

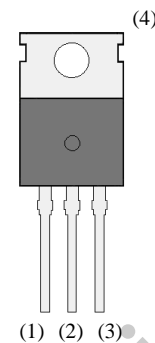
**40 V, 80 A, 3.1 mΩ Low RDS(ON)  
N ch Trench Power MOSFET  
EKI04036**

**Features**

- $V_{(BR)DSS}$  ----- 40 V ( $I_D = 100 \mu A$ )
- $I_D$  ----- 80 A
- $R_{DS(ON)}$  ----- 3.9 mΩ max. ( $V_{GS} = 10 V, I_D = 58.5 A$ )
- $Q_g$  ----- 26.4 nC ( $V_{GS} = 4.5 V, V_{DS} = 20 V, I_D = 58.5 A$ )
- Low Total Gate Charge
- High Speed Switching
- Low On-Resistance
- Capable of 4.5 V Gate Drive
- 100 % UIL Tested
- RoHS Compliant

**Package**

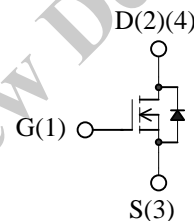
- TO220-3L



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	$V_{GS}$		$\pm 20$	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	$E_{AS}$	$V_{DD} = 20 V, L = 1 mH,$ $I_{AS} = 11.2 A, \text{ unclamped,}$ $R_G = 4.7 \Omega$ Refer to Figure 1	126	mJ
Avalanche Current	$I_{AS}$		23.3	A
Power Dissipation	$P_D$	$T_C = 25 \text{ }^\circ\text{C}$	116	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)	$R_{\theta JC}$		–	–	1.1	$^\circ\text{C/W}$
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	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$	–	–	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 1\text{ mA}$	1.0	2.0	2.5	V
Static Drain to Source On-Resistance	$R_{DS(on)}$	$I_D = 58.5\text{ A}$ , $V_{GS} = 10\text{ V}$	–	3.1	3.9	$\text{m}\Omega$
		$I_D = 29.3\text{ A}$ , $V_{GS} = 4.5\text{ V}$	–	3.9	5.7	$\text{m}\Omega$
Gate Resistance	$R_G$	$f = 1\text{ MHz}$	–	1.1	–	$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 25\text{ V}$ $V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$	–	3910	–	pF
Output Capacitance	$C_{oss}$		–	620	–	
Reverse Transfer Capacitance	$C_{rss}$		–	360	–	
Total Gate Charge ( $V_{GS} = 10\text{ V}$ )	$Q_{g1}$	$V_{DS} = 20\text{ V}$ $I_D = 58.5\text{ A}$	–	56.1	–	nC
Total Gate Charge ( $V_{GS} = 4.5\text{ V}$ )	$Q_{g2}$		–	26.4	–	
Gate to Source Charge	$Q_{gs}$		–	9.0	–	
Gate to Drain Charge	$Q_{gd}$		–	9.7	–	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}$ $I_D = 58.5\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_G = 4.7\text{ }\Omega$ Refer to Figure 2	–	6.2	–	ns
Rise Time	$t_r$		–	8.4	–	
Turn-Off Delay Time	$t_{d(off)}$		–	28.9	–	
Fall Time	$t_f$		–	17.9	–	
Source to Drain Diode Forward Voltage	$V_{SD}$	$I_S = 58.5\text{ A}$ , $V_{GS} = 0\text{ V}$	–	0.9	1.5	V
Source to Drain Diode Reverse Recovery Time	$t_{rr}$	$I_F = 58.5\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ Refer to Figure 3	–	38.7	–	ns
Source to Drain Diode Reverse Recovery Charge	$Q_{rr}$		–	37.2	–	nC

