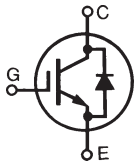
IXYS

High Voltage IGBT with Diode

IXGH 20N120BD1
IXGT 20N120BD1

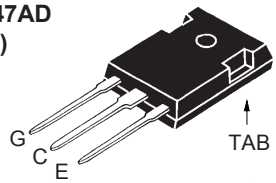
Preliminary Data Sheet

V_{CES} = 1200 V
I_{C25} = 40 A
$V_{CE(sat)}$ = 3.4 V
$t_{fi(typ)}$ = 160 ns

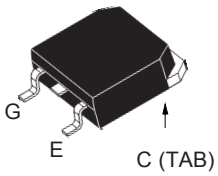


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1200	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	1200	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	40	A
I_{C110}	T_C = 110°C	20	A
I_{CM}	T_C = 25°C, 1 ms	100	A
SSOA (RBSOA)	V_{GE} = 15 V, T_J = 125°C, R_G = 10 Ω Clamped inductive load	I_{CM} = 80 @0.8 V_{CES}	A
P_C	T_C = 25°C	190	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque (TO-247)	1.13/10	Nm/lb.in.
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C
Maximum tab temperature soldering SMD devices for 10s		260	°C
Weight	TO-247AD/TO-268	6/4	g

TO-247AD (IXGH)



TO-268 (IXGT)



G = Gate C = Collector
E = Emitter TAB = Collector

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 1 μA, V_{GE} = 0 V		1200			V
$V_{GE(th)}$	I_C = 250 μA, V_{CE} = V_{GE}		2.5		5.0	V
I_{CES}	V_{CE} = V_{CES}	T_J = 25°C			150	μA
	V_{GE} = 0 V	T_J = 125°C		50		μA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15 V			2.9	3.4	V
	Note 2	T_J=125°C		2.8		V

Features

- International standard packages: JEDEC TO-247AD & TO-268
- IGBT and anti-parallel FRED for resonant power supplies
  - Induction heating
  - Rice cookers
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
  - soft recovery with low I_{RM}

Advantages

- Saves space (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost

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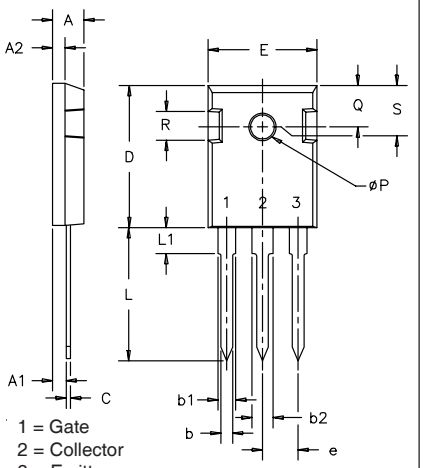
Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	I_C = 20A; V_{CE} = 10 V, Note 2.	12	18		S
C_{ies}			1700		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		105		pF
C_{res}			39		pF
Q_g			72		nC
Q_{ge}	I_C = 20A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		12		nC
Q_{gc}			27		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		25		ns
t_{ri}	I_C = 20 A; V_{GE} = 15 V		15		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 10 Ω		150	280	ns
t_{fi}	Note 1.		160	320	ns
E_{off}			2.1	3.5	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		25		ns
t_{ri}	I_C = 20A; V_{GE} = 15 V		18		ns
E_{on}	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 10 Ω		1.9		mJ
$t_{d(off)}$	Note 1		270		ns
t_{fi}			360		ns
E_{off}			3.5		mJ
R_{thJC}				0.65	K/W
R_{thCK}	(TO-247)		0.25		K/W

Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	I_F = 10 A, V_{GE} = 0 V			3.3	V
I_F	T_C = 90°C			10	A
I_{RM}	I_F = 10 A; -di$_F$/dt = 400 A/µs, V_R = 600 V		14		A
t_{rr}	V_{GE} = 0 V; T_J = 125°C		120		ns
t_{rr}	I_F = 1 A; -di$_F$/dt = 100 A/µs; V_R = 30 V, V_{GE} = 0 V		40		ns
R_{thJC}				2.5	K/W

Notes:
1. Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G.
2. Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %

