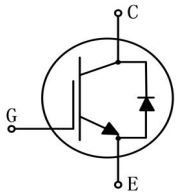
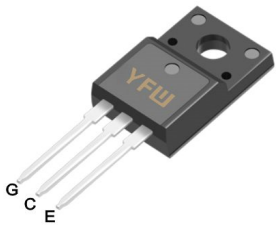
650V N-Channel Enhancement Mode Power IGBT

MAIN CHARACTERISTICS

$I_{C\ @TC=100℃}$	30A
V_{CE}	650V
VCE(sat)-typ	1.7V





TO-220F

FEATURES

- High ruggedness performance
- 10μs short circuit capability
- Positive VCE (sat) temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation
- RoHS compliant.

APPLICATIONS

- Home appliances
- Motor drives
- General inverter

MECHANICAL DATA

- Case: Molded plastic
- Mounting Position: Any
- Molded Plastic: UL Flammability Classification Rating 94V-0
- Lead free in compliance with EU RoHS 2011/65/EU directive
- Solder bath temperature 275℃ maximum,10s per JESD 22-B106

Maximum Ratings

Characteristics	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	650	V
Gate-emitter voltage	V_{GES}	±20	V
Continuous collector current (TC=25℃)	I_C	60	A
Continuous collector current (TC=100℃)		30	A
Pulsed collector current, tp limited by Tvjmax	I_{CM}	120	A
Diode continuous forward current (TC=100℃)	I_F	30	A
Diode maximum current, tp limited by Tvjmax	I_{FM}	80	A
Power dissipation (TC=25℃)	P_{tot}	50	W
Power dissipation (TC=100℃)		25	W
Operating junction temperature range	T_{vj}	-40 to +175	°C
Storage temperature range	T_{stg}	-55 to +150	°C

Thermal characteristics

Characteristics	Symbol	Values		Unit
		Typ	Max.	
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	-	3	K/ W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	-	4.5	K/ W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	-	50	K/ W

Note1:Pulse test: 300 μs pulse width, 2 % duty cycle

Electrical characteristics of IGBT at Tvj=25℃ unless otherwise specified

Characteristics	Test Condition	Symbol	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	V_{GE}=0V, I_C=250μA	B_{VCES}	650	-	-	V
Collector-emitter leakage current	V_{CE}=650V, V_{GE}=0V	I_{CES}	-	-	50	μA
Gate leakage current, forward	V_{GE}=±20V, V_{CE}=0V	I_{GES}	-	-	±100	nA
Gate-emitter threshold voltage	V_{GE}=V_{CE}, I_C=1mA	$V_{GE(th)}$	5.3	5.7	5.9	V
Collector-emitter saturation voltage	V_{GE}=15 V, I_C=30A	$V_{CE(sat)}$	-	1.7	-	V
	V_{GE}=15V, I_C=30A, T_{vj}=175℃		-	2.2	-	V
Input capacitance	V_{CE}=25V V_{GE}=0V f =1MHz	C_{ies}	-	1978	-	pF
Output capacitance		C_{oes}	-	100	-	pF
Reverse transfer capacitance		C_{res}	-	23	-	pF
Total gate charge	V_{CC}=520V V_{GE}=15V I_C=30A	Q_g	-	103	-	nC
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=30A R_G=10Ω Inductive load	td(on)	-	30	-	ns
Rise time		tr	-	39	-	ns
Turn-off delay time		td(off)	-	151	-	ns
Fall time		tf	-	29	-	ns
Turn-on energy		Eon	-	0.95	-	mJ
Turn-off energy		Eoff	-	0.6	-	mJ
Total switching energy		Ets	-	1.55	-	mJ
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=30A R_G=10Ω Inductive load Tvj =175℃	td(on)	-	28	-	ns
Rise time		tr	-	40	-	ns
Turn-off delay time		td(off)	-	169	-	ns
Fall time		tf	-	71	-	ns
Turn-on energy		Eon	-	1.5	-	mJ
Turn-off energy		Eoff	-	0.8	-	mJ
Total switching energy		Ets	-	2.3	-	mJ
Diode forward voltage	I_F=30A	VF	-	1.4	-	V
	I_F=30A,Tvj=175℃		-	1.2	-	V
Diode reverse recovery time	V_R=400V I_F=30A diF/dt=--550A/μs	trr	-	105	-	ns
Diode peak reverse recovery current		Irrm	-	16	-	A
Diode reverse recovery charge		Qrr	-	876	-	nC
Diode reverse recovery time	V_R=400V I_F=30A diF/dt=-550A/μsTvj=175℃	trr	-	171	-	ns
Diode peak reverse recovery current		Irrm	-	26	-	A
Diode reverse recovery charge		Qrr	-	2650	-	nC