Test Circuits and Performance Curves

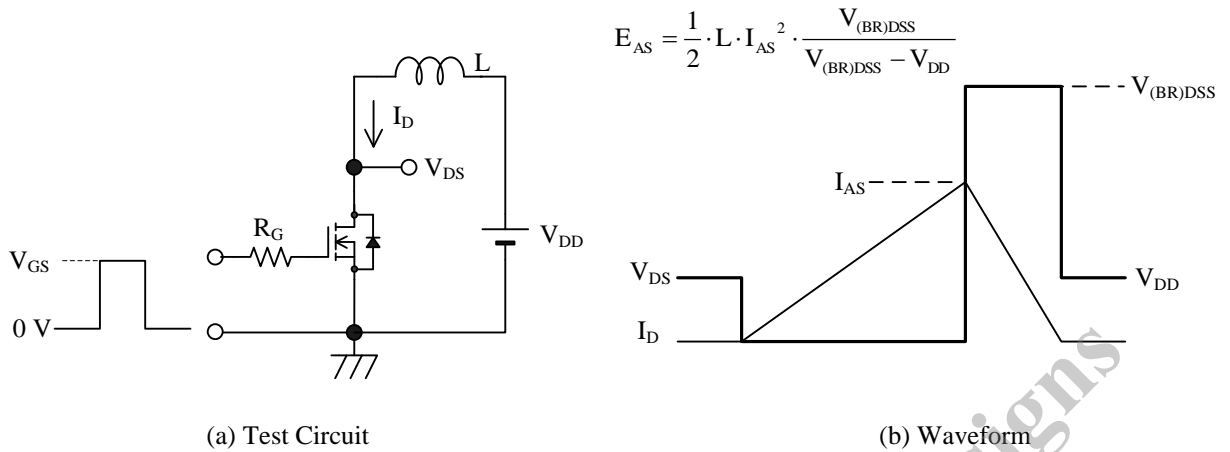


Figure 1. Unclamped Inductive Switching

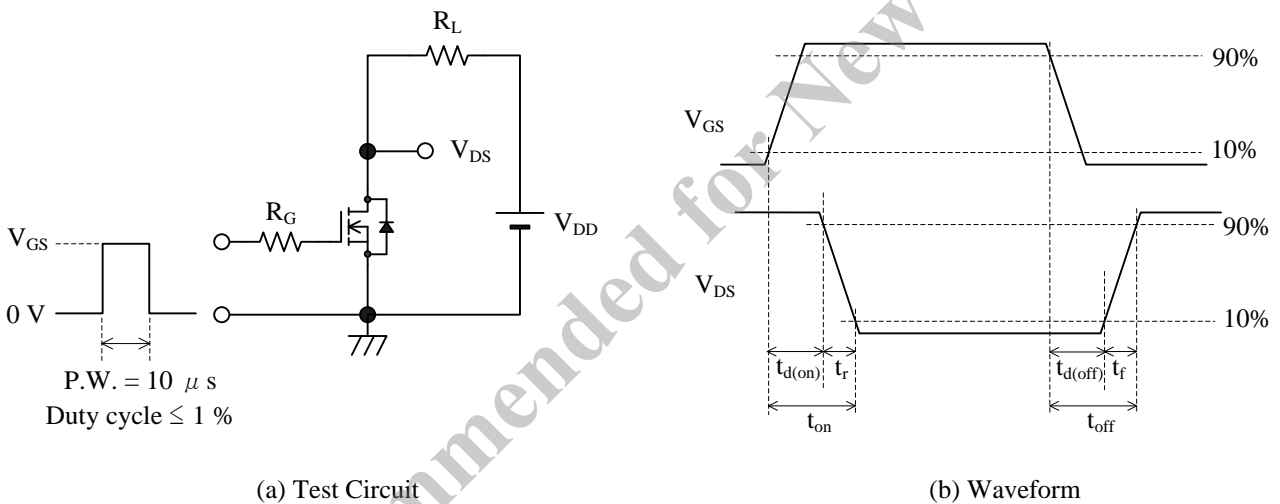


Figure 2. Switching Time

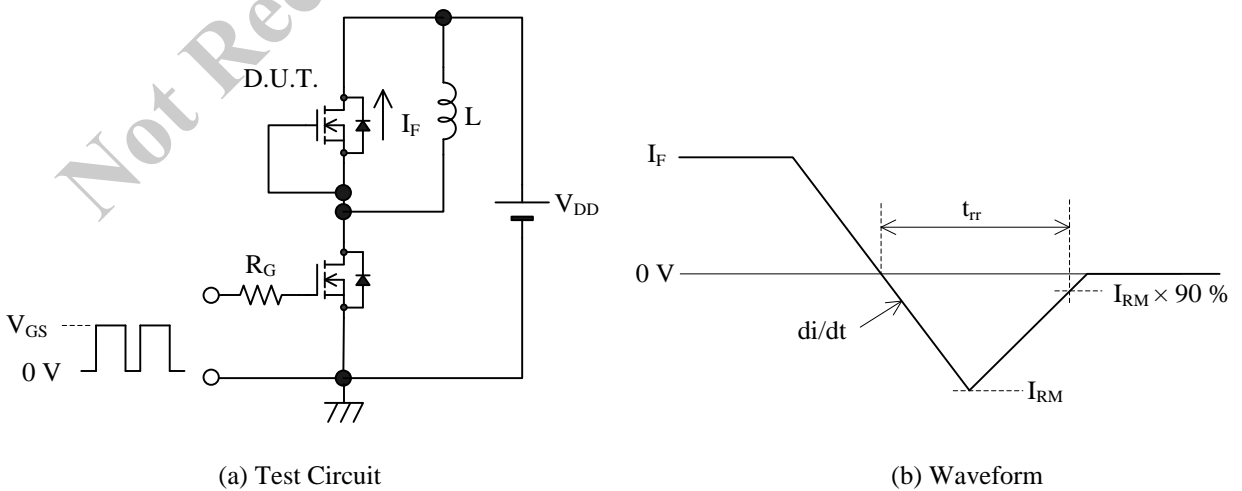
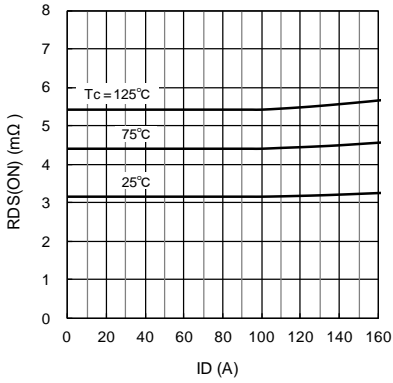
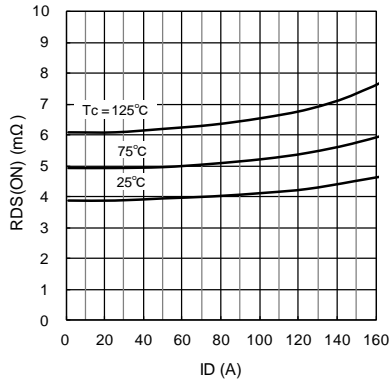


Figure 3. Diode Reverse Recovery Time

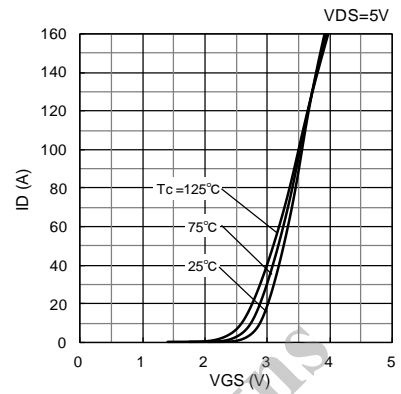
