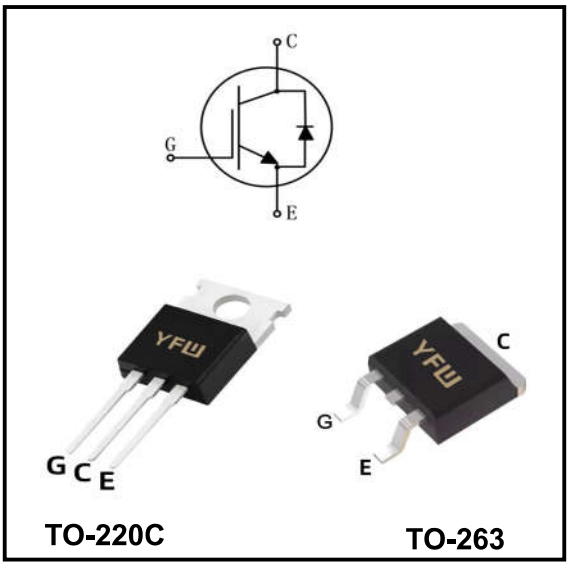
650V N-Channel Enhancement Mode Power IGBT

MAIN CHARACTERISTICS

$I_{C\ @TC=100℃}$	6A
V_{CE}	650V
VCE(sat)-typ	1.7V



FEATURES

- High ruggedness performance
- Very tight parameter distribution
- Positive VCE (sat) temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation
- RoHS compliant.

APPLICATIONS

- Home appliances
- Motor drives
- Fan, Pumps, Vacuum cleaner

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	12	A
Continuous collector current (TC=100℃)		6	A
Pulsed collector current, tp limited by Tvjmax	I_{CM}	24	A
Diode continuous forward current (TC=100℃)	I_F	6	A
Diode maximum current, tp limited by Tvjmax	I_{FM}	24	A
Short circuit withstand time	tsc	10	μs
Power dissipation (TC=25℃)	P_{tot}	136	W
Power dissipation (TC=100℃)		68	W
Operating junction temperature range	T_{vj}	-40 to +175	°C
Storage temperature range	T_{stg}	-40 to +150	°C

Thermal characteristics

Characteristics	Symbol	Values		Unit
		Typ	Max.	
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	-	1.1	K/ W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	-	4	K/ W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	-	90	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	**BVCES**	650	-	-	**V**
Collector-emitter leakage current	V_{CE}=650V, V_{GE}=0V	**ICES**	-	-	10	**μA**
Gate leakage current, forward	V_{GE}=±20V, V_{CE}=0V	**IGES**	-	-	±100	**nA**
Gate-emitter threshold voltage	V_{GE}=V_{CE}, I_C=1mA	**VGE(th)**	5.2	6.2	7.2	**V**
Collector-emitter saturation voltage	V_{GE}=15 V, I_C=6A	**VCE(sat)**	-	1.7	-	**V**
	V_{GE}=15V, I_C=6A, T_{vj}=175		-	2.2	-	**V**
Input capacitance	V_{CE}=30V V_{GE}=0V f=1MHz	**Cies**	-	480	-	**pF**
Output capacitance		**Coes**	-	22	-	**pF**
Reverse transfer capacitance		**Cres**	-	8	-	**pF**
Total gate charge	V_{CC}=520V V_{GE}=15V I_C=6A	**Qg**	-	19	-	**nC**
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=6A R_G=10Ω Inductive load	**td(on)**	-	10	-	**ns**
Rise time		**tr**	-	8	-	**ns**
Turn-off delay time		**td(off)**	-	79	-	**ns**
Fall time		**tf**	-	56	-	**ns**
Turn-on energy		**Eon**	-	0.11	-	**mJ**
Turn-off energy		**Eoff**	-	0.1	-	**mJ**
Total switching energy		**Ets**	-	0.21	-	**mJ**
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=6A R_G=10Ω Inductive load Tvj =175℃	**td(on)**	-	11	-	**ns**
Rise time		**tr**	-	10	-	**ns**
Turn-off delay time		**td(off)**	-	108	-	**ns**
Fall time		**tf**	-	89	-	**ns**
Turn-on energy		**Eon**	-	0.16	-	**mJ**
Turn-off energy		**Eoff**	-	0.16	-	**mJ**
Total switching energy		**Ets**	-	0.32	-	**mJ**
Diode forward voltage	I_F=6A	**VF**	-	1.6	-	**V**
	I_F=6A,Tvj=175℃		-	1.4	-	**V**
Diode reverse recovery time	V_R=400V I_F=6A diF/dt=-500A/μs	**trr**	-	55	-	**ns**
Diode peak reverse recovery current		**Irrm**	-	10	-	**A**
Diode reverse recovery charge		**Qrr**	-	306	-	**nC**
Diode reverse recovery time	V_R=400V I_F=6A diF/dt=-500A/μsTvj=175℃	**trr**	-	98	-	**ns**
Diode peak reverse recovery current		**Irrm**	-	12	-	**A**
Diode reverse recovery charge		**Qrr**	-	529	-	**nC**

