100V, 20A Low $R_{DS(ON)}$
N ch Trench Power MOSFET

EKG1020, FKG1020

Data Sheet

Features

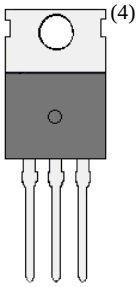
- V_{DS} ---------- 100 V
- I_D ---------- 20 A
- $R_{DS(ON)}$ ---------- 33 mΩ typ.(V_{GS} = 10 V, I_D = 10 A)
- Built-in Gate protect diode
- 100 % UIL tested
- RoHS Compliant

Applications

- Low Voltage DC Motor driver
- Solenoid driver

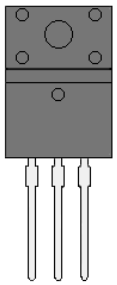
Package

EKG1020
TO220-3L



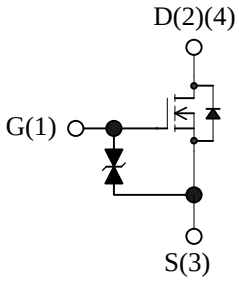
(1) (2) (3)
G D S

FKG1020
TO220F-3L



(1) (2) (3)
G D S

Not to scale



Absolute Maximum Ratings

- Unless otherwise specified, T_A = 25 °C

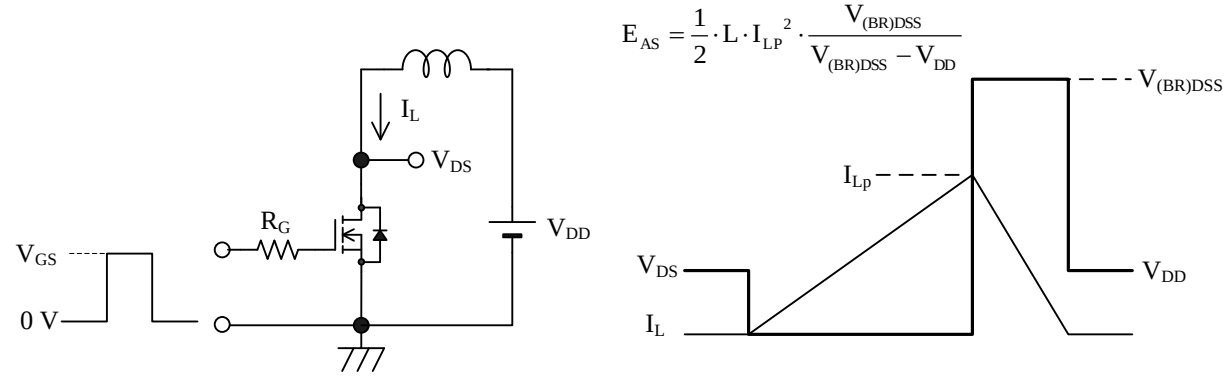
Characteristic	Symbol	Test conditions	Rating		Unit
			EKG1020	FKG1020	
Drain to Source Voltage	V_{DSS}		100		V
Gate to Source Voltage	V_{GSS}		± 20		V
Continuous Drain Current	$I_{D(DC)}$		20		A
Pulsed Drain Current	$I_{D(PULSE)}$	PW ≤ 100 µs Duty cycle ≤1 %	60		A
Continuous Diode Forward Current	$I_{SD(DC)}$		20		A
Diode Pulse Current	$I_{SD(PULSE)}$	PW ≤ 100 µs Duty cycle ≤ 1 %	60		A
Single Pulse Avalanche Energy	E_{AS}	V_{DD} = 20 V, L = 200 µH, I_{LP} = 20 A, unclamped, R_g = 50 Ω, See Figure 1	50		mJ
Maximum avalanche current	I_{AS}		20		A
Maximum Power Dissipation	P_D	T_C = 25 °C	55	40	W
Thermal Resistance	θ_{j-C}		2.27	3.13	°C/W
	θ_{j-A}		62.5		°C/W
Operating Junction Temperature	T_j		150		°C
Storage Temperature	T_{stg}		− 55 to 150		°C