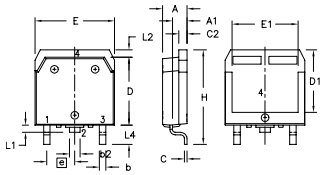
TO-247 AD Outline

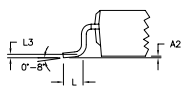


1 = Gate
2 = Collector
3 = Emitter
Tab = Collector

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.185	.209	4.7	5.3
A_1	.087	.102	2.2	2.54
A_2	.059	.098	2.2	2.6
b	.040	.055	1.0	1.4
b_1	.065	.084	1.65	2.13
b_2	.113	.123	2.87	3.12
C	.016	.031	.4	.8
D	.819	.845	20.80	21.46
E	.610	.640	15.75	16.26
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1		.177		4.50
øP	.140	.144	3.55	3.65
Q	.212	.244	5.4	6.2
R	.170	.216	4.32	5.49
S	.242 BSC		6.15 BSC	

TO-268 Outline





Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.9	5.1	.193	.201
A_1	2.7	2.9	.106	.114
A_2	.02	.25	.001	.010
b	1.15	1.45	.045	.057
b_2	1.9	2.1	.75	.83
C	.4	.65	.016	.026
D	13.80	14.00	.543	.551
E	15.85	16.05	.624	.632
E_1	13.3	13.6	.524	.535
e	5.45 BSC		.215 BSC	
H	18.70	19.10	.736	.752
L	2.40	2.70	.094	.106
L1	1.20	1.40	.047	.055
L2	1.00	1.15	.039	.045
L3	0.25 BSC		.010 BSC	
L4	3.80	4.10	.150	.161

IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1 4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

