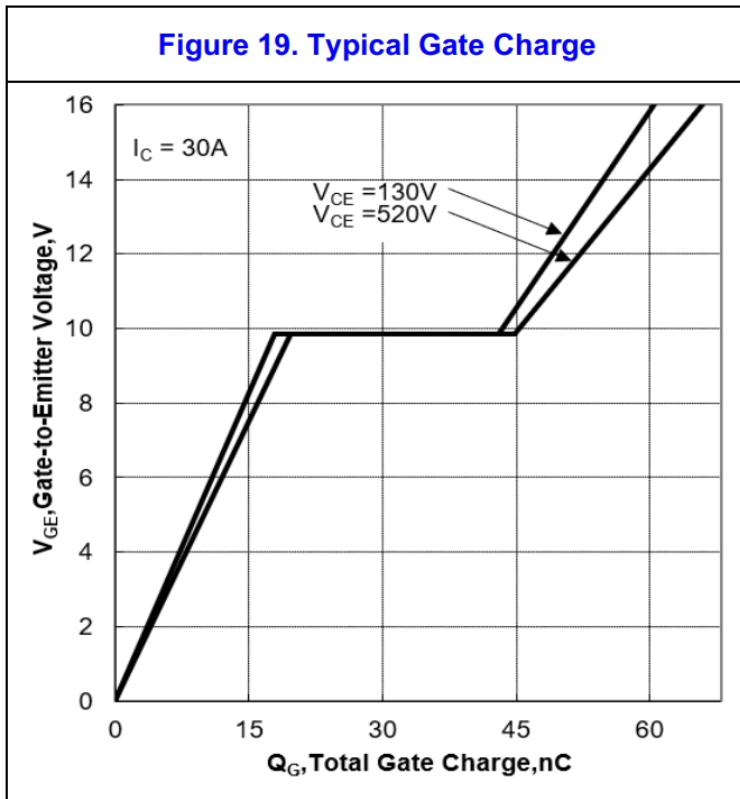