RATINGS AND CHARACTERISTIC CURVES

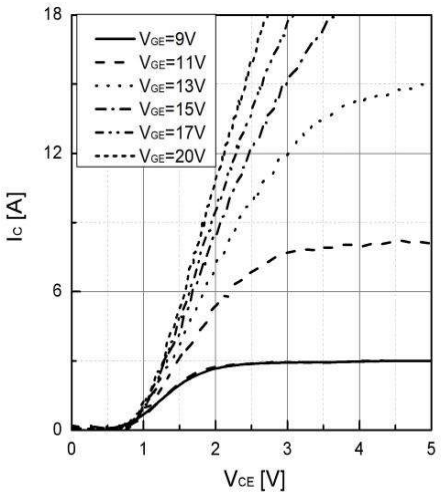


Fig 1. Typical output characteristic (T_{vj}=25℃)

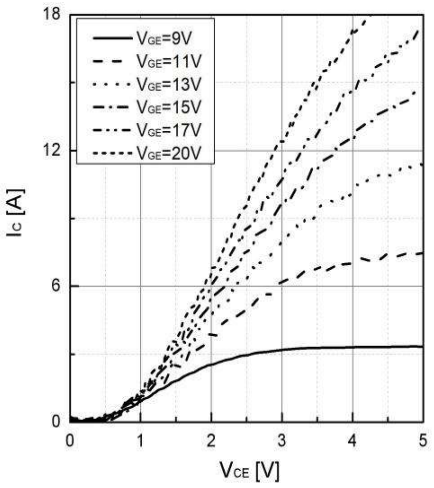


Fig 2. Typical output characteristic(T_{vj}=175℃)

