

90A, 30V N-CHANNEL ENHANCEMENT MODE POWER MOSFET

DESCRIPTION:



The ALP90N03S is an 90A, 30V N-Channel Enhancement Mode Power MOSFET and it has High density cell design for ultra low $R_{DS(on)}$

FEATURES:

- $V_{(BR)DSS} = 30V$, $I_D = 90A$.
- $R_{DS(ON)MAX} = 5.8m\Omega$ @ $V_{GS} = 10V$, $I_D = 90A$.
- $R_{DS(ON)MAX} = 8.5m\Omega$ @ $V_{GS} = 4.5V$, $I_D = 90A$.
- High density cell design for ultra low $R_{DS(on)}$.
- Excellent package for heat dissipation.
- Fully characterized avalanche voltage and current.
- Good stability and uniformity with high E_{AS}
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicated Halogen Free part, ex. ALP90N03S -H

APPLICATIONS:

- DC to DC Converter.
- Synchronous Rectifier.

MECHANICAL CHARACTERISTICS

- Case: Molded plastic, TO-252AB
- Mounting Position: Any.

MAXIMUM RATINGS

MAXIMUM RATINGS @ $T_A = 25^\circ\text{C}$ unless otherwise specified			
PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $T_C = 25^\circ\text{C}$	I_D	90	A
Pulsed Drain Current	I_{DM}	200	A
Power Dissipation $T_C = 25^\circ\text{C}$	P_D	100	W
Thermal Resistance Junction to Case	$R_{\theta JC}$	1.5	$^\circ\text{C/W}$
Single pulse avalanche energy	E_{AS}	150	mJ
Operating Junction Temperature	T_J	+150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS @ TA = 25 °C unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	$V_{(BR)DSS}$	30			V
Zero gate voltage drain current	$V_{DS}=30V, V_{GS}=0V$	I_{DSS}			1.0	μA
Gate-body leakage current	$V_{GS}= \pm 20V, V_{DS}= 0V$	I_{GSS}			± 100	nA
ON CHARACTERISTICS						
Gate-Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(th)}$	1.0		2.5	V
Drain-to-Source On-Resistance (Note 1)	$V_{GS} = 10V, I_D = 20A$	$R_{DS(ON)}$		4.1	5.8	m Ω
	$V_{GS} = 4.5V, I_D = 20A$			5.9	8.5	
Forward transconductance (Note 1)	$V_{DS} = 5V, I_D = 20A$	g_{FS}	20			S

DYNAMIC CHARACTERISTICS (Note 2)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Input Capacitance	$V_{DS} = 15V, V_{GS} = 0V, F_{req} = 1.0\text{ MHz}$	C_{iss}		3433		pF
Output Capacitance	$V_{DS} = 15V, V_{GS} = 0V, F_{req} = 1.0\text{ MHz}$	C_{oss}		360		pF
Reverse Transfer Capacitance	$V_{DS} = 15V, V_{GS} = 0V, F_{req} = 1.0\text{ MHz}$	C_{rss}		287		pF

SWITCHING CHARACTERISTICS

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Total Gate Charge	$V_{DS} = 15V, V_{GS} = 10V, I_D = 45A$	Q_g		60		nC
Gate to Source Charge	$V_{DS} = 15V, V_{GS} = 10V, I_D = 45A$	Q_{gs}		8.2		nC
Gate to Drain Charge	$V_{DS} = 15V, V_{GS} = 10V, I_D = 45A$	Q_{gd}		16.4		nC
Turn-On Delay Time	$V_{DD} = 15V, V_{GS} = 10V, I_D = 20A, R_G=3\Omega$	$t_{d(on)}$		12		nS
Turn-On Rise time	$V_{DD} = 15V, V_{GS} = 10V, I_D = 20A, R_G=3\Omega$	t_r		15		nS
Turn-Off Delay Time	$V_{DD} = 15V, V_{GS} = 10V, I_D = 20A, R_G=3\Omega$	$t_{d(off)}$		40		nS
Turn-Off Fall time	$V_{DD} = 15V, V_{GS} = 10V, I_D = 20A, R_G=3\Omega$	t_f		14		nS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Diode forward Current (Note 1)		I_S			90	A
Diode forward Voltage	$I_S = 20A, V_{GS} = 0V$	V_{DS}			1.2	V
Reverse recovery time	$T_J = 25^\circ C, I_F = 20A, dI_F/dt = 100A/\mu s$ (Note 1)	t_{rr}		29		nS
Reverse recovery charge	$T_J = 25^\circ C, I_F = 20A, dI_F/dt = 100A/\mu s$ (Note 1)	Q_{rr}		32		nC

