

# FGH40N120AN

## 1200V NPT IGBT

### Features

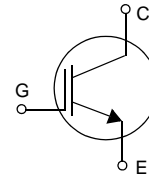
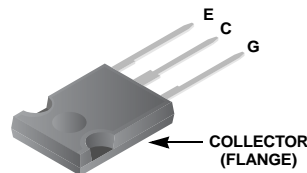
- High speed switching
- Low saturation voltage :  $V_{CE(sat)} = 2.6\text{ V @ } I_C = 40\text{ A}$
- High input impedance
- RoHS compliant

### Description

Employing NPT technology, Fairchild's AN series of IGBTs provides low conduction and switching losses. The AN series offers an solution for application such as induction heating (IH), motor control, general purpose inverters and uninterruptible power supplies (UPS).

### Applications

Induction Heating, UPS, AC & DC motor controls and general purpose inverters.



### Absolute Maximum Ratings

Symbol	Parameter	FGH40N120AN	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	±25	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	64	A
	Collector Current @ $T_C = 100^\circ\text{C}$	40	A
$I_{CM(1)}$	Pulsed Collector Current	160	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	417	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	167	W
SCWT	Short Circuit Withstand Time, $V_{CE} = 600\text{V}, V_{GE} = 15\text{V}, T_C = 125^\circ\text{C}$	10	µs
$T_J$	Operating Junction Temperature	-55 to +150	°C
$T_{STG}$	Storage Temperature Range	-55 to +150	°C
$T_L$	Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 seconds	300	°C

**Notes:**

(1) Pulse width limited by max. junction temperature

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction-to-Case	--	0.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGH40N120AN	FGH40N120AN	TO-247	-	-	30

## Electrical Characteristics of the IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
BV <sub>CES</sub>	Collector-Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 1mA	1200	--	--	V
BV <sub>CES</sub> /ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 1mA	--	0.6	--	V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	--	--	1	mA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	--	--	±250	nA
<b>On Characteristics</b>						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 250μA, V <sub>CE</sub> = V <sub>GE</sub>	3.5	5.5	7.5	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 40A, V <sub>GE</sub> = 15V	--	2.6	3.2	V
		I <sub>C</sub> = 40A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 125°C	--	2.9	--	V
		I <sub>C</sub> = 64A, V <sub>GE</sub> = 15V	--	3.15	--	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30V, V <sub>GE</sub> = 0V f = 1MHz	--	3200	--	pF
C <sub>oes</sub>	Output Capacitance		--	370	--	pF
C <sub>res</sub>	Reverse Transfer Capacitance		--	125	--	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 600V, I <sub>C</sub> = 40A, R <sub>G</sub> = 5Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 25°C	--	15	--	ns
t <sub>r</sub>	Rise Time		--	20	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	110	--	ns
t <sub>f</sub>	Fall Time		--	40	80	ns
E <sub>on</sub>	Turn-On Switching Loss		--	2.3	3.45	mJ
E <sub>off</sub>	Turn-Off Switching Loss		--	1.1	1.65	mJ
E <sub>ts</sub>	Total Switching Loss		--	3.4	5.1	mJ
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 600V, I <sub>C</sub> = 40A, R <sub>G</sub> = 5Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 125°C	--	20	--	ns
t <sub>r</sub>	Rise Time		--	25	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	120	--	ns
t <sub>f</sub>	Fall Time		--	45	--	ns
E <sub>on</sub>	Turn-On Switching Loss		--	2.5	--	mJ
E <sub>off</sub>	Turn-Off Switching Loss		--	1.8	--	mJ
E <sub>ts</sub>	Total Switching Loss		--	4.3	--	mJ
Q <sub>g</sub>	Total Gate charge	V <sub>CE</sub> = 600V, I <sub>C</sub> = 40A, V <sub>GE</sub> = 15V	--	220	--	nC
Q <sub>ge</sub>	Gate-Emitter Charge		--	25	--	nC
Q <sub>gc</sub>	Gate-Collector Charge		--	130	--	nC

