

1200V N-Channel Enhancement Mode Power IGBT

MAIN CHARACTERISTICS

$I_C @ T_C=100^{\circ}\text{C}$	40A
V_{CE}	1200V
$V_{CE(sat)}\text{-typ}$	1.7V

FEATURES

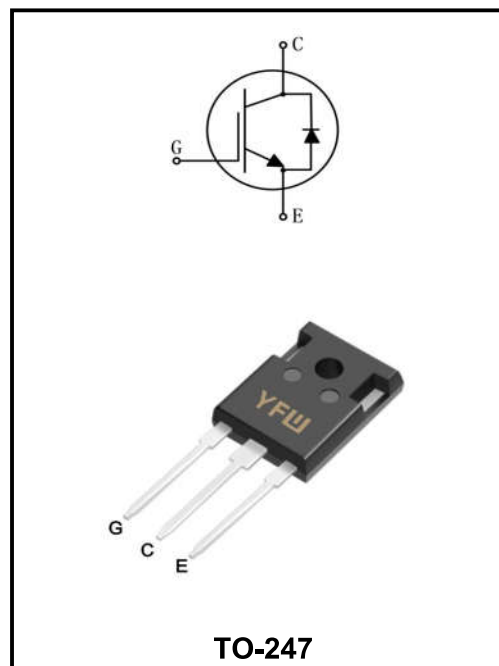
- ◆ Positive temperature coefficient
- ◆ High speed switching
- ◆ Low collector to emitter saturation voltage
- ◆ Easy parallel switching capability
- ◆ Short circuit withstands time 10 μ s
- ◆ High ruggedness performance

APPLICATIONS

- ◆ Portable power station
- ◆ Motor driver

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 $^{\circ}\text{C}$ maximum, 10s per JESD 22-B106



Maximum Ratings

Characteristics	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	1200	V
Gate-emitter voltage	V_{GES}	± 30	V
Continuous collector current (TC=25 $^{\circ}\text{C}$)	I_C	80	A
Continuous collector current (TC=100 $^{\circ}\text{C}$)		40	A
Pulsed collector current, tp limited by Tvjmax	I_{CM}	160	A
Diode continuous forward current (TC=100 $^{\circ}\text{C}$)	I_F	40	A
Diode maximum current, tp limited by Tvjmax	I_{FM}	160	A
Power dissipation (TC=25 $^{\circ}\text{C}$)	P_{tot}	625	W
Operating junction temperature range	T_{vj}	-45 to +175	$^{\circ}\text{C}$
Storage temperature range	T_{stg}	-55 to +175	$^{\circ}\text{C}$

