

Peak 3A, Low Dropout Regulator with Enable

Features

- Adjustable Output Low to 0.8V
- Input Voltage as Low as 1.1V and VPP Voltage 5V
- 300mV Dropout @ 2A, VO 2.5V
- Over Current and Over Temperature Protection
- Enable Pin
- Low Reverse Leakage (Output to Input)
- TSOT-23-6, SOP-8(FD), MSOP-10(FD) and TDFN3X3-10 Packages
- ±1.5% ADJ Voltage
- VO Power OK Signal
- 2.5V Options by Setting ADJ Pin Below 0.2V and Adjustable Externally Using Resistors
- VO Pull Low Resistance when Disable
- VO Soft Start When Enable

Applications

- Motherboards
- Peripheral Cards
- Network Cards
- Set Top Boxes
- Notebook Computers

General Description

The G9661 is a high performance positive voltage regulator designed for use in applications requiring very low Input voltage and very low dropout voltage at up to 2 amps. It operates with a V_{IN} as low as 1.1V and VPP voltage 5V with output voltage programmable as low as 0.8V. The G9661 features ultra low dropout, ideal for applications where V_{OUT} is very close to V_{IN} . Additionally, the G9661 has an enable pin to further reduce power dissipation while shutdown. The G9661 provides excellent regulation over variations in line, load and temperature. The G9661 provides a power OK signal to indicate if the voltage level of VO reaches 92% of its rating value.

The G9661 is available in the power TSOT-23-6, SOP-8(FD), MSOP-10(FD) and TDFN3X3-10 package. It is available with 2.5V internally preset outputs that are also adjustable using external resistors.

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G9661-25ADJTP1U	961Ax	-40°C~+85°C	TSOT-23-6
G9661-25ADJF11U	9661-25	-40°C~+85°C	SOP-8 (FD)
G9661-25ADJF61U	9661-25	-40°C~+85°C	MSOP-10 (FD)
G9661-25ADJRE1U	9661A	-40°C~+85°C	TDFN3X3-10

Note: TP: TSOT-23-6 F1: SOP-8 (FD) F6: MSOP-10 (FD) RE: TDFN3X3-10

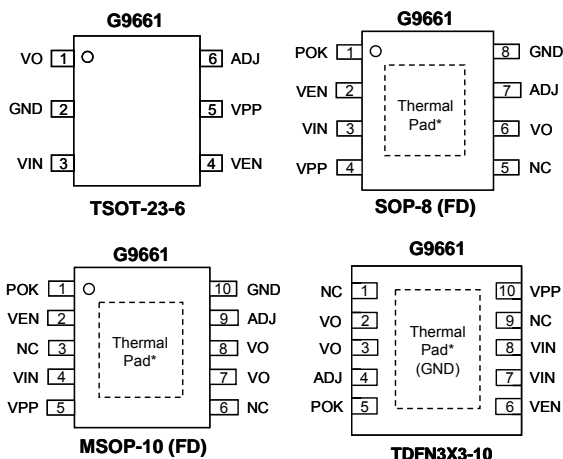
1: Bonding Code

U : Tape & Reel

e.g. 25 denotes the 2.5V output voltage

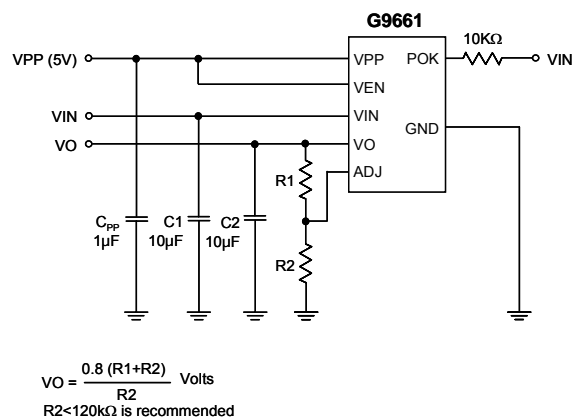
Green : Lead Free / Halogen Free

Pin Configuration



* Recommend connecting the Thermal Pad to the Ground for excellent power dissipation.

Typical Application Circuit



Absolute Maximum Ratings (Note 1)

V_{PP} , V_{IN} , POK, VEN, ADJ, VO Input Voltage	7V
Power Dissipation Internally Limited (Note 2)	
Maximum Junction Temperature	150°C
Storage Temperature Range	-65°C ≤ T _J ≤ +150°C
Reflow Temperature (soldering, 10sec)	260°C
Thermal Resistance Junction to Ambient, (θ _{JA})	
TSOT-23-6	250°C/W (Note 4)
SOP-8 (FD)	42°C/W (Note 5)
MSOP-10 (FD)	76°C/W (Note 6)
TDFN3X3-10	98°C/W (Note 6)
Continuous Power Dissipation (T _A = +25°C)	
TSOT-23-6	0.5W (Note 4)
SOP-8 (FD)	3.0W (Note 5)

MSOP-10 (FD)	1.7W (Note 6)
TDFN3X3-10	1.3W (Note 6)
Thermal Resistance Junction to Case, (θ _{JC})	
TSOT-23-6	60°C/W
SOP-8 (FD)	12°C/W
MSOP-10 (FD)	37°C/W
TDFN3X3-10	40°C/W
ESD Rating (Human Body Model)	2kV

Operation Conditions

V_{IN} Voltage	1.1V ~5.5V
V_{PP} Voltage	3V~5.5V
($V_{PP} \geq V_{IN}$ for normal operation)	
Temperature Range	-40°C ≤ T _A ≤ +85°C

