

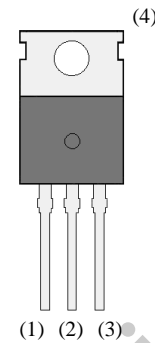
**40 V, 80 A, 4.1 mΩ Low RDS(ON)
N ch Trench Power MOSFET
EKI04047**

Features

- $V_{(BR)DSS}$ ----- 40 V ($I_D = 100 \mu A$)
- I_D ----- 80 A
- $R_{DS(ON)}$ ----- 5.2 mΩ max. ($V_{GS} = 10 V, I_D = 42.8 A$)
- Q_g ----- 16.0 nC ($V_{GS} = 4.5 V, V_{DS} = 20 V, I_D = 42.8 A$)
- Low Total Gate Charge
- High Speed Switching
- Low On-Resistance
- Capable of 4.5 V Gate Drive
- 100 % UIL Tested
- RoHS Compliant

Package

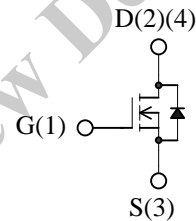
- TO220-3L



Not to scale

Applications

- DC-DC converters
- Synchronous Rectification
- Power Supplies



Absolute Maximum Ratings

- Unless otherwise specified, $T_A = 25 \text{ }^\circ\text{C}$

Parameter	Symbol	Test conditions	Rating	Unit
Drain to Source Voltage	V_{DS}		40	V
Gate to Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C = 25 \text{ }^\circ\text{C}$	80	A
Pulsed Drain Current	I_{DM}	$PW \leq 100\mu s$ Duty cycle $\leq 1 \%$	161	A
Continuous Source Current (Body Diode)	I_S		80	A
Pulsed Source Current (Body Diode)	I_{SM}	$PW \leq 100\mu s$ Duty cycle $\leq 1 \%$	161	A
Single Pulse Avalanche Energy	E_{AS}	$V_{DD} = 20 V, L = 1 mH,$ $I_{AS} = 9.4 A, \text{ unclamped,}$ $R_G = 4.7 \Omega$ Refer to Figure 1	89	mJ
Avalanche Current	I_{AS}		16.7	A
Power Dissipation	P_D	$T_C = 25 \text{ }^\circ\text{C}$	90	W
Operating Junction Temperature	T_J		150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}		- 55 to 150	$^\circ\text{C}$

Thermal Characteristics

- Unless otherwise specified, $T_A = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Thermal Resistance (Junction to Case)	$R_{\theta JC}$		–	–	1.4	$^\circ\text{C/W}$
Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$		–	–	62.5	$^\circ\text{C/W}$

Electrical Characteristics

- Unless otherwise specified, $T_A = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 100\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	40	–	–	V
Drain to Source Leakage Current	I_{DSS}	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$	–	–	100	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	–	–	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 650\text{ }\mu\text{A}$	1.0	2.0	2.5	V
Static Drain to Source On-Resistance	$R_{DS(on)}$	$I_D = 42.8\text{ A}$, $V_{GS} = 10\text{ V}$	–	4.1	5.2	$\text{m}\Omega$
		$I_D = 21.4\text{ A}$, $V_{GS} = 4.5\text{ V}$	–	5.4	7.0	$\text{m}\Omega$
Gate Resistance	R_G	$f = 1\text{ MHz}$	–	1.5	–	Ω
Input Capacitance	C_{iss}	$V_{DS} = 25\text{ V}$ $V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$	–	2410	–	pF
Output Capacitance	C_{oss}		–	395	–	
Reverse Transfer Capacitance	C_{rss}		–	190	–	
Total Gate Charge ($V_{GS} = 10\text{ V}$)	Q_{g1}	$V_{DS} = 20\text{ V}$ $I_D = 42.8\text{ A}$	–	35.0	–	nC
Total Gate Charge ($V_{GS} = 4.5\text{ V}$)	Q_{g2}		–	16.0	–	
Gate to Source Charge	Q_{gs}		–	5.6	–	
Gate to Drain Charge	Q_{gd}		–	6.0	–	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}$ $I_D = 42.8\text{ A}$ $V_{GS} = 10\text{ V}$, $R_G = 4.7\text{ }\Omega$ Refer to Figure 2	–	4.1	–	ns
Rise Time	t_r		–	5.6	–	
Turn-Off Delay Time	$t_{d(off)}$		–	19.7	–	
Fall Time	t_f		–	11.9	–	
Source to Drain Diode Forward Voltage	V_{SD}	$I_S = 42.8\text{ A}$, $V_{GS} = 0\text{ V}$	–	0.9	1.5	V
Source to Drain Diode Reverse Recovery Time	t_{rr}	$I_F = 42.8\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ Refer to Figure 3	–	32.9	–	ns
Source to Drain Diode Reverse Recovery Charge	Q_{rr}		–	30.3	–	nC