### Typical Performance Characteristics

Figure 1. Typical Output Characteristics

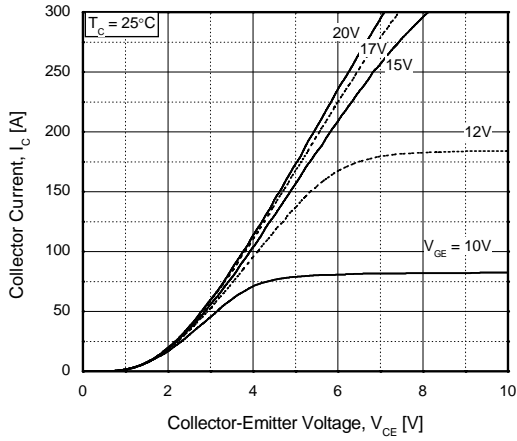


Figure 2. Typical Saturation Voltage Characteristics

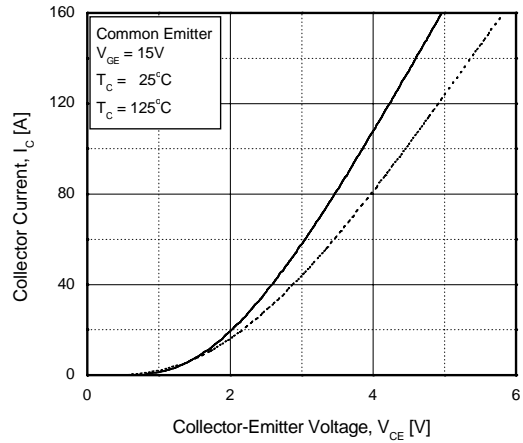


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

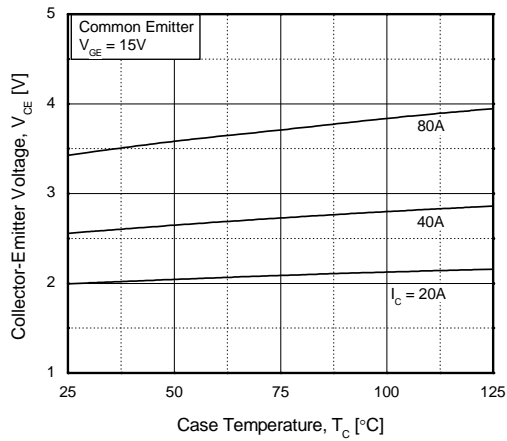


Figure 4. Load Current vs. Frequency

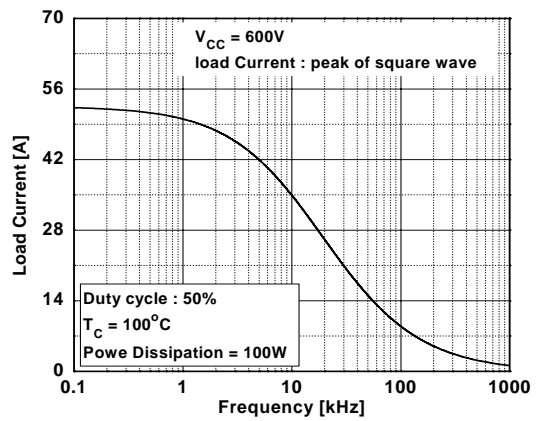


Figure 5. Saturation Voltage vs. V\_GE

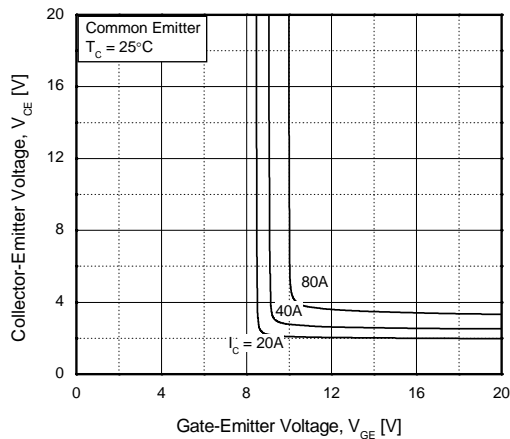
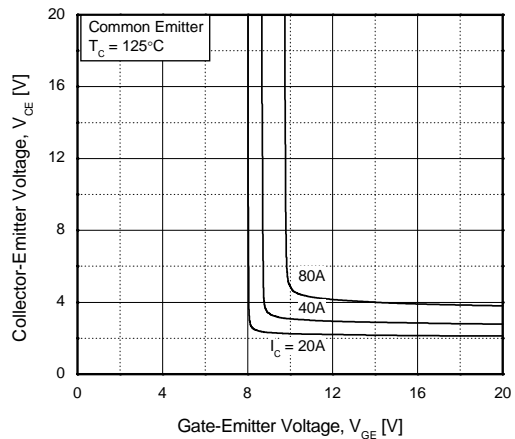
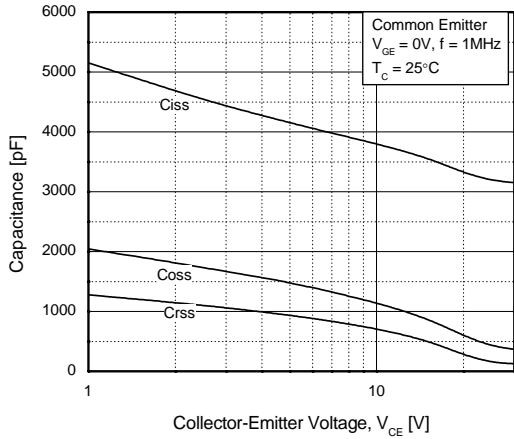