Note:

1. Pulse test (pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$).
2. Guaranteed by design, not subject to production testing.

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

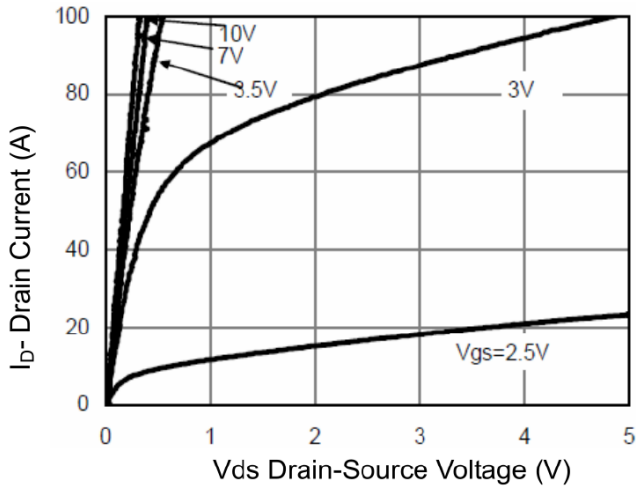


Fig.1 OUTPUT CHARACTERISTICS

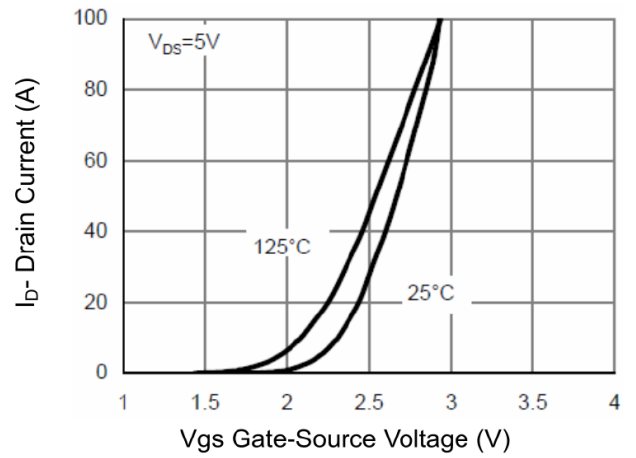


Fig.2 TRANSFER CHARACTERISTICS

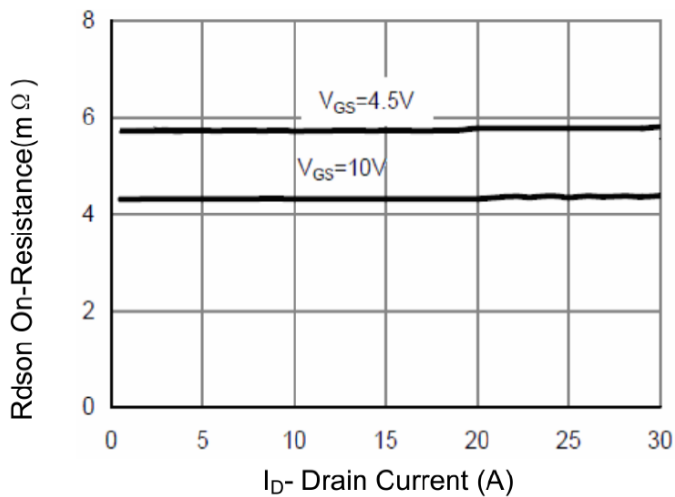


Fig.3 $R_{ds(on)}$ - DRAIN CURRENT

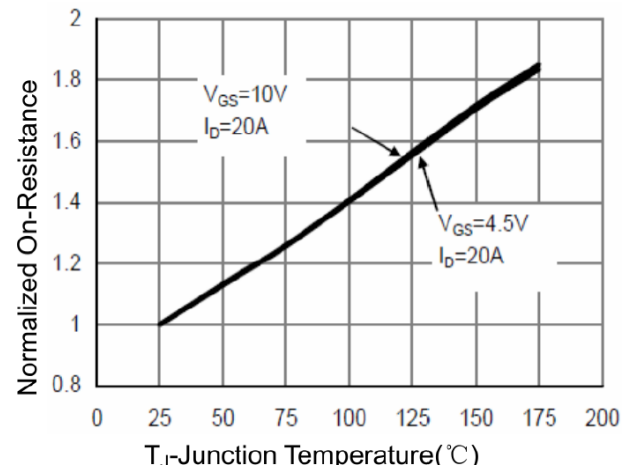


Fig.4 $R_{ds(on)}$ - JUNCTION TEMPERATURE