RATINGS AND CHARACTERISTIC CURVES

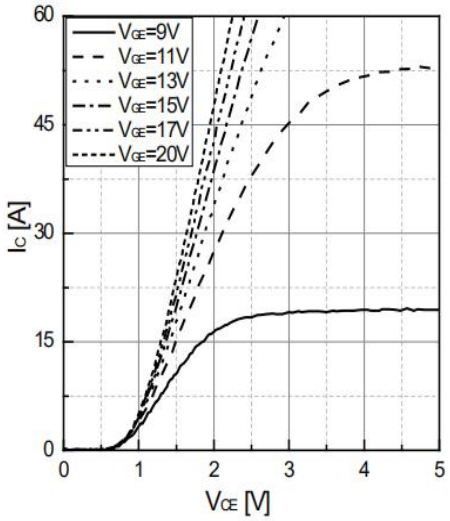


Fig 1. Typical output characteristic (T_{vj}=25℃)

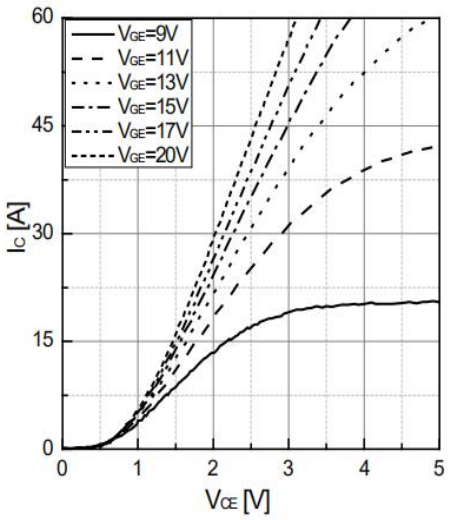


Fig 2. Typical output characteristic(T_{vj}=175℃)

