SI7405DN-T1-GE3-VB Datasheet
P-Channel 12 V (G-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 12	0.015 at V_{GS} = - 4.5 V	- 25	35 nC
	0.021 at V_{GS} = - 2.5 V	- 24	
	0.023 at V_{GS} = - 1.8 V	- 24	

FEATURES

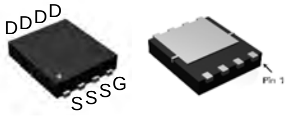
- **Halogen-free according to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Ultra Small DFN3x3 Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area
- **Compliant to RoHS Directive 2002/95/EC**

APPLICATIONS

- PA Switch
- Battery Switch
- Load Switch

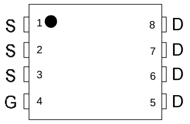
Pin Description

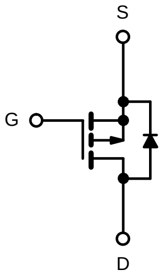
Top View Bottom View



DFN3x3-8(punch type)

Top View





P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 12	V
Gate-Source Voltage		V_{GS}	± 8	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 25	A
	T_C = 70 °C		- 19	
	T_A = 25 °C		- 20[b, c]	
	T_A = 70 °C		- 11[b, c]	
Pulsed Drain Current		I_{DM}	- 80	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 26.7	
	T_A = 25 °C		- 3.5[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	37	W
	T_C = 70 °C		26	
	T_A = 25 °C		3.9[b, c]	
	T_A = 70 °C		1.96[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Package Reflow Conditions[d]	IR/Convection		260	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Refer to IPC/JEDEC (J-STD-020), no manual or hand soldering.
e. In this document, any reference to the *Case* represents the body of the DFN2X2 device and *Foot* is the bump.

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[a, b]		R_{thJA}	31	42	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	13	16	

Notes:
a. Surface mounted on 1" x 1" FR4 board.
b. Maximum under steady state conditions is 72 °C/W.

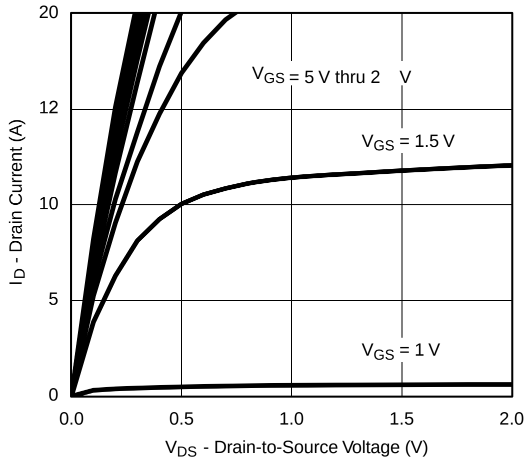
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 13.3		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.4		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 0.5		- 1.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = 5 V			- 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 12 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = - 12 V, V_{GS} = 0 V, T_J = 70 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ 5 V, V_{GS} = - 4.5 V	- 20			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 1 A		0.015		Ω
		V_{GS} = - 2.5 V, I_D = - 1 A		0.021		
		V_{GS} = - 1.8 V, I_D = - 1 A		0.023		
Forward Transconductance[a]	g_{fs}	V_{DS} = - 4 V, I_D = - 1 A		8.3		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 6 V, V_{GS} = 0 V, f = 1 MHz		2220		pF
Output Capacitance	C_{oss}			865		
Reverse Transfer Capacitance	C_{rss}			555		
Total Gate Charge	Q_g	V_{DS} = - 6 V, V_{GS} = - 5 V, I_D = - 1 A		38	57	nC
		V_{DS} = - 6 V, V_{GS} = - 4.5 V, I_D = - 1 A		35	53	
Gate-Source Charge	Q_{gs}			7.3		
Gate-Drain Charge	Q_{gd}			5.9		
Gate Resistance	R_g	V_{GS} = - 0.1 V, f = 1 MHz		28		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 6 V, R_L = 4 Ω $I_D \cong$ - 1 A, V_{GEN} = - 4.5 V, R_g = 6 Ω		14	21	ns
Rise Time	t_r			25	40	
Turn-Off Delay Time	$t_{d(off)}$			380	570	
Fall Time	t_f			240	360	