Test Circuits and Performance Curves

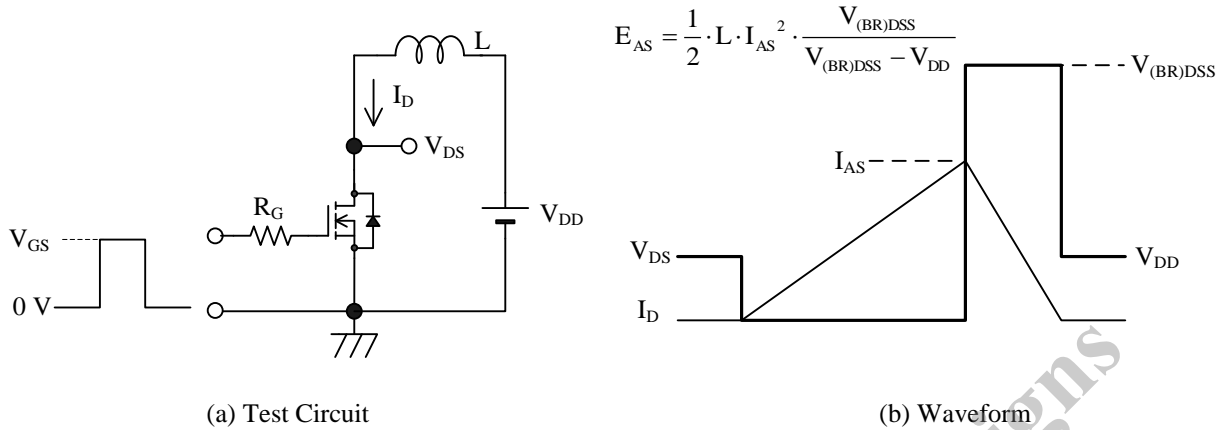


Figure 1. Unclamped Inductive Switching

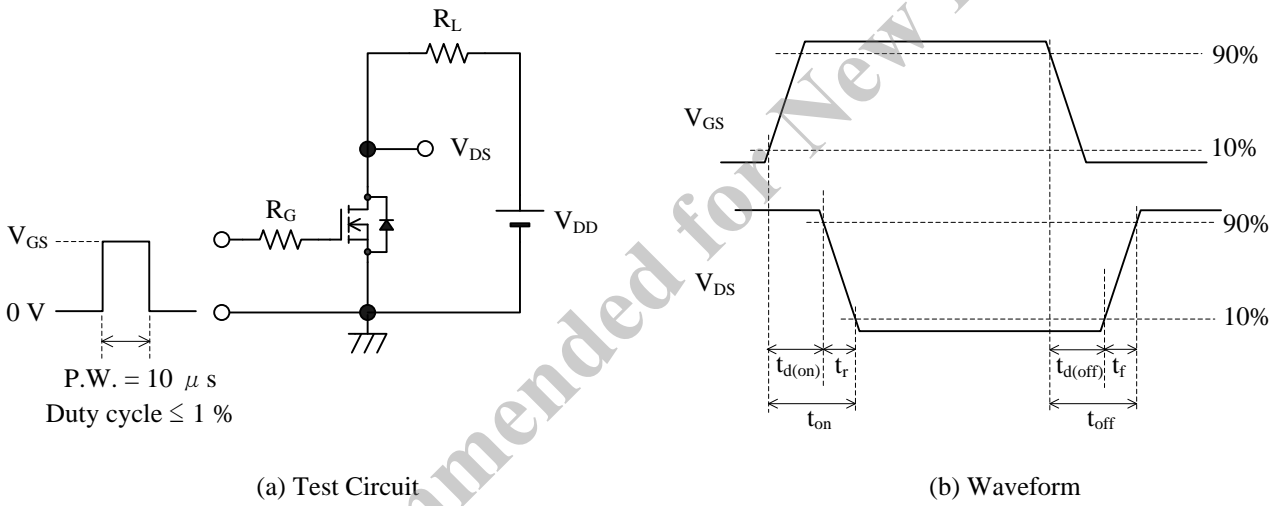