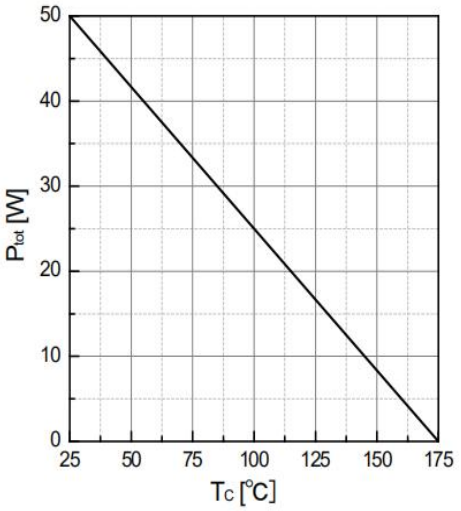


Fig 3. Power dissipation as a function of T_C

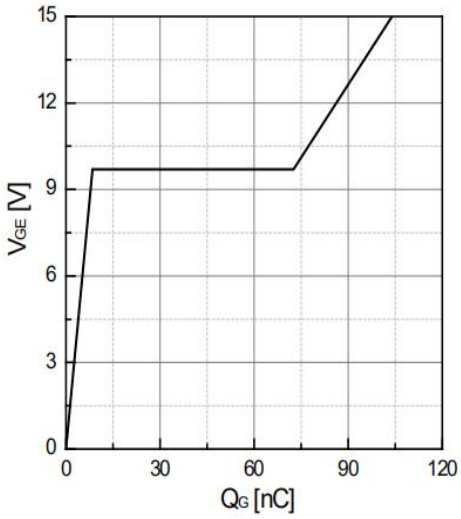


Fig 4. Typical Gate charge

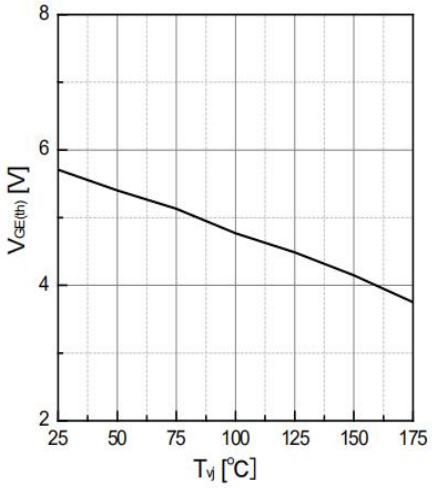


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

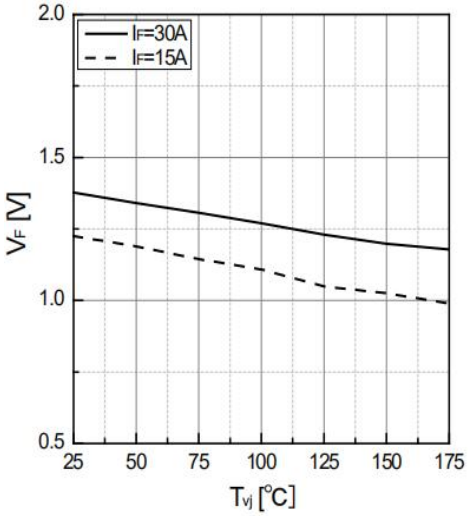


Fig 6. Typical V_F as a function of T_{vj}

RATINGS AND CHARACTERISTIC CURVES

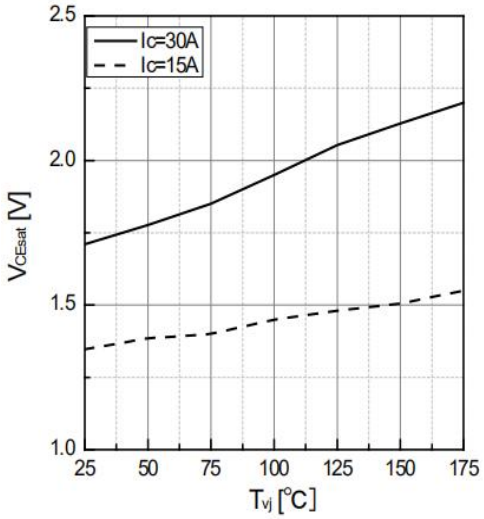


Fig 7. Typical V_{CEsat} as a function of T_{vj}

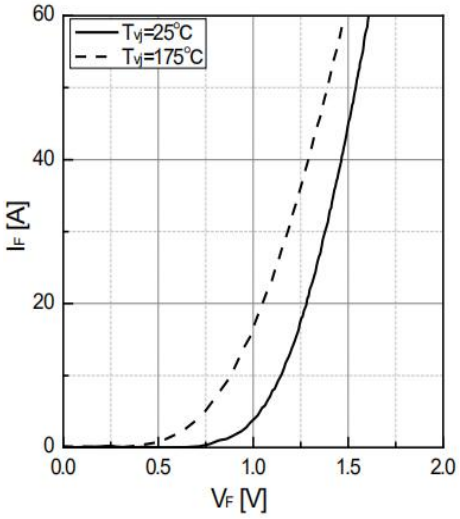


Fig 8. Typical I_F as a function of V_F

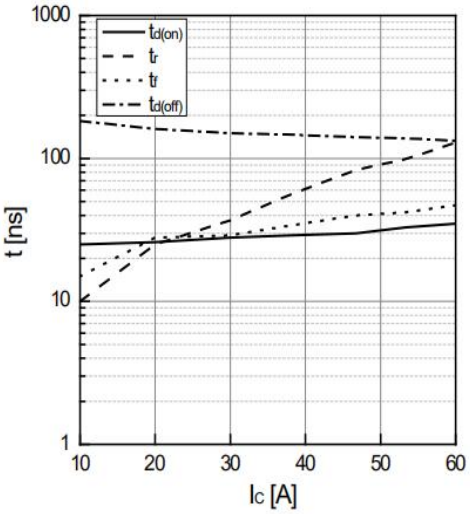