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C		- 8		A
Pulse Diode Forward Current	I_{SM}			- 25		
Body Diode Voltage	V_{SD}	I_S = - 1 A, V_{GS} = 0 V		- 0.65	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 1 A, dI/dt = 100 A/µs, T_J = 25 °C		311	467	ns
Body Diode Reverse Recovery Charge	Q_{rr}			1.136	1.705	µC
Reverse Recovery Fall Time	t_a			116		ns
Reverse Recovery Rise Time	t_b			195		

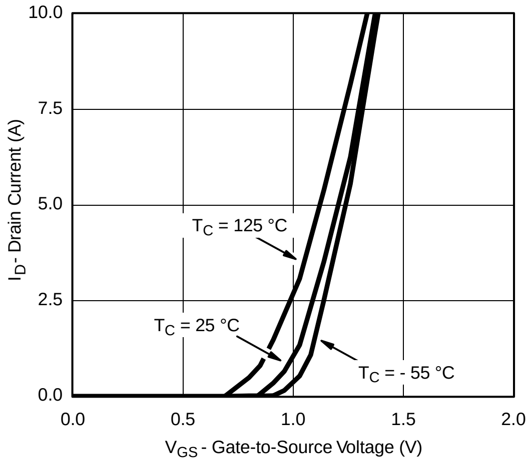
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

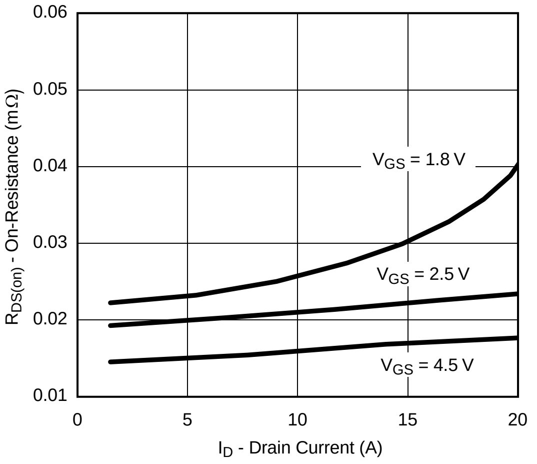
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



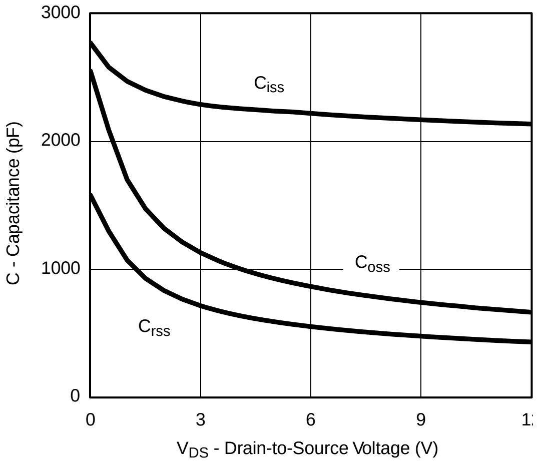
Output Characteristics



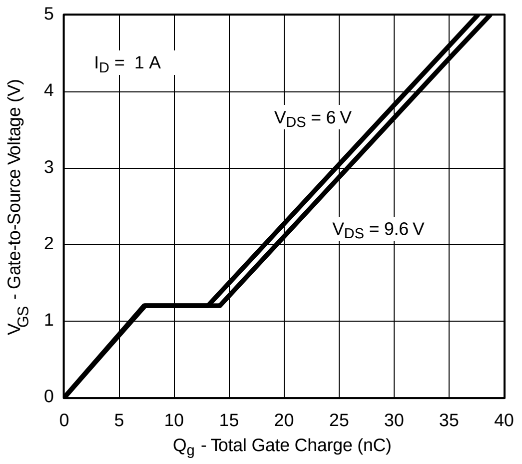
Transfer Characteristics



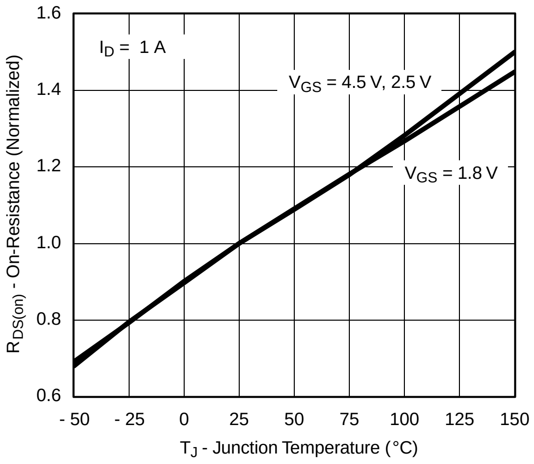
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