Electrical Characteristics

$V_{PP}=5V$, $V_{IN}=3.3V$, $V_{EN}=V_{PP}$, $I_O=10mA$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$, $T_A=T_J=25^\circ C$ unless otherwise specified. (Note 3)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
VIN						
Input Voltage Range	V_{IN}	$V_O=0.8V$	1.1	---	5.5	V
Quiescent Current (Ground Current)	I_Q	$V_O=2.5V$	---	0.9	1.1	mA
VPP						
V_{PP} Voltage Range	V_{PP}	$V_{PP}>V_O+1V$ and $V_{PP}>3V$	3	---	5.5	V
V_{PP} Current	I_{PPH}	$V_O=2.5V$	---	0.23	0.5	mA
	I_{PPL}	$V_{EN}=0V$	---	36	60	μA
VO						
Output Voltage (Internal Fixed Voltage)	V_O	$V_{IN}=V_O+0.5V, V_O=2.5V$	2.45	2.5	2.55	V
Line Regulation		$V_{IN}=(V_O+0.5V)$ to 5V	---	0.05	0.1	%
Load Regulation		10mA ≤ I_O ≤ 2A	---	0.2	1	%
Dropout Voltage	V_D	$I_O=2A, V_O=2.5V$	---	250	300	mV
Short Circuit Current			---	1.4	---	A
Current Limit	I_{LIM}		3	---	---	A
V_O Pull Low Resistance		$V_{EN}=0V$	---	90	---	Ω
ADJ						
Reference Voltage	V_{REF}	$V_{ADJ}=V_O$	0.788	0.8	0.812	V
Adjust Pin Current	I_{ADJ}		---	20	100	nA
Adjust Pin Threshold			0.15	0.2	0.25	V
VEN						
V_{EN} Pin Voltage High	V_{ENH}		1.6	---	---	V
V_{EN} Pin Voltage Low	V_{ENL}		---	---	0.4	V
V_{EN} Pin Bias Current	I_{ENL}	$V_{EN}=V_{PP}$	---	10	20	μA
POK						
V_O Power OK Voltage	V_{THPOK}		---	92	---	%
Hysteresis	V_{HYPOK}		---	7	---	%
Over Temperature Protection						
Over Temperature	T_{OT}		---	150	---	°C
Over Temperature Hysteresis	T_{OTHY}		---	30	---	°C

Note 1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Conditions are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.

Note 2: The maximum power dissipation is a function of the maximum junction temperature, T_{Jmax}; total thermal resistance, θ_{JA}, and ambient temperature T_A. The maximum allowable power dissipation at any ambient temperature is (T_{Jmax}-T_A)/θ_{JA}. If this dissipation is exceeded, the die temperature will rise above 150°C and IC will go into thermal shutdown.

Note 3: Low duty pulse techniques are used during test to maintain junction temperature as close to ambient as possible.

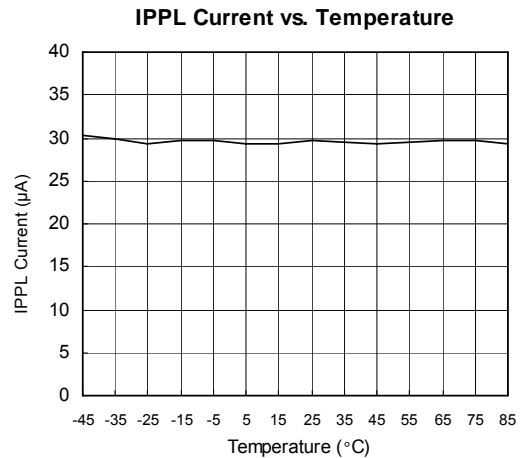
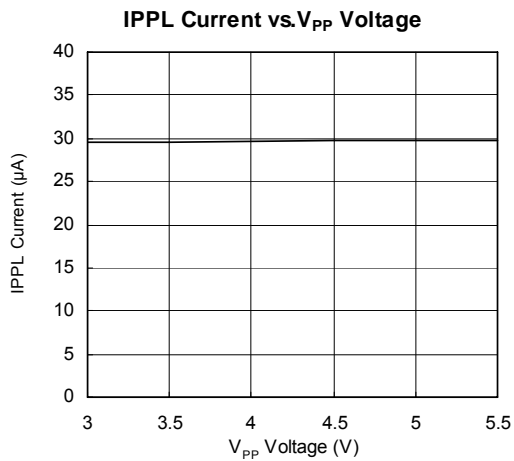
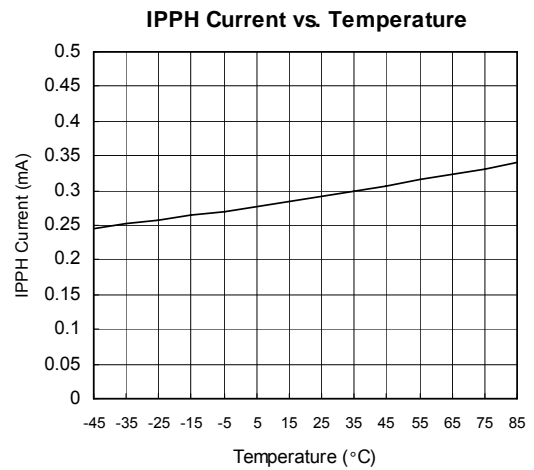
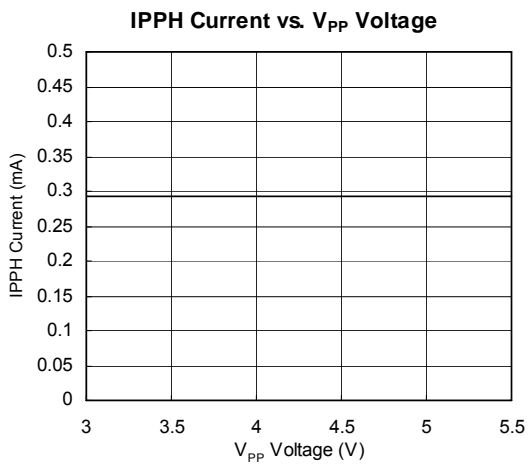
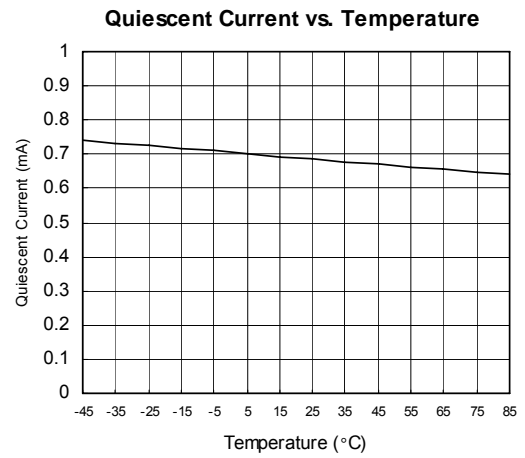
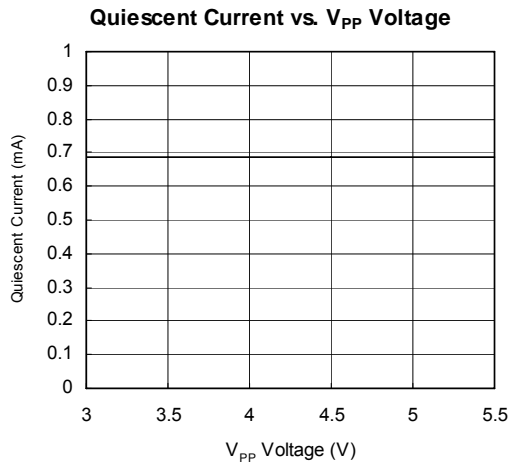
Note 4: Please refer to Minimum Footprint PCB Layout Section.

