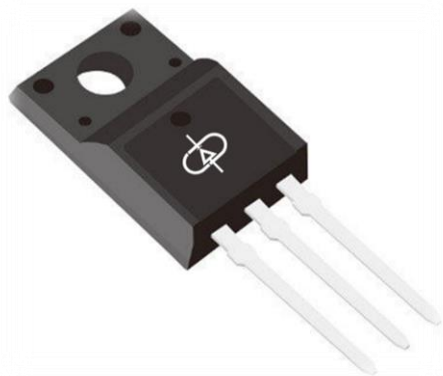


21A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION:



The ALP21NM60 is an 21A, 600V N-Channel Super Junction MOSFET and it has high switching speed.

FEATURES:

- $V_{DS}=600V$, $I_D = 21A$
- $R_{DS(ON)} \leq 0.19\Omega$ @ $V_{GS}=10V$, $I_D=10.5A$.
- High switching speed.
- Avalanche energy tested.
- Improved dv/dt capability, high ruggedness.
- RoHS compliant & halogen-free.
- Suffix "-H" indicated Halogen Free part, ex. ALP21NM60-H

APPLICATIONS:

- Switching Power Supply.
- Inverter motor applications.
- High power inverter system.

MECHANICAL CHARACTERISTICS

- Epoxy: UL94-V0 rated flame retardant.
- Case: Molded plastic, ITO-220AB.
- Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position: Any.

MAXIMUM RATINGS

MAXIMUM RATINGS @ $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise specified			
PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	21	A
Pulsed Drain Current (Note 2)	I_{DM}	63	A
Avalanche current (Note 3)	I_{AR}	4.4	A
Single pulse avalanche energy (Note 3)	E_{AS}	706	mJ
Peak diode recovery dv/dt (Note 4)	dv/dt	20	V/ns
Power Dissipation ($T_C = 25\text{ }^{\circ}\text{C}$)	P_D	35	W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	62.5	$^{\circ}\text{C/W}$
Thermal Resistance Junction to Case	$R_{\theta JC}$	3.57	$^{\circ}\text{C/W}$
Operating Junction Temperature	T_J	+150	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^{\circ}\text{C}$
Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied. 2. Repetitive rating: pulse width limited by maximum junction temperature. 3. $L = 73\text{mH}$, $I_{AS} = 4.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$ Starting $T_J = 25\text{ }^{\circ}\text{C}$. 4. $I_{SD} \leq 21\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25\text{ }^{\circ}\text{C}$. 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.			

ELECTRICAL CHARACTERISTICS @ TA = 25 °C unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	$I_D = 250 \mu A$, $V_{GS} = 0V$	BV_{DSS}	600			V
Drain-source leakage current	$V_{DS} = 600V$, $V_{GS} = 0V$	I_{DSS}			1.0	μA
Gate-source leakage current	$V_{GS} = \pm 30V$, $V_{DS} = 0V$	I_{GSS}			± 100	nA
ON CHARACTERISTICS						
Gate-Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$	$V_{GS(TH)}$	2.5		4.5	V
Static Drain-to-Source On-Resistance (Note 4)	$V_{GS} = 10V$, $I_D = 10.5A$	$R_{DS(ON)}$			0.19	Ω

SWITCHING PARAMETERS						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$, $F_{req} = 1.0 \text{ MHz}$	C_{iss}		1600		pF
Output Capacitance		C_{oss}		1200		
Reverse Transfer Capacitance		C_{rss}		120		
Total Gate Charge (Note 1)	$V_{DS} = 480V$, $V_{GS} = 10V$, $I_D = 21A$, $I_G = 1mA$ (Note 1, 2)	Q_g		54		nC
Gate to Source Charge		Q_{gs}		13		
Gate to Drain Charge		Q_{gd}		23		
Turn-On Delay Time (Note 1)	$V_{DS} = 100V$, $I_D = 21A$, $V_{GS} = 10V$, $R_G = 25\Omega$ (Note 1, 2)	$t_{d(on)}$		28		nS
Rise time		t_r		35		
Turn-Off Delay Time		$t_{d(off)}$		170		
Fall time		t_f		60		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Continuous source current	Integral PN - diode in MOSFET	I_S			21	A
Pulsed source current		I_{SM}			63	
Drain-source diode forward voltage (Note 1)	$I_{SD} = 21A$, $V_{GS} = 0V$	V_{SD}			1.4	V
Reverse recovery time (Note 1)	$V_{GS} = 0V$, $I_S = 21A$, $di/dt = 100A/\mu s$	t_{rr}		470		ns
Reverse recovery charge		Q_{rr}		9.4		μC

Note:

1. Pulse test (pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$).
2. Essentially independent of operating temperature.