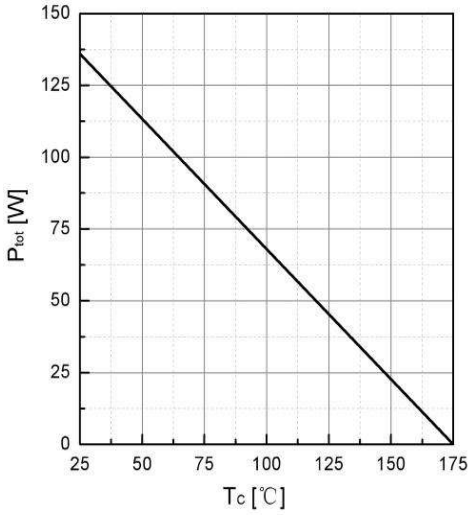


Fig 3.Power dissipation as a function of T_C

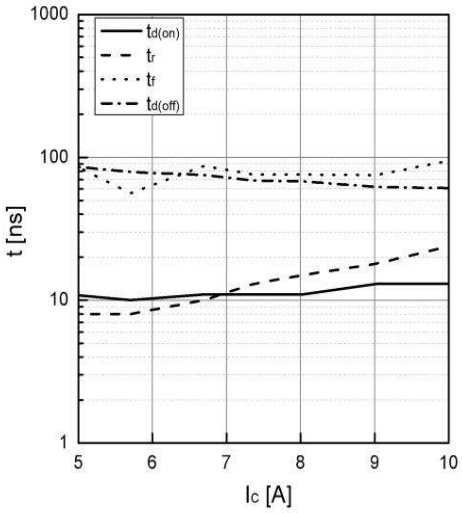


Fig 4. Typical switching time as a function of I_C

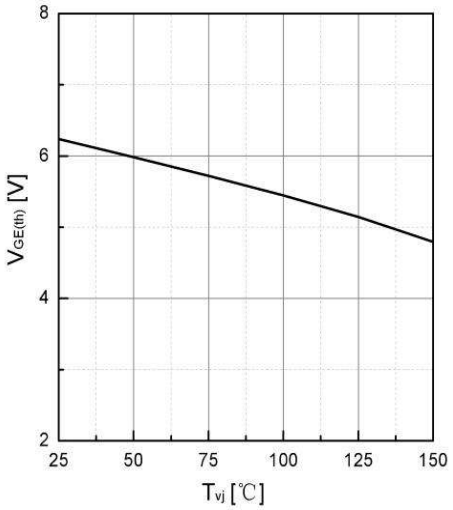


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

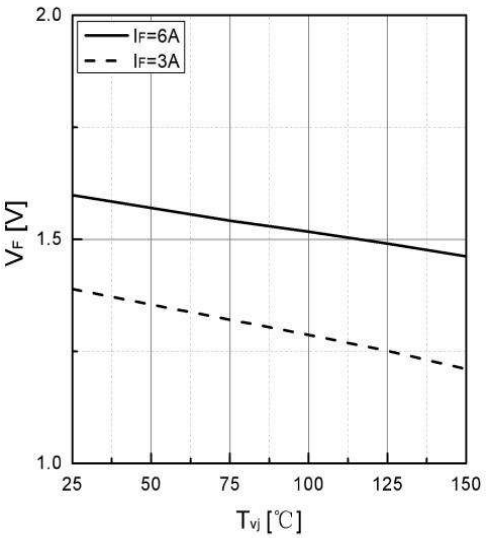


Fig 6. Typical V_F as a function of T_{vj}

RATINGS AND CHARACTERISTIC CURVES

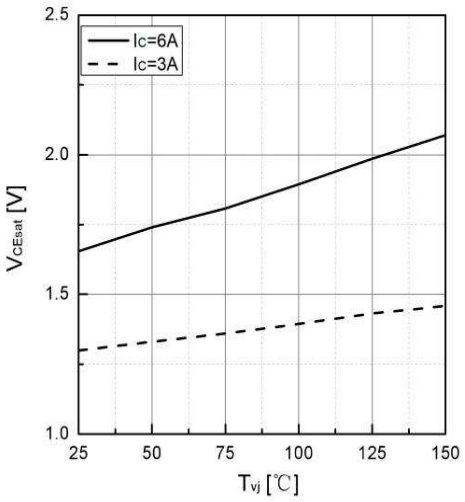


Fig 7. Typical V_{CEsat} as a function of T_{vj}

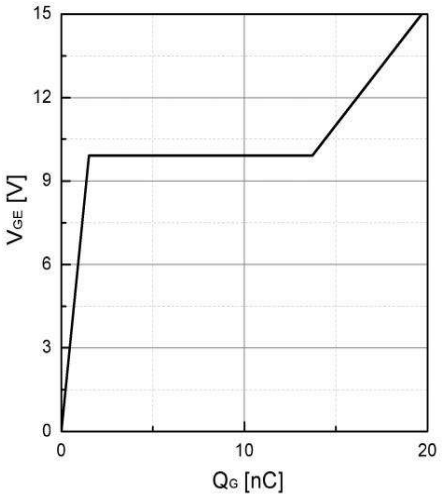


Fig 8. Typical Gate charge