Note 5: The package is placed on a 2-layer PCB (1oz/1oz) with 3vias. Please refer to Demo Board Footprint section.

Note 6: Please refer to 1in² of 1oz PCB Layout Section.

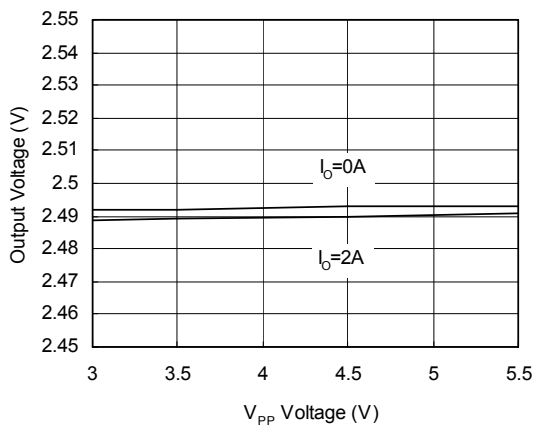
Typical Performances Characteristics

($V_{PP}=5V$, $V_{IN}=3.3V$, $V_O=2.5V$, $T_A=25^\circ C$, unless otherwise noted.)

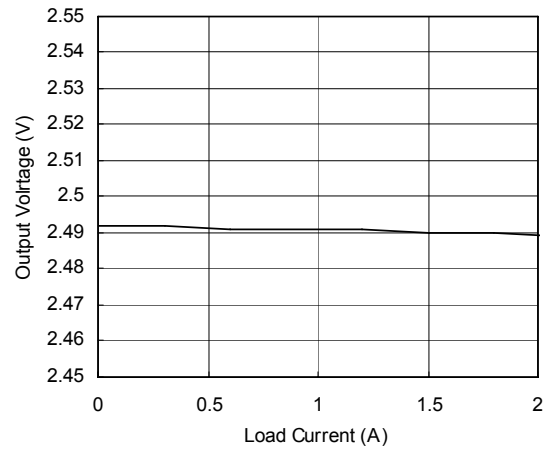


Typical Performances Characteristics (continued)

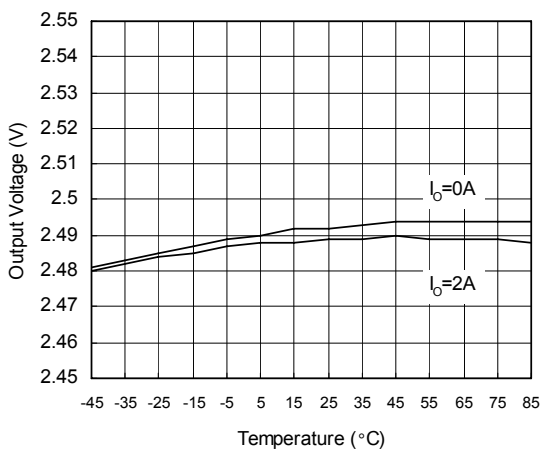
Output Voltage vs. V_{PP} Voltage



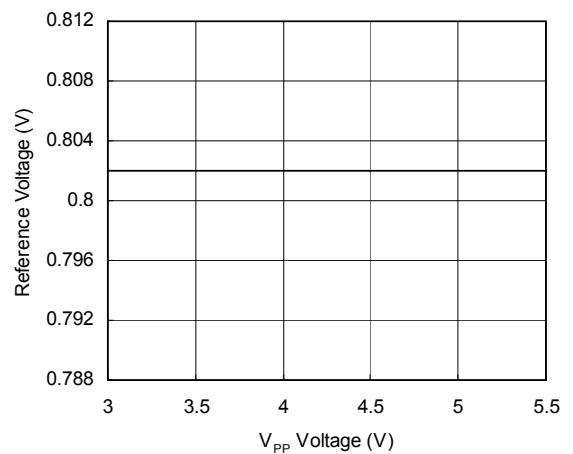
Output Voltage vs. Load Current



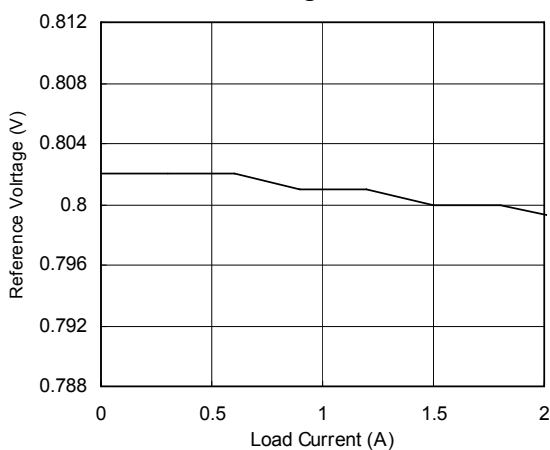
Output Voltage vs. Temperature



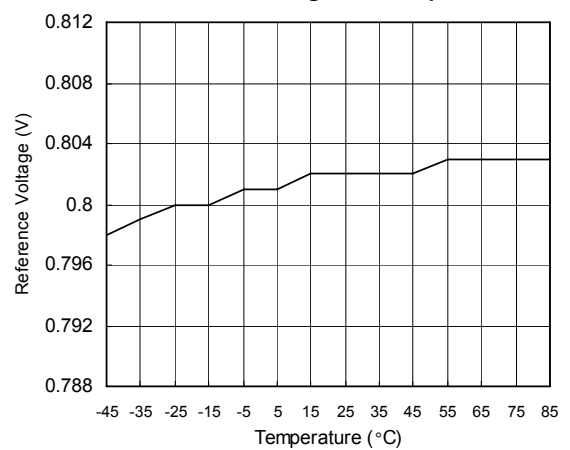
Reference Voltage vs. V_{PP} Voltage



Reference Voltage vs. Load Current

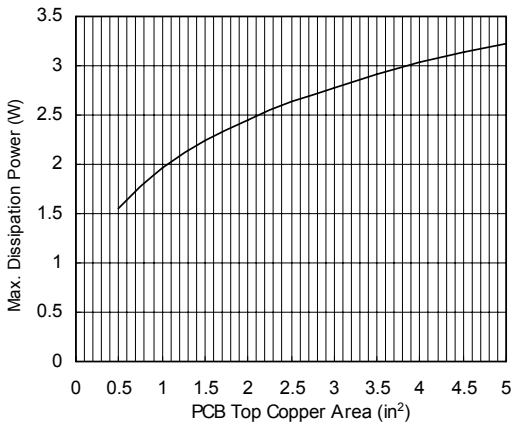


Reference Voltage vs. Temperature

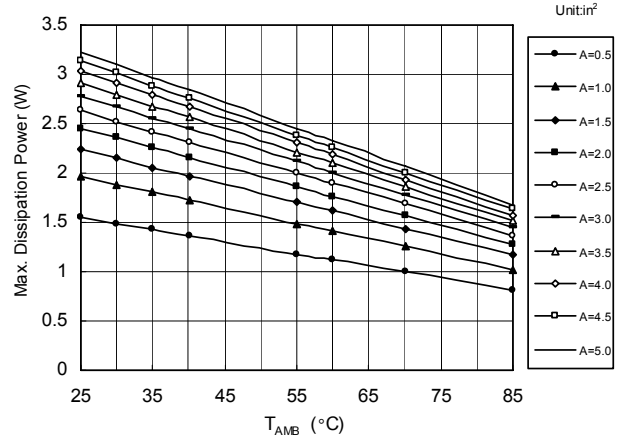


Typical Performances Characteristics (continued)

