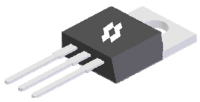
SMJ65R1K3ANS

650V Super Junction N-Channel Power MOSFET

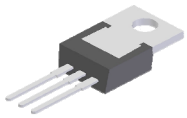
Product Summary

V_{DS}	$R_{DS(ON)\_MAX}$	I_{D_MAX}
650 V	1.25 Ω @V_{GS} = 10V	4.0 A

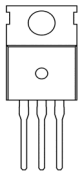
TO220-3L



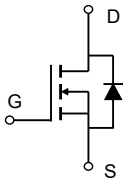
Top View



Bottom View



PIN Configuration
(Top View)



Schematic Diagram

Features

- Low On-Resistance
- Fast Switching Capability
- 100% UIS and R_g tested

RoHS HALOGEN FREE

Applications

- LED Lighting
- Charger and Adapter
- PC and Telecom Power

Mechanical Data

- Green Molding Compound
- UL Flammability Classification Rating 94V-0

Ordering Information

Orderable Part Number	Package Type	Device Marking	Form	Quantity (pcs)
SMJ65R1K3ANS	TO220-3L	65R1K3AN	Tube	50

Maximum Ratings (@ T_C = 25°C, unless otherwise specified.)

Parameter		Symbol	Value	Unit
Drain - Source Voltage		V_{DS}	650	V
Gate - Source Voltage		V_{GS}	±30	V
Continuous Drain Current (V_{GS} = 10V) (1)	T_C = 25°C	I_D	4.0	A
	T_C = 100°C		2.5	A
Pulsed Drain Current (2)		I_{DM}	16.0	A
Single Pulse Avalanche Energy (3)		E_{AS}	62	mJ
Single Pulse Avalanche Current (L= 10.0mH)		I_{AS}	2.8	A
Power Dissipation	T_C = 25°C	P_D	54	W
	T_C = 100°C		21.7	W
MOSFET dv/dt Ruggedness, V_{DS}=0…480V		dv/dt	50	V/ns
Reverse Diodes dv/dt, V_{DS}=0…480V, I_{SD}≤I_D		dv/dt	15.0	V/ns
Junction & Storage Temperature Range		T_J, T_{STG}	-55 ~ +150	°C

Thermal Characteristics

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient (4)	$R_{\theta JA}$	55	68	°C/W
Thermal Resistance, Junction-to-Case (5)	$R_{\theta JC}$	1.8	2.3	°C/W

Electrical Characteristics (@ T_J = 25°C, unless otherwise specified.)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics [6]						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	650	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0V	-	-	1.0	μA
		T_J = 125°C	-	-	100	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics [6]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 250μA	2.5	3.5	4.5	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 2.0A	-	1.05	1.25	Ω
Forward Transconductance	g_{fs}	V_{DS} = 5.0V, I_D = 2.0A	-	2.9	-	S
Diodes Forward Voltage	V_{SD}	I_S = 2.0A, V_{GS} = 0V	-	0.85	1.2	V
Dynamic Characteristics [7]						
Input Capacitance	C_{iss}	V_{DS} = 50V, V_{GS} = 0V, f = 1MHz	-	235	-	pF
Output Capacitance	C_{oss}		-	25	-	pF
Reverse Transfer Capacitance	C_{rss}		-	6.1	-	pF
Effective Output Capacitance, Energy Related [8]	$C_{O(er)}$	V_{GS}=0V, V_{DS}=0...480V, f = 1MHz	-	15.3	-	pF
Effective Output Capacitance, Time Related [9]	$C_{O(tr)}$		-	55	-	pF
Gate Resistance	R_g	V_{GS} = 0V, V_{DS} = 0V, f = 1MHz	-	10.0	-	Ω
Switching Characteristics [7]						
Turn-On DelayTime	$t_{d(on)}$	V_{GS} = 10V, V_{DS} = 400V I_D = 2.0A, R_{GEN} = 3.0Ω	-	8.2	-	ns
Rise Time	t_r		-	7.7	-	ns
Turn-Off DelayTime	$t_{d(off)}$		-	19.3	-	ns
Fall Time	t_f		-	22	-	ns
Gate Charge Characteristics [7]						
Total Gate Charge (V_{GS} = 10V)	Q_g	V_{DS} = 400V, I_D = 2.0A V_{GS} = 10V	-	6.1	-	nC
Total Gate Charge (V_{GS} = 6.0V)	Q_g		-	4.1	-	nC
Gate-Source Charge	Q_{gs}		-	1.3	-	nC
Gate-Drain Charge	Q_{gd}		-	2.6	-	nC
Gate Plateau Voltage	$V_{plateau}$		-	5.3	-	V
Drain-Source Diode Characteristics [7]						
Body Diode Reverse Recovery Time	t_{rr}	I_F = 2.0A, dI/dt = 100A/μs, T_J = 25°C	-	137	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.75	-	μC
Body Diode Reverse Recovery Current	I_{rrm}		-	10.4	-	A
Diode Forward Current	I_S	T_C = 25°C	-	-	4.0	A