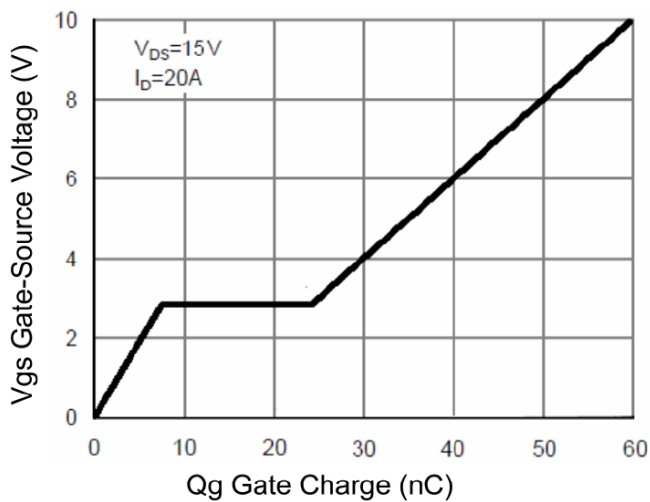


Fig.5 GATE CHARGE

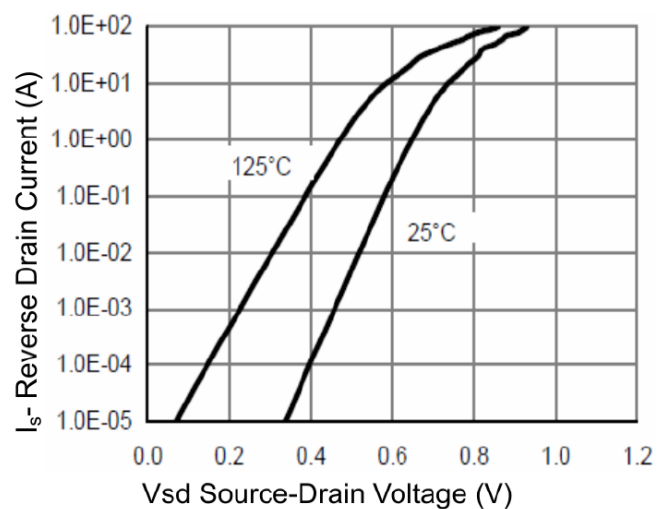


Fig.6 SOURCE- DRAIN DIODE FORWARD

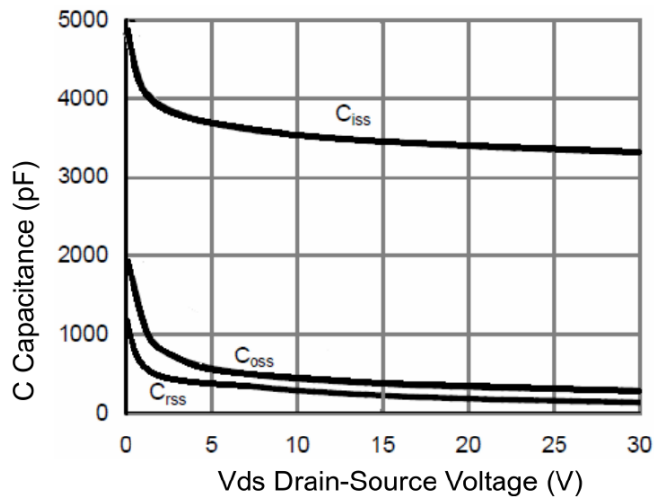


Fig.7 CAPACITANCE Vs V_{ds}

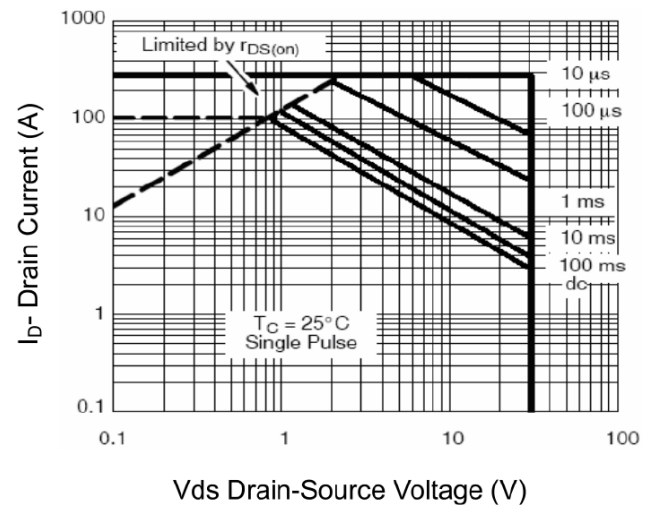


Fig.8 SAFE OPERATION AREA