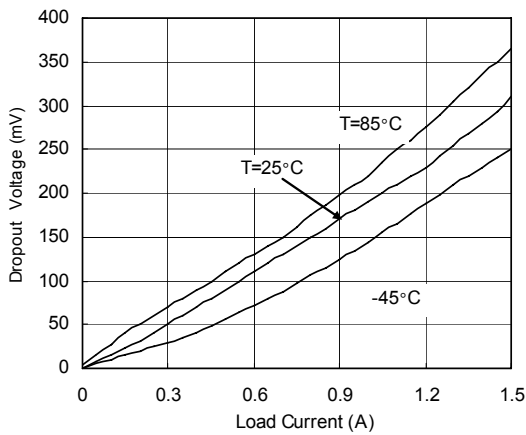
Max. Power Dissipation vs. PCB Top Copper Area



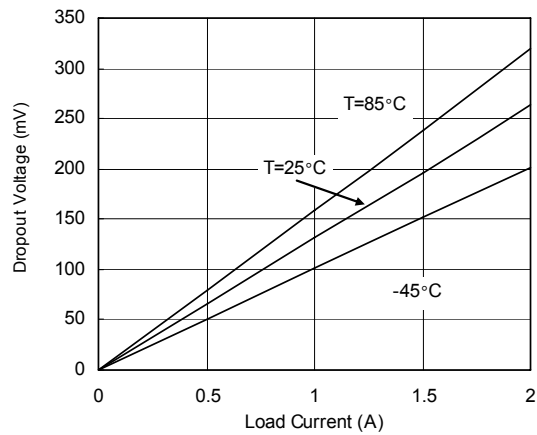
Max. Power Dissipation vs. T_{AMB} (still air)



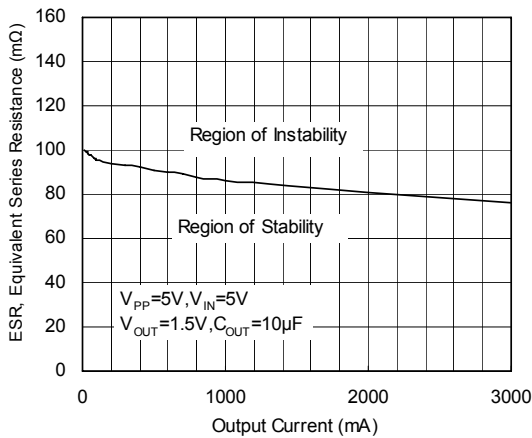
V_{drop} vs. I_{Load} @ V_{PP}=3.3V, V_O=1.8V



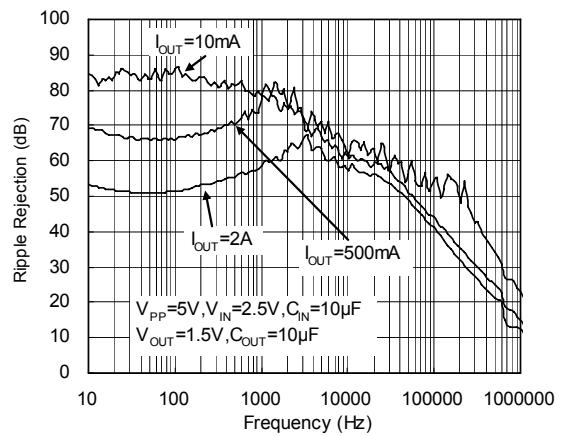
V_{drop} vs. I_{Load} @ V_{PP}=5V



ESR, Equivalent Series Resistance vs. Output Current

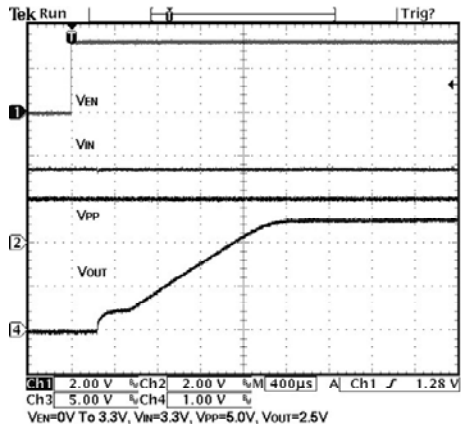


Ripple Rejection vs. Frequency

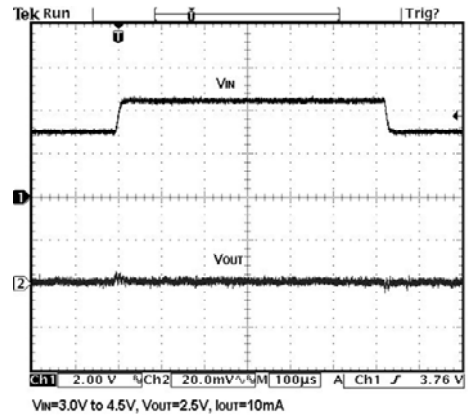


Typical Performances Characteristics (continued)

