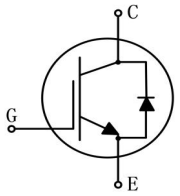
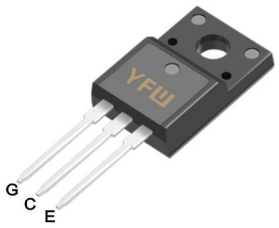
650V N-Channel Enhancement Mode Power IGBT

MAIN CHARACTERISTICS

$I_{C\ @TC=100℃}$	30A
V_{CE}	650V
VCE(sat)-typ	1.69V





TO-220F

FEATURES

- Positive temperature coefficient
- Fast Switching
- Low VCE(sat)
- Reliable and Rugged
- Halogen Free and Green Devices Available

APPLICATIONS

- Motor drives
- Air Condition
- Inverters

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}	±30	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}	90	A
Diode continuous forward current (TC=25℃)	I_F	60	A
Diode continuous forward current (TC=100℃)		30	A
Diode maximum current, tp limited by Tvjmax	I_{FM}	90	A
Operating junction temperature range	T_{vj}	-55 to +175	°C
Storage temperature range	T_{stg}	-55 to +175	°C

Thermal characteristics

Characteristics	Symbol	Values		Unit
		Typ	Max.	
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	-	0.83	K/ W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	-	0.65	K/ W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	-	40	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}	-	-	10	μA
Gate leakage current, forward	V_{GE}=±20V, V_{CE}=0V	I_{GES}	-	-	±200	nA
Gate-emitter threshold voltage	V_{GE}=V_{CE}, I_C=1mA	$V_{GE(th)}$	4.3	5.3	6.3	V
Collector-emitter saturation voltage	V_{GE}=15 V, I_C=30A	$V_{CE(sat)}$	-	1.69	2	V
	V_{GE}=15V, I_C=30A, T_{vj}=125℃		-	1.9	-	V
	V_{GE}=15V, I_C=30A, T_{vj}=175℃		-	2.05		
Input capacitance	V_{CE}=25V V_{GE}=0V f =1MHz	C_{ies}	-	1853	-	pF
Output capacitance		C_{oes}	-	72	-	pF
Reverse transfer capacitance		C_{res}	-	55	-	pF
Total gate charge	V_{CC}=520V V_{GE}=15V I_C=30A	Q_g	-	98	-	nC
Gate- Emitter Charge		Q_{ge}	-	18	-	nC
Gate- Collector Charge		Q_{gc}	-	47	-	nC
Short circuit collector current	V_{GE} =15V, V_{CC}≤400V T_J≤175°C	t(SC)	-	8	-	μs
Max.1000 short circuits, times			-		-	
Between short circuits: ≥ 1.0s			-		-	
Turn-on delay time	V_{CC} =400V V_{GE} =15V I_C =30A R_G=5Ω Inductive load	td(on)	-	16	-	ns
Rise time		tr	-	46	-	ns
Turn-off delay time		td(off)	-	72	-	ns
Fall time		tf	-	80	-	ns
Turn-on energy		Eon	-	0.52	-	mJ
Turn-off energy		Eoff	-	0.77	-	mJ
Total switching energy		Ets	-	1.29	-	mJ
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=30A R_G=5Ω Inductive load Tvj=175℃	td(on)	-	18	-	ns
Rise time		tr	-	54	-	ns
Turn-off delay time		td(off)	-	90	-	ns
Fall time		tf	-	75	-	ns
Turn-on energy		Eon	-	0.97	-	mJ
Turn-off energy		Eoff	-	1.36	-	mJ
Total switching energy		Ets	-	2.33	-	mJ
Diode forward voltage	I_F=30A	VF	-	2	2.3	V
	I_F=30A T_{vj}=125℃		-	1.7	-	V
	I_F=30A T_{vj}=175℃		-	1.5	-	V

Diode reverse recovery time	I_F=30A diF/dt=-200A/μs	**trr**	-	48	-	**ns**
Diode peak reverse recovery current		**Qrr**	-	80	-	**nC**
Diode reverse recovery charge		**Irrm**	-	5.1	-	**A**
Diode reverse recovery time	I_F=30A diF/dt=-200A/μs T_{vj}=175℃	**trr**	-	39	-	**ns**
Diode peak reverse recovery current		**Qrr**	-	127	-	**nC**
Diode reverse recovery charge		**Irrm**	-	8.5	-	**A**