Electrical Characteristics

● Unless otherwise specified, T_A = 25 °C

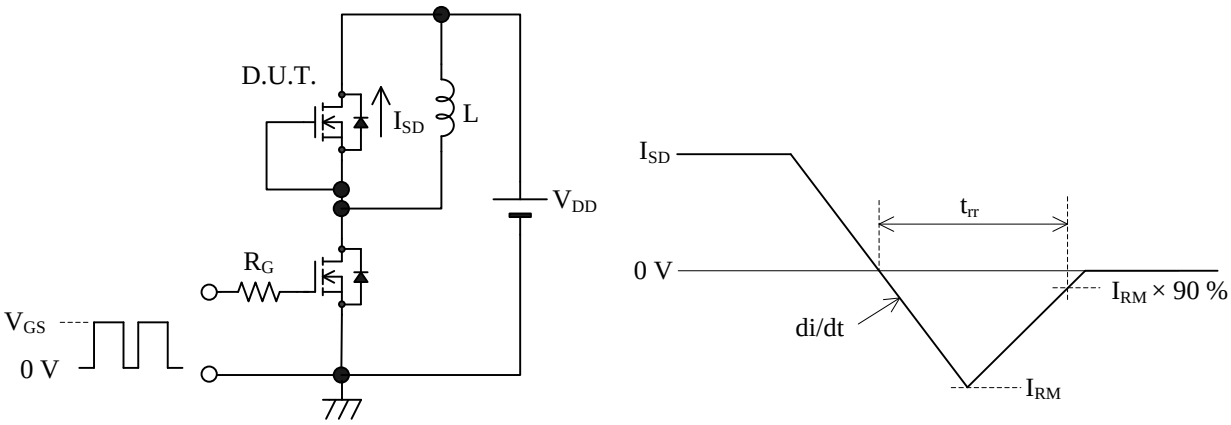
Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = 1 mA, V_{GS} = 0 V	100	–	–	V
Drain to Source Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}$	I_D = 1 mA, V_{GS} = 0 V	–	80	–	mV/°C
Drain to Source Leakage Current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V	–	–	100	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ± 20 V	–	–	±10	μA
Gate Threshold Voltage	V_{TH}	V_{DS} = 10 V, I_D = 1 mA	1.5	2.0	2.5	V
Gate Threshold Voltage Temp. Coefficient	ΔV_{TH}	V_{DS} = 10 V, I_D = 1 mA	–	− 6	–	mV/°C
Static Drain to Source On-Resistance	$R_{DS(ON)}$	I_D = 10 A, V_{GS} = 10 V	–	33	52	mΩ
		I_D = 10 A, V_{GS} = 4.5 V	–	36	59	
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 10 A	9.0	–	–	S
Input Capacitance	C_{iss}	V_{DS} = 10 V V_{GS} = 0 V F = 1 MHz	–	2200	–	pF
Output Capacitance	C_{oss}		–	210	–	
Reverse Transfer Capacitance	C_{rss}		–	110	–	
Total Gate Charge	Q_g	V_{DD} = 50 V I_D = 10 A, V_{GS} = 10 V R_L = 5 Ω	–	45	–	nC
Gate to Source Charge	Q_{gs}		–	4	–	
Gate to Drain Charge	Q_{gd}		–	9	–	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 50 V I_D = 10 A R_L = 5 Ω, R_g = 10 Ω V_{GS} = 10 V , See Figure 3	–	15	–	ns
Rise Time	t_r		–	20	–	
Turn-Off Delay Time	$t_{d(off)}$		–	180	–	
Fall Time	t_f		–	90	–	
Source-Drain Diode Forward Voltage	V_{SD}	I_{SD} = 20 A, V_{GS} = 0 V	–	0.9	1.2	V
Source-Drain Diode Reverse Recovery Time	t_{rr}	I_{SD} = 20 A di/dt = 100 A/μs See Figure 2	–	50	–	ns
		I_{SD} = 20 A di/dt = 100 A/μs T_C = 150 °C See Figure 2	–	60	–	ns
Source-Drain Diode Recovery Charge	Q_{rr}	I_{SD} = 20 A di/dt = 100 A/μs See Figure 2	–	90	–	nC
		I_{SD} = 20 A di/dt = 100 A/μs T_C = 150 °C See Figure 2	–	120	–	nC