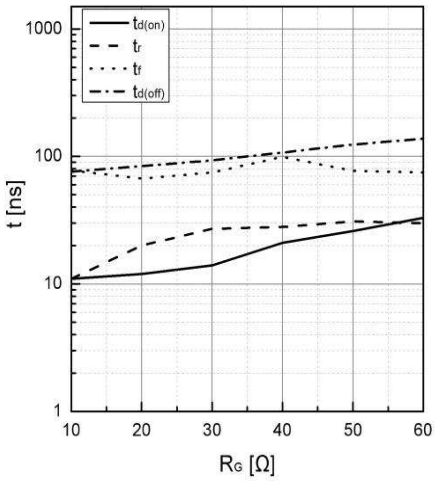


Fig 9. Typical switching times as a function of R_G

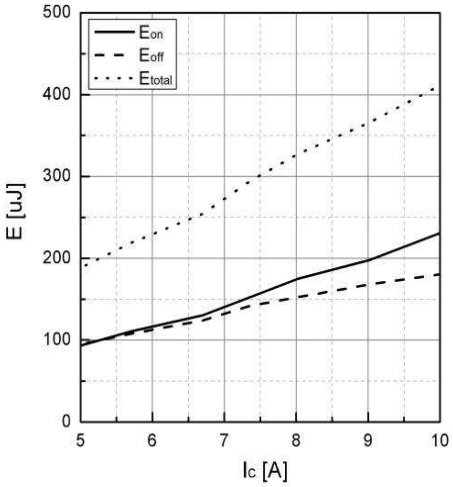


Fig 10. Typical switching energy losses as a function of I_C

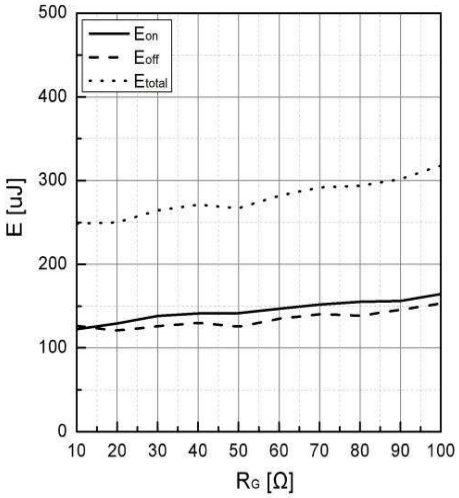


Fig 11. Typical switching energy losses as a function of R_G

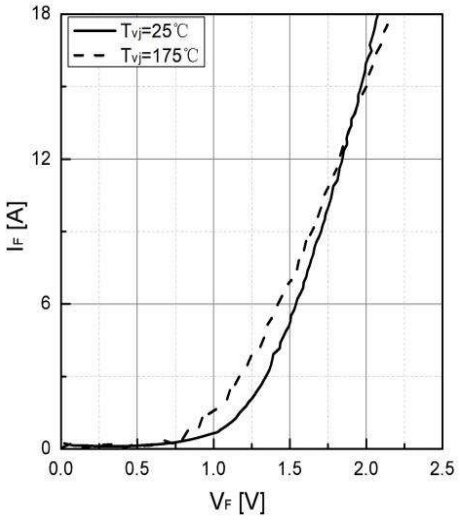


Fig 12. Typical I_F as a function of V_F

RATINGS AND CHARACTERISTIC CURVES

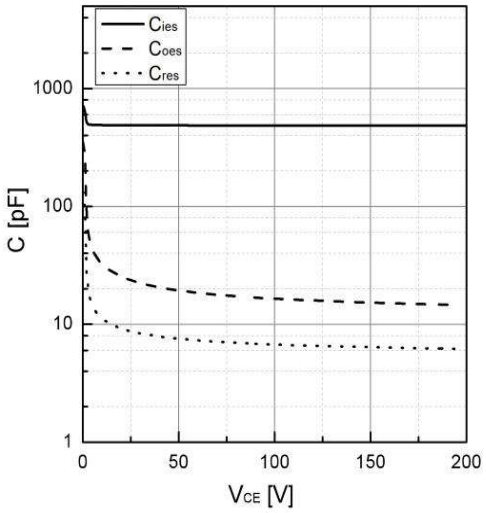


Fig 13. Typical capacitance as a function of V_{CE}
(f=1Mhz, V_{GE}=0V)