RATINGS AND CHARACTERISTIC CURVES

Figure 1: Power Dissipation

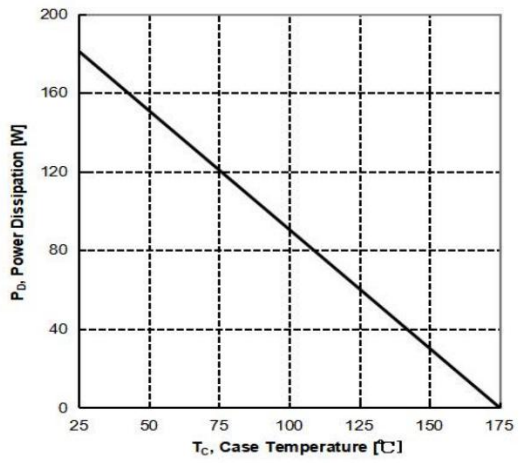


Figure 2: Collector Current vs. Case Temperature

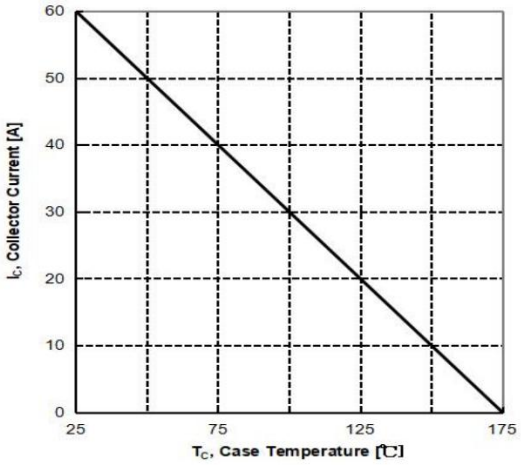


Figure 3: Safe Operation Area

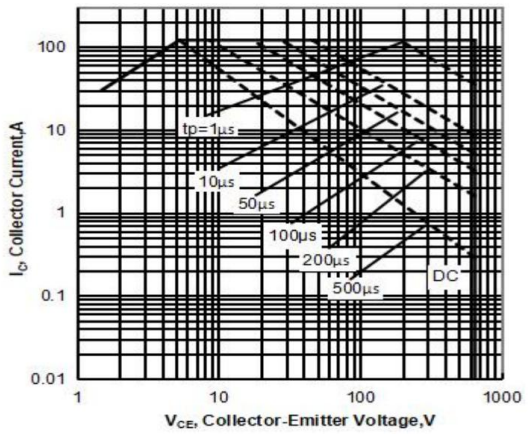


Figure 4: Typical Transfer Characteristics

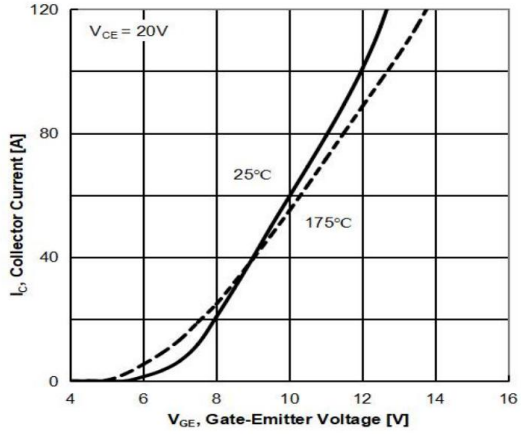


Figure 5: Typical Output Characteristics

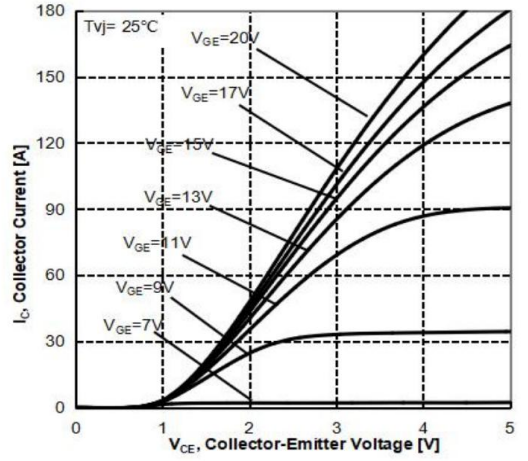