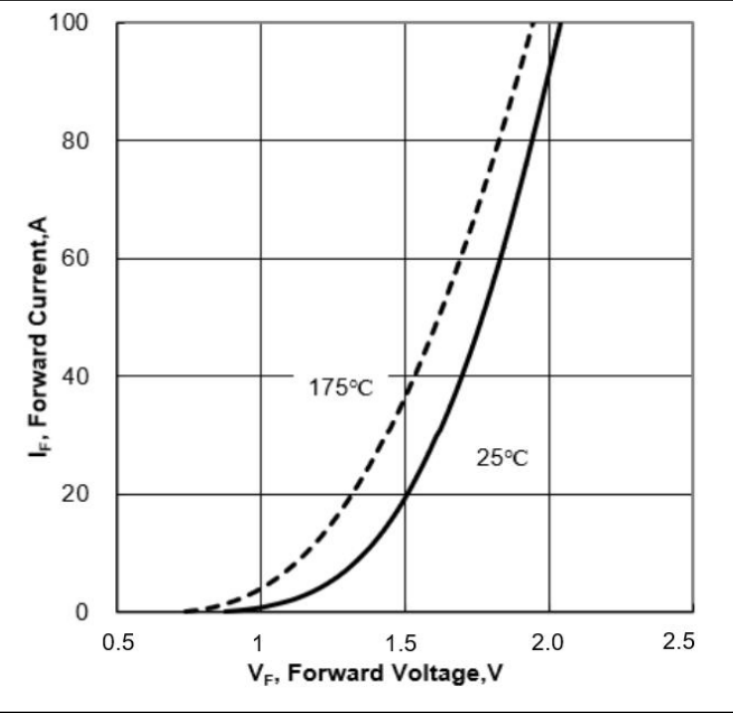
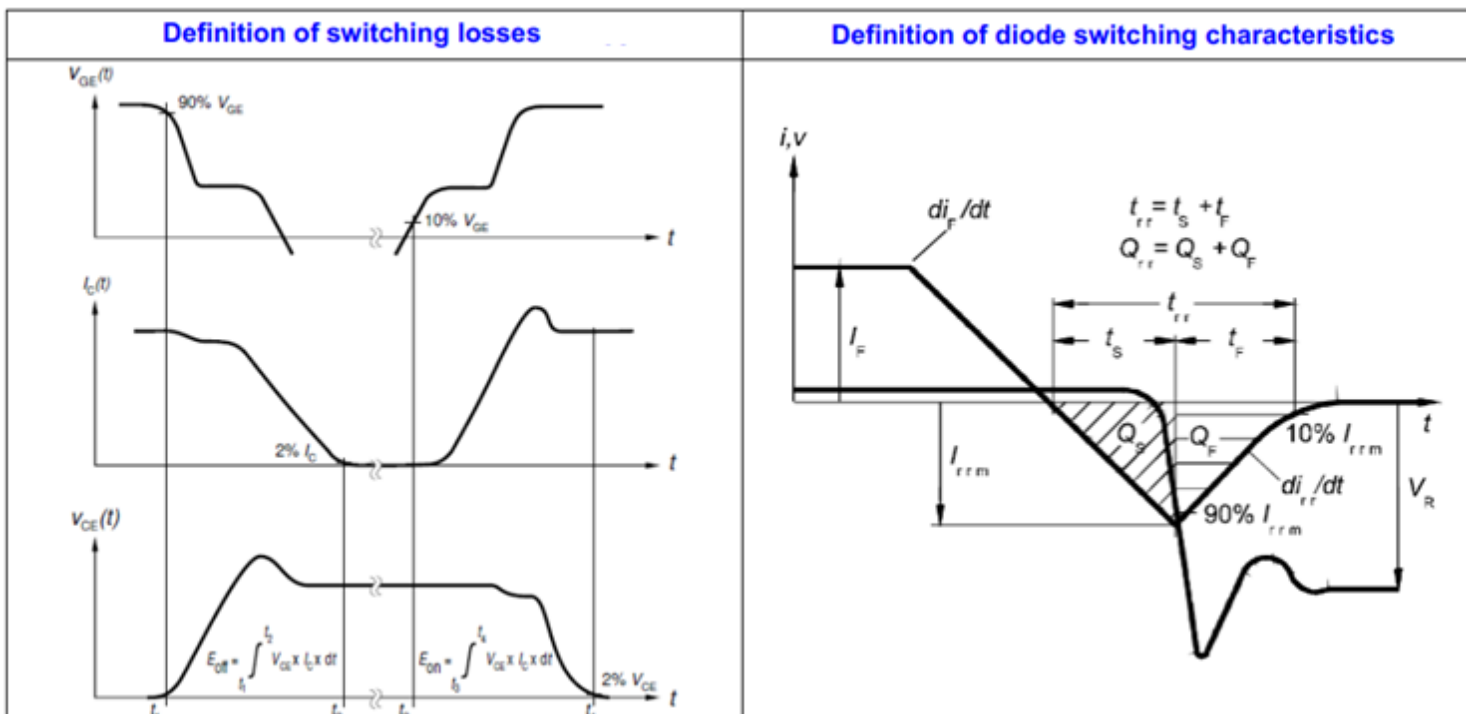