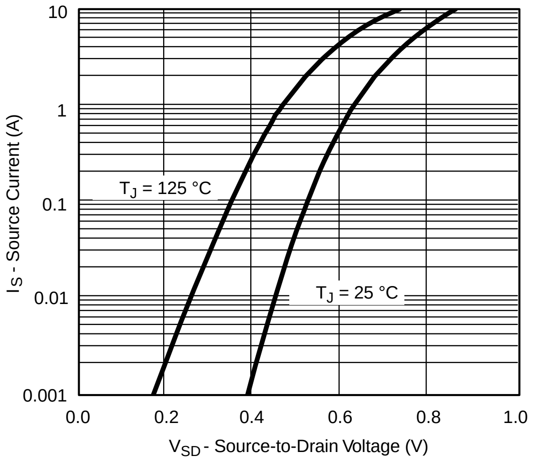


Gate Charge

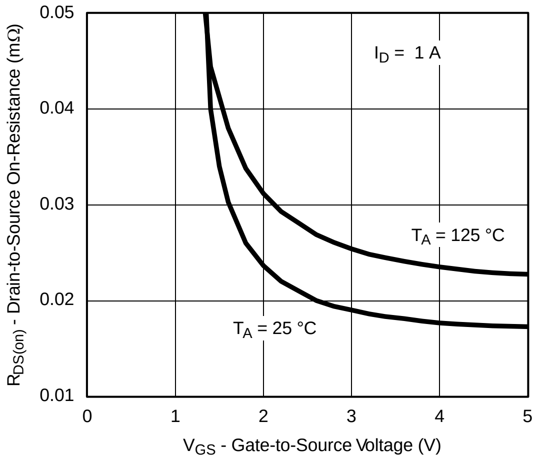


On-Resistance vs. Junction Temperature

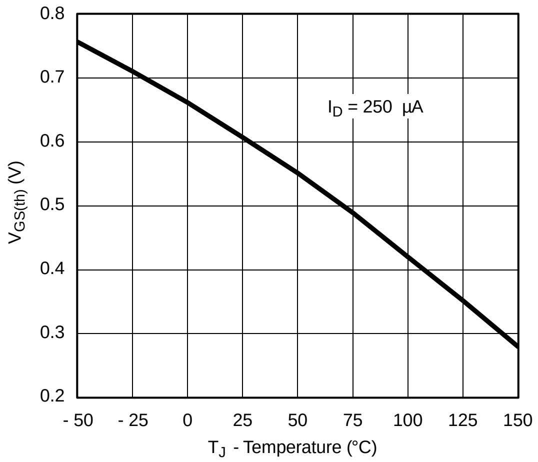
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



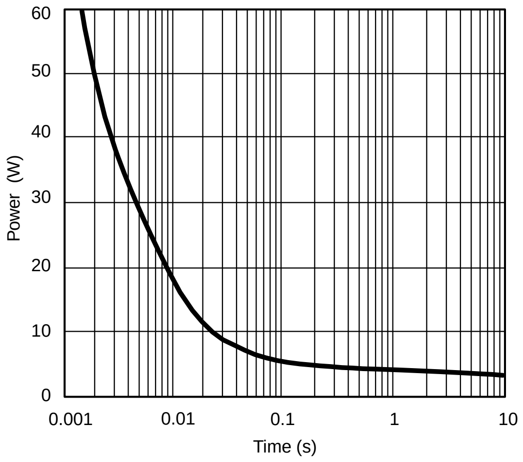
Source-Drain Diode Forward Voltage



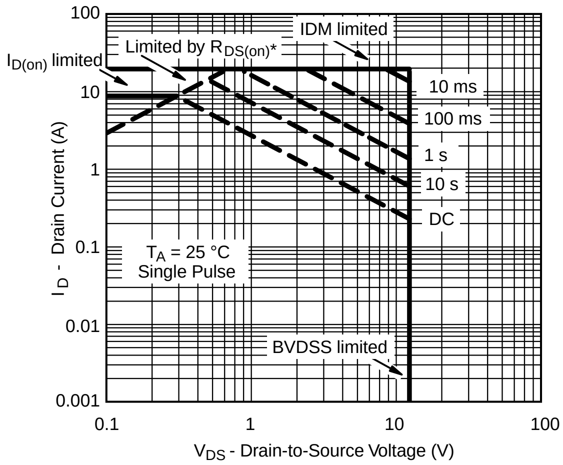
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



