

650V N-Channel Enhancement Mode Power IGBT

MAIN CHARACTERISTICS

I_C @TC=100℃	15A
V_{CE}	650V
V_{CE(sat)}-typ	1.6V

FEATURES

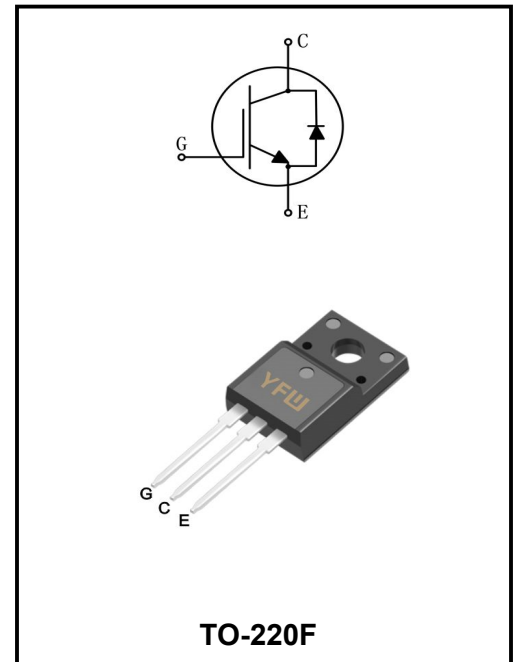
- ♦ High ruggedness performance
- ♦ 10μs short circuit capability
- ♦ Positive V_{CE} (sat) temperature coefficient
- ♦ High efficiency for motor control
- ♦ Excellent current sharing in parallel operation

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	30	A
Continuous collector current (TC=100℃)		15	A
Pulsed collector current, tp limited by Tvjmax	I _{CM}	60	A
Diode continuous forward current (TC=100℃)	I _F	15	A
Diode maximum current, tp limited by Tvjmax	I _{FM}	60	A
Power dissipation (TC=25℃)	P _{tot}	150	W
Power dissipation (TC=100℃)		75	W
Operating junction temperature range	T _{vj}	-40 to +175	℃
Storage temperature range	T _{stg}	-55 to +150	℃

Thermal characteristics

Characteristics	Symbol	Values		Unit
		Typ	Max.	
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	-	1	K/ W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	-	1.5	K/ W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	-	40	K/ W

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

Electrical characteristics of IGBT at $T_{vj}=25^{\circ}\text{C}$ unless otherwise specified

Characteristics	Test Condition	Symbol	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	$V_{GE}=0V, I_c=250\mu A$	$B_{V_{CES}}$	650	-	-	V
Collector-emitter leakage current	$V_{CE}=650V, V_{GE}=0V$	I_{CES}	-	-	50	μA
Gate leakage current, forward	$V_{GE}=\pm 20V, V_{CE}=0V$	I_{GES}	-	-	± 100	nA
Gate-emitter threshold voltage	$V_{GE}=V_{CE}, I_c=1mA$	$V_{GE(th)}$	5.4	5.6	5.9	V
Collector-emitter saturation voltage	$V_{GE}=15V, I_c=15A$	$V_{CE(sat)}$	-	1.6	1.8	V
	$V_{GE}=15V, I_c=15A, T_{vj}=150^{\circ}\text{C}$		-	1.9	-	V
Input capacitance	$V_{CE}=30V$ $V_{GE}=0V$ $f=1MHz$	C_{ies}	-	1055	-	pF
Output capacitance		C_{oes}	-	57	-	pF
Reverse transfer capacitance		C_{res}	-	15	-	pF
Total gate charge	$V_{CC}=520V, V_{GE}=15V, I_c=15A$	Q_g	-	55	-	nC
Turn-on delay time	$V_{CC}=400V$ $V_{GE}=15V$ $I_c=15A$ $R_G=10\Omega$ Inductive load	$t_d(on)$	-	17	-	ns
Rise time		t_r	-	14	-	ns
Turn-off delay time		$t_d(off)$	-	104	-	ns
Fall time		t_f	-	46	-	ns
Turn-on energy		E_{on}	-	0.3	-	mJ
Turn-off energy		E_{off}	-	0.27	-	mJ
Total switching energy		E_{ts}	-	0.57	-	mJ
Turn-on delay time	$V_{CC}=400V$ $V_{GE}=15V$ $I_c=15A$ $R_G=10\Omega$ Inductive load $T_{vj}=150^{\circ}\text{C}$	$t_d(on)$	-	16	-	ns
Rise time		t_r	-	15	-	ns
Turn-off delay time		$t_d(off)$	-	119	-	ns
Fall time		t_f	-	81	-	ns
Turn-on energy		E_{on}	-	0.38	-	mJ
Turn-off energy		E_{off}	-	0.4	-	mJ
Total switching energy		E_{ts}	-	0.78	-	mJ
Diode forward voltage	$I_F=15A$	V_F	-	1.4	1.8	V
	$I_F=15A, T_{vj}=175^{\circ}\text{C}$		-	1.2	-	V
Diode reverse recovery time	$V_R=400V$ $I_F=15A$ $diF/dt=-600A/\mu s$	t_{rr}	-	55	-	ns
Diode peak reverse recovery current		I_{rrm}	-	9.5	-	A
Diode reverse recovery charge		Q_{rr}	-	220	-	nC
Diode reverse recovery time	$V_R=400V$ $I_F=15A$ $diF/dt=-600A/\mu s, T_{vj}=150^{\circ}\text{C}$	t_{rr}	-	75	-	ns
Diode peak reverse recovery current		I_{rrm}	-	15	-	A
Diode reverse recovery charge		Q_{rr}	-	450	-	nC