Thermal characteristics

Characteristics	Symbol	Values		Unit
		Typ	Max.	
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	-	0.34	K/ W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	-	0.8	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	$V_{GE}=0V, I_C=250\mu A$	$B_{V_{CES}}$	1200	-	-	V
Collector-emitter leakage current	$V_{CE}=1200V, V_{GE}=0V$	I_{CES}	-	-	10	μA
Gate leakage current, forward	$V_{GE}=\pm 20V, V_{CE}=0V$	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	$V_{GE}=15V, I_C=40A$	$V_{CE(sat)}$	-	1.7	2	V
	$V_{GE}=15V, I_C=40A, T_{vj}=175^{\circ}\text{C}$		-	2.2	-	V
Input capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=1MHz$	C_{ies}	-	3980	-	pF
Output capacitance		C_{oes}	-	157	-	pF
Reverse transfer capacitance		C_{res}	-	93	-	pF
Total gate charge	$V_{CC}=960V, V_{GE}=15V, I_C=40A$	Q_g	-	346	-	nC
Gate- Emitter Charge		Q_{ge}	-	2.4	-	nC
Gate- Collector Charge		Q_{gc}	-	238	-	nC
Turn-on delay time	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=40A$ $R_G=5\Omega$ Inductive load	$t_{d(on)}$	-	25	-	ns
Rise time		t_r	-	28	-	ns
Turn-off delay time		$t_{d(off)}$	-	262	-	ns
Fall time		t_f	-	149	-	ns
Turn-on energy		E_{on}	-	1.3	-	mJ
Turn-off energy		E_{off}	-	2.3	-	mJ
Total switching energy		E_{ts}	-	3.6	-	mJ
Turn-on delay time		$t_{d(on)}$	-	26	-	ns
Rise time		t_r	-	35	-	ns
Turn-off delay time		$t_{d(off)}$	-	331	-	ns
Fall time		t_f	-	224	-	ns
Turn-on energy	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=40A$ $R_G=5\Omega$ Inductive load $T_{vj}=175^{\circ}\text{C}$	E_{on}	-	2.2	-	mJ
Turn-off energy		E_{off}	-	3.7	-	mJ
Total switching energy		E_{ts}	-	5.9	-	mJ
Short circuit collector current Max.1000 short circuits, times between short circuits: $\geq 1.0s$		$t(SC)$	-	13	-	us
Diode forward voltage	$I_F=40A$	V_F	-	1.6	1.9	V
Diode reverse recovery time	$V_R=600V$ $I_F=40A$ $di_F/dt=-200A/\mu s$	t_{rr}	-	94	-	ns
Diode peak reverse recovery current		I_{rrm}	-	9.7	-	A
Diode reverse recovery charge		Q_{rr}	-	225	-	nC
Diode forward voltage	$I_F=40A, T_J=175^{\circ}\text{C}$	V_F	-	1.5	-	V
Diode reverse recovery time	$V_R=600V$ $I_F=40A$ $di_F/dt=-200A/\mu s, T_{vj}=175^{\circ}\text{C}$	t_{rr}	-	125	-	ns
Diode peak reverse recovery current		I_{rrm}	-	11.2	-	A
Diode reverse recovery charge		Q_{rr}	-	277	-	nC