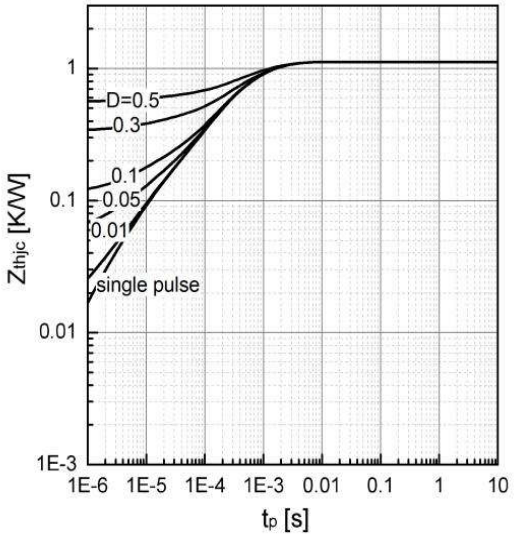
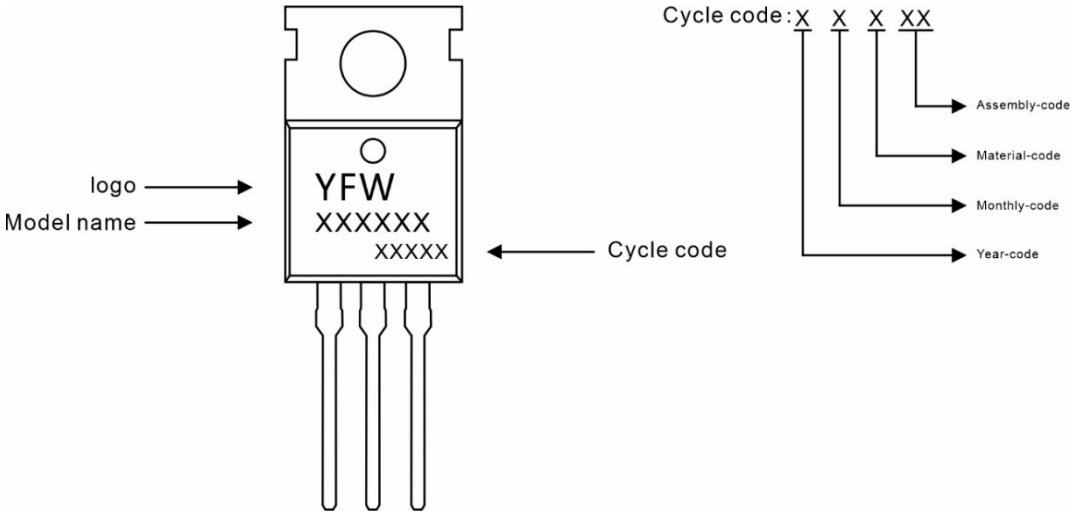


Fig 14. Transient thermal impedance of IGBT

Marking Diagram

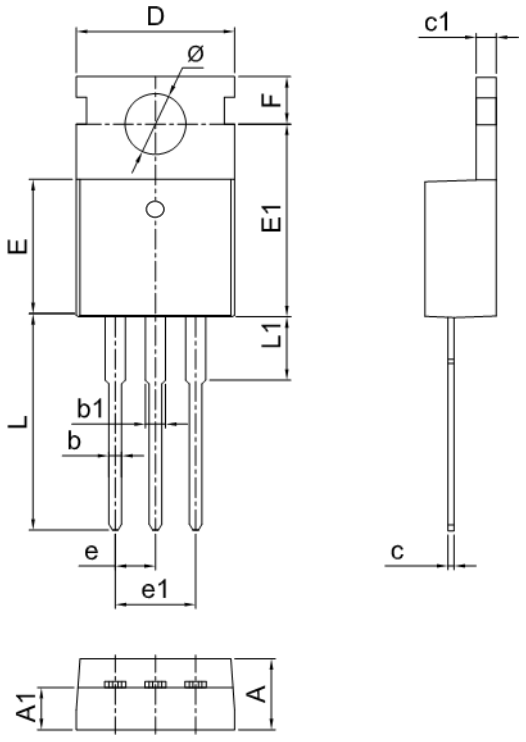


Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG06T65AC	TO-220C	0.07oz(1.96g)	50pcs/tube	1000PCS/Box 5000PCS/Carton