Notes:

1. This current is chip limited, whiich is calculated based on Rthjc.
2. This current is calculated on single pulse with 10μs Pulse & Duty Cycle = 1%.
3. Defined by design, not subject to production test, E_{AS} condition: T_J=25°C, V_{DD}=400V, V_{GS}=10V, L=30mH.
4. Device without any heatsink.
5. Thermal resistance from junction to soldering point (on the exposed drain pad).
6. Short duration pulse test used to minimize self-heating effect.
7. Defined by design, not subject to production.
8. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 480V.
9. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480V.

Typical Electrical and Thermal Characteristics

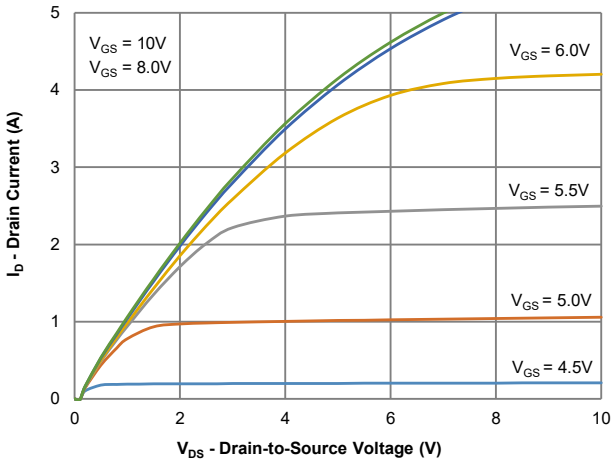


Figure 1: Output Characteristics

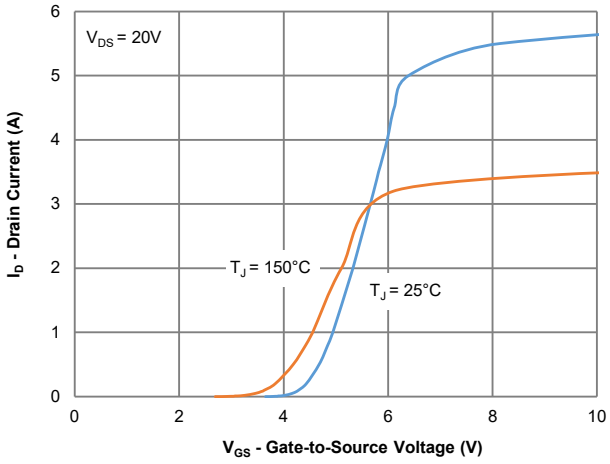


Figure 2: Transfer Characteristics

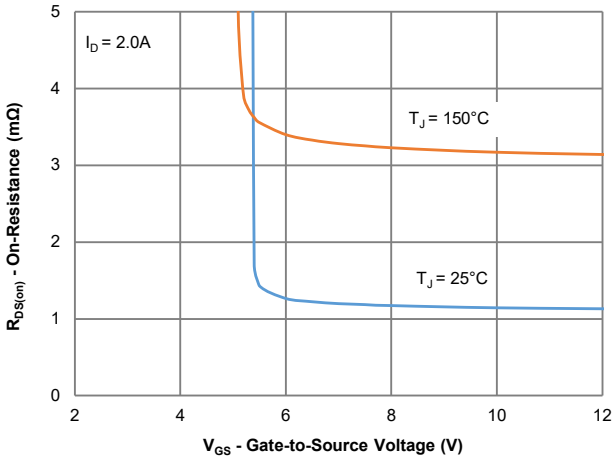


Figure 3: On-Resistance vs. Gate-Source Voltage

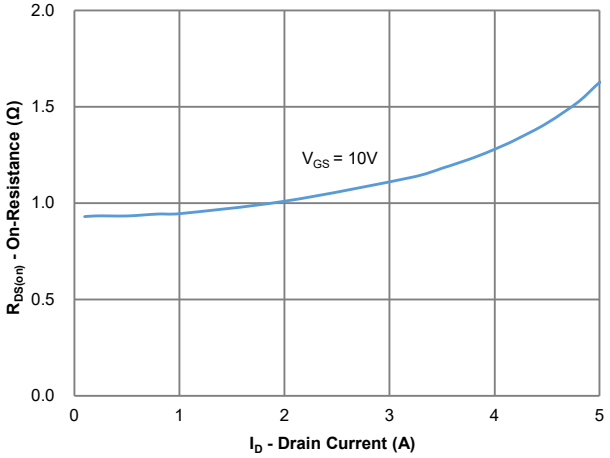


Figure 4: On-Resistance vs. Gate-Source Voltage