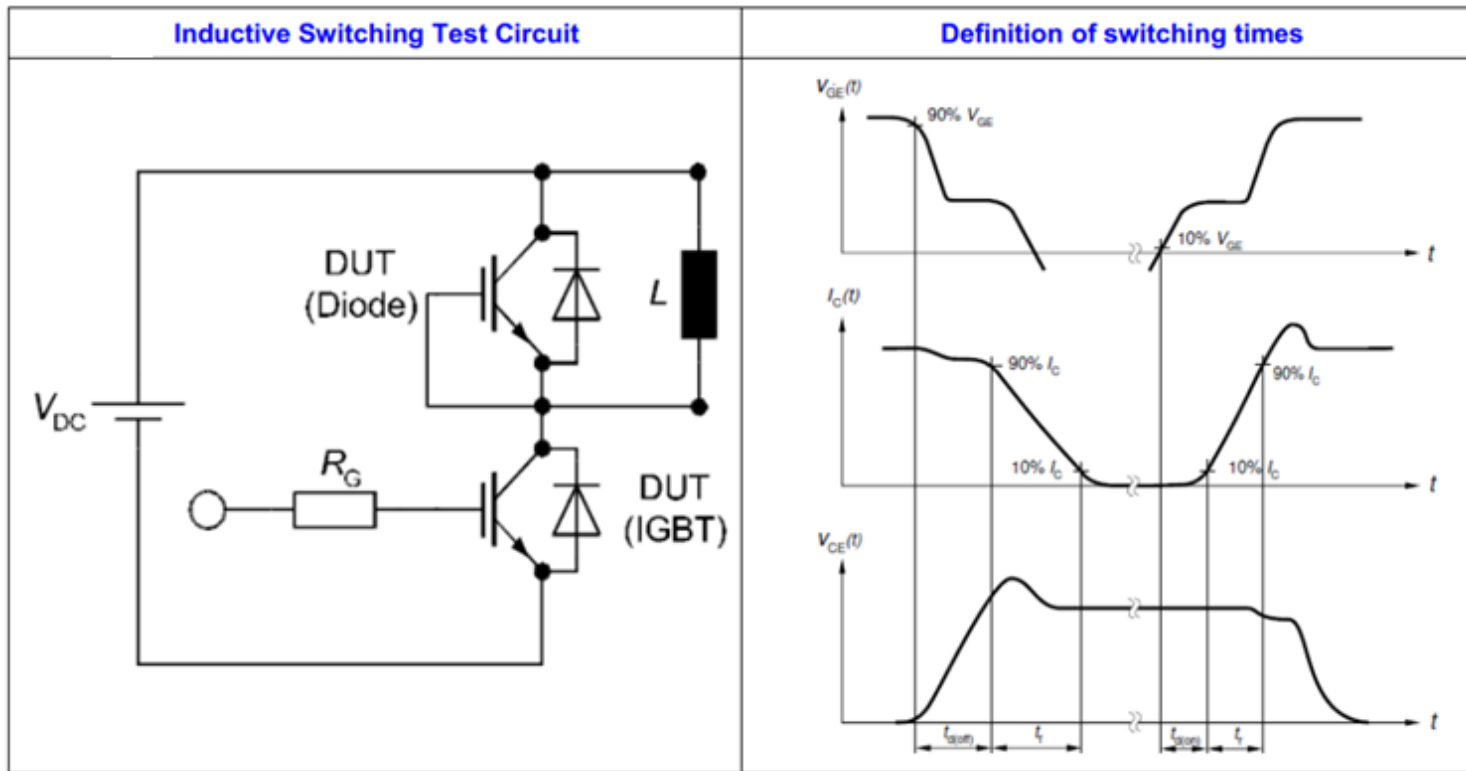