RATINGS AND CHARACTERISTIC CURVES

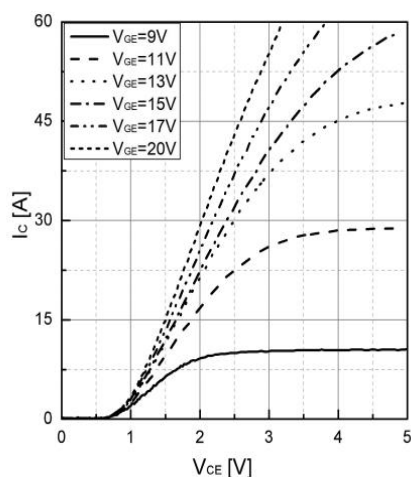


Fig 1. Typical output characteristic ($T_{vj}=25^{\circ}C$)

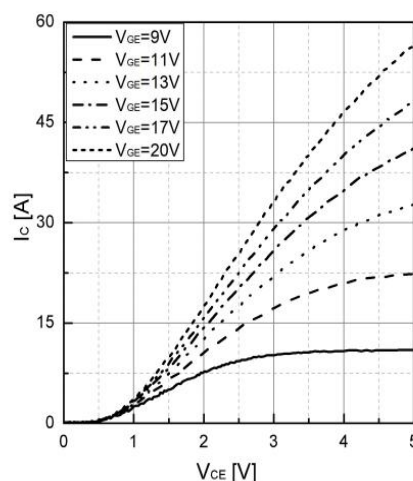


Fig 2. Typical output characteristic ($T_{vj}=175^{\circ}C$)