Figure 2. Switching Time

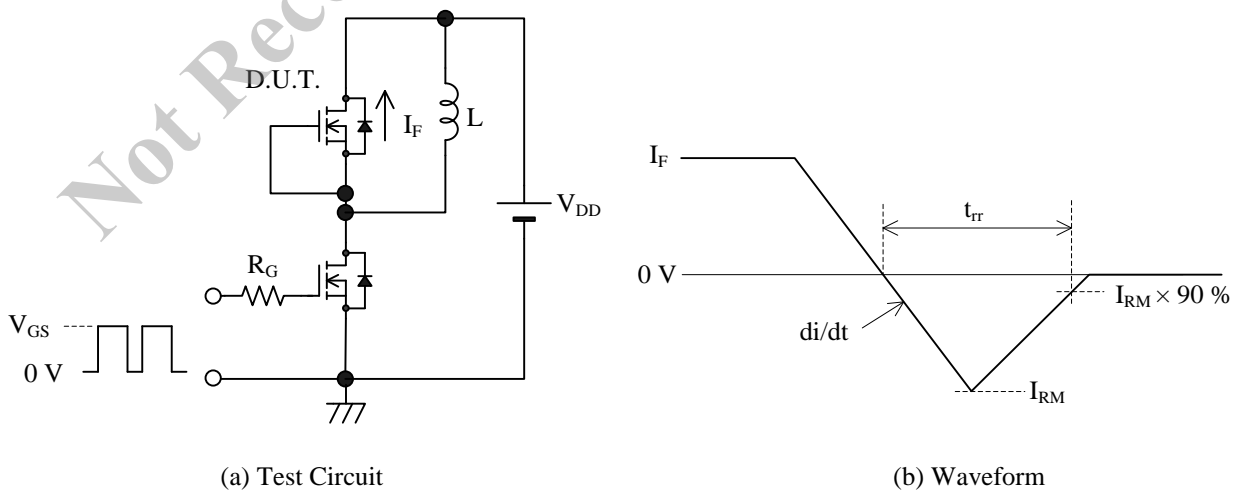
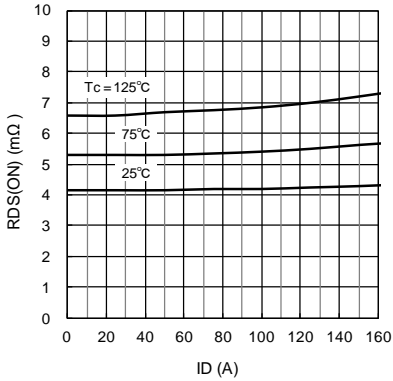
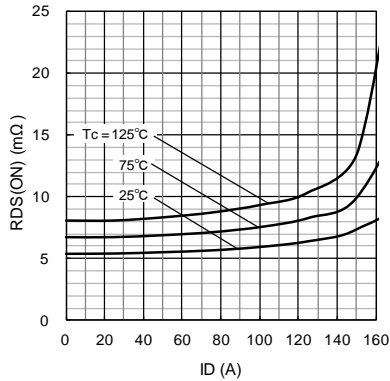