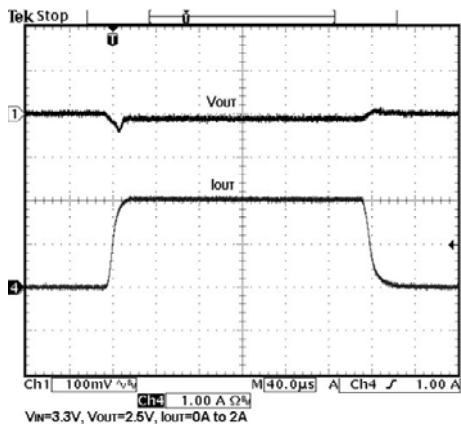
V_{EN} Start up Waveform



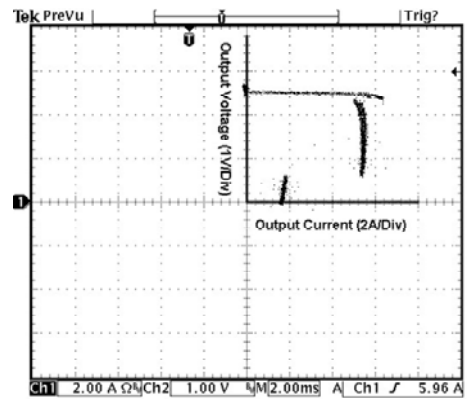
Line Transient



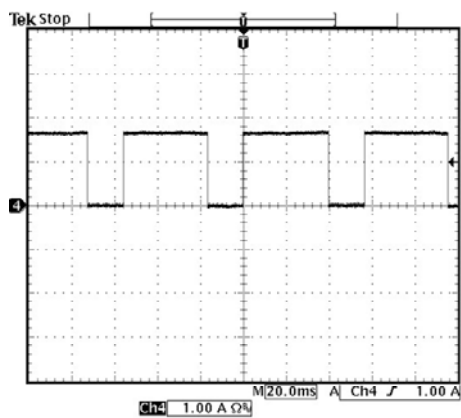
Load Transient



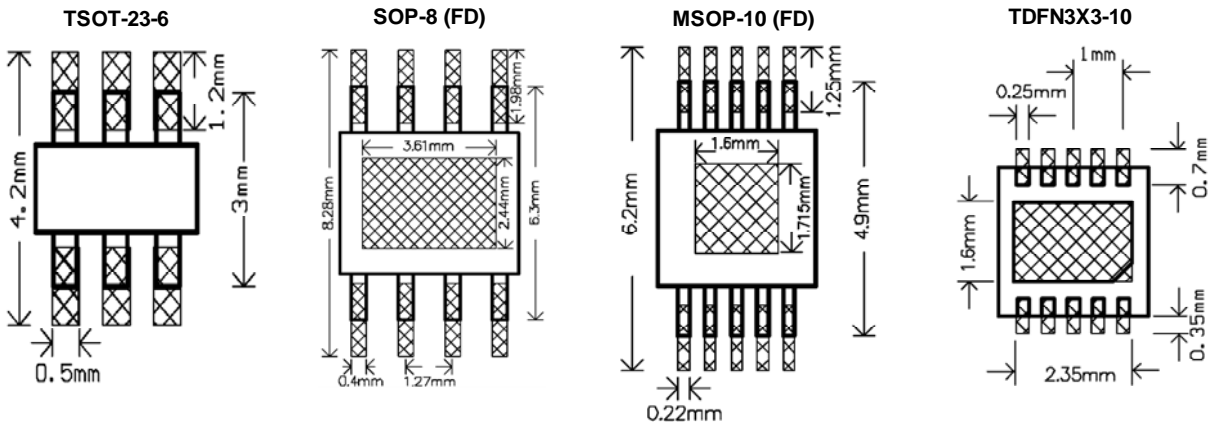
OC Protection Waveform



Short Circuit Current

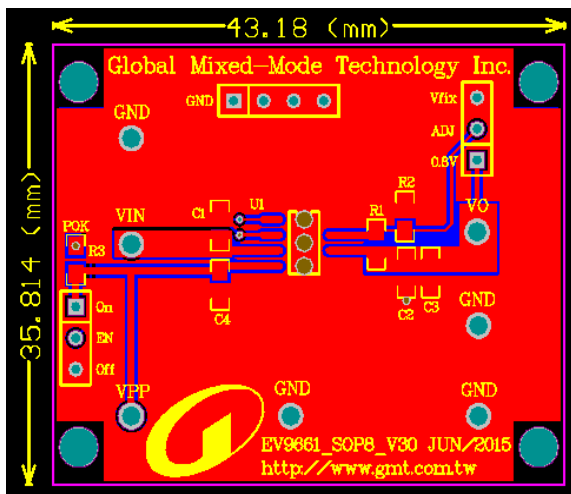


Minimum Footprint PCB Layout Section

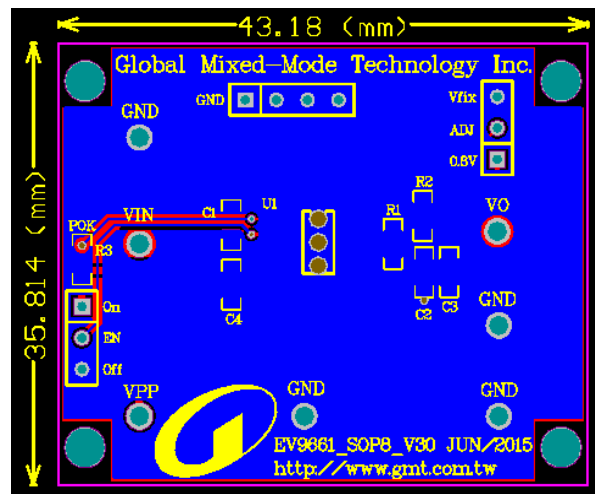


Demo Board Footprint

SOP-8 (FD) Top Side

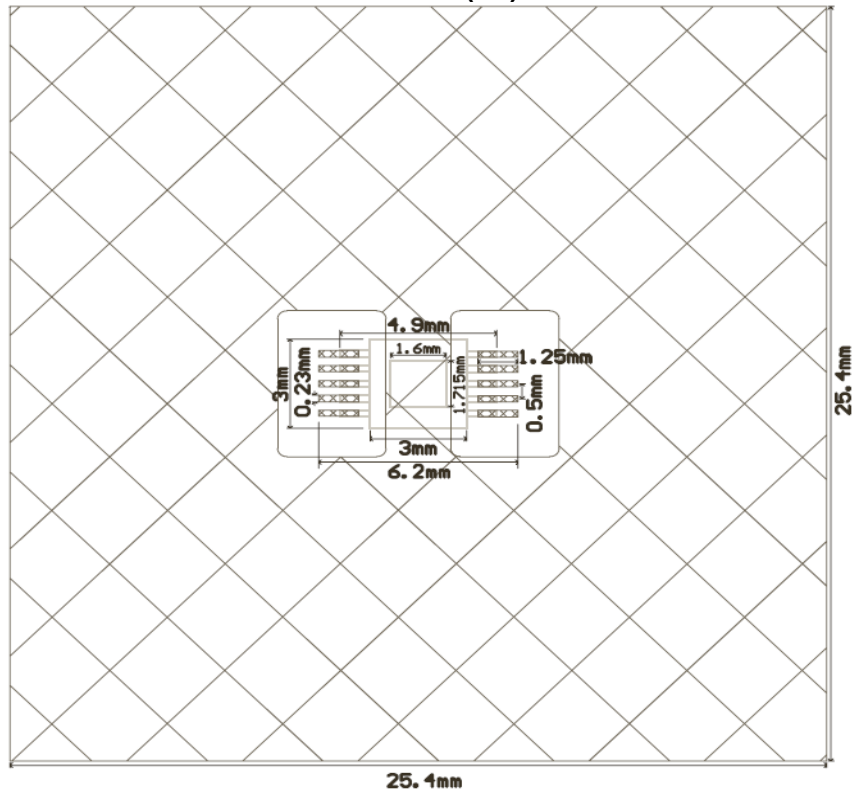


SOP-8 (FD)-8 Bottom Side

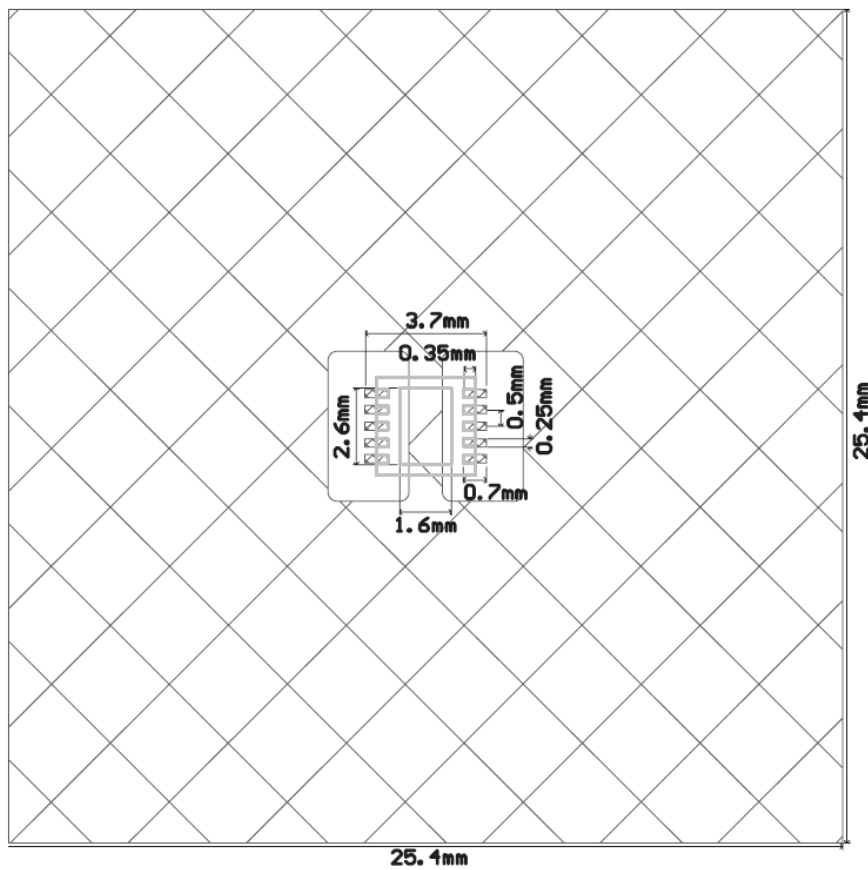


1in² of 1oz PCB Layout Section

MSOP-10 (FD)



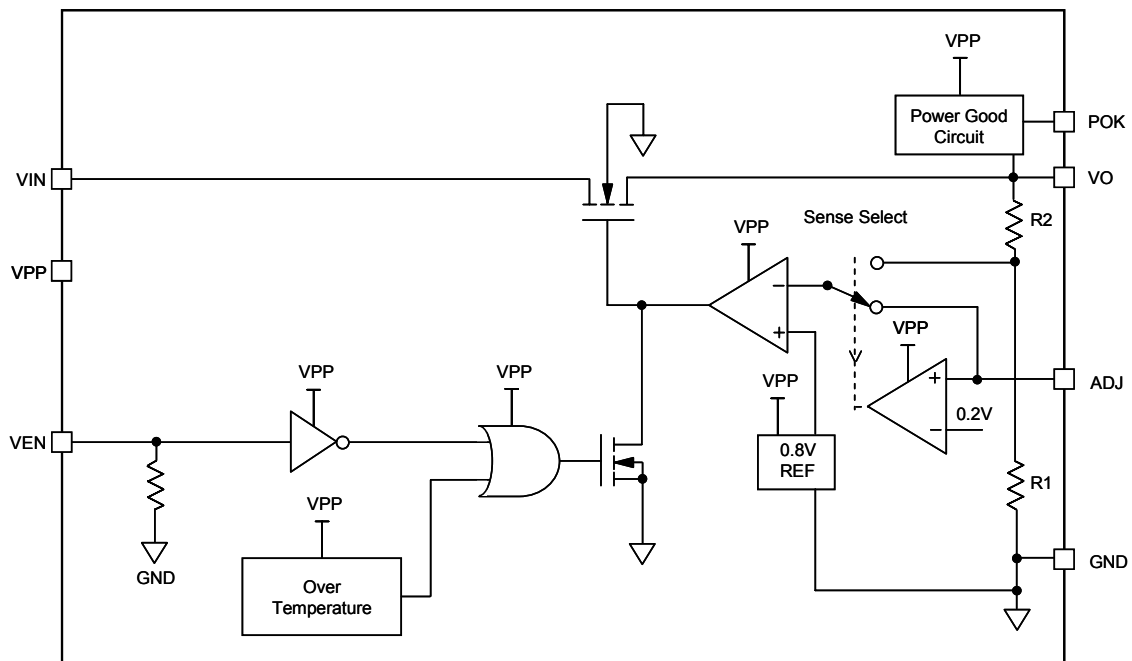
TDFN3X3-10



Pin Description

PIN				NAME	FUNCTION
TSOT-23-6	SOP-8 (FD)	MSOP-10 (FD)	TDFN3X3-10		
1	6	7,8	2,3	VO	The power output of the device. A pull low resistance exists when deactivate device by VEN.
2	8	10		GND	Reference ground.
3	3	4	7,8	VIN	Input voltage. Large bulk capacitance should be placed closely to this pin. A 10μF ceramic capacitor is recommended at this pin.
4	2	2	6	VEN	Enable Input. Pulling this pin below 0.4V turns the regulator off, reducing the quiescent current to a fraction of its operating value. The device will be disabled if this pin is left open.
5	4	5	10	VPP	Input voltage for controlling circuit.
6	7	9	4	ADJ	This pin, when grounded, sets the output voltage by the internal feedback resistors. If external feedback resistors are used, the output voltage will be $VO = 0.8(R1+R2)/R2$ Volts.
	1	1	5	POK	Assert high once VO reaches 92% of its rating voltage. Open-drain output.
	5	3,6	1,9	NC	Not connected.