RDS(ON)-ID characteristics (typical)  
VGS=10V



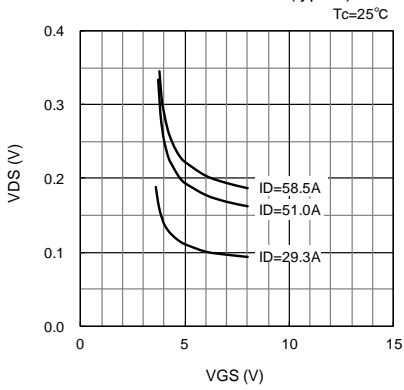
RDS(ON)-ID characteristics (typical)  
VGS=4.5V



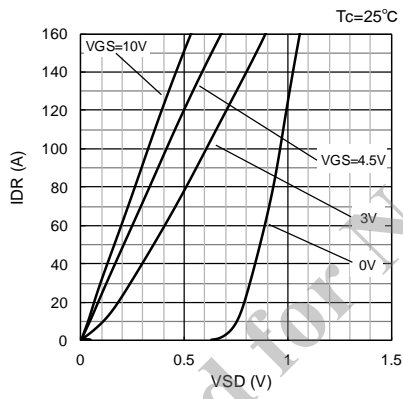
ID-VGS characteristics (typical)  
VDS=5V



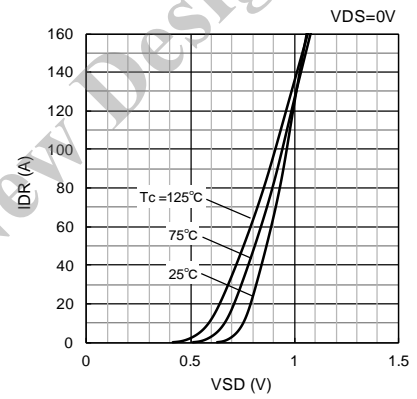
VDS-VGS characteristics (typical)  
Tc=25°C



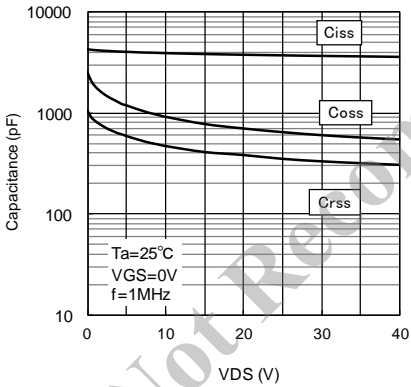
IDR-VSD characteristics (typical)  
Tc=25°C