Figure 1: Power Dissipation

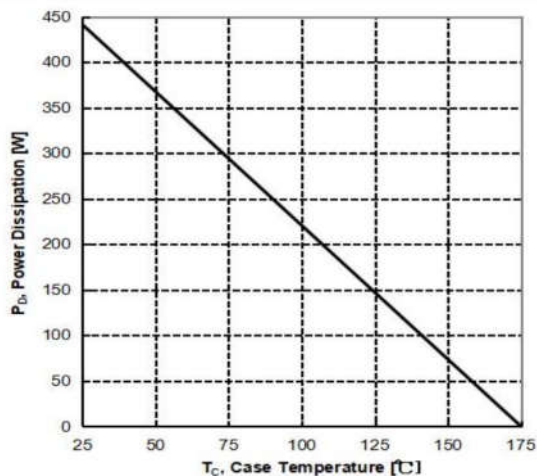


Figure 2: Collector Current vs. Case Temperature

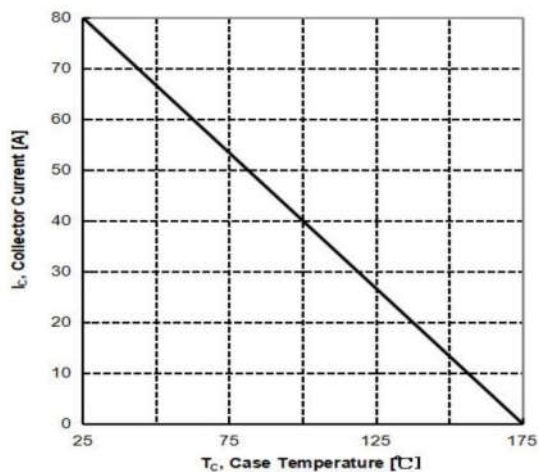


Figure 3: Safe Operation Area

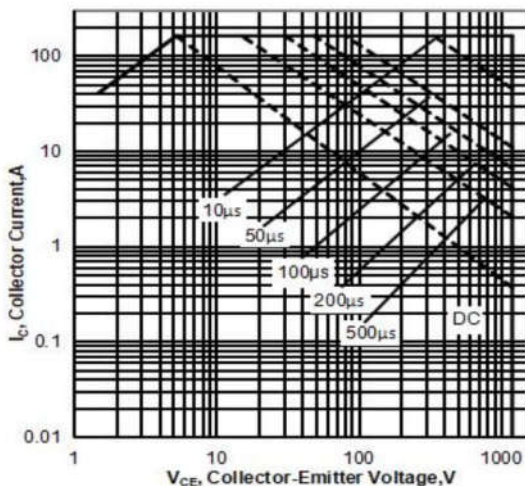


Figure 4: Typical Transfer Characteristics

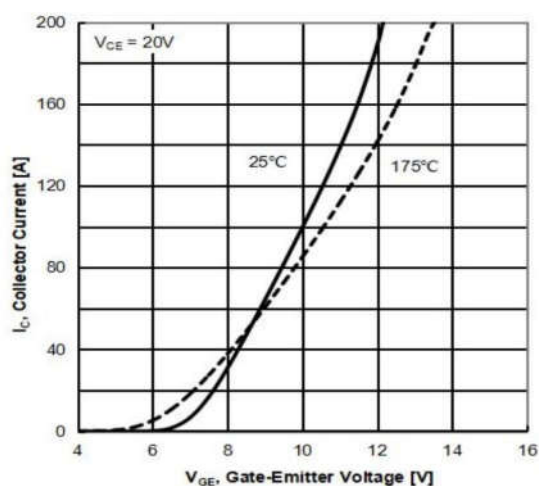


Figure 5: Output Characteristics

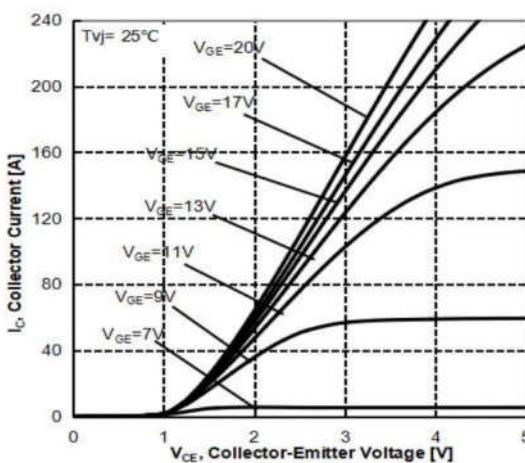
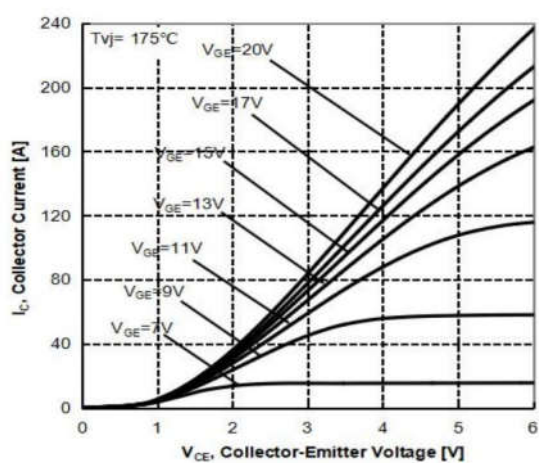