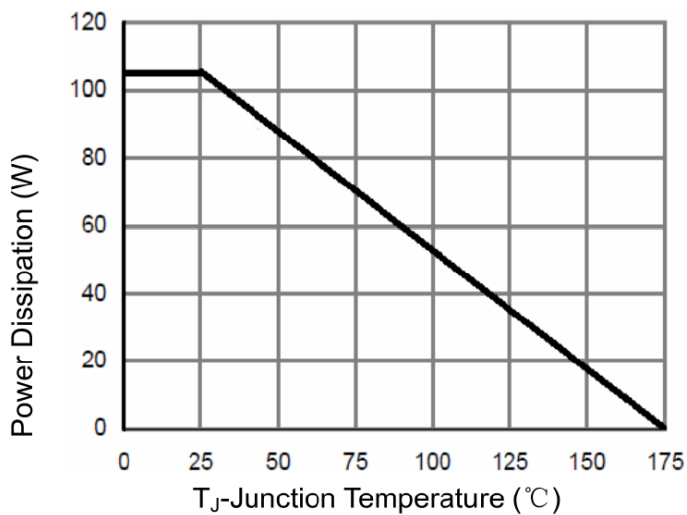


Fig.9 POWER DE-RATING

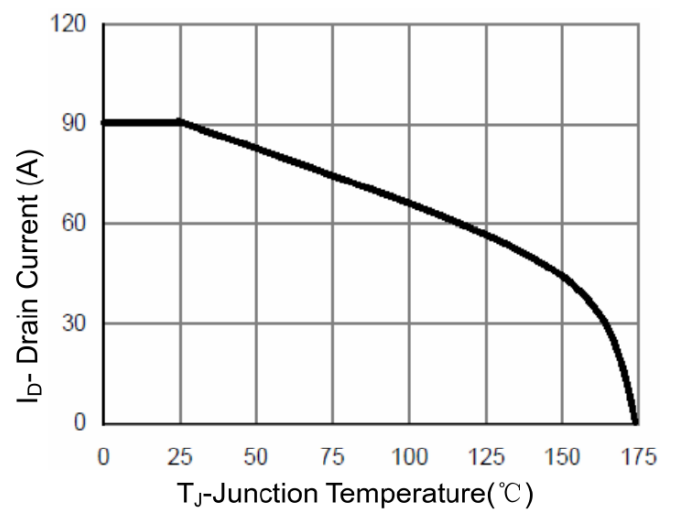


Fig.10 ID CURRENT DERATING

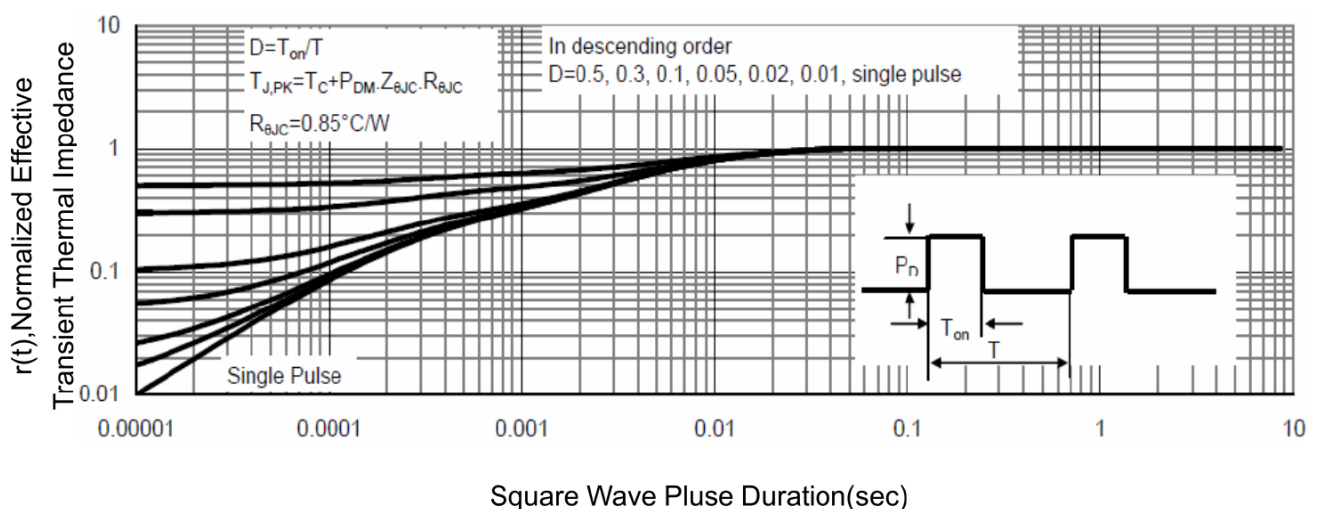
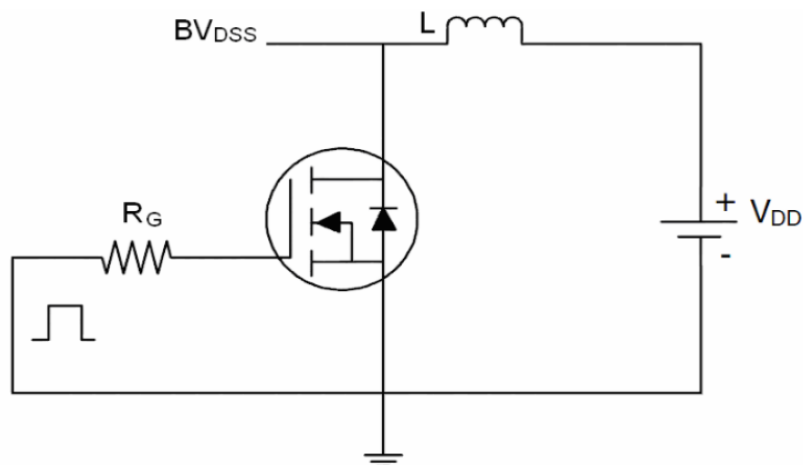
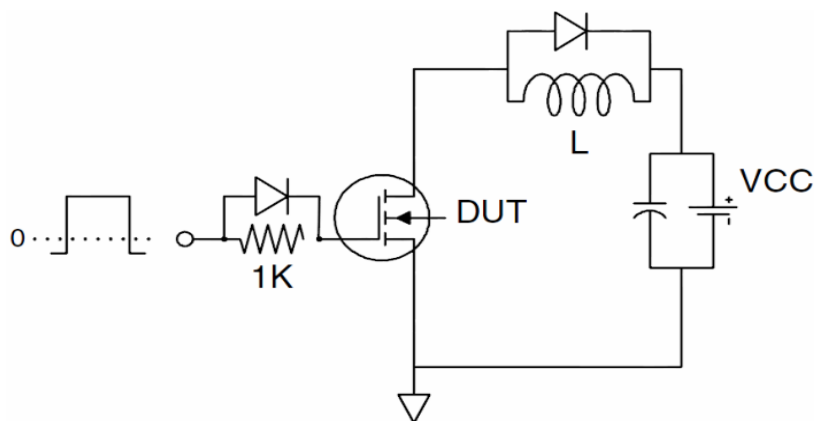


