



SGM46000

3W Primary-Side Transformer H-Bridge Driver for Isolated Supplies

GENERAL DESCRIPTION

SGM46000 is a 3W primary-side transformer driver providing isolated power. The device has an internal oscillator, multiple protection features and H-bridge drivers in order to provide 3W of power to the transformer's primary winding with +5V input.

Either the internal adjustable oscillator or the external clock can drive the device. A fixed duty cycle of 50% will be used to prevent current from flowing in the transformer.

The SGM46000 operates over a wide input voltage range of 2.5V to 5.5V and has multiple protection functions, including under-voltage lockout (UVLO) and thermal shutdown (TSD).

In order to prevent the cross-conduction of the H-bridge MOSFETs, the device is implemented by break-before-make switching.

The SGM46000 is available in Green TDFN-2×3-8BL and SOIC-8 (Exposed Pad) packages. It operates over an ambient temperature range of -40°C to +125°C.

FEATURES

- **3W Driver for Isolation Transformer**
- **Supply Voltage Range: 2.5V to 5.5V**
- **Adjustable Oscillator Mode**
- **External Clock Mode with Watchdog**
- **Disable Mode**
- **Under-Voltage Lockout Function**
- **Thermal Shutdown**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green TDFN-2×3-8BL and SOIC-8 (Exposed Pad) Packages**

APPLICATIONS

Isolated Power Supply
Medical Instruments
Telecommunications
Isolated Communications Links

PACKAGE/ORDERING INFORMATION

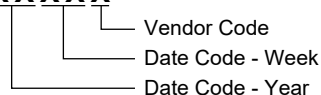
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM46000	SOIC-8 (Exposed Pad)	-40°C to +125°C	SGM46000XPS8G/TR	SGM46000 XPS8 XXXXX	Tape and Reel, 2500
	TDFN-2×3-8BL	-40°C to +125°C	SGM46000XTDC8G/TR	M62 XXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code. XXXX = Date Code.

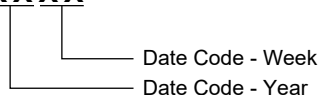
SOIC-8 (Exposed Pad)

XXXXX



TDFN-2×3-8BL

XXXX



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND	-0.3V to 6V
CK_RS, ST1, ST2 ⁽¹⁾ to GND	-0.3V to V_{CC} + 0.3V
ST1, ST2 to GND (< 10ns)	-1V to 6.5V
MODE	-0.3V to 6V
ST1, ST2 Maximum Continuous Current	
T_A < +125°C	±0.6A
T_A < +100°C	±0.9A
T_A < +85°C	±1.0A
Package Thermal Resistance	
SOIC-8 (Exposed Pad), θ_{JA}	53°C/W
TDFN-2×3-8BL, θ_{JA}	104°C/W
Power Dissipation, P_D @ T_A = +70°C	
SOIC-8 (Exposed Pad)	1.5W
TDFN-2×3-8BL	0.76W
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM	5000V
MM	400V
CDM	1000V

NOTE: 1. ST1 and ST2 have no short-circuit protection. A short-circuit fault may cause damage to the equipment.

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range	-40°C to +125°C
Supply Voltage Range	2.5V to 5.5V

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

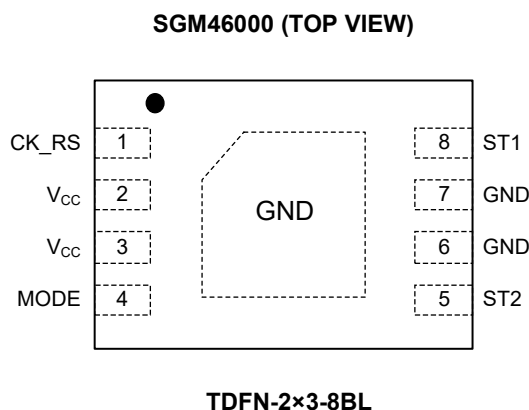
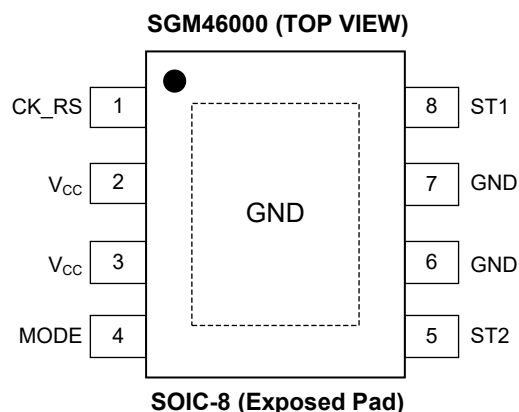
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	CK_RS	Clock Input and Programmable Oscillator Frequency. If the MODE pin is pulled high, the internal oscillation frequency is set with a resistance of 5kΩ or greater and a capacitance of 100nF between CK_RS and GND pins. If the MODE pin is pulled low, an external clock signal needs to be applied to CK_RS pin. The output switch of the SGM46000 is half the frequency of the external clock.
2, 3	V _{CC}	Supply Voltage (V _{CC} = 2.5V to 5.5V). It is recommended to place 4.7μF and 470nF bypass capacitors as close to this pin as possible.
4	MODE	Mode Selection Input.
5	ST2	Drive Output 2 of the Transformer.
6, 7	GND	Ground.
8	ST1	Drive Output 1 of the Transformer.
Exposed Pad	GND	Exposed Pad.