TYPICAL DEVICE RATING AND CHARACTERISTICS CURVES ($T_A = 25^\circ\text{C}$ unless otherwise noted)

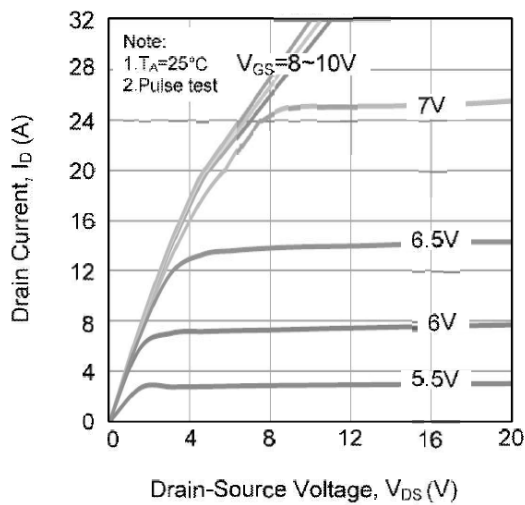


Fig.1 Drain Current Vs. Drain-Source Voltage

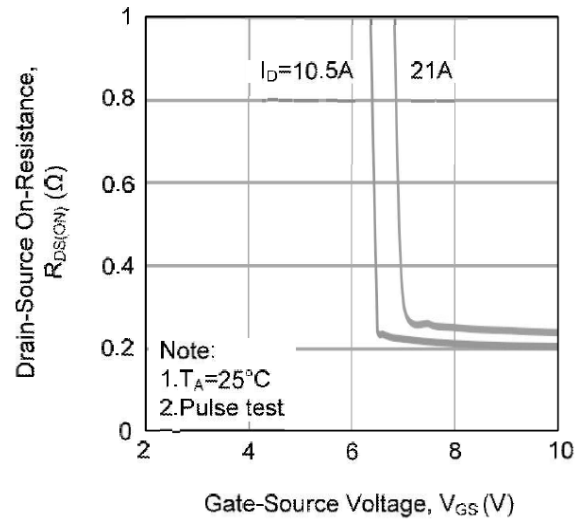


Fig.2 Drain Source On-Resistance Vs. Gate-Source Voltage

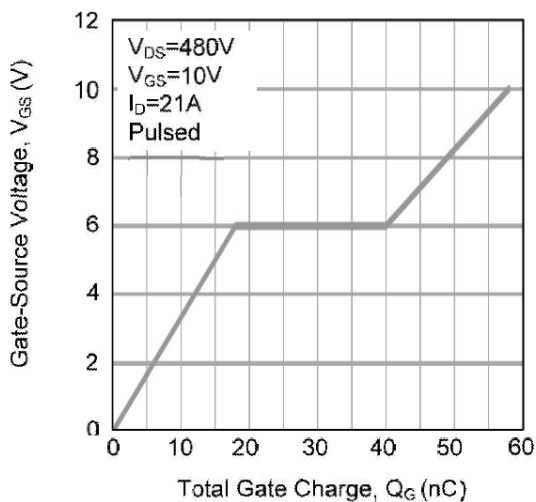


Fig.3 Gate Charge Characteristics

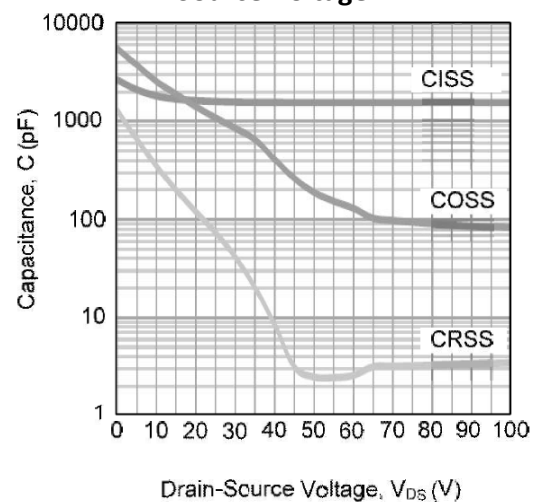


Fig.4 Capacitance Characteristics

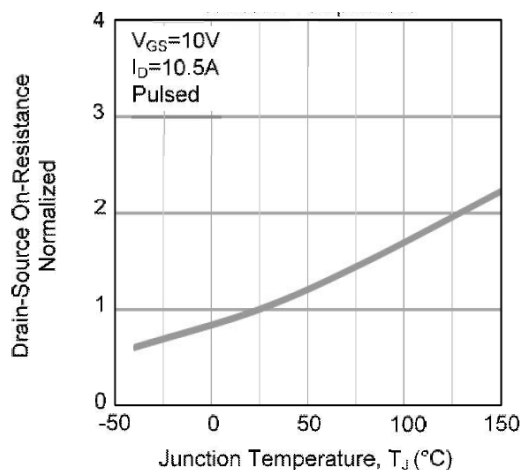