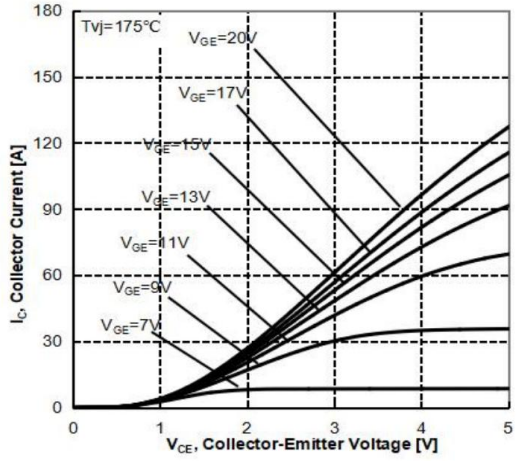


Figure 6: Typical Output Characteristics



RATINGS AND CHARACTERISTIC CURVES

Figure 7: Typical Collector-Emitter Saturation Voltage vs. Junction Temperature

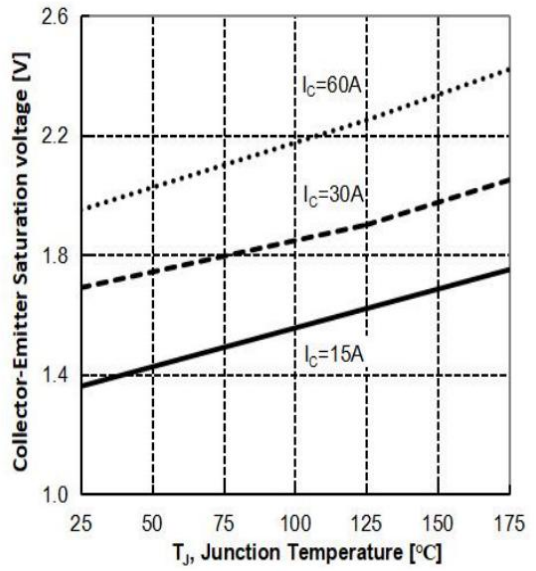


Figure 8: Typical Gate-Emitter Threshold Voltage vs. Junction Temperature

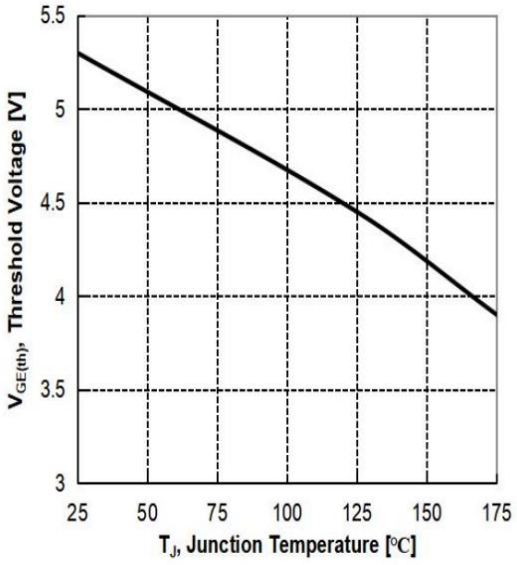


Figure 9: Typical Switching Times vs. Gate Resistor (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V, I_C=30A)