Fig.9 NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

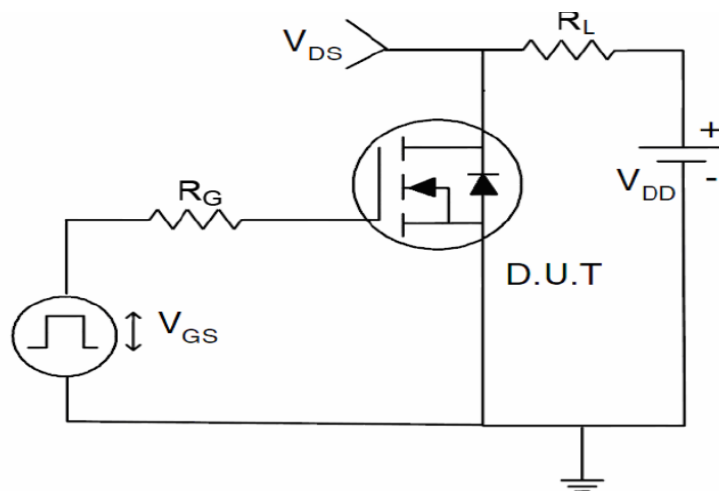
TEST CIRCUIT



1) E_{AS} TEST CIRCUIT

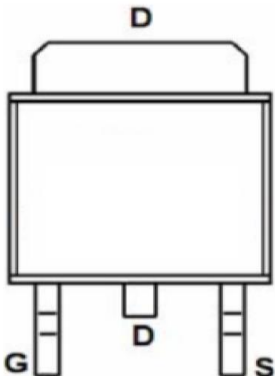
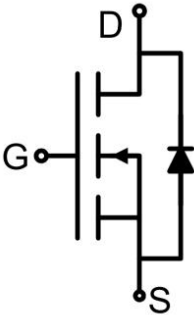