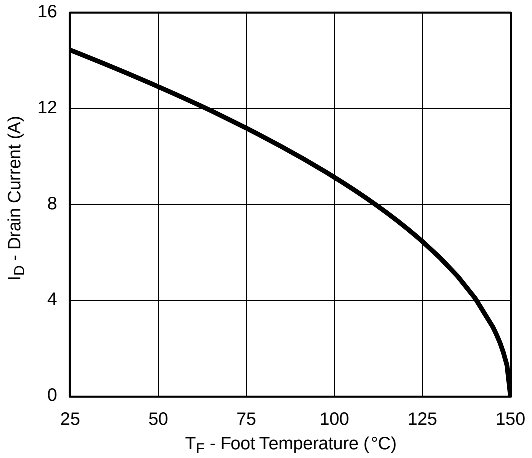
Single Pulse Power, Junction-to-Ambient



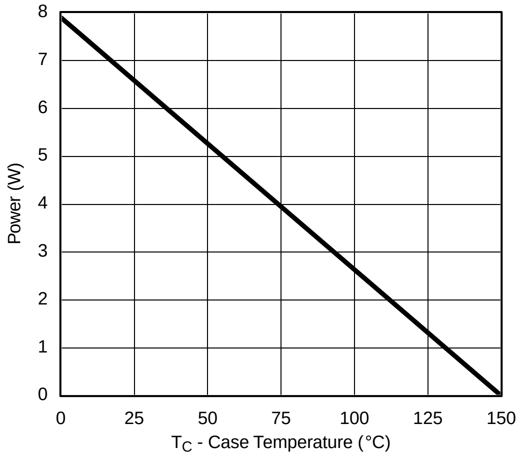
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

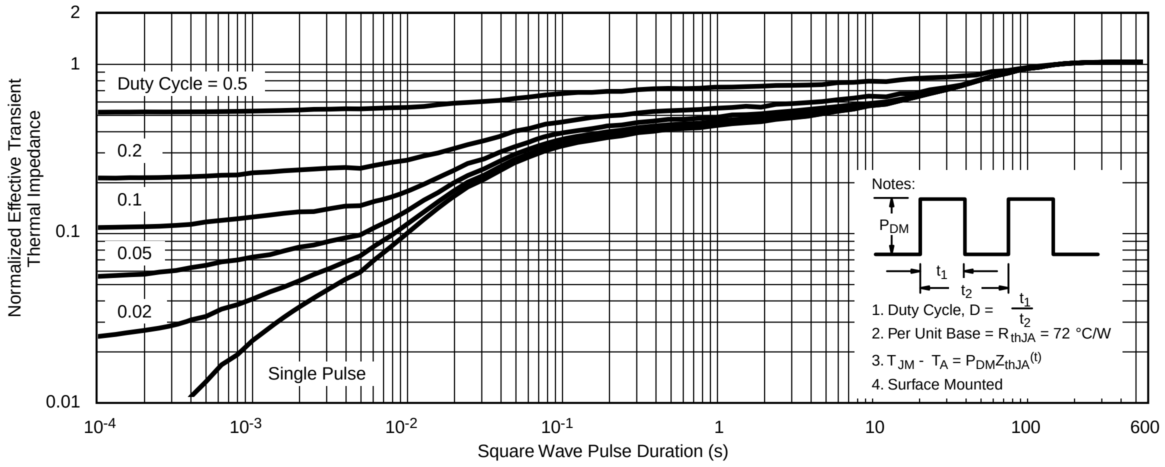
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