Figure 6: Output Characteristics



RATINGS AND CHARACTERISTIC CURVES

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

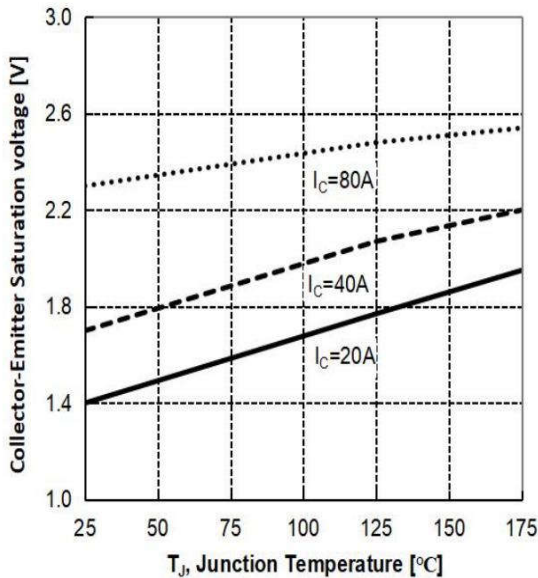


Figure 8: Typical Gate-Emitter Threshold Voltage vs. Junction Temperature

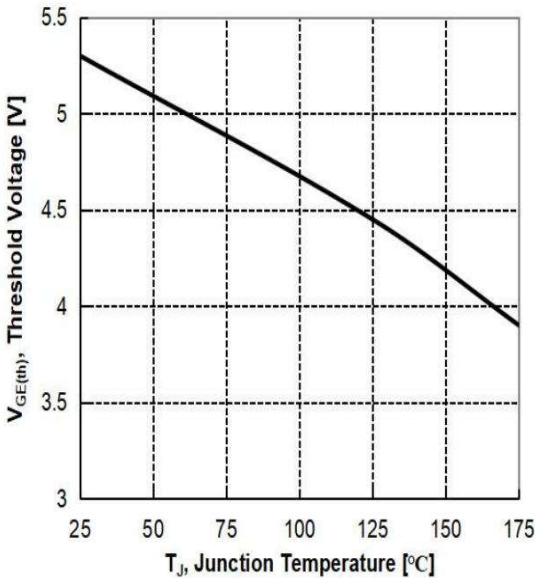


Figure 9: Typical Switching Times vs. Gate Resistor (T_J=25°C, V_{CE}=600V V_{GE}=15/0V, I_C=40A)

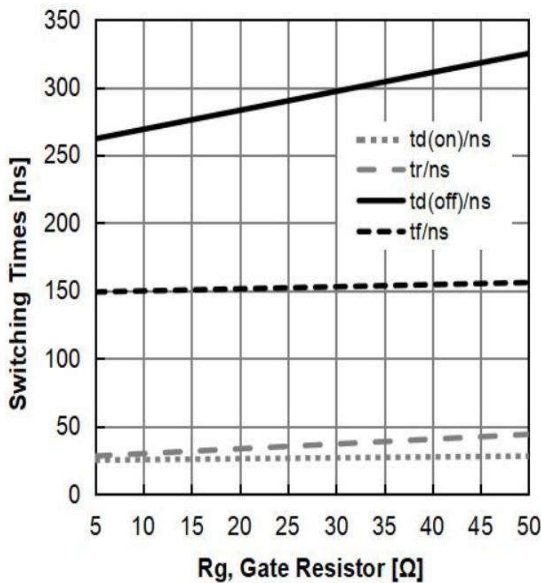


Figure 10: Typical Switching Energy vs. Gate Resistor (T_J=25°C, V_{CE}=600V V_{GE}=15/0V, I_C=40A)

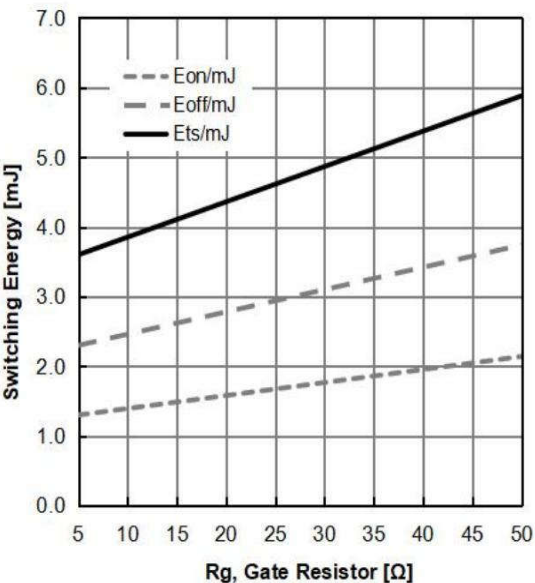


Figure 11: Typical Switching Times vs. Junction Temperature ($V_{CE}=600V$, $V_{GE}=15/0V$, $I_C=40A$)