2) GATE CHARGE TEST CIRCUIT



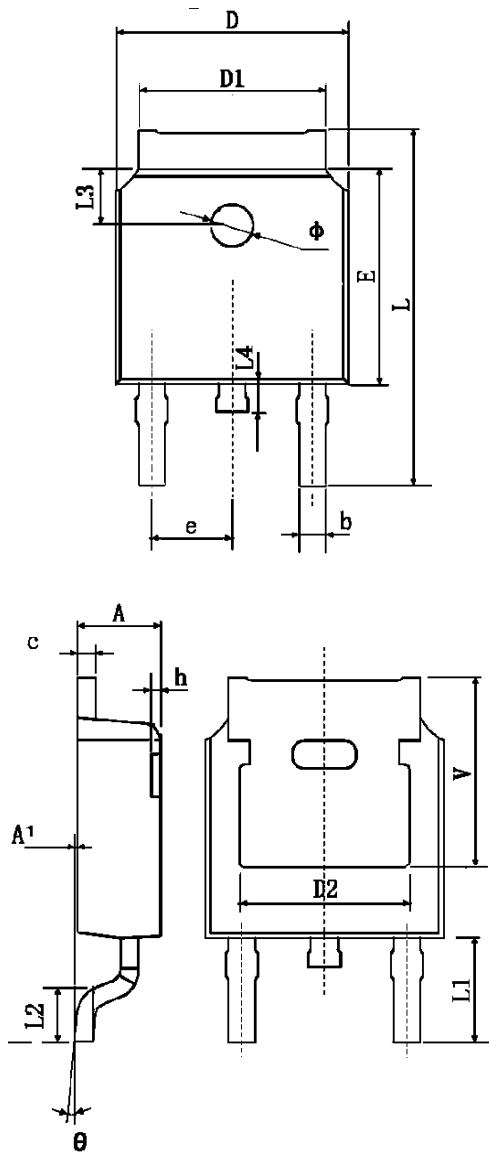
3) SWITCH TIME TEST CIRCUIT

PINNING INFORMATION

PIN	SIMPLIFIED OUTLINE	CIRCUIT DIAGRAM
D Drain S Source G Gate		

PACKAGE INFORMATION

TO-252AB

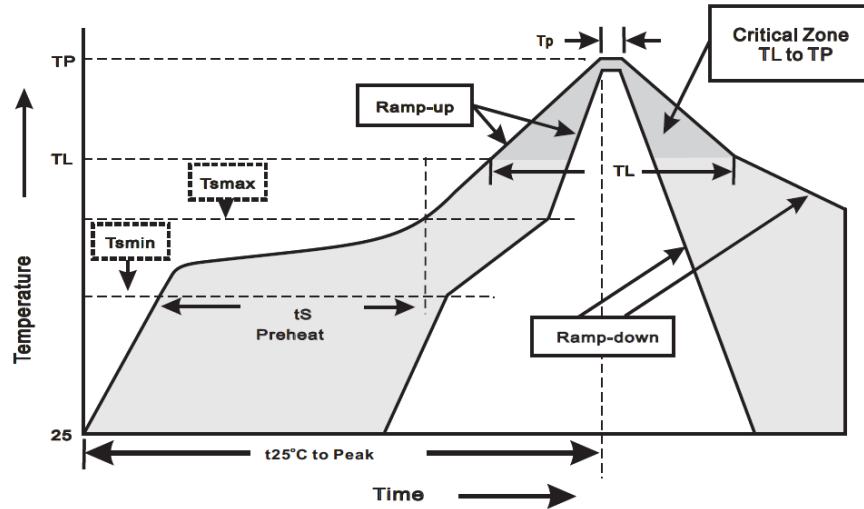


OUTLINE DIMENSIONS				
SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 Typ.		0.190 Typ.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 Typ.		0.114 Typ.	
L2	1.400	1.700	0.055	0.067
L3	1.600 Typ.		0.063 Typ.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 Typ.		0.211 Typ.	

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	<6 °C/sec
Time 25 °C to Peak Temperature	<6 minutes



beyond boundaries...

ALP90N03S
TO-252AB

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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