Figure 3. Diode Reverse Recovery Time

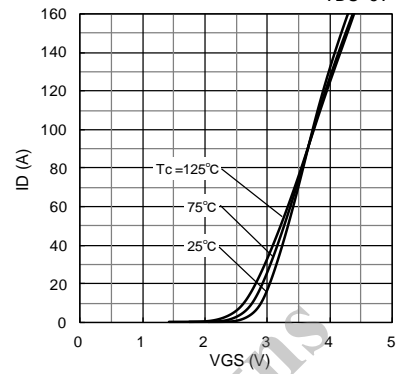
RDS(ON)-ID characteristics (typical)
VGS=10V



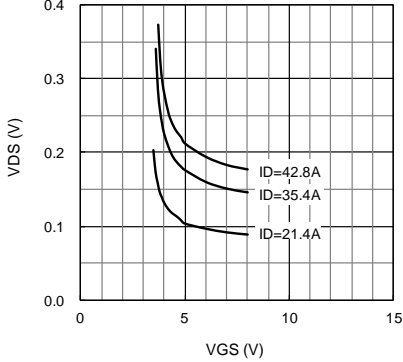
RDS(ON)-ID characteristics (typical)
VGS=4.5V



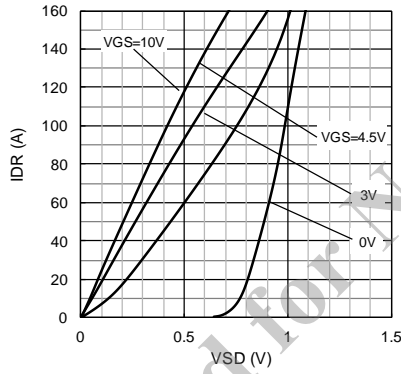
ID-VGS characteristics (typical)
VDS=5V



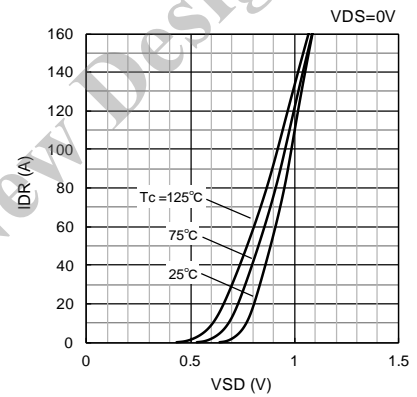
VDS-VGS characteristics (typical)
Tc=25°C



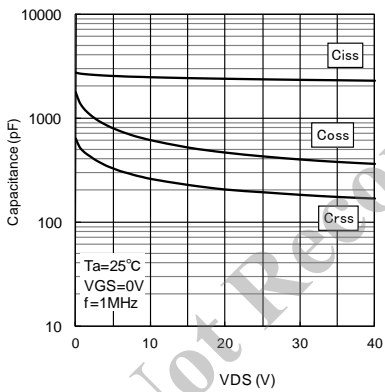
IDR-VSD characteristics (typical)
Tc=25°C



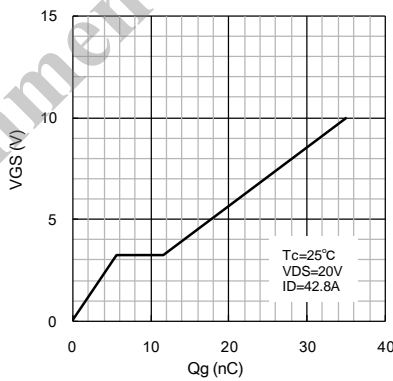
IDR-VSD characteristics (typical)
VDS=0V



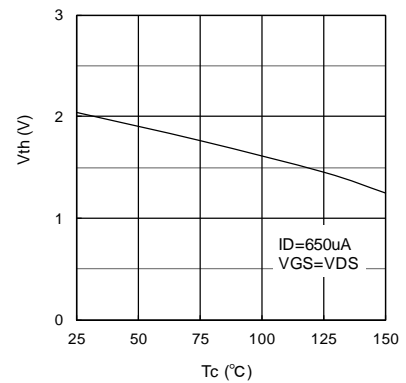
Capacitance-VDS characteristics (typical)