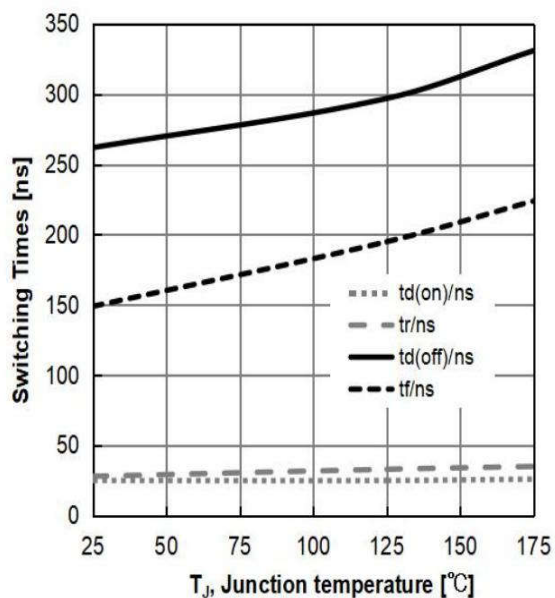


Figure 12: Typical Switching Energy vs. Junction Temperature ($V_{CE}=600V$, $V_{GE}=15/0V$, $I_C=40A$)

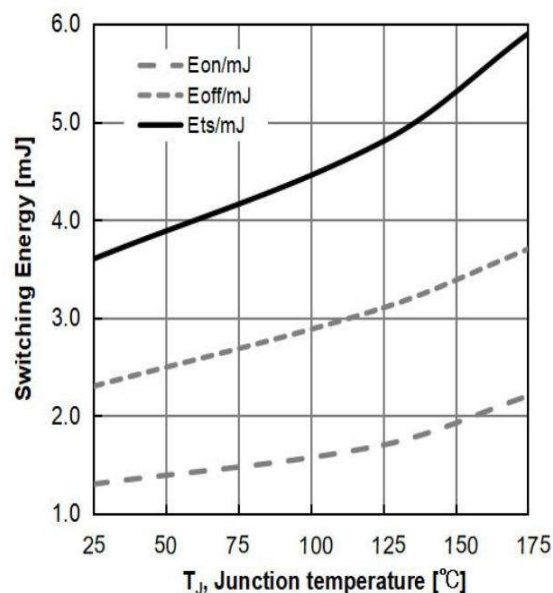


Figure 13: Typical Switching Times vs. Collector Current ($T_J=25^\circ C$, $V_{CE}=600V$, $V_{GE}=15/0V$)

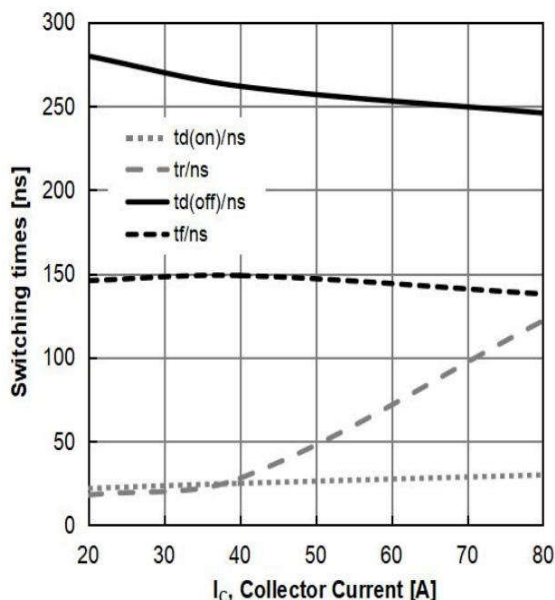
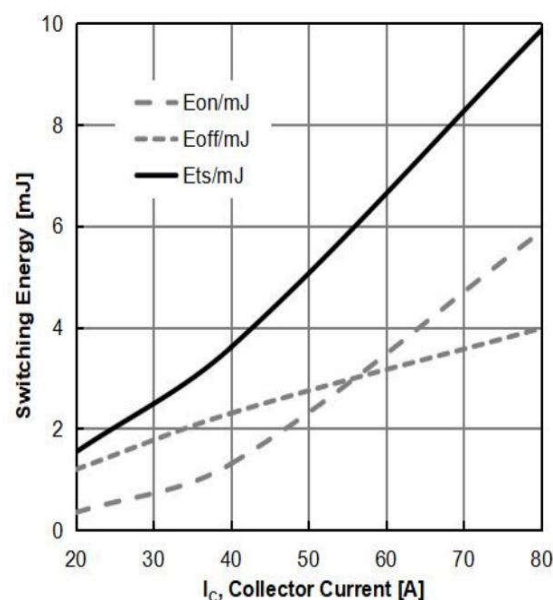