Block Diagram



Definitions

Dropout Voltage

The input/output Voltage differential at which the regulator output no longer maintains regulation against further reductions in input voltage. Measured when the output drops 2% below its nominal value, dropout voltage is affected by junction temperature, load current and minimum input supply requirements.

Line Regulation

The change in output voltage for a change in input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that average chip temperature is not significantly affected.

Load Regulation

The change in output voltage for a change in load current at constant chip temperature. The measurement is made under conditions of low dissipation or by using pulse techniques such that average chip temperature is not significantly affected.

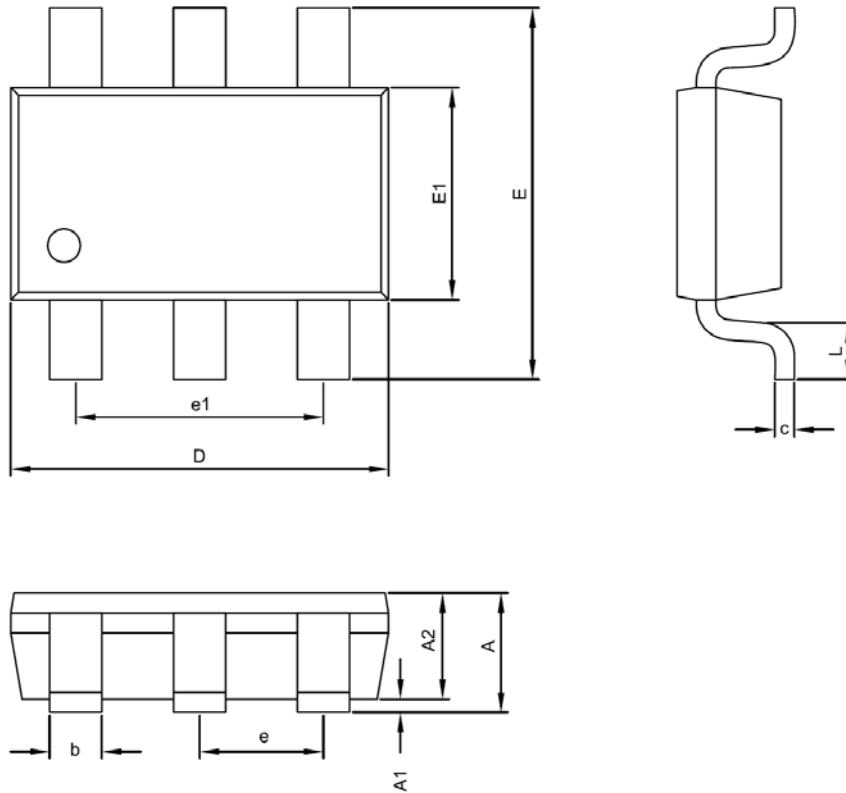
Maximum Power Dissipation

The maximum total device dissipation for which the regulator will operate within specifications.

Quiescent Bias Current

Current which is used to operate the regulator chip and is not delivered to the load.

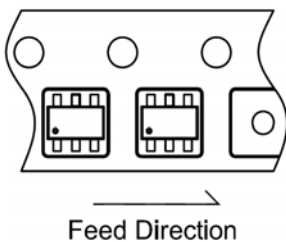
Package Information



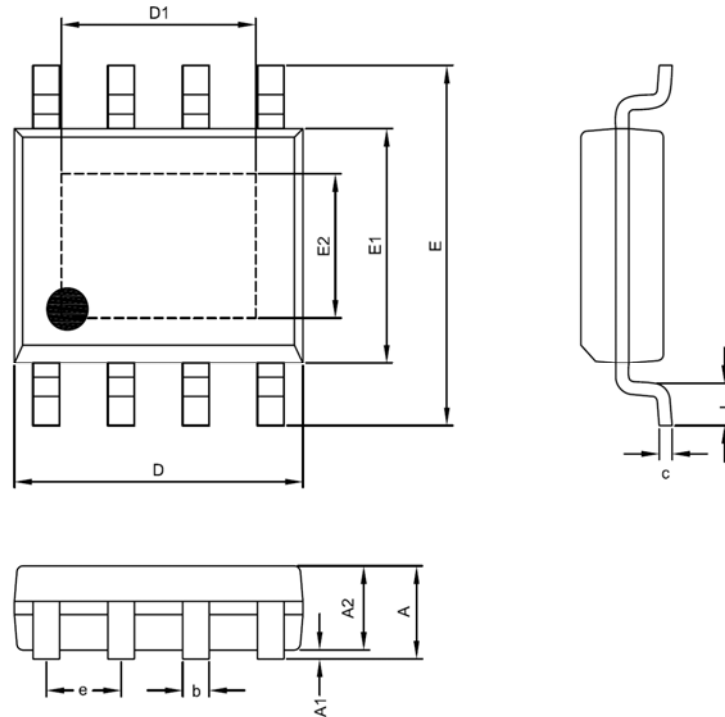
TSOT-23-6 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	---	---	0.90	---	---	0.035
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70	0.75	0.80	0.028	0.030	0.031
D	2.70	2.90	3.10	0.106	0.114	0.122
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
c	0.08	0.15	0.25	0.003	0.006	0.010
b	0.30	0.40	0.50	0.012	0.016	0.020
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	0.45	0.60	0.012	0.018	0.024