Fig.5 Drain-Source On-Resistance Vs. Junction Temperature

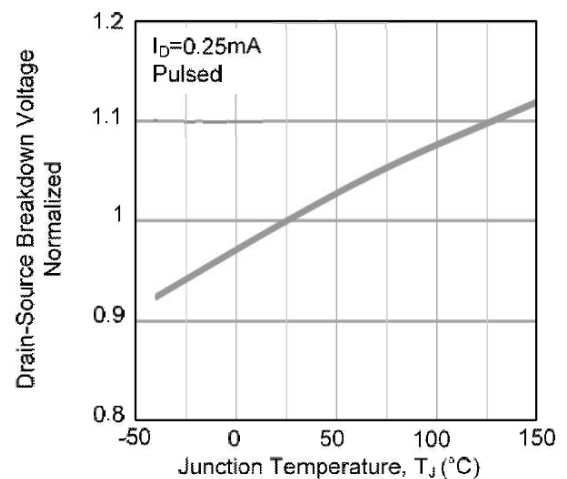


Fig.6 Breakdown Voltage Vs. Junction Temperature

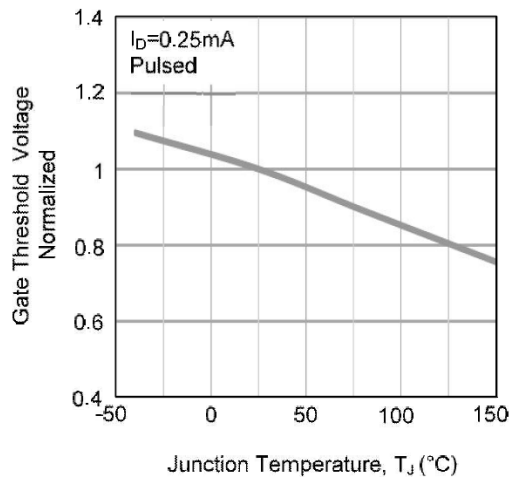


Fig.7 Gate Threshold Voltage Vs. Junction Temperature

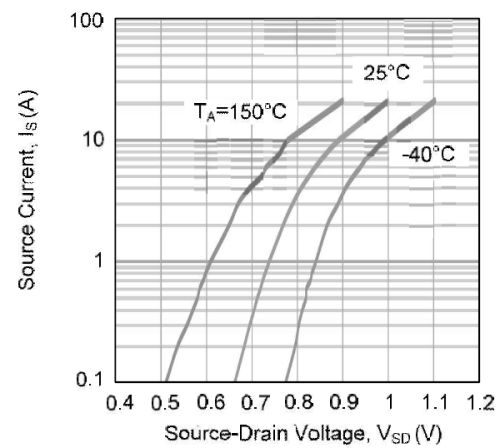


Fig.8 Source Current Vs. Source-Drain Voltage

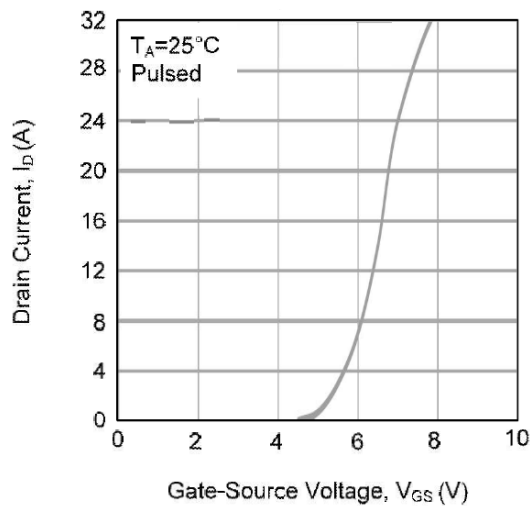


Fig.9 Drain Current Vs. Gate-Source Voltage

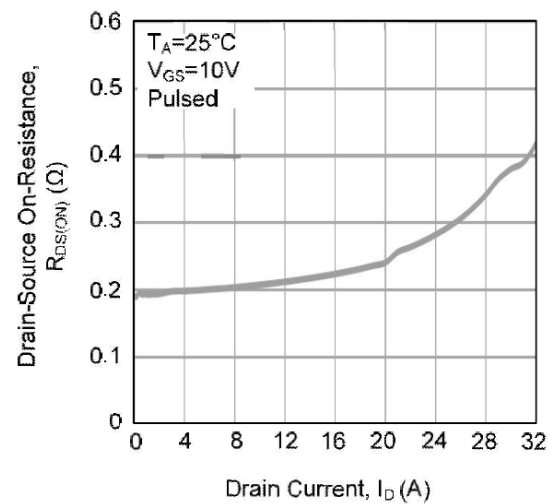