Test Circuits and Waveforms



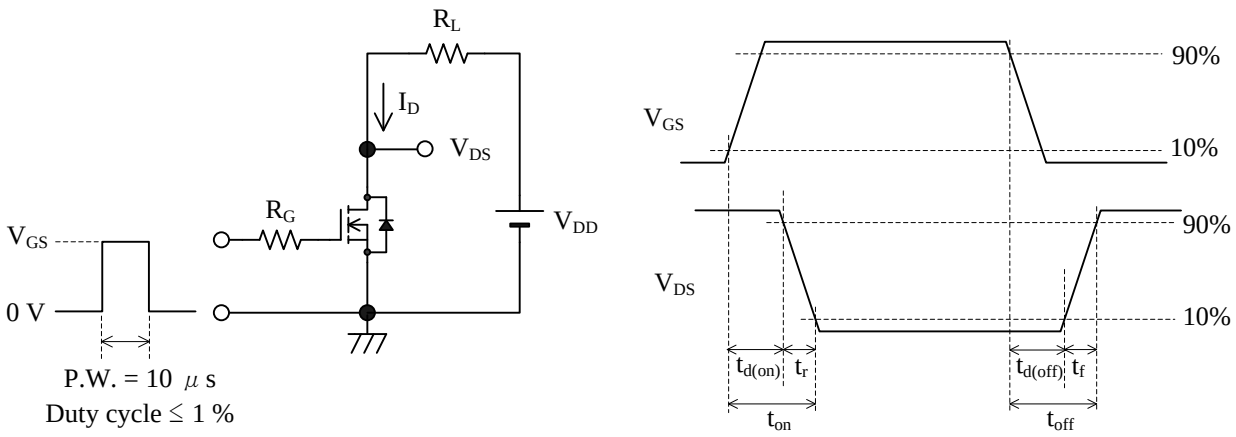
(a) Test Circuit (b) Waveform

Figure 1. Unclamped Inductive



(a) Test Circuit (b) Waveform

Figure 2. Diode Reverse Recovery Time

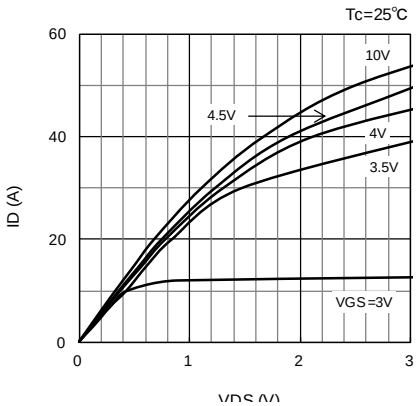


(a) Test Circuit (b) Waveform

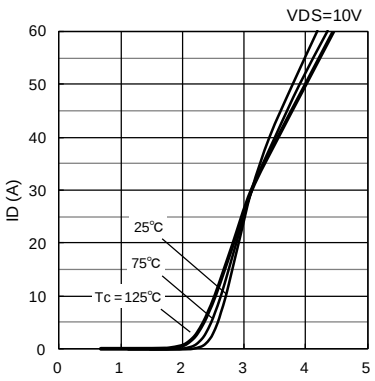
Figure 3. Switching Time

Performance Curves

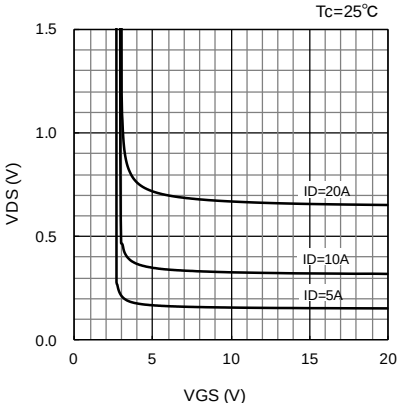
ID-VDS characteristics (typical)



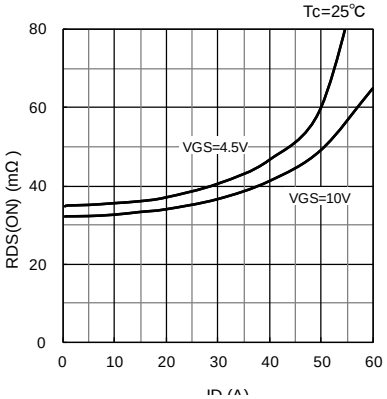
ID-VGS characteristics (typical)