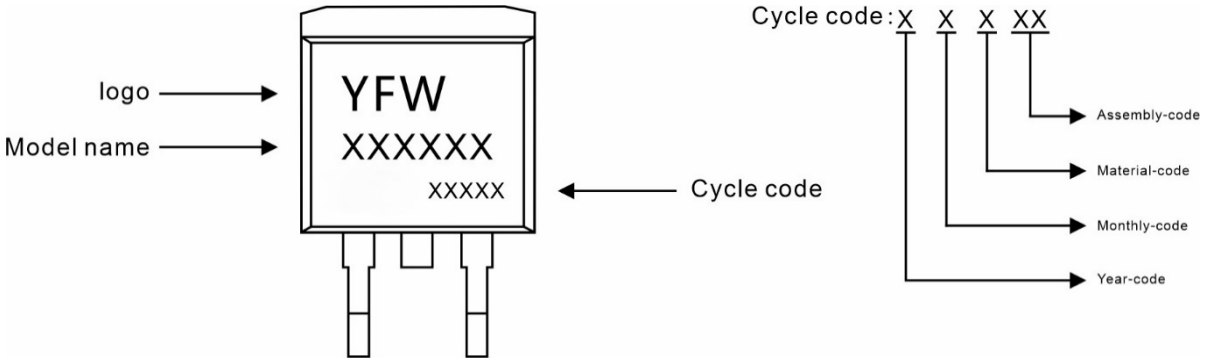
Package Dimensions

TO-220C



Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.34	4.67	0.171	0.184
A1	2.52	2.82	0.099	0.111
b	0.71	0.91	0.028	0.036
b1	1.17	1.37	0.046	0.054
c	0.30	0.50	0.012	0.020
c1	1.17	1.37	0.046	0.054
D	9.90	10.20	0.390	0.402
E	8.50	8.90	0.335	0.350
E1	12.00	12.50	0.472	0.492
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
F	2.60	2.80	0.102	0.110
L	13.20	13.80	0.520	0.543
L1	3.80	4.20	0.150	0.165
Φ	3.60	3.96	0.142	0.156

Marking Diagram

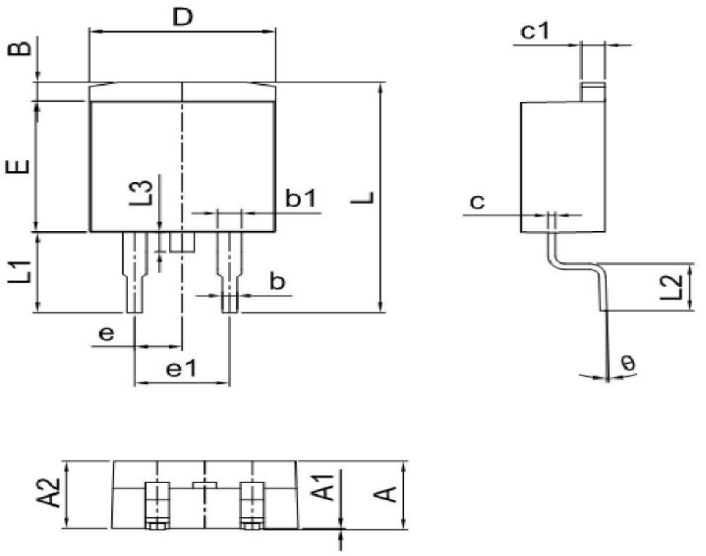


Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG06T65AS	TO-263	0.04oz(1.16g)	800pcs/reel	1600pcs/box 8000pcs/Carton

Package Dimensions

TO-263



Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.70	0.169	0.185
A1	0.00	0.15	0.000	0.006
A2	4.30	4.55	0.169	0.179
B	1.10	1.50	0.043	0.059
b	0.70	0.90	0.028	0.035
b1	1.20	1.50	0.047	0.059
c	0.30	0.60	0.012	0.024
c1	1.17	1.37	0.046	0.054
D	9.90	10.20	0.390	0.402
E	8.50	8.90	0.335	0.350
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
L	15.00	15.30	0.591	0.602
L1	5.20	5.40	0.205	0.213
L2	2.40	2.60	0.094	0.102
L3	1.60	1.80	0.063	0.071

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