Figure 6. Saturation Voltage vs. V\_GE

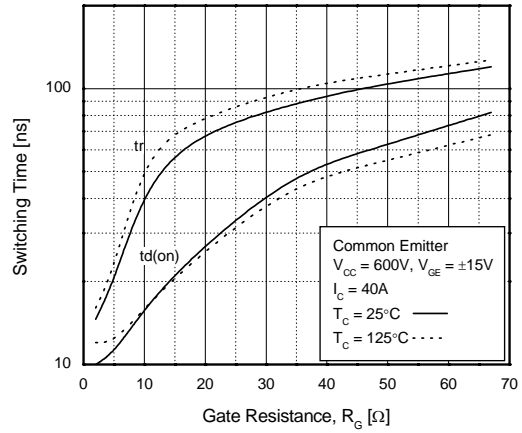


**Typical Performance Characteristics** (Continued)

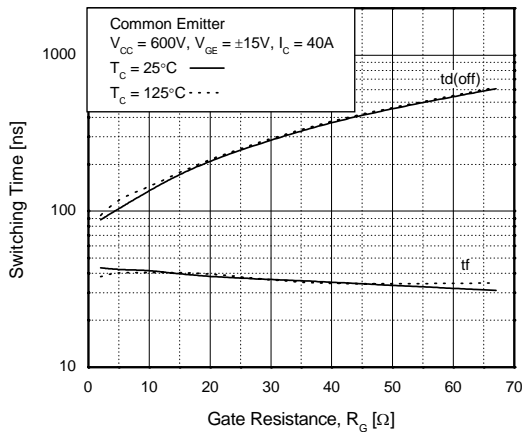
**Figure 7. Capacitance Characteristics**



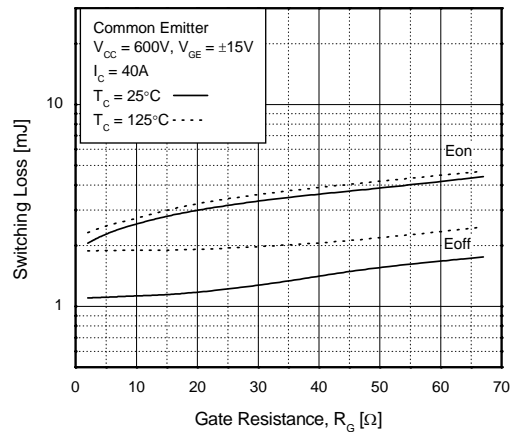
**Figure 8. Turn-On Characteristics vs. Gate Resistance**



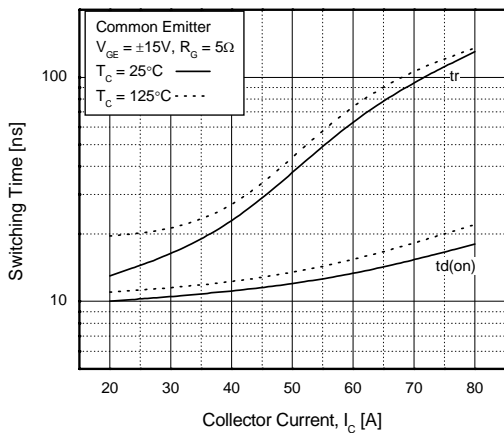
**Figure 9. Turn-Off Characteristics vs. Gate Resistance**



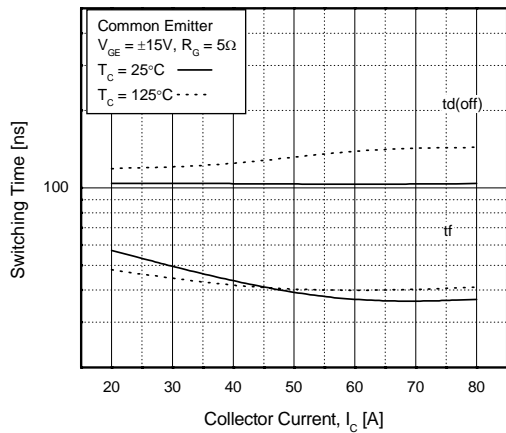
**Figure 10. Switching Loss vs. Gate Resistance**