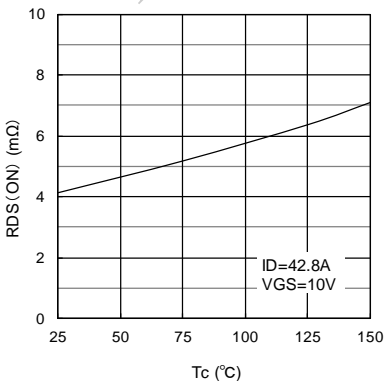
VGS - Qg characteristics (typical)



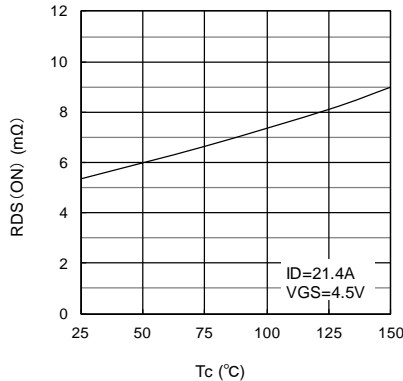
Vth-Tc characteristics (typical)



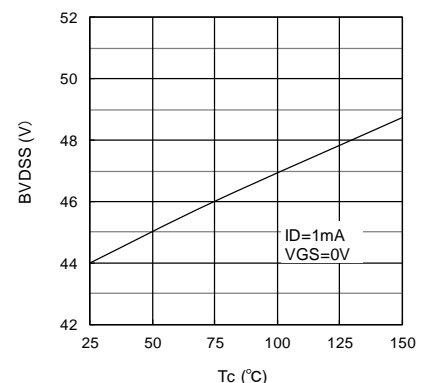
RDS(ON)-Tc characteristics (typical)



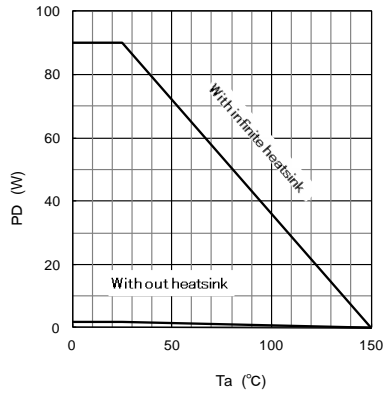
RDS(ON)-Tc characteristics (typical)



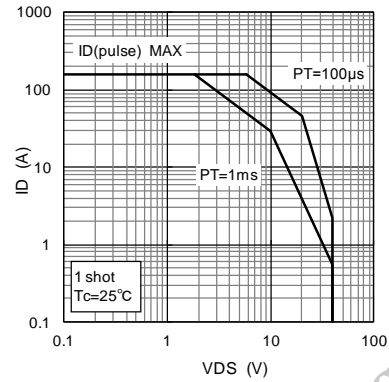
BVDSS-Tc characteristics (typical)