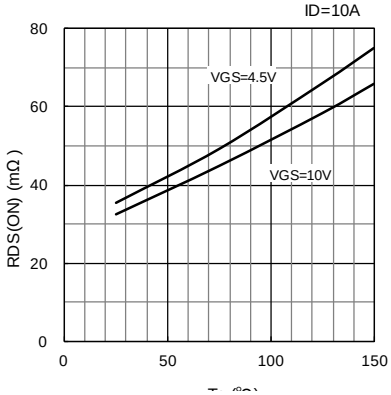
VDS-VGS characteristics (typical)



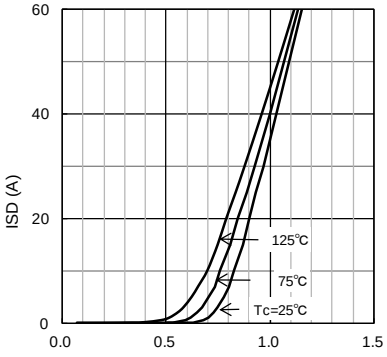
RDS(ON)-ID characteristics (typical)



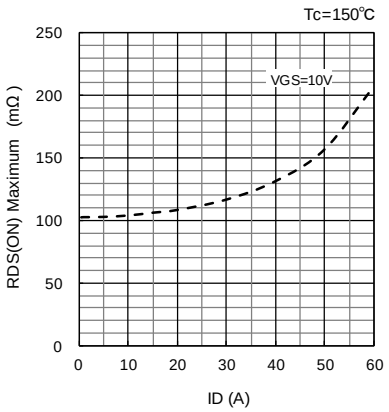
RDS(ON)-Tc characteristics (typical)



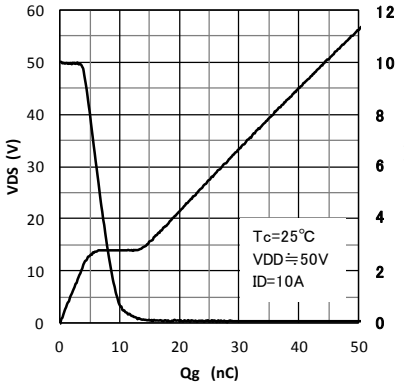
ISD-VSD characteristics (typical)



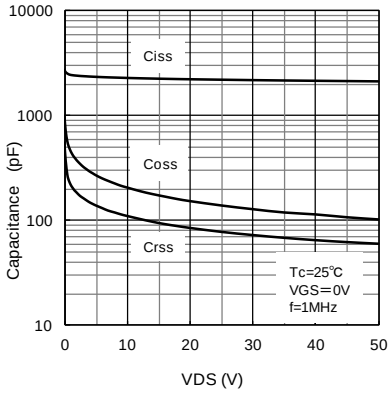
RDS(ON)-ID characteristics (maximum)



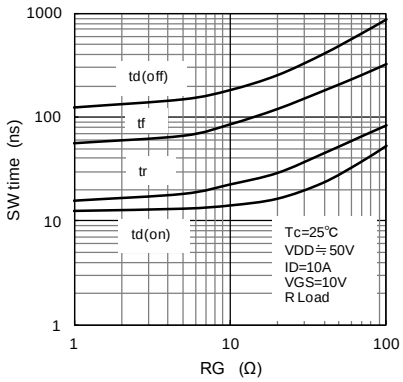
Dynamic Input Output Characteristics (typical)



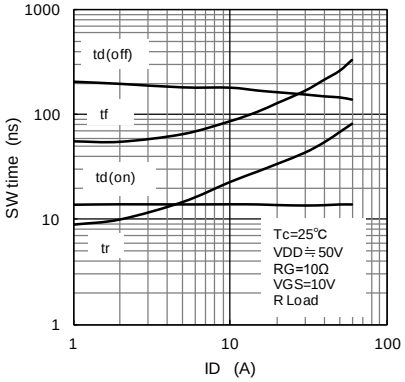
Capacitance-VDS caracteristics (typical)