Figure 14: Typical Switching Energy vs. Collector Current ($T_J=25^\circ C$, $V_{CE}=600V$, $V_{GE}=15/0V$)



RATINGS AND CHARACTERISTIC CURVES

Figure 15: Typical Switching Times vs. VCE ($T_J=25^{\circ}\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=40\text{A}$)

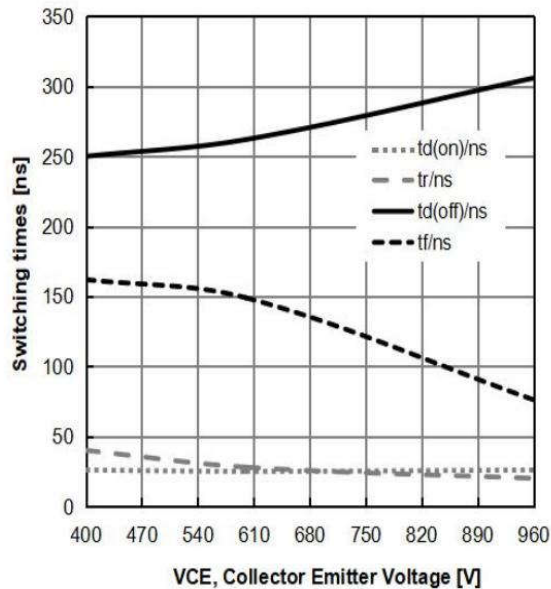


Figure 16: Typical Switching Energy vs. VCE ($T_J=25^{\circ}\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=40\text{A}$)