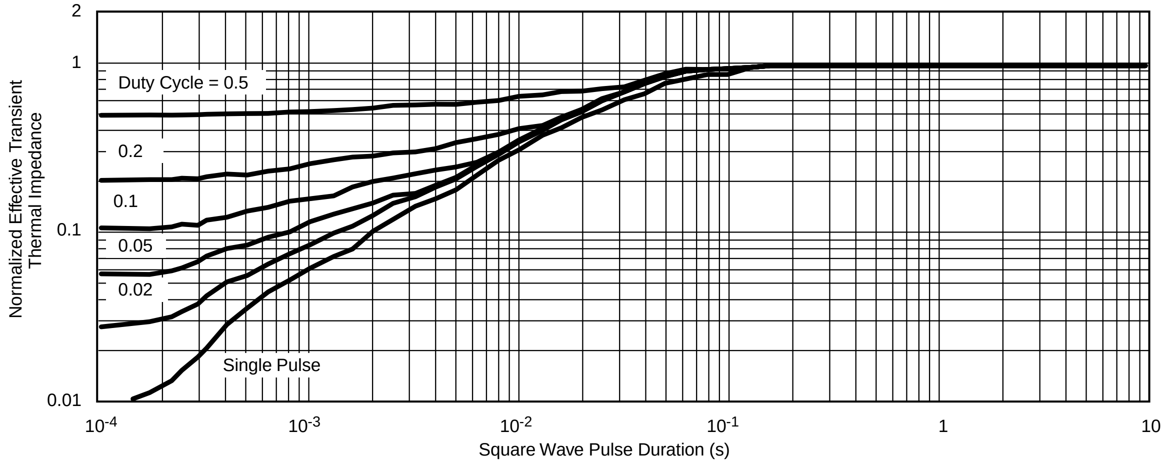
Current Derating*



Power Derating

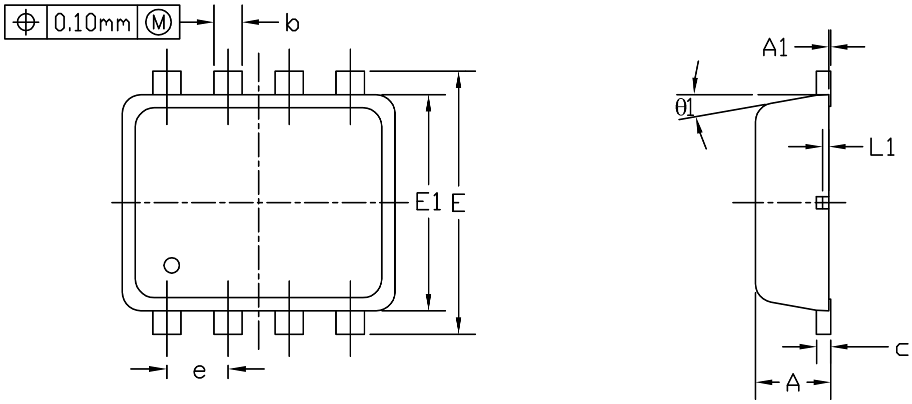


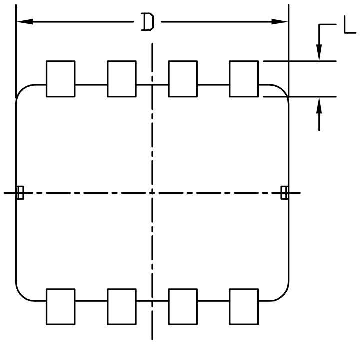
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

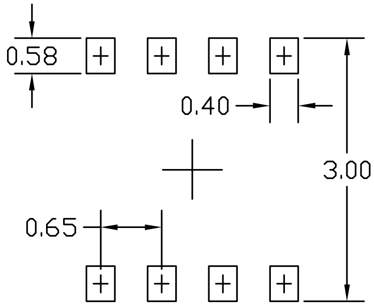
DFN3x3A_8L_NEP_P PACKAGE OUTLINE





BOTTOM VIEW

RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0. 70	0. 80	0. 90	0. 028	0. 031	0. 035
A1	0. 00	——	0. 05	0. 000	——	0. 002
b	0. 24	0. 30	0. 35	0. 009	0. 012	0. 014
c	0. 08	0. 15	0. 25	0. 003	0. 006	0. 010
D	2. 80	2. 90	3. 00	0. 110	0. 114	0. 118
E	2. 70	2. 80	2. 90	0. 106	0. 110	0. 114
E1	2. 20	2. 30	2. 40	0. 0087	0. 091	0. 095
e	0. 65 BSC			0. 026 BSC		
L	0. 20	0. 38	0. 45	0. 008	0. 015	0. 018
L1	0. 05	---	0. 10	0. 002	---	0. 004
θ1	0°	10°	12°	0°	10°	12°

NOTE

1. PAKCAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MIL EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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