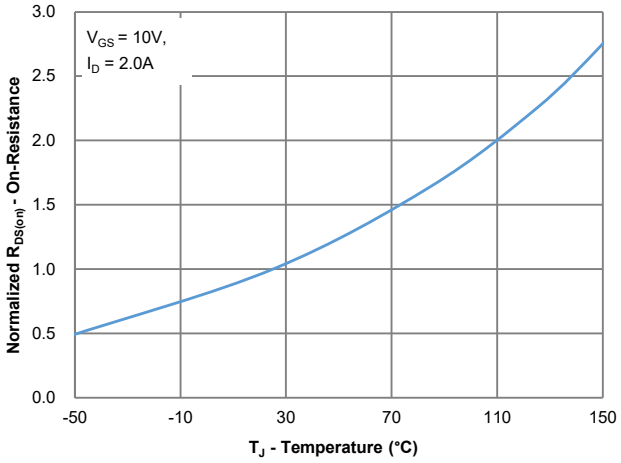


Figure 5: On-Resistance vs. Junction Temperature

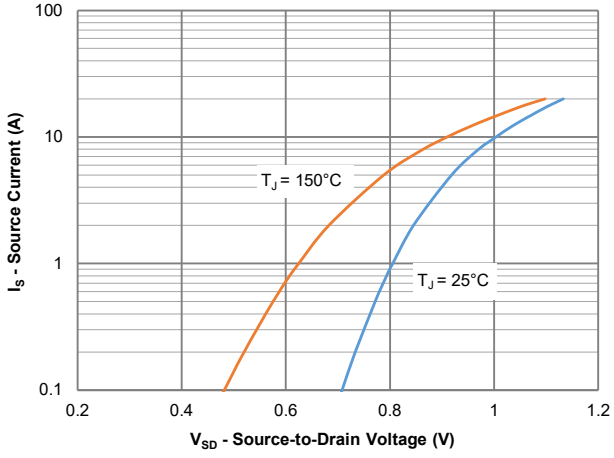


Figure 6: Source-Drain Diode Forward Voltage

Typical Electrical and Thermal Characteristics

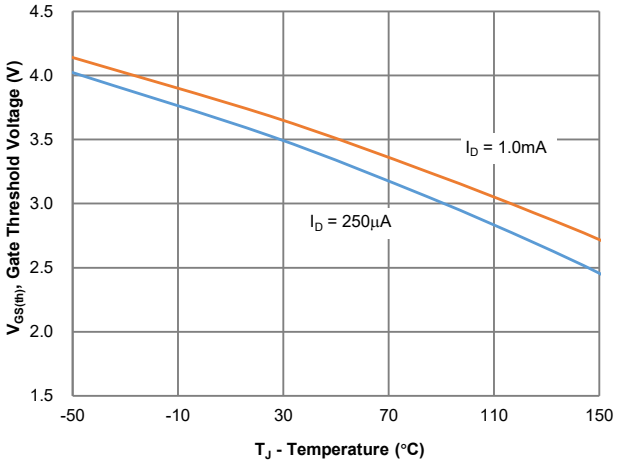


Figure 7: Gate Threshold Variation vs. Junction Temperature

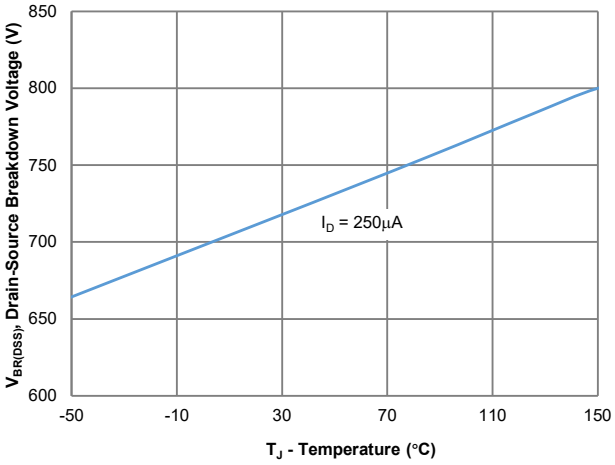


Figure 8: $V_{BR(DSS)}$ vs. Junction Temperature

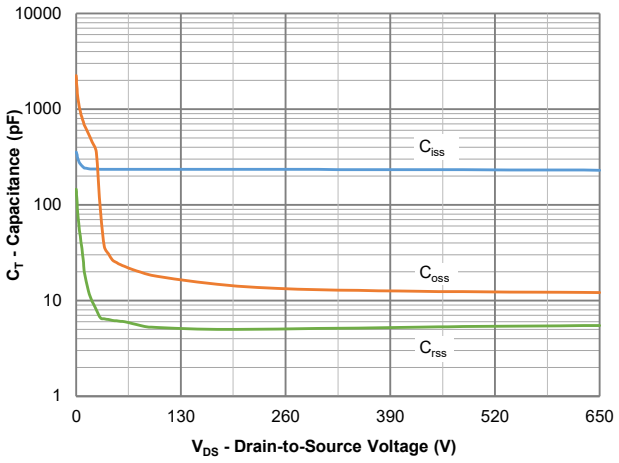


Figure 9: Capacitance Characteristics