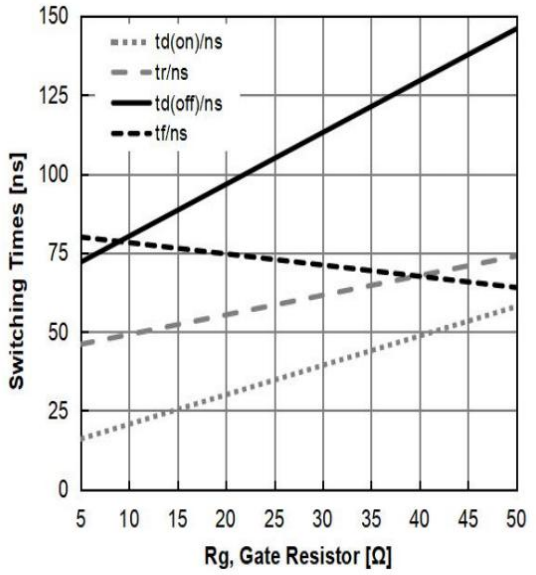
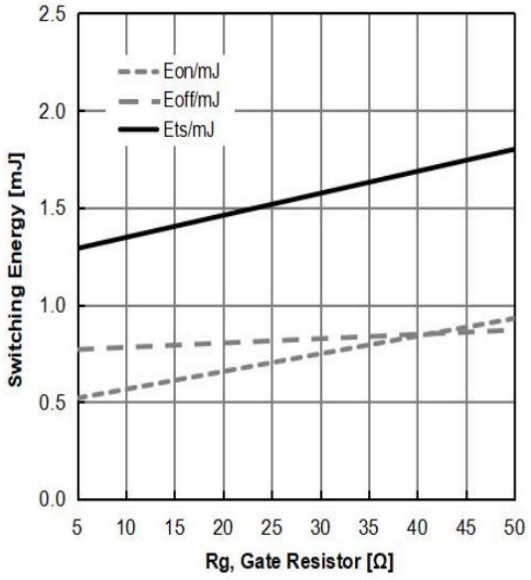


Figure 10: Typical Switching Energy vs. Gate Resistor (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V, I_C=30A)



RATINGS AND CHARACTERISTIC CURVES

Figure 11: Typical Switching Times vs. Junction Temperature (V_{CE}=400V, V_{GE}=15/0V, I_C=30A)

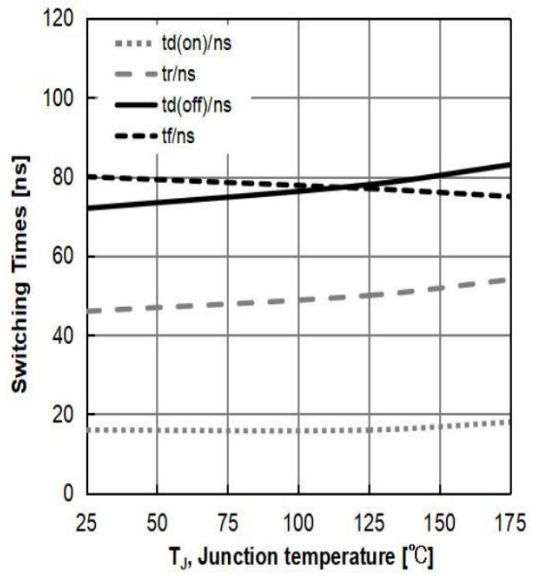


Figure 12: Typical Switching Energy vs. Junction Temperature (V_{CE}=400V, V_{GE}=15/0V, I_C=30A)

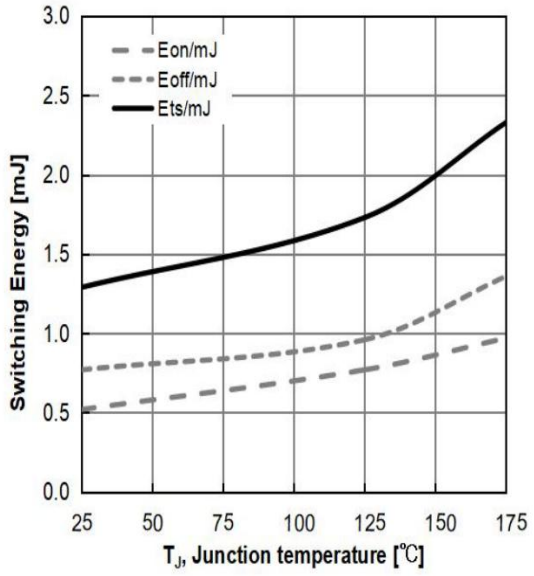


Figure 13: Typical Switching Times vs. Collector Current (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V)