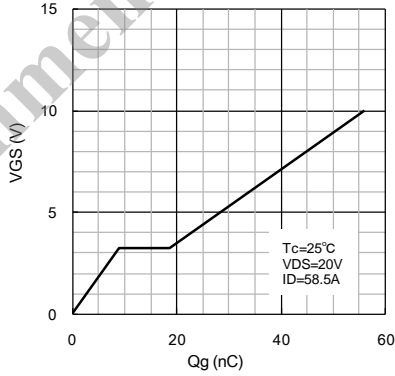
IDR-VSD characteristics (typical)  
VDS=0V



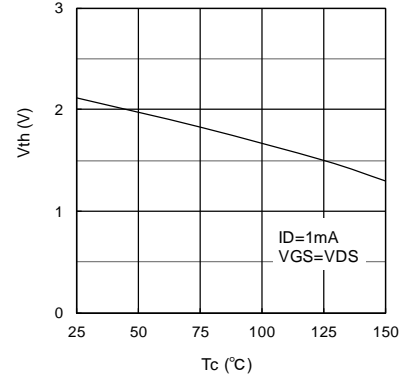
Capacitance-VDS characteristics (typical)



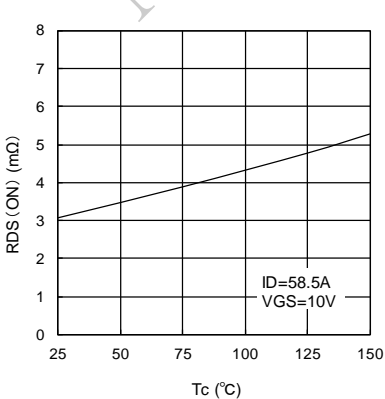
VGS - Qg characteristics (typical)



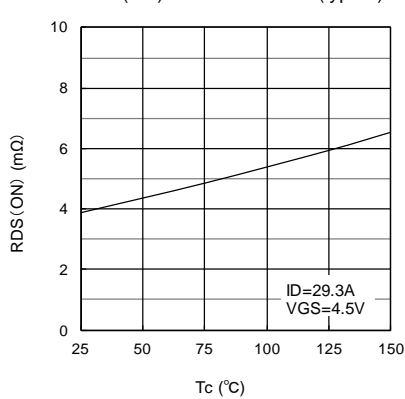
Vth-Tc characteristics (typical)



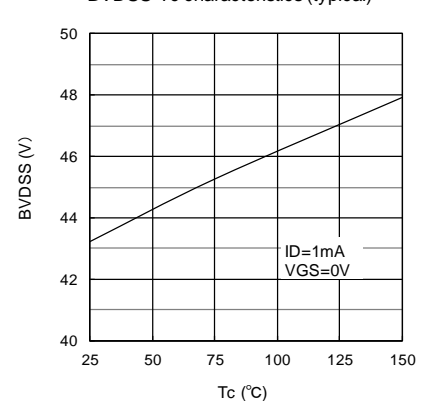
RDS(ON)-Tc characteristics (typical)  
ID=58.5A, VGS=10V

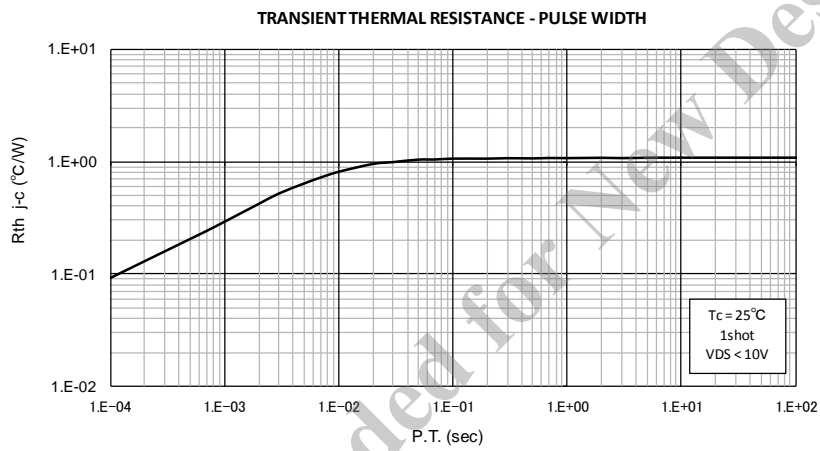
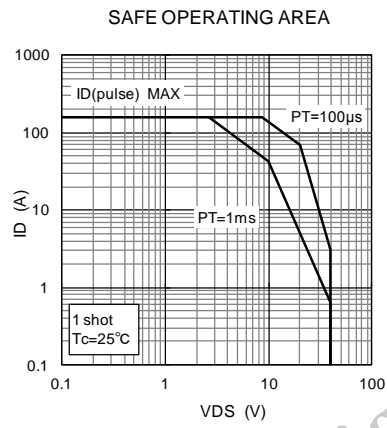
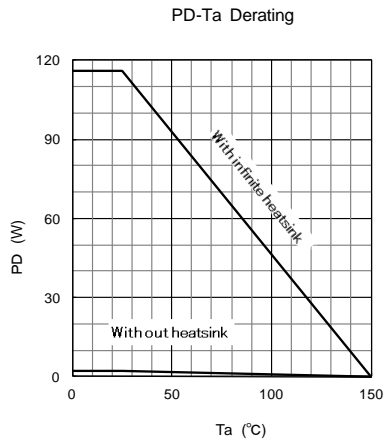