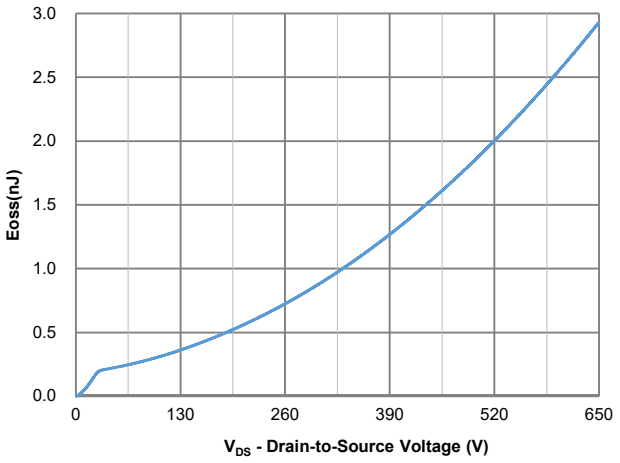


Figure 10: Coss Stored Energy

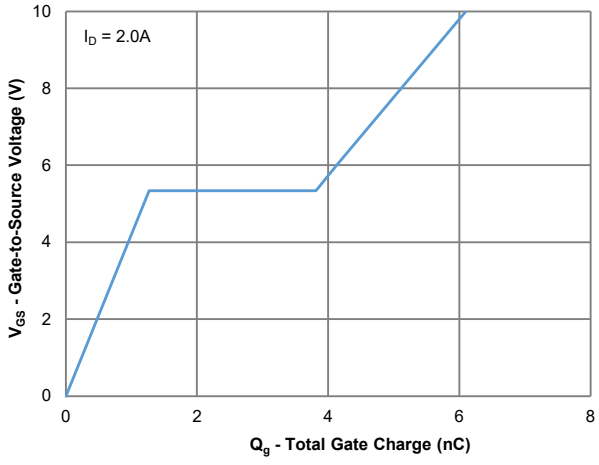


Figure 11: Gate Charge Characteristics

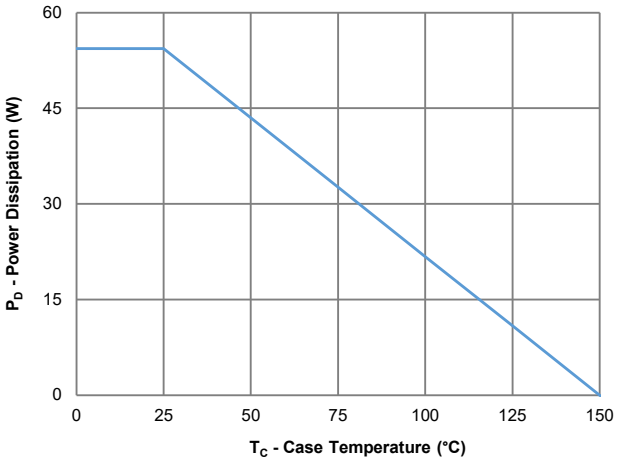


Figure 12: Power Derating

Typical Electrical and Thermal Characteristics

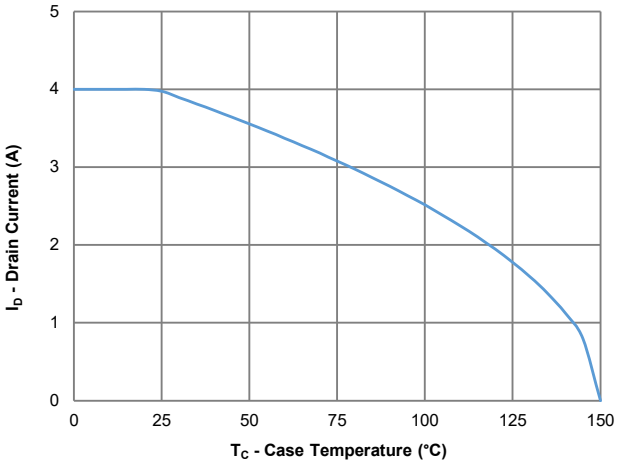


Figure 13: Current Derating

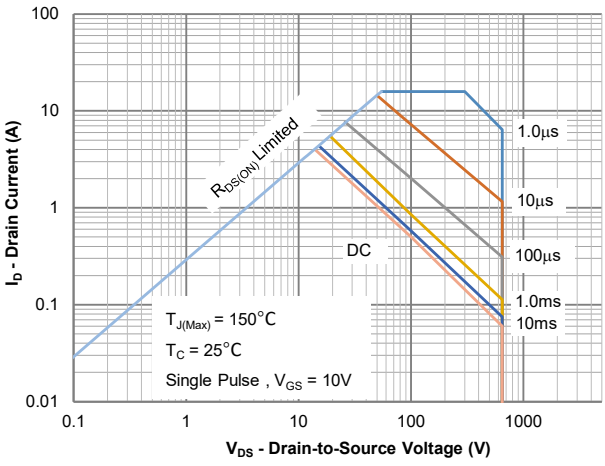


Figure 14: Safe Operating Area

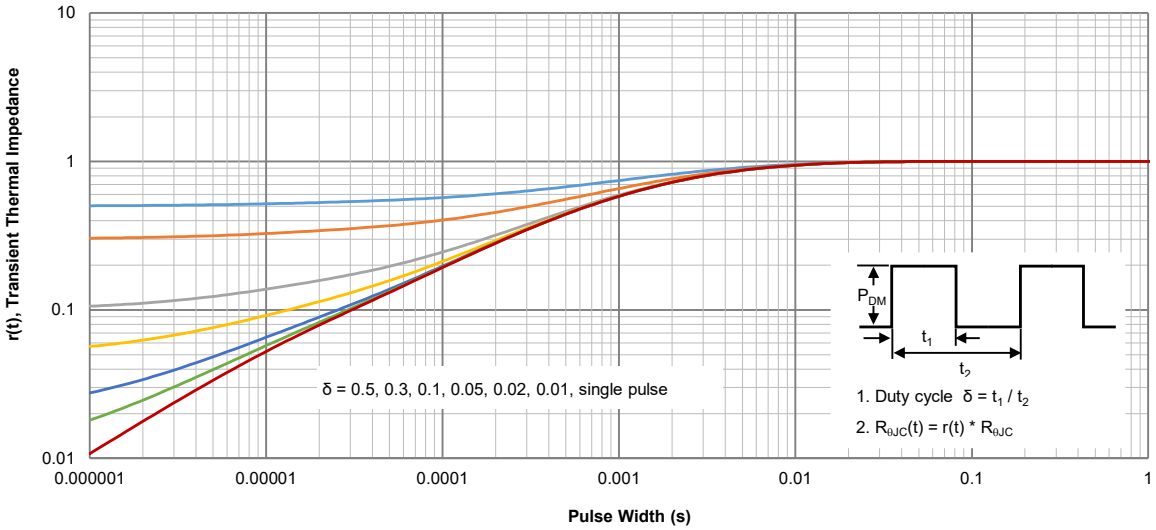
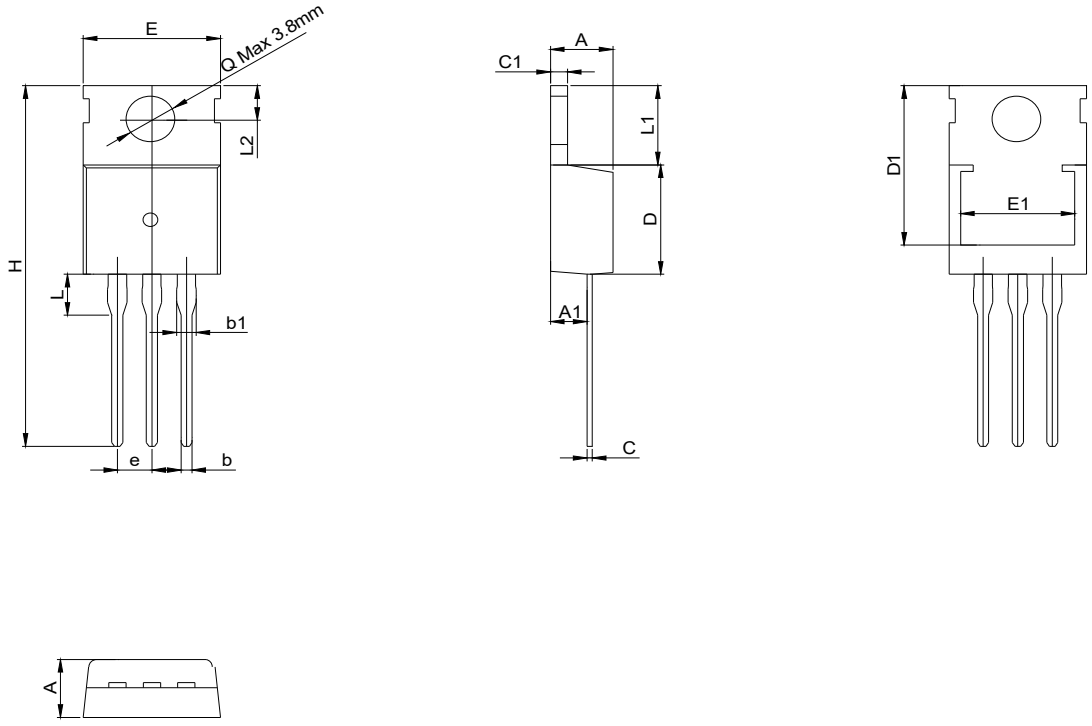


Figure 15: Normalized Maximum Transient Thermal Impedance

TO220-3L Package Outline

Package Outline



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMNESIONS IN MILLIMETER (ANNGLE IN DEGREE).
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.35	4.50	4.70
A1	2.20	2.30	3.00
b	0.70	0.80	0.95
b1	1.10	1.30	1.50
C	0.45	0.50	0.60
C1	1.23	1.30	1.40
H	28.00	28.80	29.80
D	8.80	9.21	9.90
D1	12.80	13.20	13.60
E	9.70	10.00	10.50
E1	7.40	8.00	8.60
L	--	--	3.80
L1	6.25	6.50	6.90
L2	2.40	2.90	3.05
e	2.54 BSC		