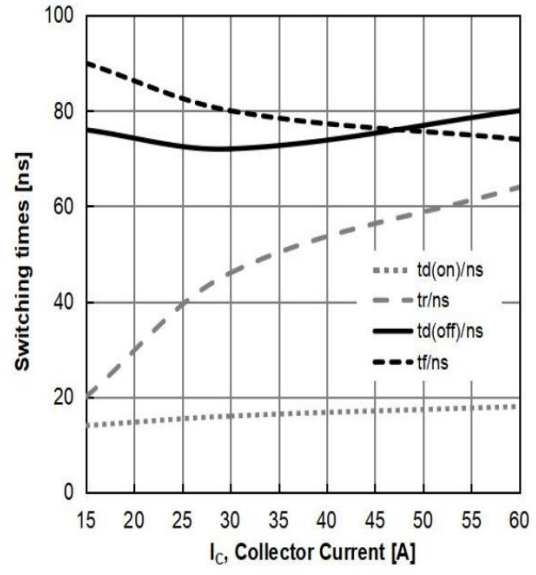
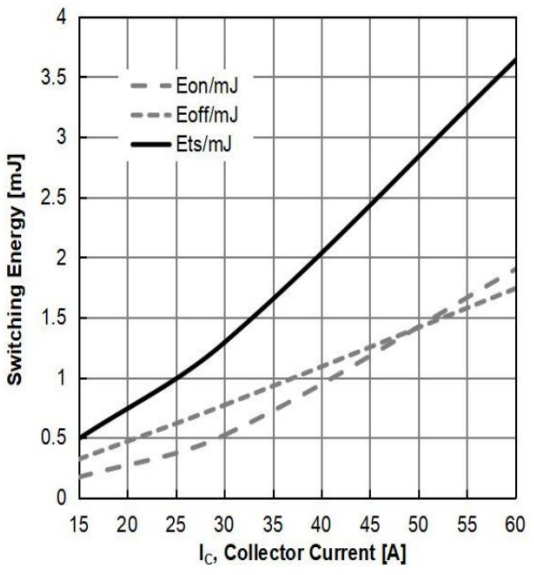


Figure 14: Typical Switching Energy vs. Collector Current (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V)