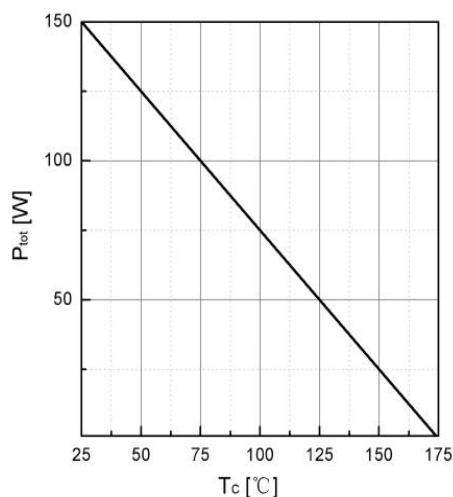


Fig 3. Power dissipation as a function of T_C

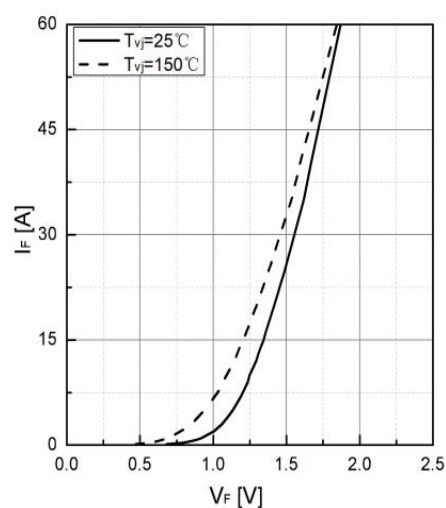


Fig 4. Typical I_F as a function of V_F

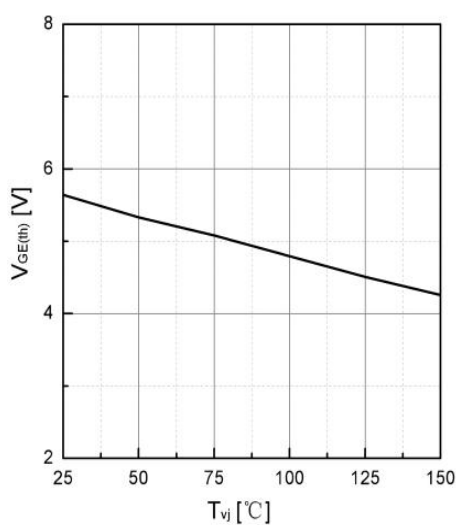


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj}
($I_C=1mA$)