Fig. 1. Output Characteristics @ 25 Deg. C

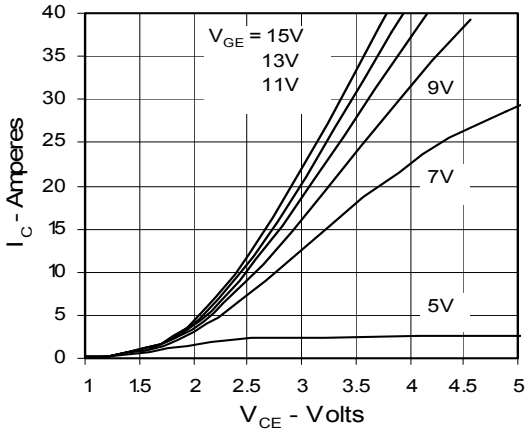


Fig. 2. Extended Output Characteristics @ 25 deg. C

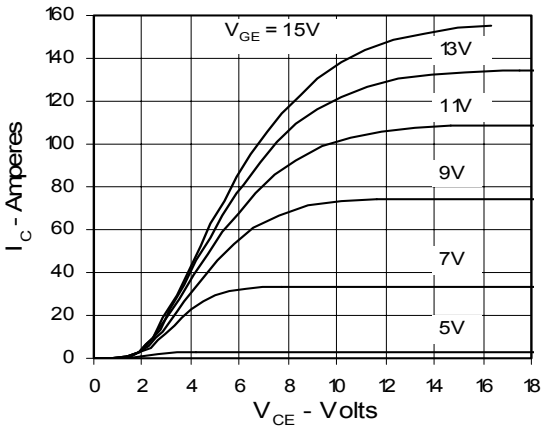


Fig. 3. Output Characteristics @ 125 Deg. C

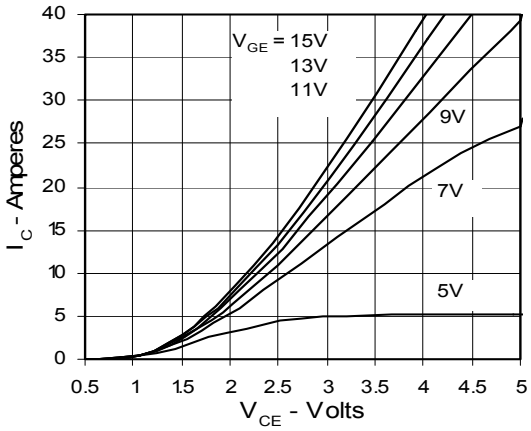


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

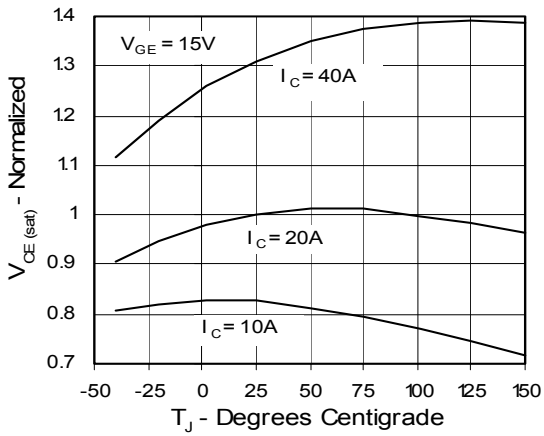


Fig. 5. Input Admittance

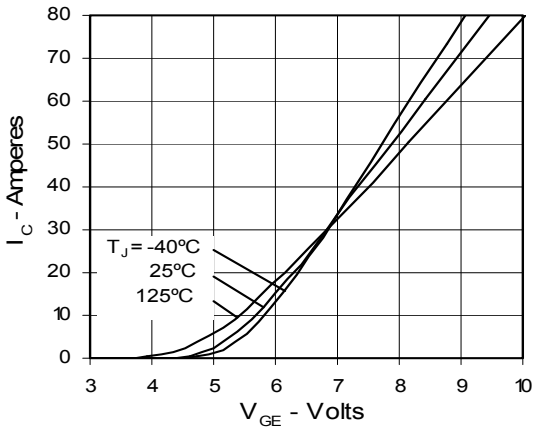


Fig. 6. Transconductance

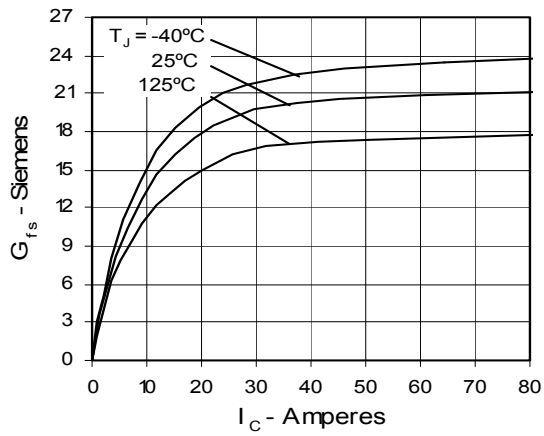


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Fig. 7. Dependence of E_{off} on R_G