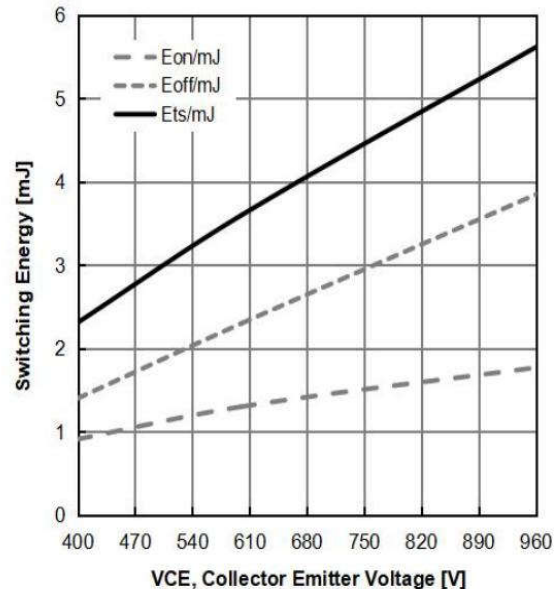


Figure 17: Typical Gate Charge

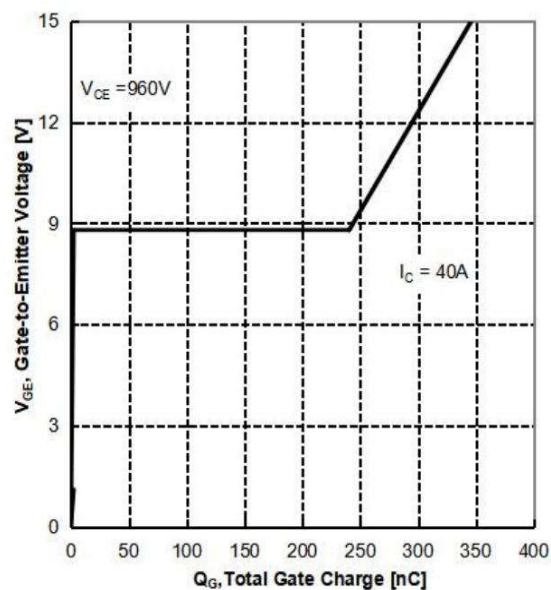


Figure 18: Typical Capacitance vs. Collector- Emitter Voltage

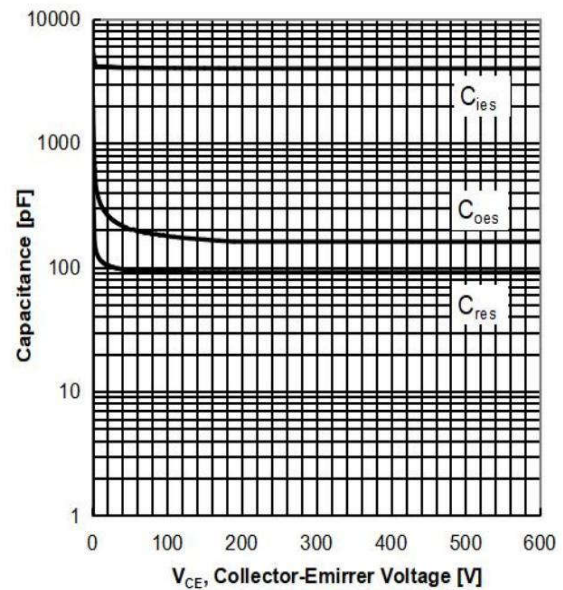


Figure 19: IGBT Transient Thermal Impedance vs. Pulse Width

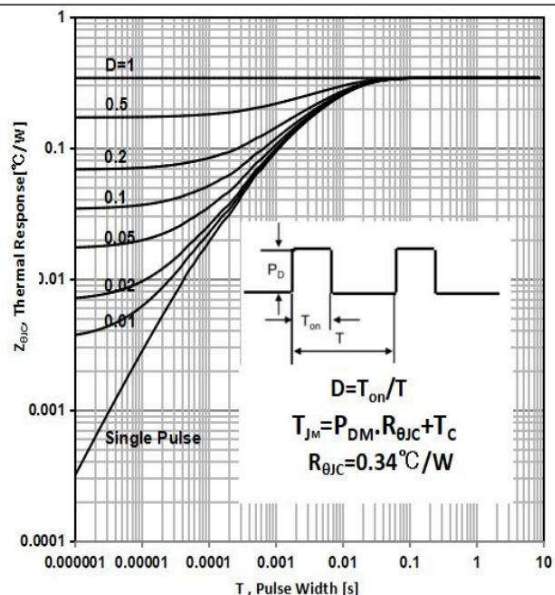


Figure 20: Diode Transient Thermal Impedance vs. Pulse Width

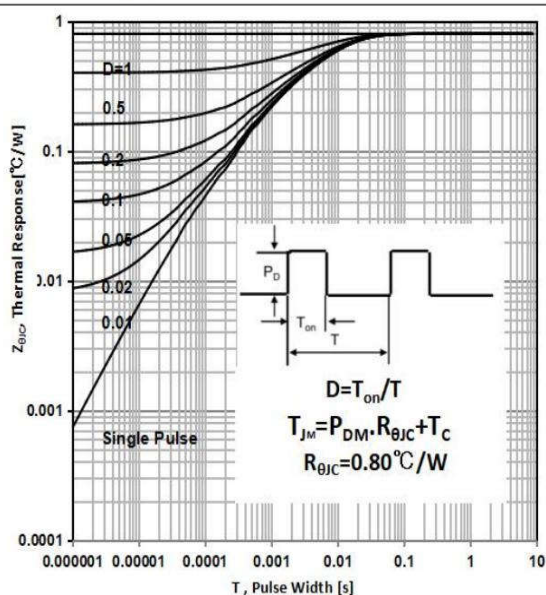
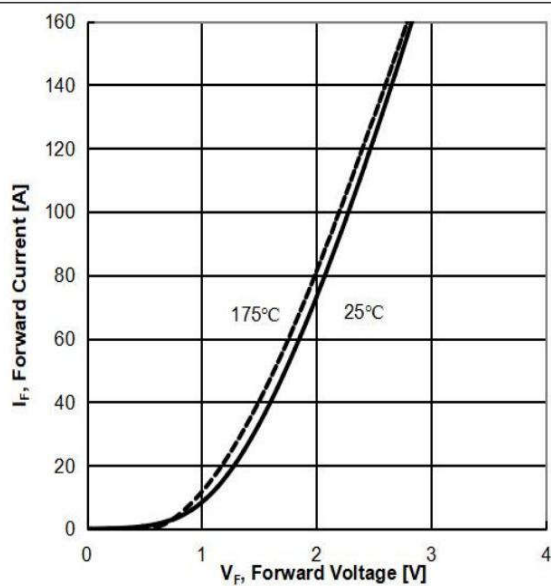
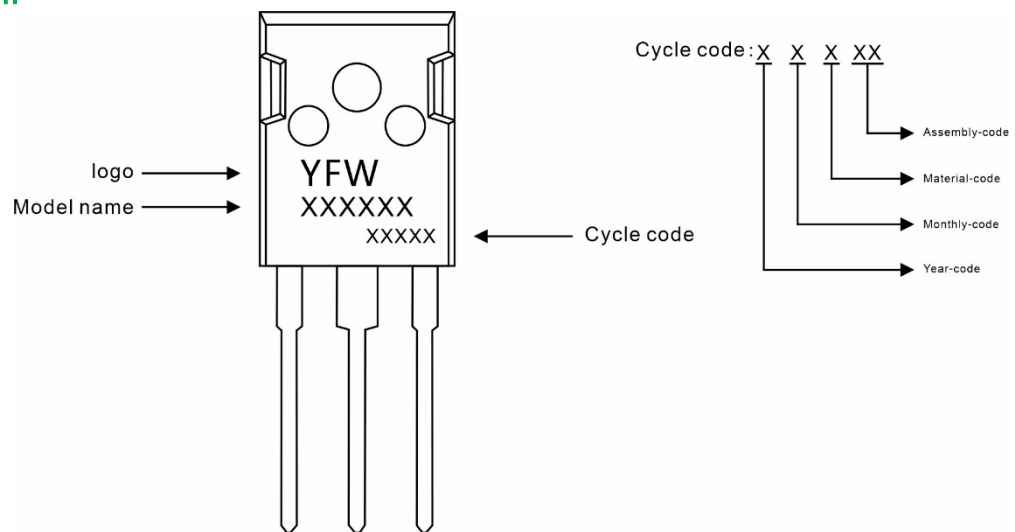


Figure 21: Typical Diode Forward Current vs. Forward Voltage



Marking Diagram



Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG40T120AP	TO-247	0.209oz(5.93g)	30pcs/tube	600PCS/Box 2400PCS/Carton

Package Dimensions

TO-247

Symbol	Dimensions in mm		Dimensions in Inch	
	Min.	Max.	Min.	Max.
A	4.90	5.10	0.193	0.201
A1	1.90	2.10	0.075	0.083
A2	2.29	2.54	0.090	0.100
b	1.00	1.40	0.039	0.055
b1	2.00	2.20	0.079	0.087
b2	3.00	3.20	0.118	0.126
c	0.50	0.70	0.020	0.028
D	15.75	16.05	0.620	0.632
E	20.20	20.80	0.795	0.819
e	5.45 (BSC)		0.215 (BSC)	
e1	10.90 (BSC)		0.429 (BSC)	
F	6.05	6.25	0.238	0.246
F1	5.80	6.00	0.228	0.236
L	20.10	20.40	0.791	0.803
L1	4.05	4.35	0.159	0.171
Φ	3.50	3.70	0.138	0.146

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.