ELECTRICAL CHARACTERISTICS(V_{CC} = 2.5V to 5.5V, Full = -40°C to +125°C. Typical values are at V_{CC} = 5V and T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Supply Voltage Range	V _{CC}		Full	2.5		5.5	V
Supply Current ⁽¹⁾	I _{CC}	MODE = V _{CC} , R _S = 390kΩ	Full		0.7	1.7	mA
Disable Supply Current	I _{SD}	MODE = GND, R _S = 390kΩ	Full		20	40	μA
External Resistance	R _S		Full	5		390	kΩ
Driver Total Resistance ⁽²⁾	R _{OHL}	V _{CC} = 4.5V	Full		0.50	0.82	Ω
		V _{CC} = 3V	Full		0.58	0.95	
Under-Voltage Lockout Threshold	V _{UVLO}	V _{CC} Rising	Full	1.3	1.9	2.4	V
Under-Voltage Lockout Hysteresis	V _{UVLO_HST}		Full		160		mV
Logic-Low Level (MODE, CK_RS)	V _{IL}		Full			0.4	V
Logic-High Level (MODE, CK_RS)	V _{IH}		Full	1.7			V
Input Leakage Current (MODE)	I _{LK}		Full		0.01	1	μA
Internal Pull-Down Resistance on CK_RS	R _{S_INT}	MODE = GND	Full		160		kΩ
Thermal Shutdown Temperature	T _{SHDN}				155		°C
Thermal Shutdown Hysteresis	ΔT _{SHDN}				15		°C

TIMING CHARACTERISTICS(V_{CC} = 2.5V to 5.5V, Full = -40°C to +125°C. Typical values are at V_{CC} = 5V and T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Watchdog Timeout	t _{WDOG}	MODE = GND	Full	14		58	μs
CK_RS Input Frequency	f _{IN}	MODE = GND	Full	0.2		2	MHz
Switching Frequency	f _{SW}	MODE = V _{CC} , R _S = 5.1kΩ	+25°C	0.75	1	1.45	MHz
		MODE = V _{CC} , R _S = 390kΩ	+25°C	100	150	200	kHz
ST1 and ST2 Duty Cycle	Dtc	MODE = V _{CC}	+25°C		50		%
Crossover Dead Time	t _{DEAD}	R _L = 100Ω	+25°C		10		ns

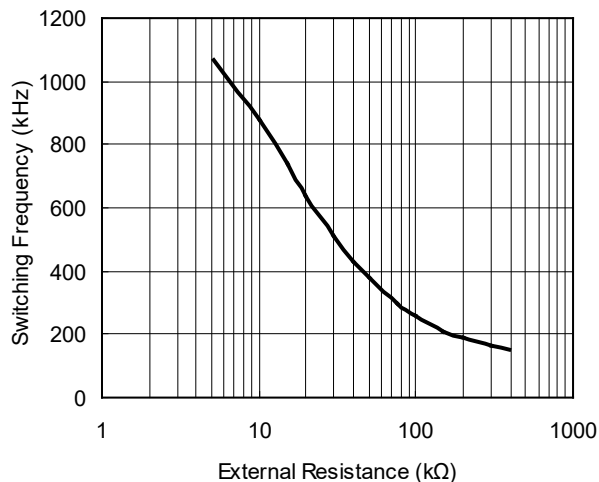
NOTES:

1. Test MIN & MAX limits when ST1, ST2 are not connected.
2. Total driver resistance consists of the high-side resistance (R_{OH}) and low-side resistance (R_{OL}). R_{OHL} = R_{OH} + R_{OL}.