Fig 9. Typical switching time as a function of I_C

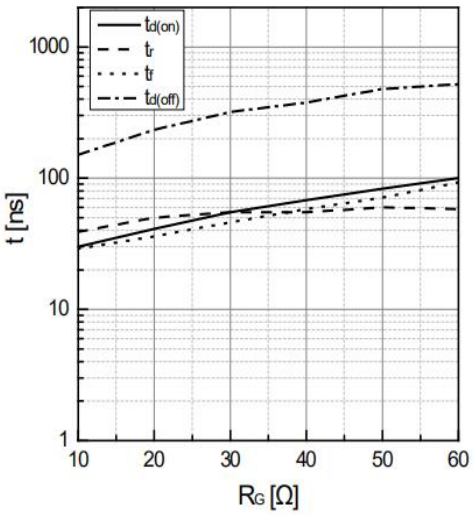


Fig 10. Typical switching times as a function of R_G

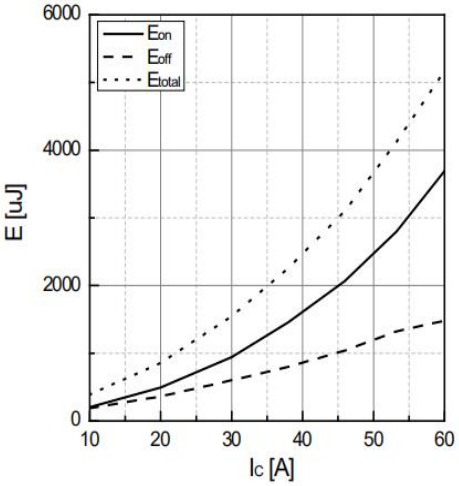


Fig 11. Typical switching energy losses as a function of I_C

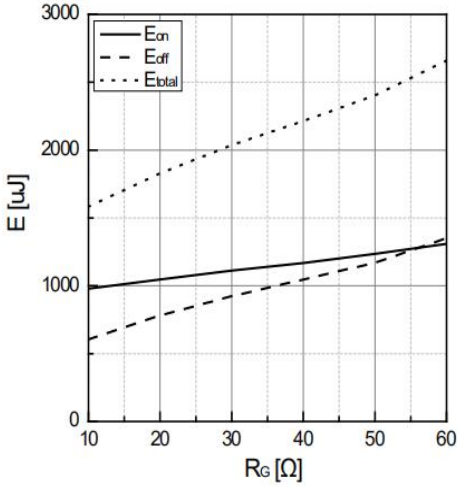


Fig 12. Typical switching energy losses as a function of R_G

RATINGS AND CHARACTERISTIC CURVES

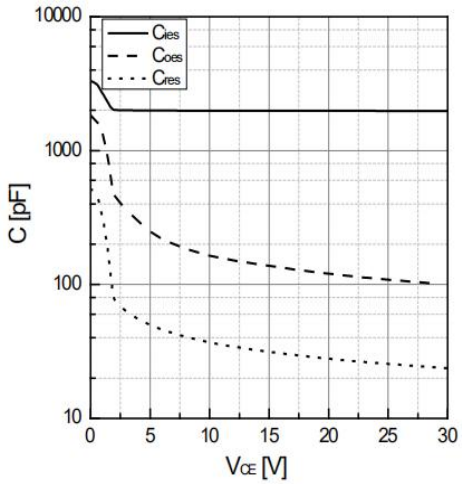
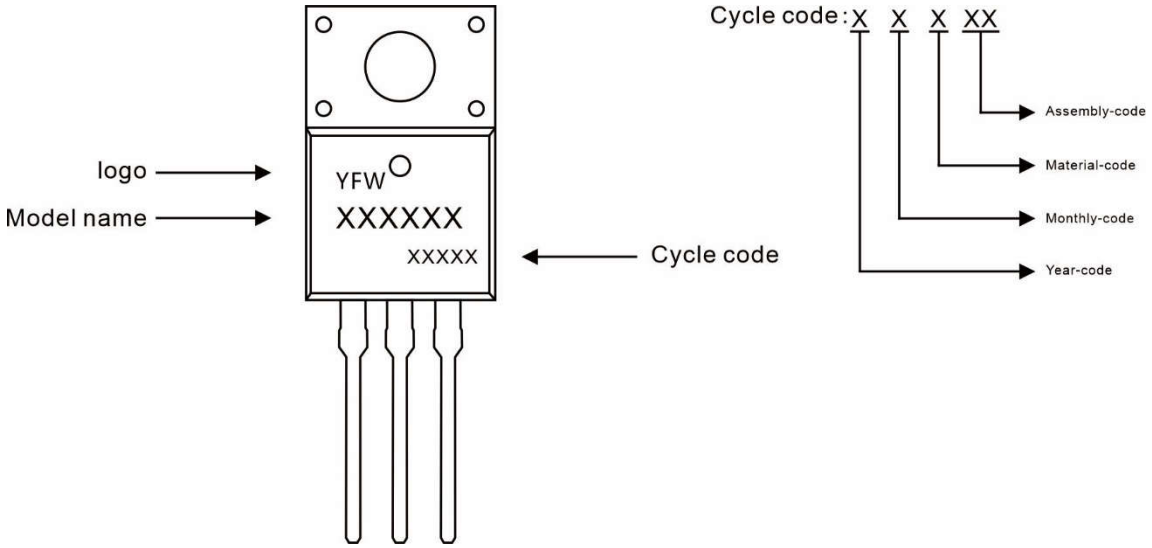


Fig 13. Typical capacitance as a function of V_{CE}
(f=1Mhz, V_{GE}=0V)

Marking Diagram