RATINGS AND CHARACTERISTIC CURVES

Figure 19: IGBT Transient Thermal Impedance vs. Pulse Width

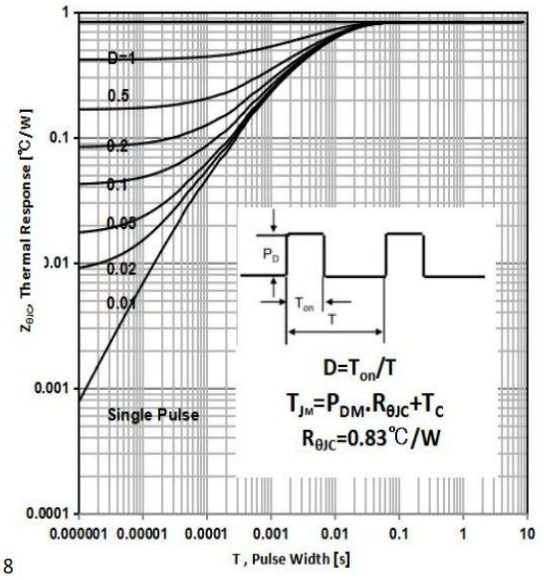


Figure 20: Diode Transient Thermal Impedance vs. Pulse Width

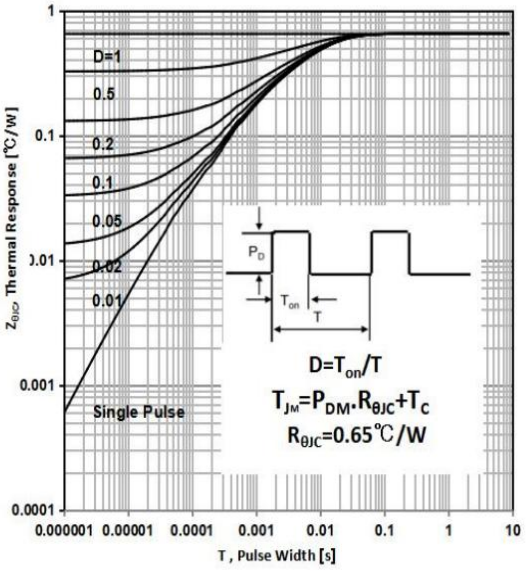
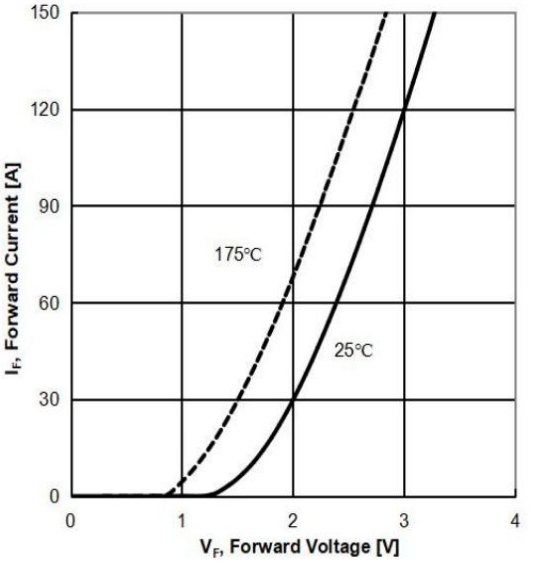
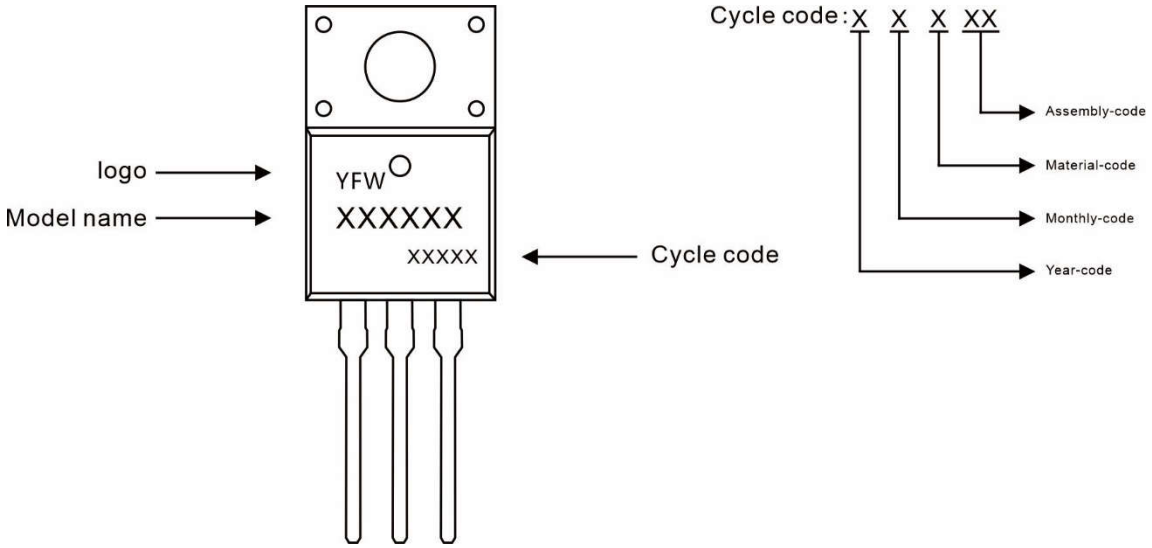


Figure 21: Typical Diode Forward Current vs. Forward Voltage



Marking Diagram

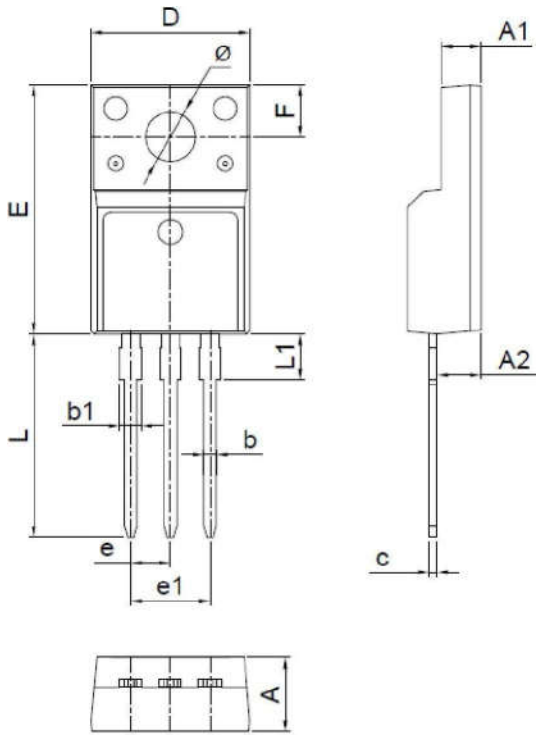


Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG30T65HAF	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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