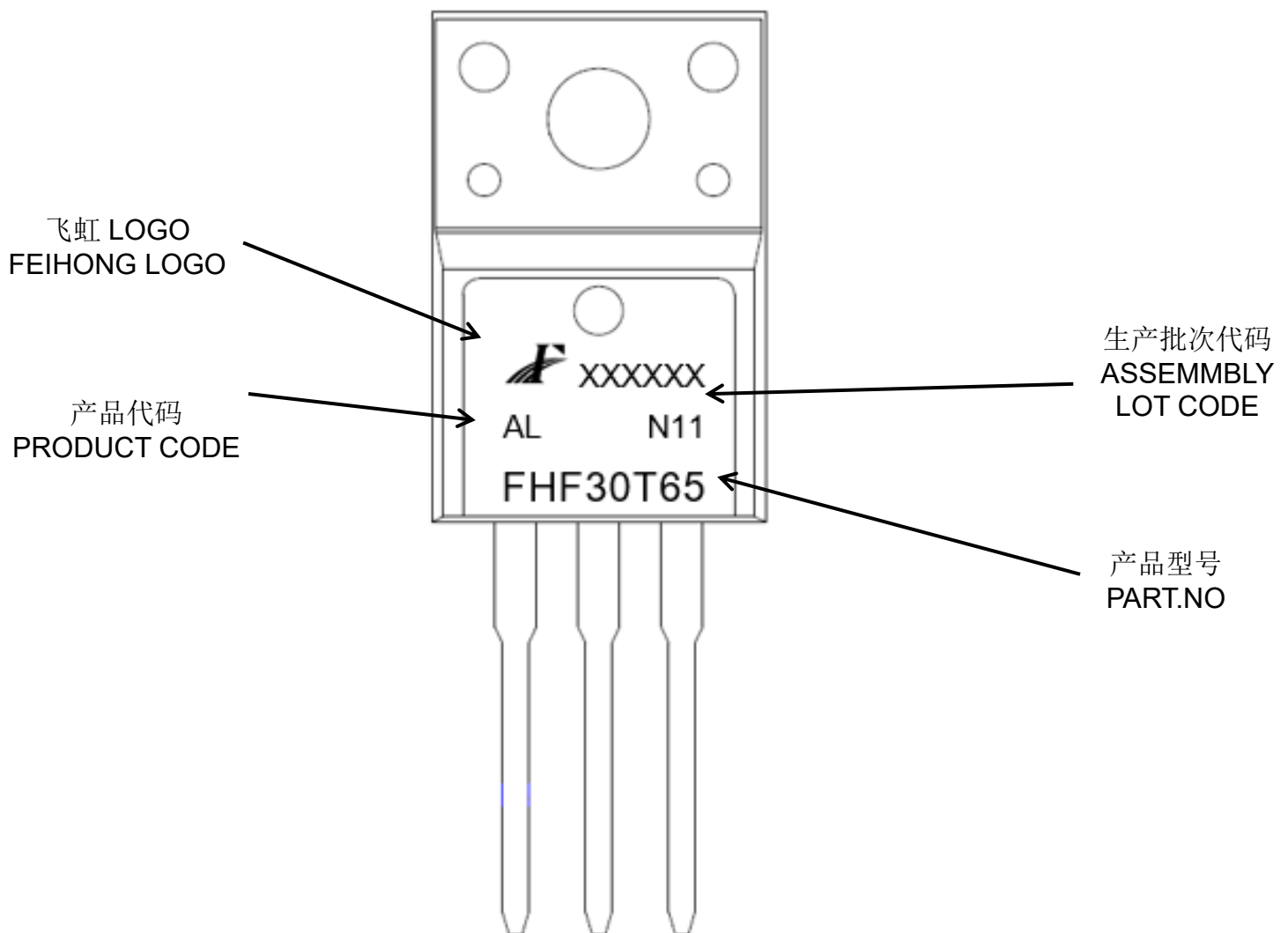
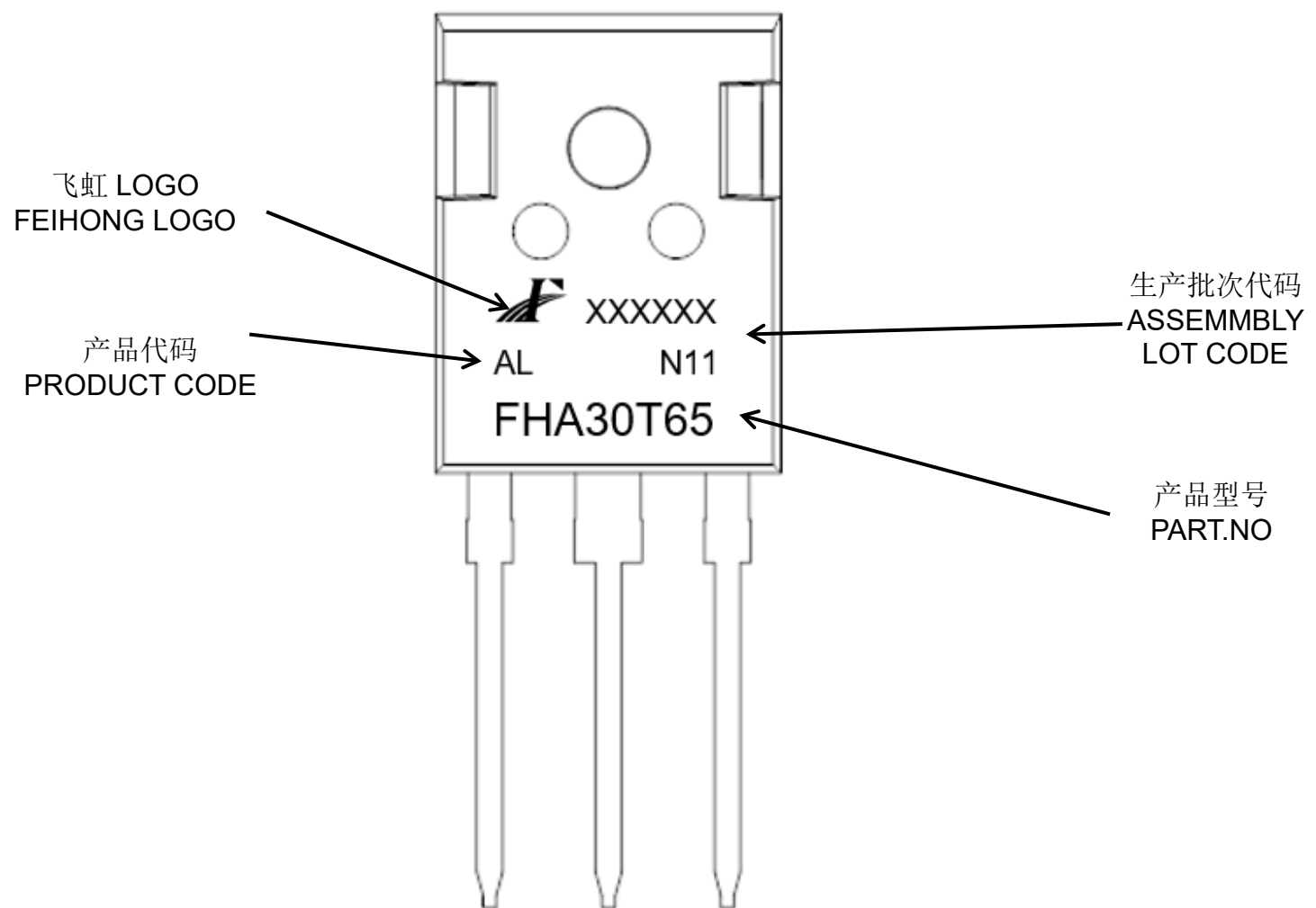
Figure 25. Typical Diode Forward Current vs Forward Voltage