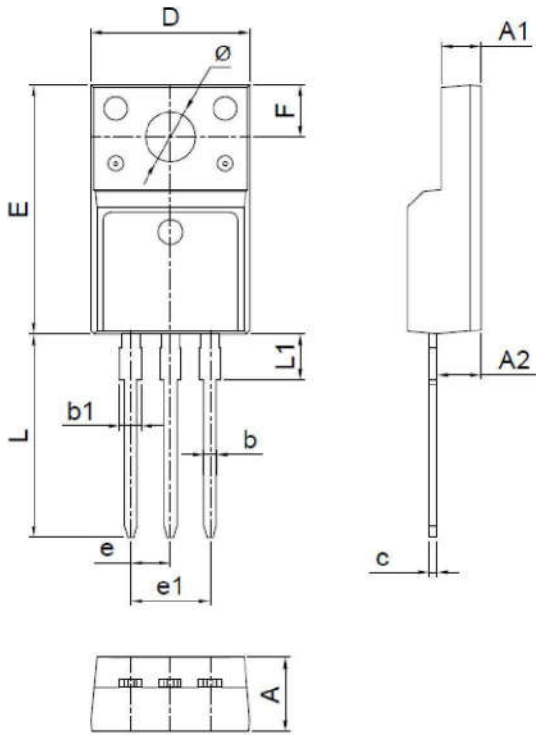


Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG30T65AF	TO-220F	0.06oz(1.74g)	50pcs/tube	1000PCS/Box 5000PCS/Carton

Package Dimensions

TO-220F



Symbol	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.66	2.86	0.105	0.113
b	0.75	0.85	0.030	0.033
b1	1.24	1.44	0.049	0.057
c	0.40	0.60	0.016	0.024
D	10.00	10.32	0.394	0.406
E	15.75	16.05	0.620	0.632
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
F	3.10	3.5	0.122	0.138
L	13.50	13.90	0.531	0.547
L1	2.90	3.30	0.114	0.130
Φ	3.10	3.30	0.122	0.130

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