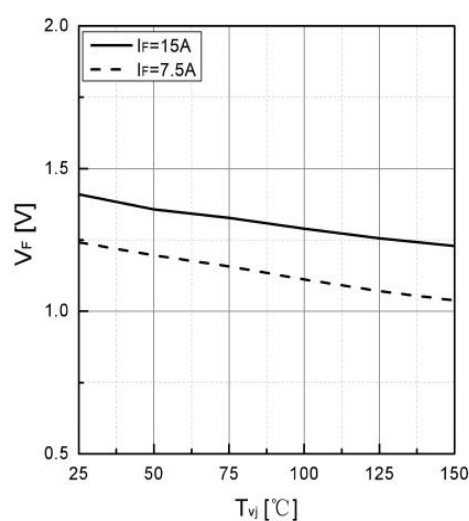


Fig 6. Typical V_F as a function of T_{vj}

RATINGS AND CHARACTERISTIC CURVES

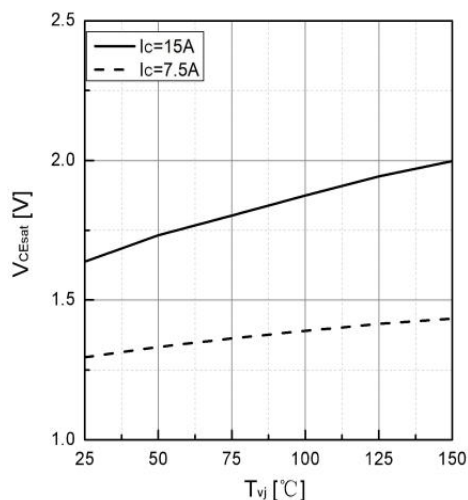


Fig 7. Typical V_{CEsat} as a function of T_{vj}

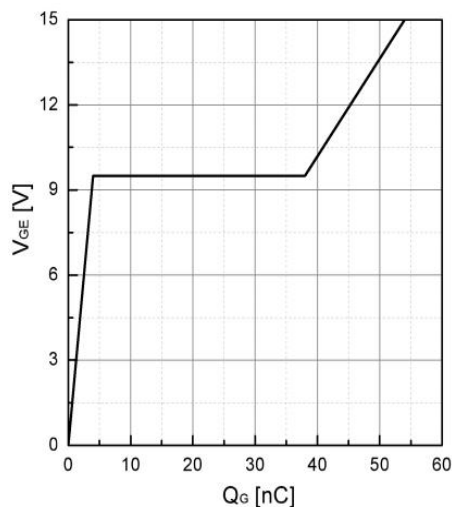


Fig 8. Typical Gate charge

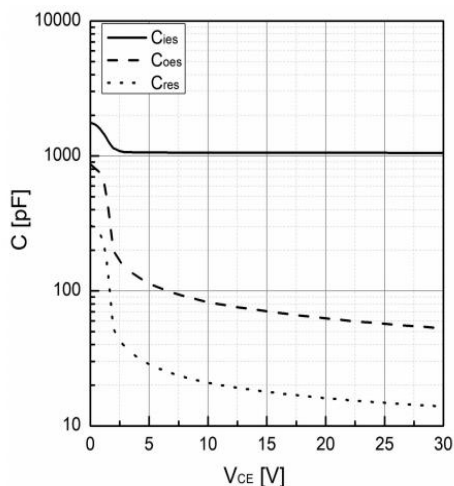


Fig 9. Typical capacitance as a function of V_{CE}
($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