Fig.10 Drain-Source On-Resistance Vs. Drain Current

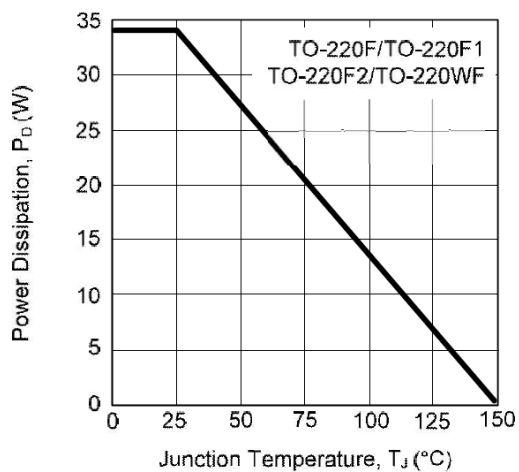


Fig.11 Power Dissipation Vs. Junction Temperature

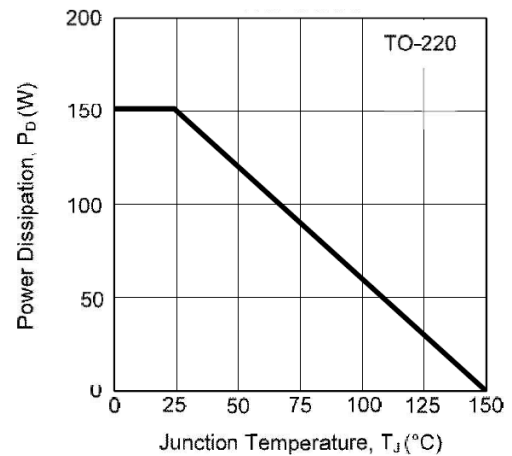


Fig.12 Power Dissipation Vs. Junction Temperature

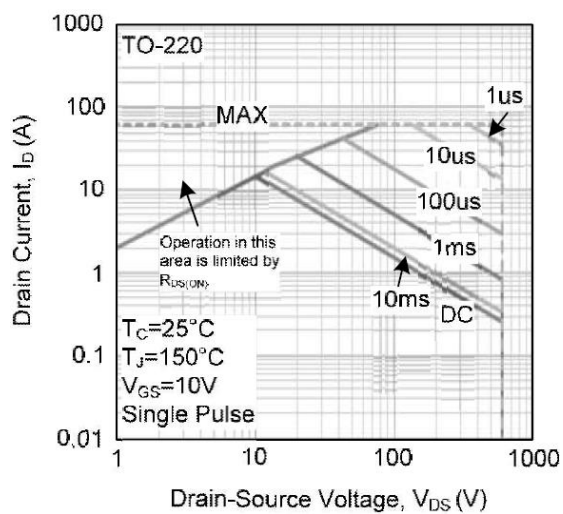


Fig.13 Safe Operating Area

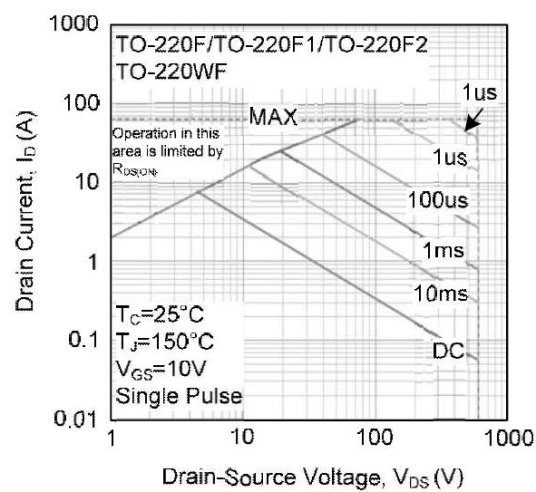


Fig.14 Safe Operating Area

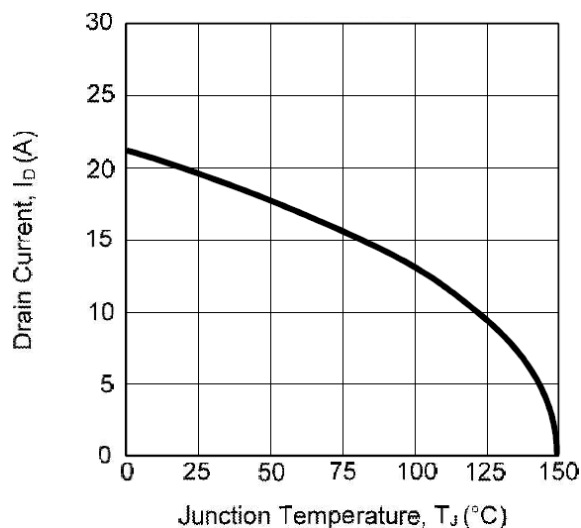
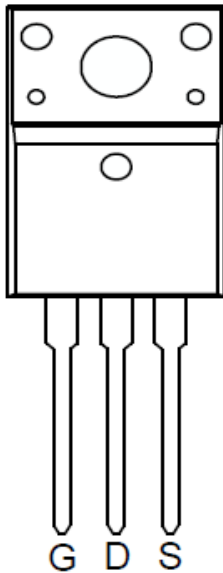