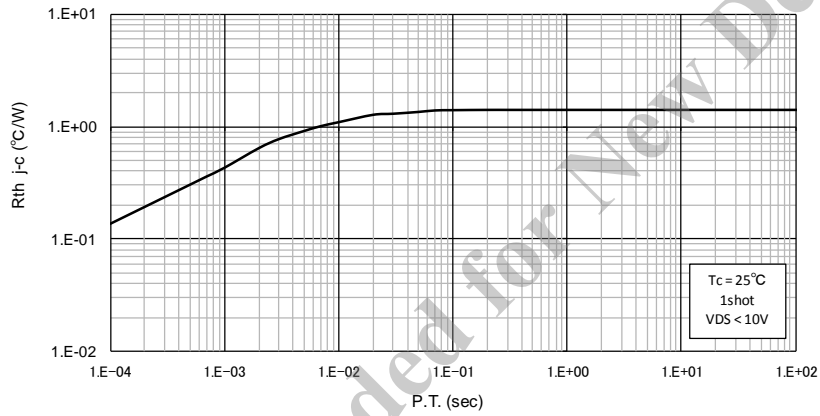
PD-Ta Derating



SAFE OPERATING AREA



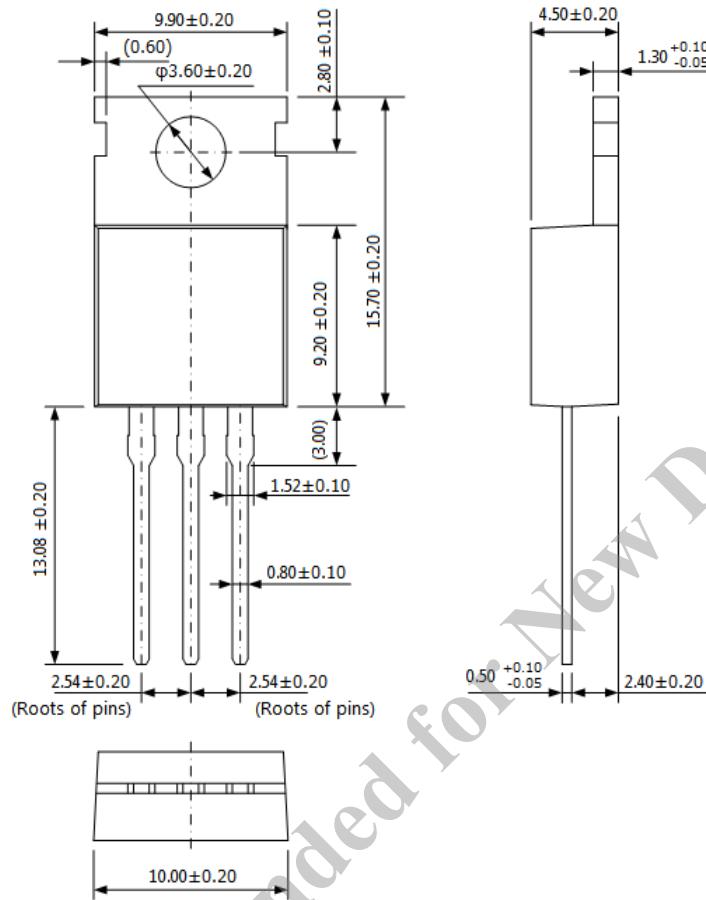
TRANSIENT THERMAL RESISTANCE - PULSE WIDTH



Not Recommended for New Designs

Physical Dimensions

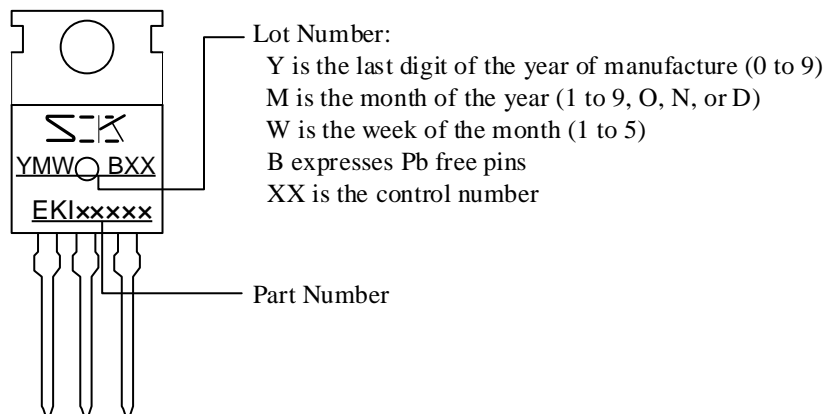
- TO220-3L



NOTES:

- Dimensions in millimeters
- Maximum gate burr height is 0.3 mm.
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, it is required to minimize the working time, within the following limits:
 - Flow: $260 \pm 5 \text{ }^\circ\text{C} / 10 \pm 1 \text{ s}$, 2 times
 - Soldering Iron: $380 \pm 10 \text{ }^\circ\text{C} / 3.5 \pm 0.5 \text{ s}$, 1 time
 - Soldering should be at a distance of at least 1.5 mm from the body of the product.
- Recommended screw torque for TO220: 0.490 N·m to 0.686 N·m (5 kgf·cm to 7 kgf·cm)

Marking Diagram



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