Taping Specification



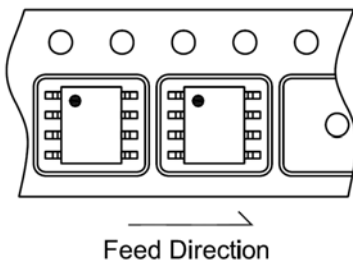
PACKAGE	Q'TY/REEL
TSOT-23-6	3,000 ea



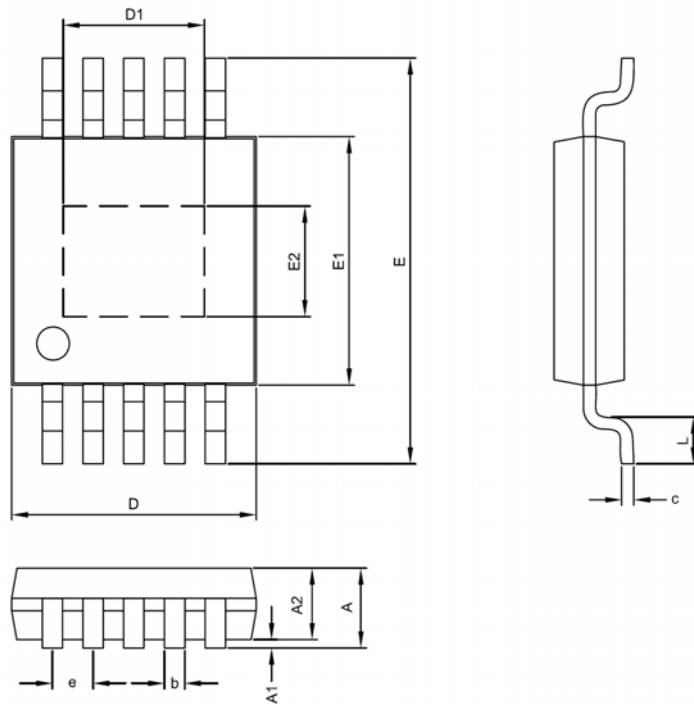
SOP- 8 (FD) Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.35	1.55	1.60	0.053	0.061	0.063
A1	0.00	---	0.10	0.000	---	0.004
A2	1.15	1.35	1.50	0.045	0.053	0.059
D	4.80	4.90	5.00	0.189	0.192	0.197
D1	2.29	---	3.71	0.090	---	0.146
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.153	0.157
E2	2.29	---	2.64	0.090	---	0.104
c	0.19	0.23	0.27	0.007	0.009	0.011
b	0.33	0.43	0.53	0.013	0.017	0.021
e	1.27 BSC			0,050 BSC		
L	0.40	0.70	1.00	0.016	0.028	0.039

Taping Specification



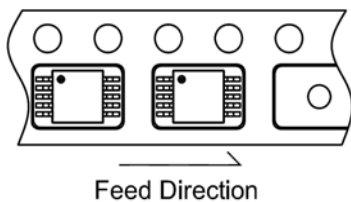
PACKAGE	Q'TY/REEL
SOP-8 (FD)	2,500 ea



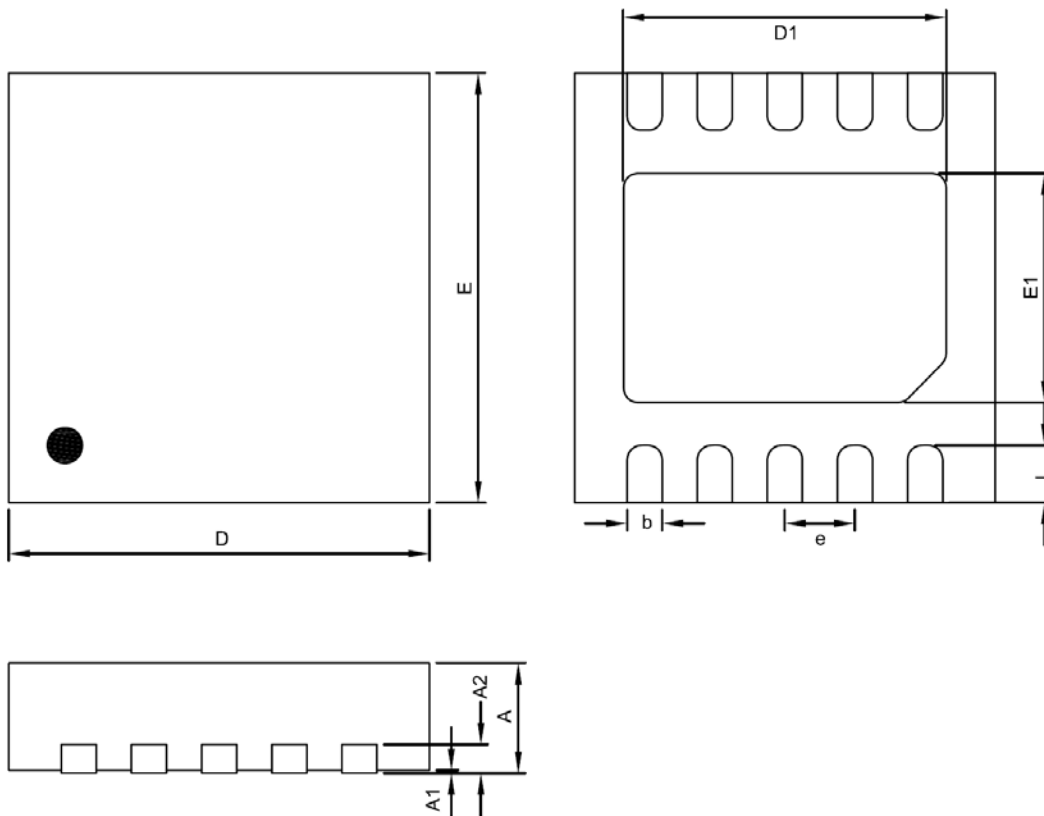
MSOP-10 (FD) Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.81	0.95	1.10	0.032	0.037	0.043
A1	0.00	---	0.15	0.000	---	0.006
A2	0.76	0.86	0.96	0.030	0.034	0.038
D	2.90	3.00	3.10	0.114	0.118	0.122
D1	2.00 REF			0.79 REF		
E	4.80	4.90	5.00	0.189	0.193	0.197
E1	2.90	3.00	3.10	0.114	0.118	0.122
E2	1.60 REF			0.063 REF		
c	0.13	0.15	0.23	0.005	0.006	0.009
b	0.15	0.25	0.35	0.006	0.010	0.014
e	0.50 BSC			0.020 BSC		
L	0.40	0.53	0.80	0.016	0.021	0.031

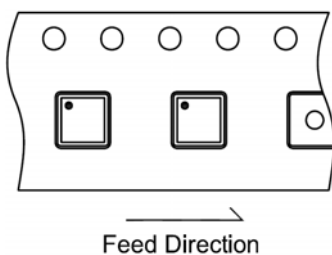
Taping Specification



PACKAGE	Q'TY/ REEL
MSOP-10 (FD)	3,000 ea


TDFN3X3-10 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	---	0.05	0.0000	---	0.0020
A2	0.19	0.20	0.21	0.0075	0.0079	0.0083
D	2.95	3.00	3.05	0.1161	0.1181	0.1201
E	2.95	3.00	3.05	0.1161	0.1181	0.1201
D1	2.20	2.30	2.40	0.0866	0.0906	0.0945
E1	1.40	1.50	1.60	0.0551	0.0591	0.0630
b	0.18	0.25	0.30	0.0071	0.0098	0.0118
e	0.50 BSC			0.0197 BSC		
L	0.35	0.40	0.45	0.0138	0.0157	0.0177

Taping Specification


PACKAGE	Q'TY/REEL
TDFN3X3-10	3,000 ea

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