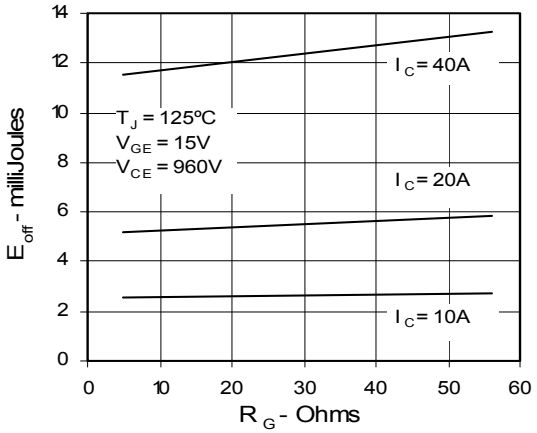


Fig. 8. Dependence of E_{off} on I_C

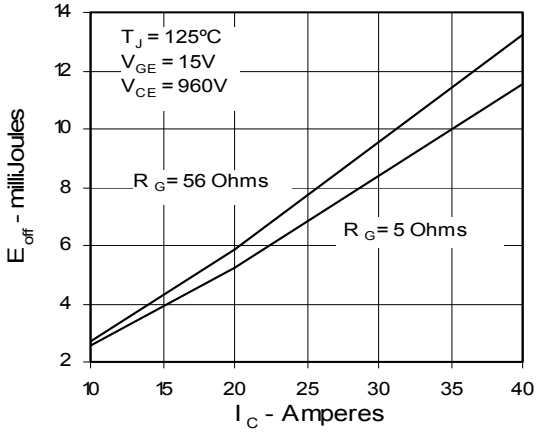


Fig. 9. Dependence of E_{off} on Temperature

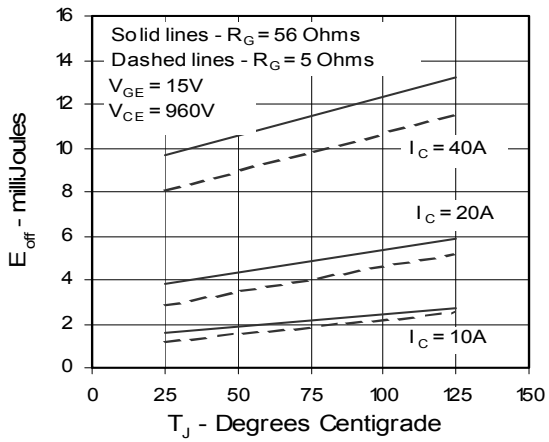


Fig. 10. Gate Charge

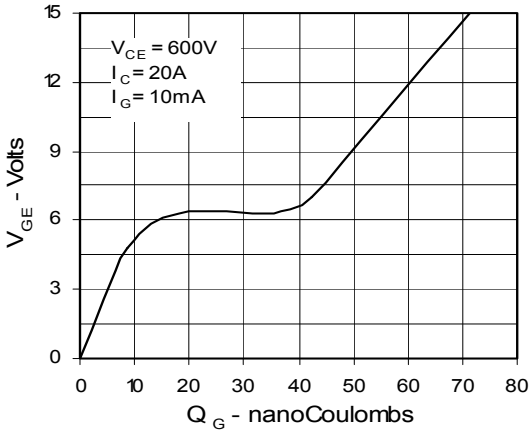


Fig. 11. Reverse-Bias Safe Operating Area

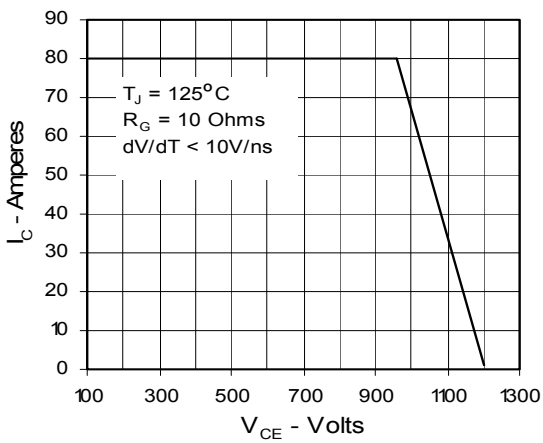
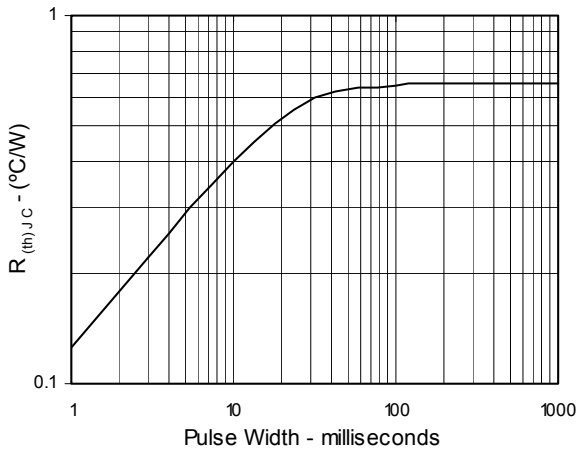


Fig. 12. Maximum Transient Thermal Resistance



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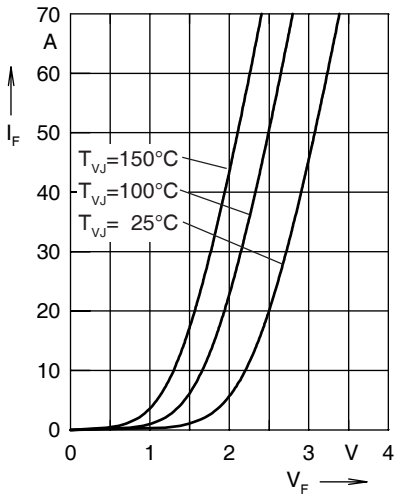