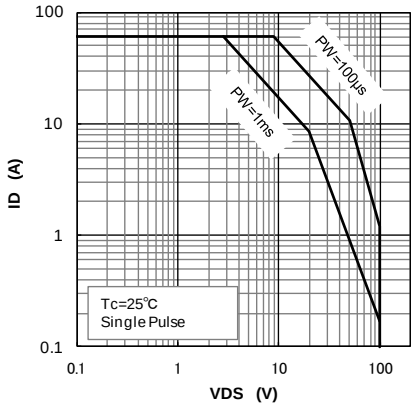
SW time - RG Characteristics (typical)



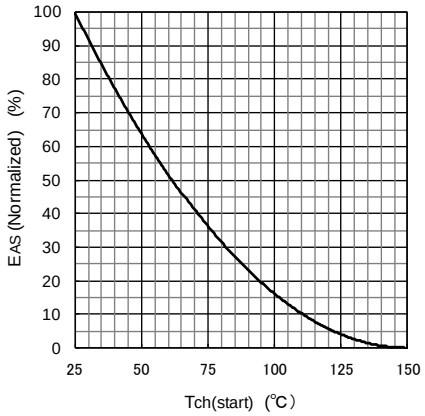
SW time - ID Characteristics (typical)



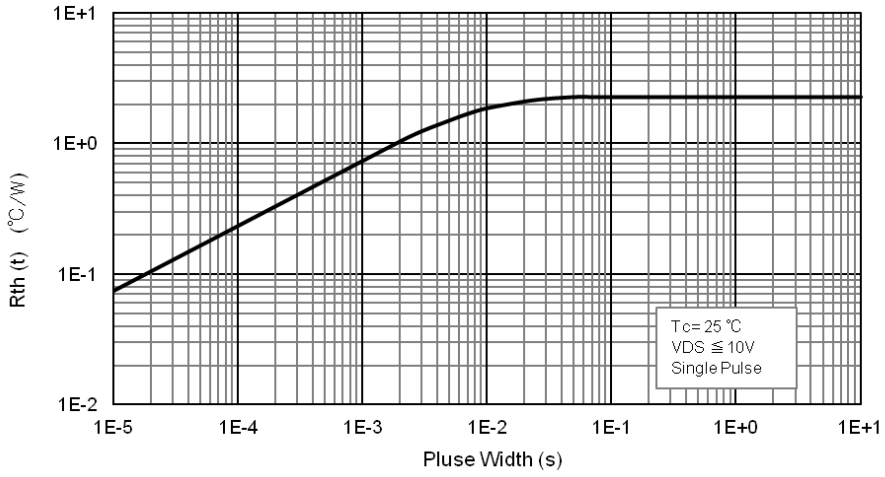
Safe Operating Area



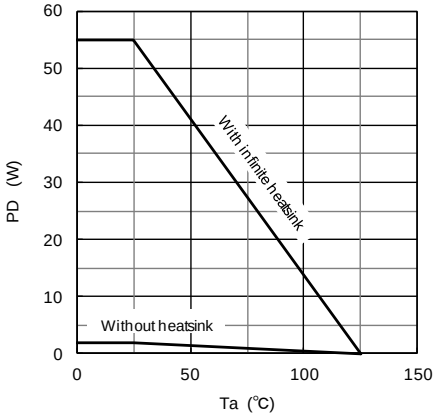
EAS - Tc(start) Characteristics



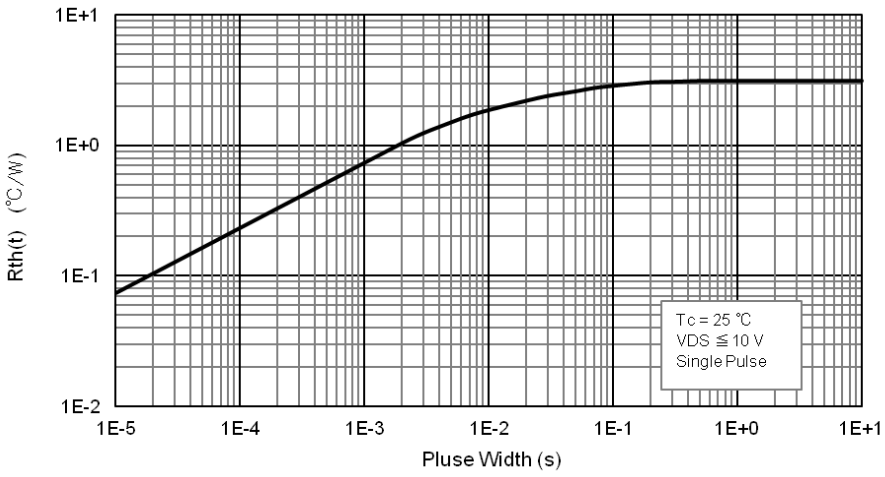
EKG1020 Transient Thermal Resistance - Pulse Width