Test Circuit and Waveform



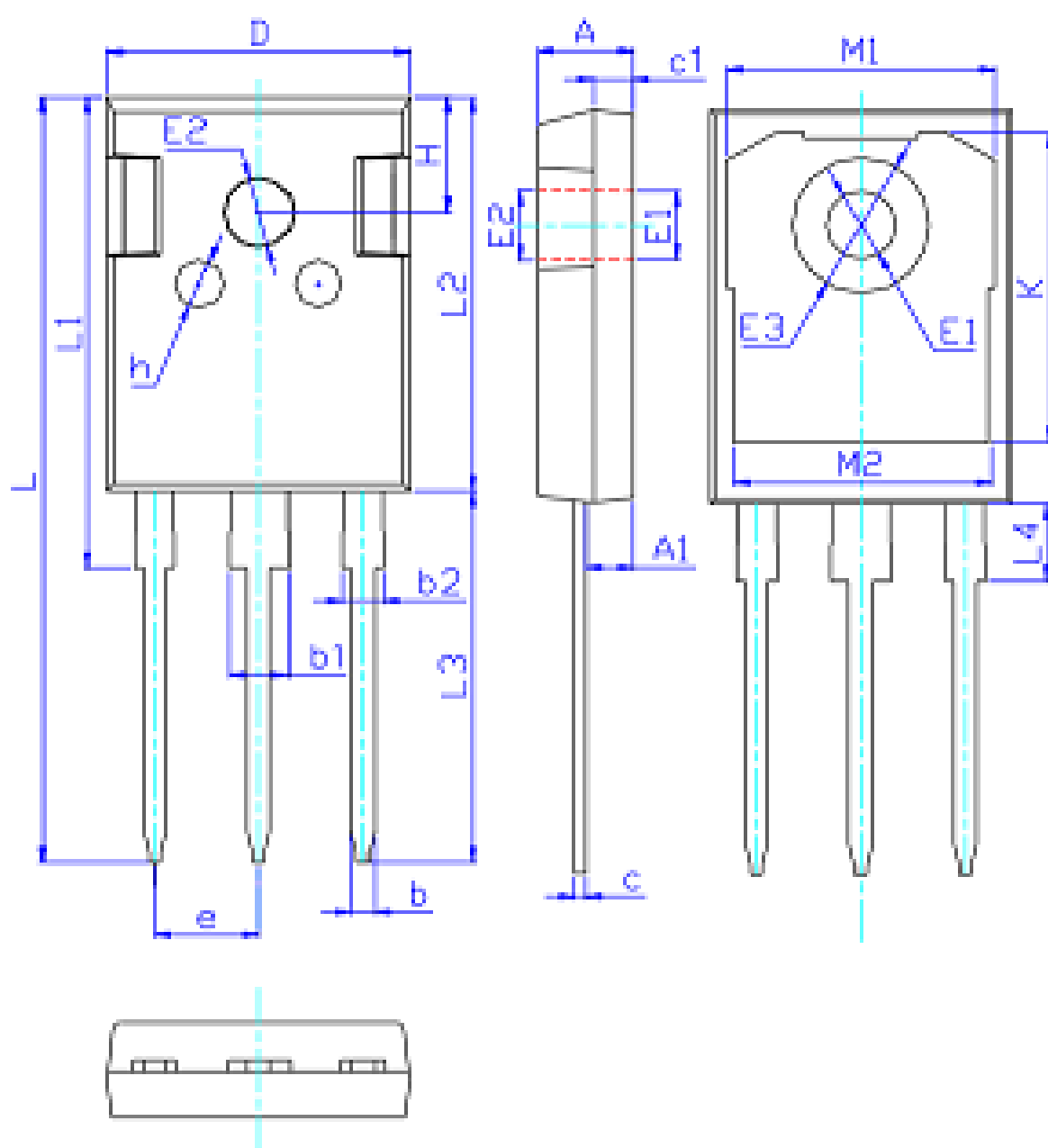
印记 Marking:



外形尺寸:

Package Dimension:

TO-247

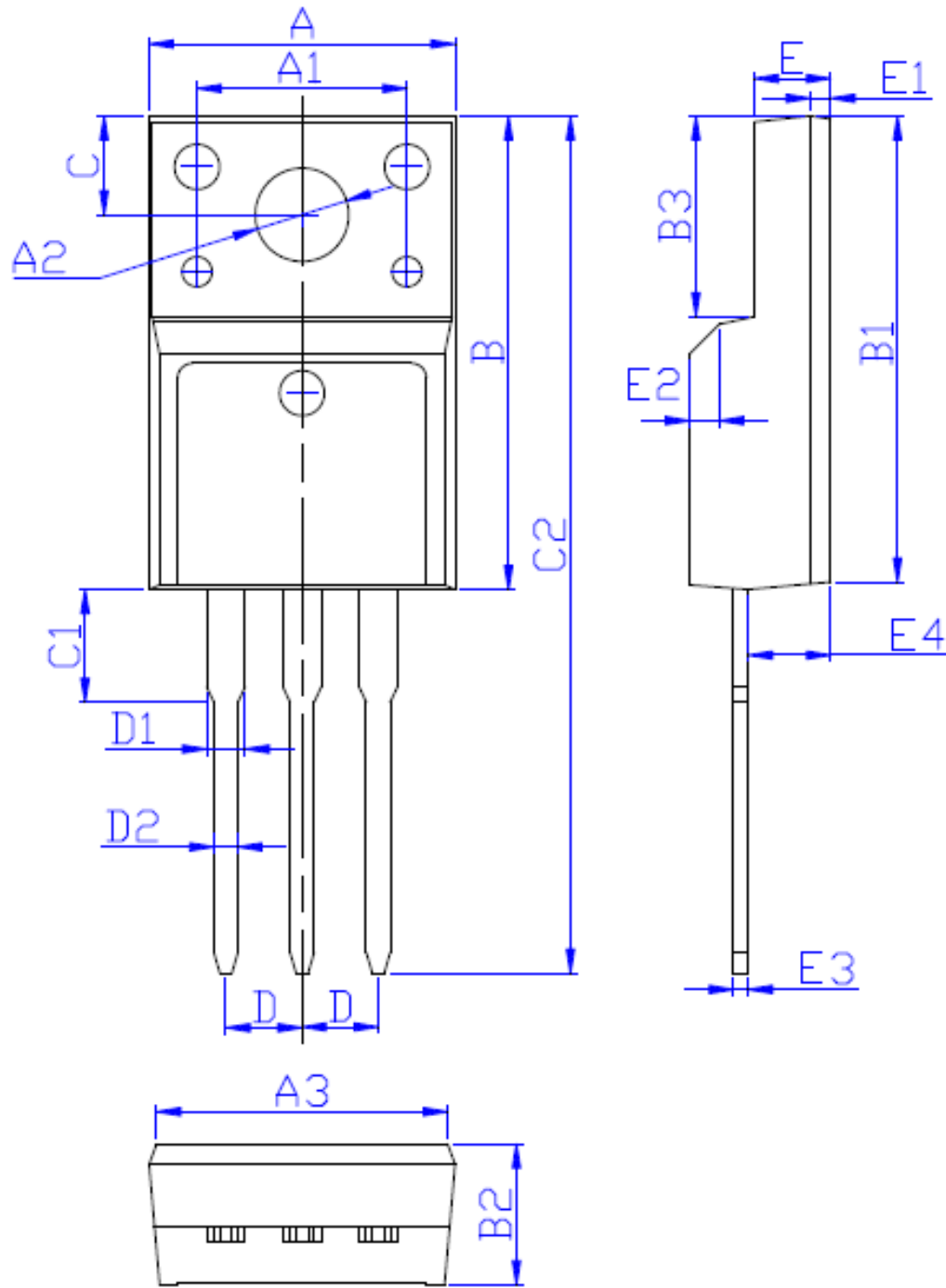


标注	尺寸(mm)
A	5.00±0.05
A1	2.41±0.05
b	1.2±0.05
b1	3.05±0.05
b2	2.05±0.05
c	0.60±0.05
c1	2.00±0.05
D	15.80±0.10
E1	3.60±0.05
E2	3.70±0.05
E3	7.19±0.05
L	40.92±0.10
L1	24.95±0.10
L2	21.00±0.10
L3	19.92±0.10
L4	4.10±0.05
e	5.44±0.05
H	6.15±0.05
h	2.50±0.05
K	16.45±0.10
M1	14.00±0.10
M2	13.30±0.10

外形尺寸:

Package Dimension:

TO-220F



DIM	MILLIMETERS
A	10.16±0.30
A1	7.00±0.20
A2	3.12±0.20
A3	9.70±0.30
B	15.90±0.50
B1	15.60±0.50
B2	4.70±0.30
B3	6.70±0.30
C	3.30±0.25
C1	3.25±0.30
C2	28.70±0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80±0.20
E	2.55±0.25
E1	0.70±0.25
E2	1.0×45°
E3	0.50±0.20
E4	2.75±0.30

(Unit: mm)