Fig.15 Drain Current Vs. Junction Temperature

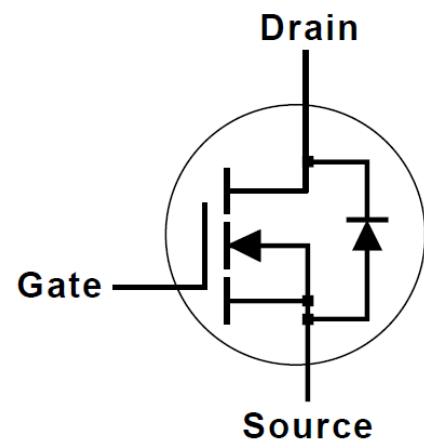
PINNING INFORMATION

SIMPLIFIED OUTLINE

ITO-220AB

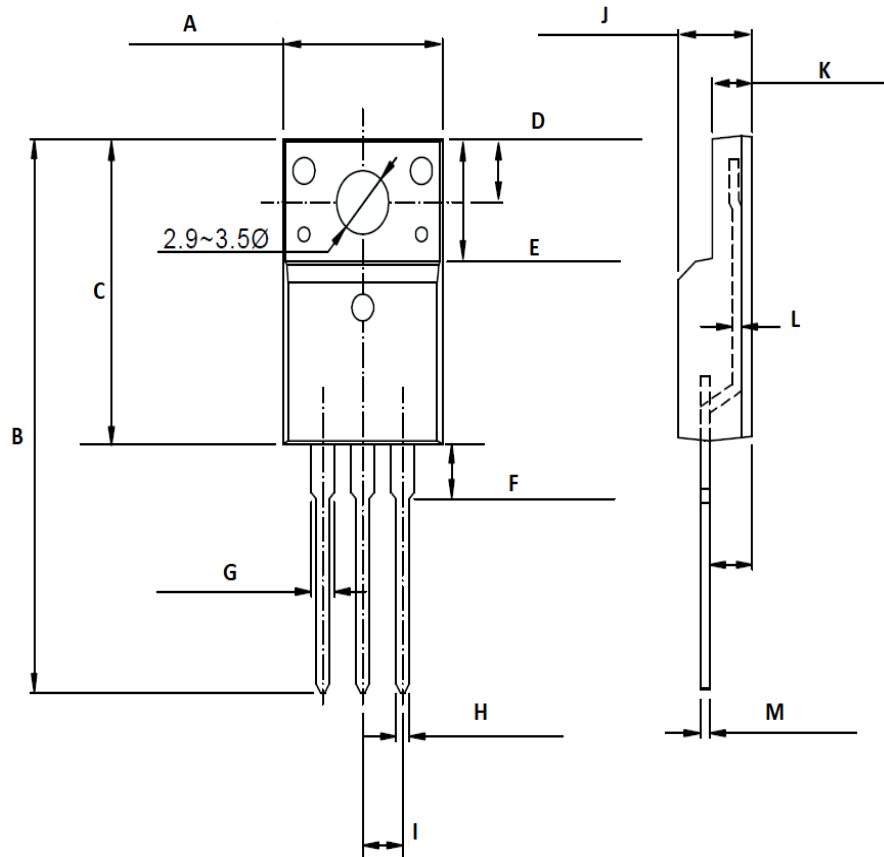


SYMBOL



PACKAGE INFORMATION

ITO-220AB

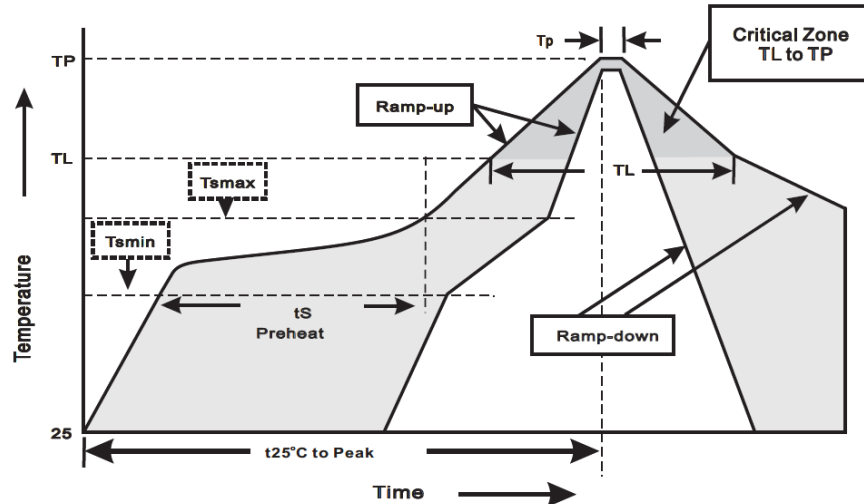


OUTLINE DIMENSIONS				
SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.86	10.46	0.388	0.412
B	28.20	29.20	1.110	1.150
C	15.40	16.40	0.606	0.646
D	3.05	3.55	0.120	0.140
E	6.40	7.00	0.252	0.276
F	2.95	3.55	0.116	0.140
G	1.10	1.50	0.043	0.059
H	0.60	1.00	0.024	0.039
I	2.54 Typ.		0.100 Typ.	
J	4.40	5.00	0.173	0.197
K	2.30	2.80	0.091	0.110
L	0.6 Ref.			
M	0.30	0.70	0.012	0.028

SOLDERING PARAMETERS

SUGGESTED THERMAL PROFILES FOR SOLDERING PROCESSES

1. Storage environment: Temperature=5 °C~40 °C Humidity=55% ±25%
2. Reflow soldering of surface-mount devices



3. Reflow soldering

PROFILE FEATURE	SOLDERING CONDITION
Average ramp-up rate (T_L to T_P)	<3 °C/sec
Preheat	
- Temperature Min (T_{smin})	150 °C
- Temperature Max (T_{smax})	200 °C
- Time (min to max) (t_s)	60 ~ 120 sec
T_{smax} to T_L	
- Ramp-upRate	<3 °C/sec
Time maintained above:	
- Temperature (T_L)	217 °C
- Time(t_L)	60 ~ 260 sec
Peak Temperature (T_P)	255 °C-0/+5 °C
Time within 5 °C of actual Peak Temperature(t_P)	10 ~ 30 sec
Ramp-down Rate	<3 °C/sec
Time 25 °C to Peak Temperature	<6 minutes



beyond boundaries...

ALP21NM60
ITO-220AB

CUSTOMER NOTE:

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2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).



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