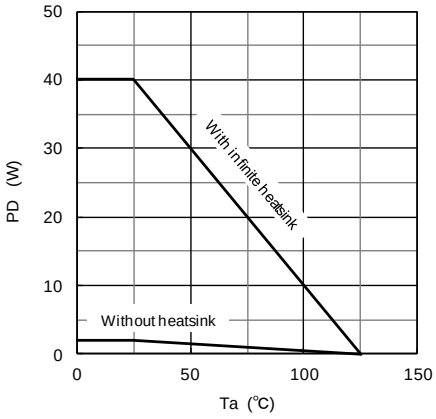
EKG1020
PD-Ta Characteristics



FKG1020 Transient Thermal Resistance - Pulse Width

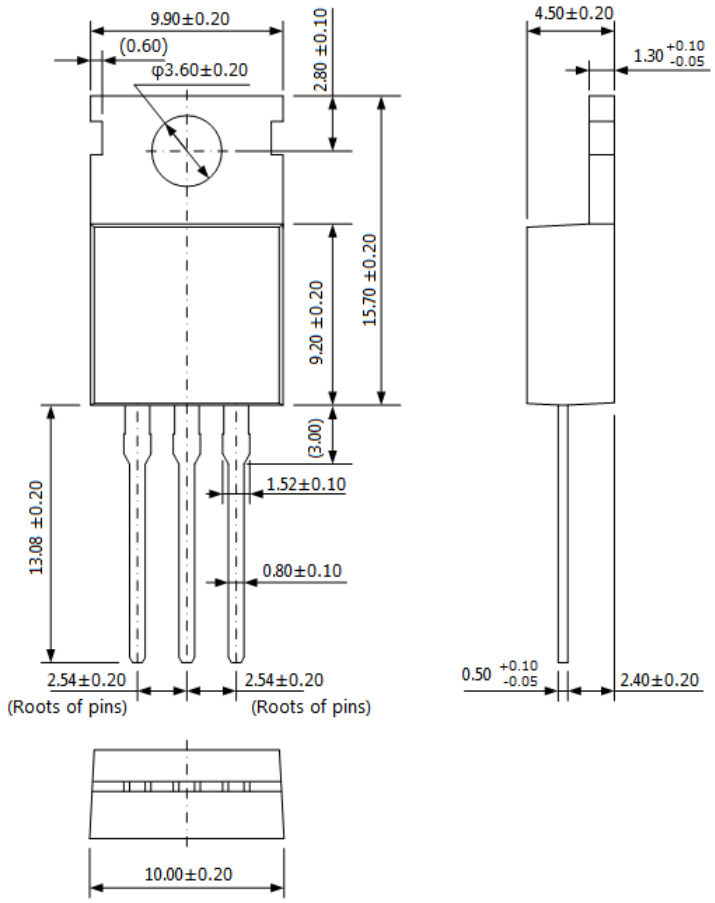


FKG1020
PD-Ta Characteristics



Physical Dimensions and Marking Diagram

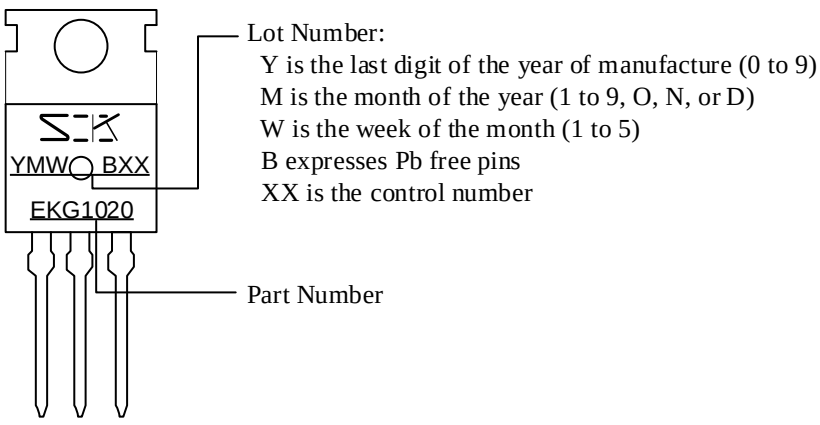
● **EKG1020 Physical Dimensions**
(TO220-3L)



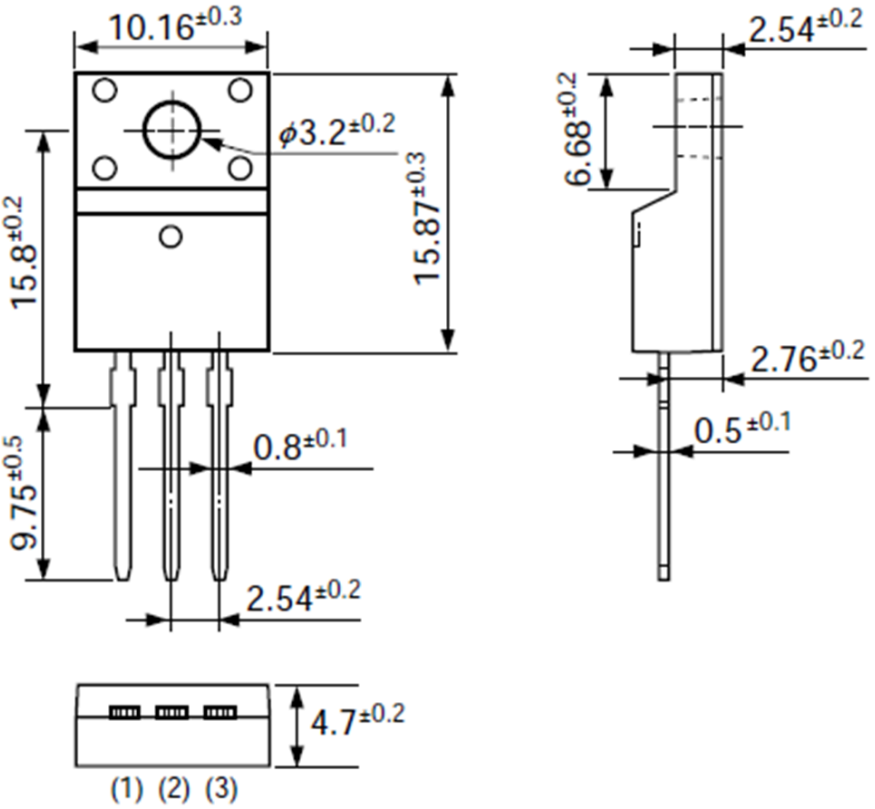
NOTES:

- Dimensions in millimeters
- 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 ± 5 °C / 10 ± 1 s, 2 times
  Soldering Iron: 380 ± 10 °C / 3.5 ± 0.5 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)

● **EKG1020 Marking Diagram**



● **FKG1020 Physical Dimensions**
(TO220F-3L)



NOTES:

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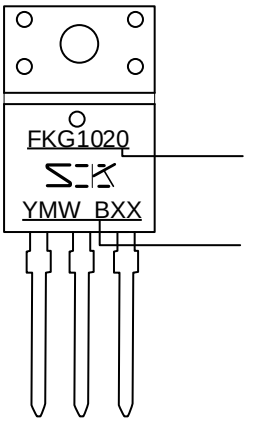

Part Number

Lot Number:
Y is the last digit of the year of manufacture (0 to 9)
M is the month of the year (1 to 9, O, N, or D)
W is the week of the month (1 to 5)
B expresses Pb free pins
XX is the control number

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