**Figure 11. Turn-On Characteristics vs. Collector Current**

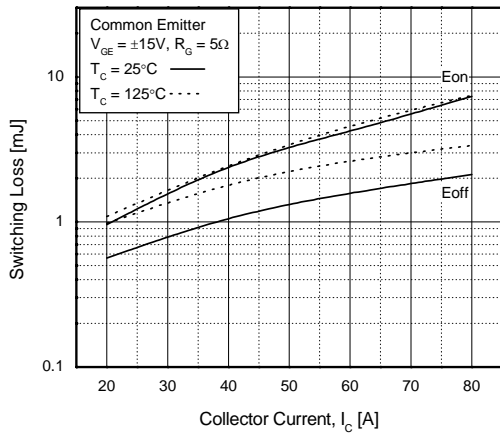


**Figure 12. Turn-Off Characteristics vs. Collector Current**

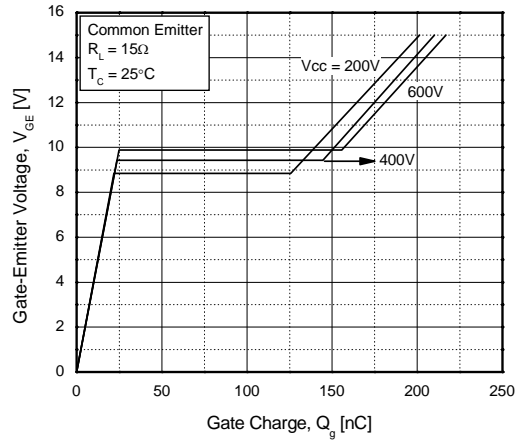


### Typical Performance Characteristics (Continued)

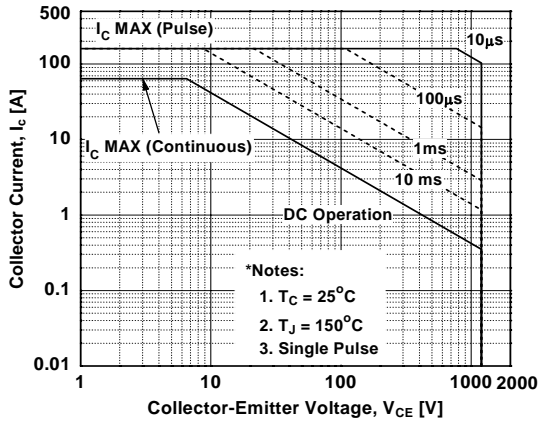
**Figure 13. Switching Loss vs. Collector Current**



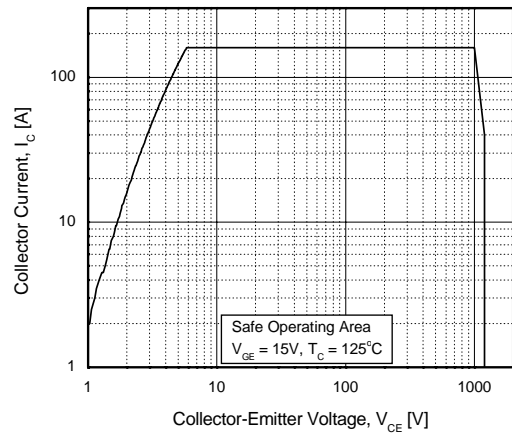
**Figure 14. Gate Charge Characteristics**