RDS(ON)-Tc characteristics (typical)  
ID=29.3A, VGS=4.5V



BVDSS-Tc characteristics (typical)  
ID=1mA, VGS=0V

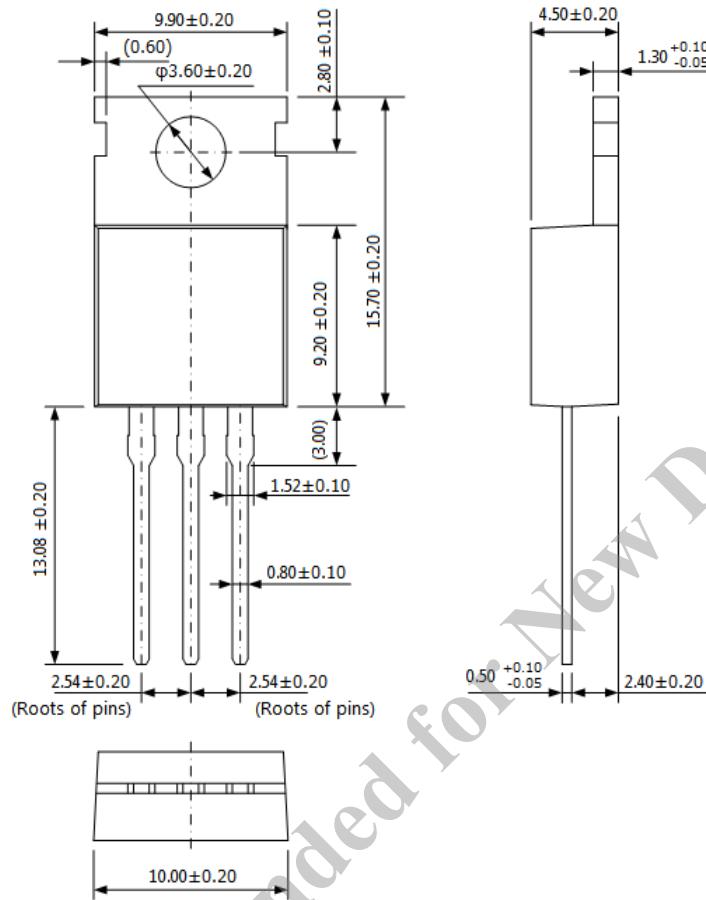




Not Recommended for New Designs

Physical Dimensions

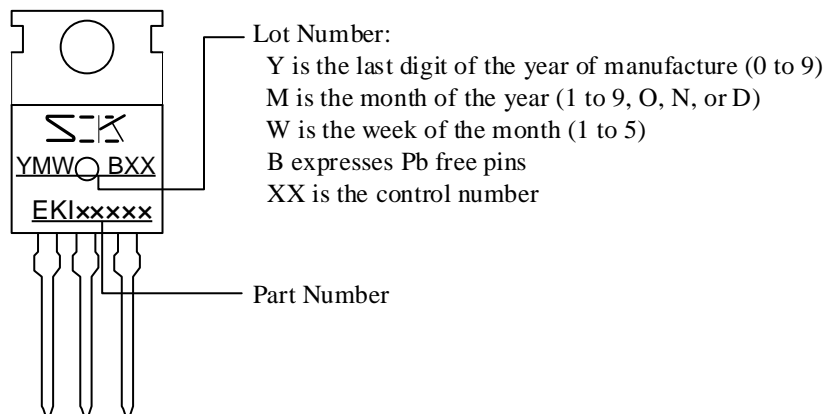
- TO220-3L



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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