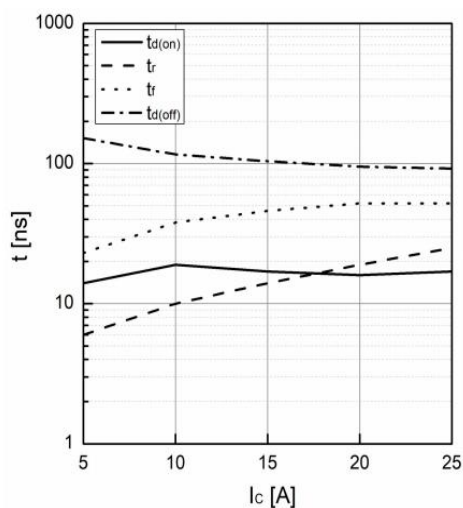


Fig 10. Typical switching times as a function of I_C

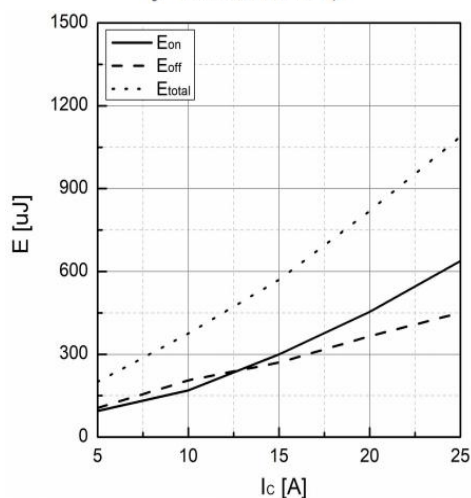


Fig 11. Typical switching energy losses as a function of I_C

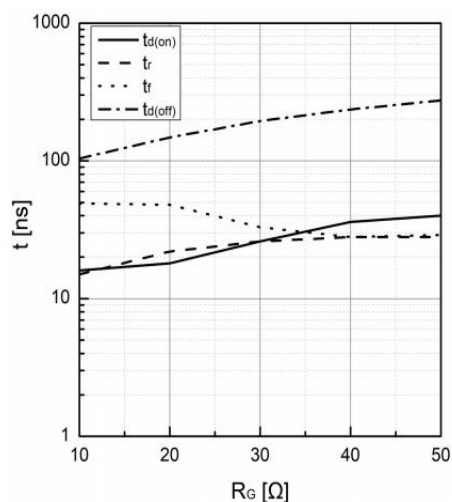


Fig 12. Typical switching times as a function of R_G

RATINGS AND CHARACTERISTIC CURVES

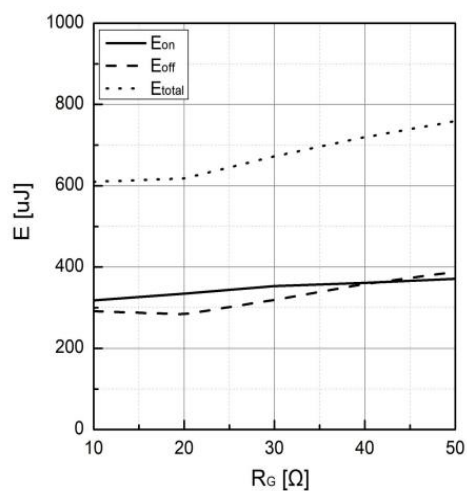


Fig 13. Typical switching energy losses as a function of R_G

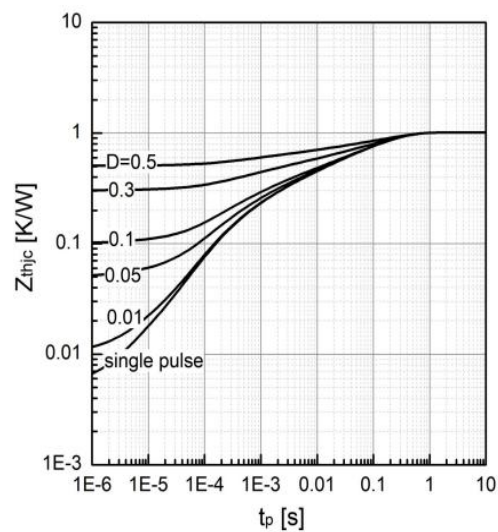
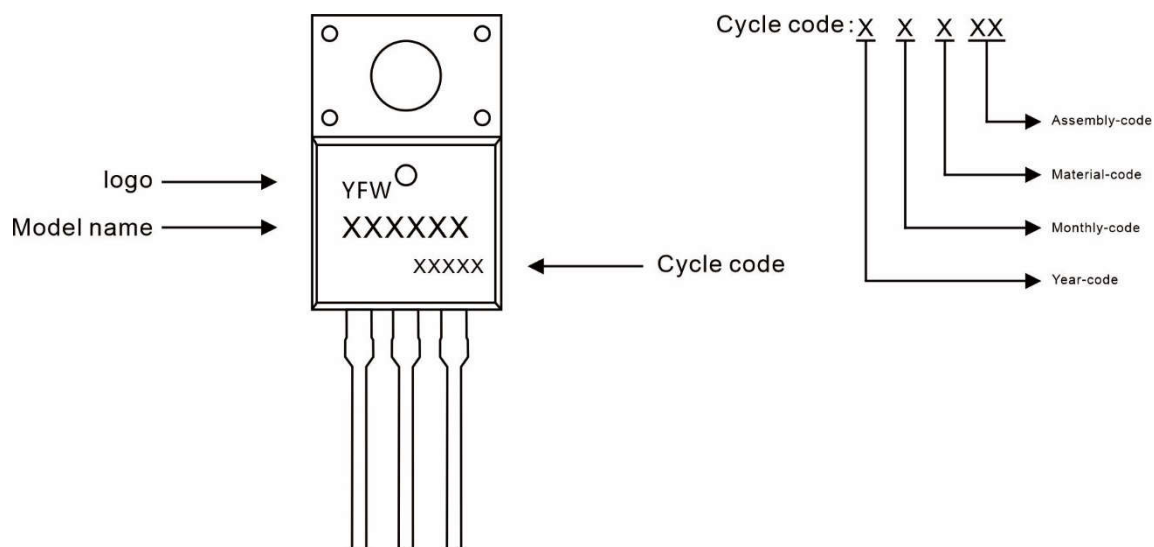


Fig 14. Transient thermal impedance, IGBT

Marking Diagram



Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG15T65AF	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

Disclaimer

The information presented in this document is for reference only. Guangdong Youfeng Microelectronics Co.,Ltd. reserves the right to make changes without notice for the specification of the products displayed herein to improve reliability, function or design or otherwise. The product listed herein is designed to be used with ordinary electronic equipment or devices, and not designed to be used with equipment or devices which require high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), YFW or anyone on its behalf, assumes no responsibility or liability for any damages resulting from such improper use of sale. This publication supersedes & replaces all information previously supplied. For additional information, please visit our website <https://www.yfwdiode.com>, or consult YFW sales office for further assistance.