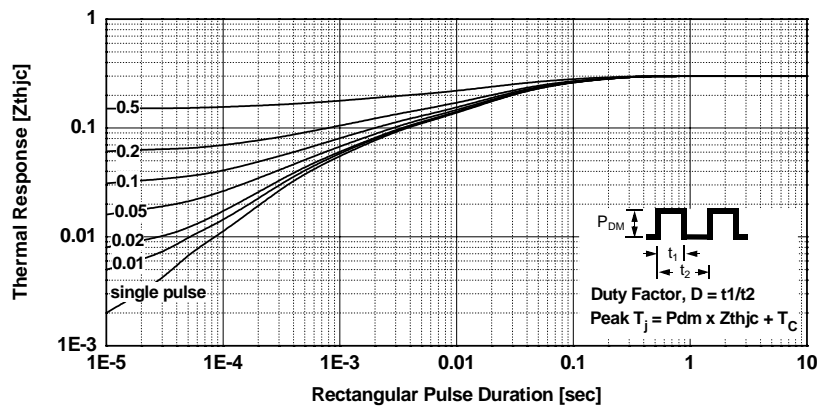
**Figure 15. SOA Characteristics**



**Figure 16. Turn-Off SOA**

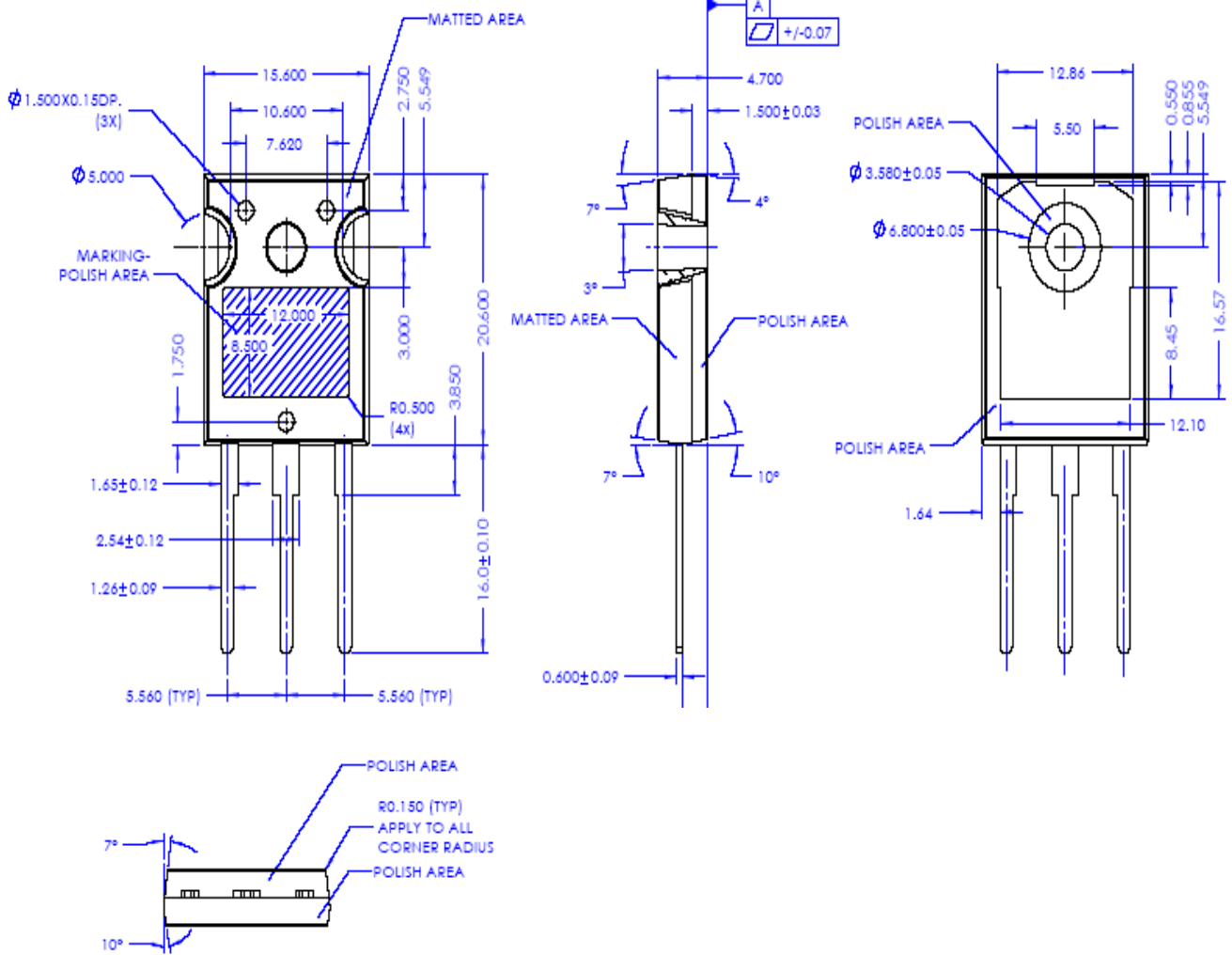


**Figure 17. Transient Thermal Impedance of IGBT**



**Mechanical Dimensions**

**TO-247AB (FKS PKG CODE 001)**




Dimensions in Millimeters



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