Fig. 13. Forward current I_F versus V_F

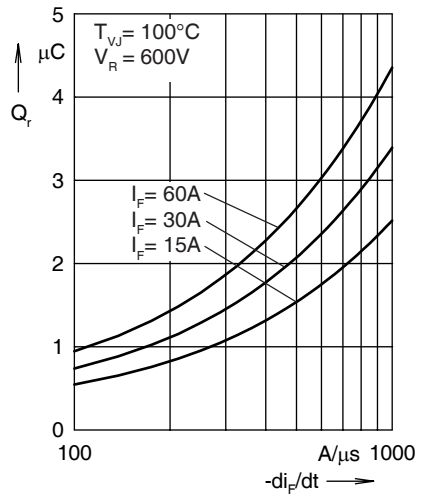

Fig. 14. Reverse recovery charge Q_r versus $-di_F/dt$

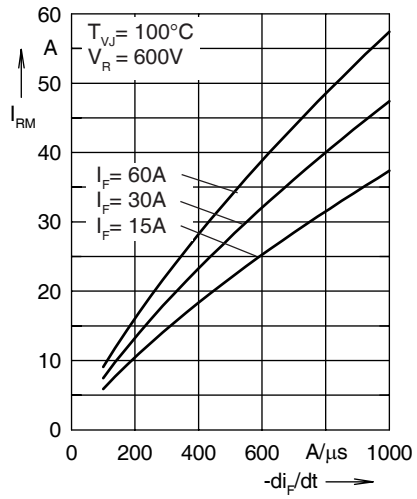

Fig. 15. Peak reverse current I_{RM} versus $-di_F/dt$

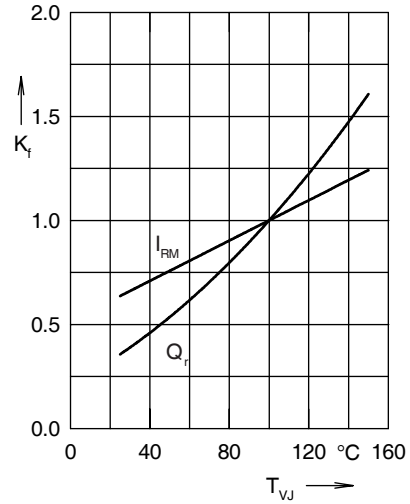

Fig. 16. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

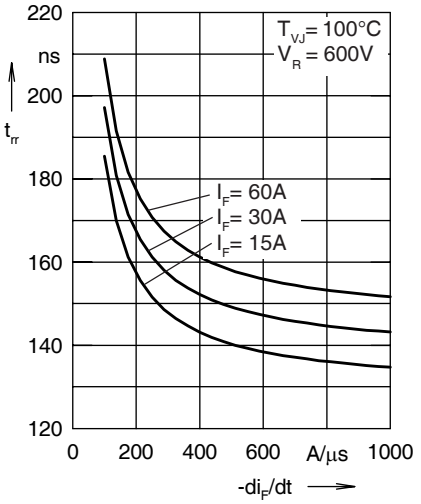

Fig. 17. Recovery time t_{rr} versus $-di_F/dt$

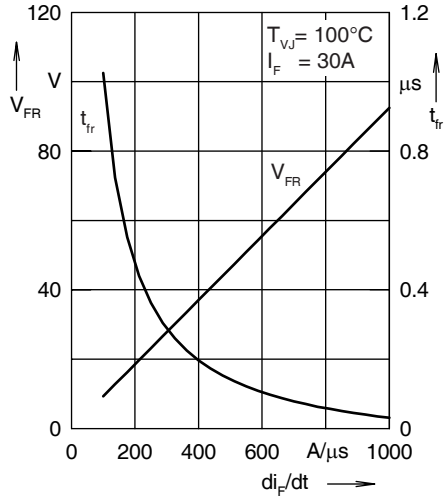

Fig. 18. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

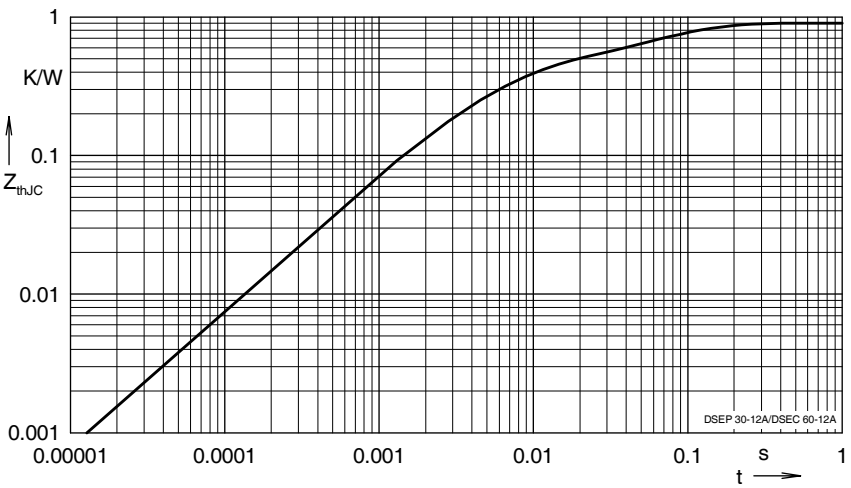

Fig. 19. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397

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