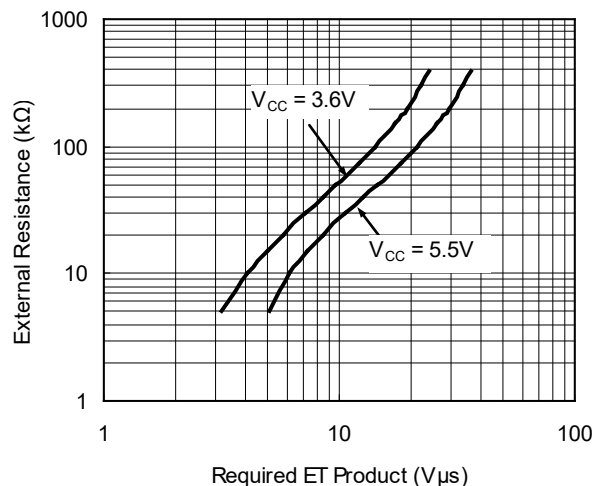
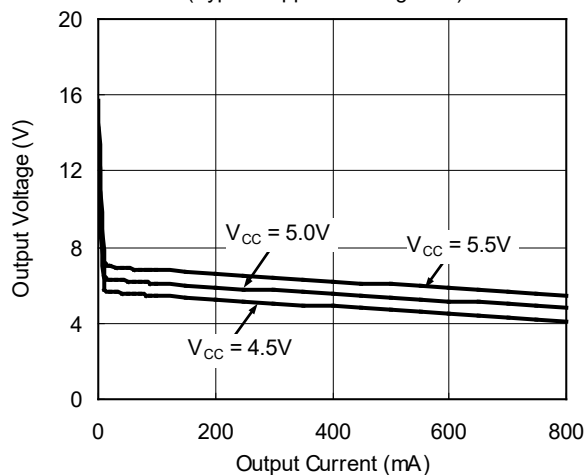
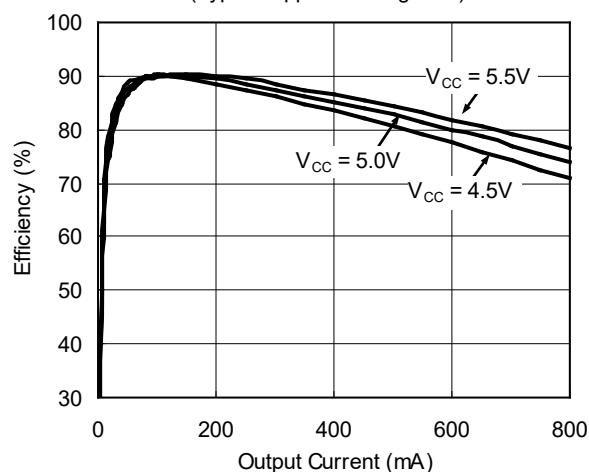
TYPICAL PERFORMANCE CHARACTERISTICS

 $V_{CC} = 5V$, $T_A = +25^\circ C$, unless otherwise noted.

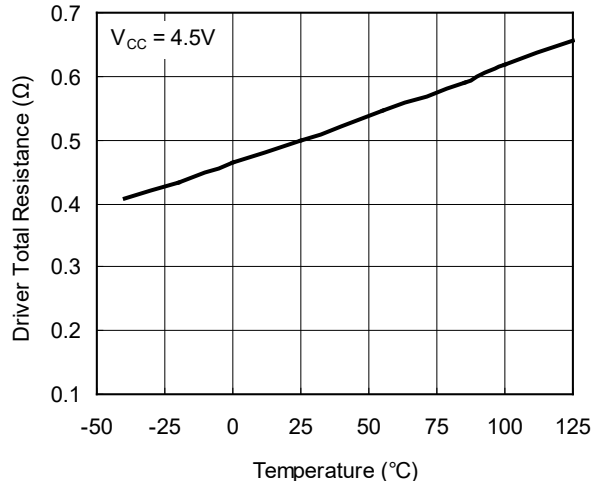
Switching Frequency vs. External Resistance



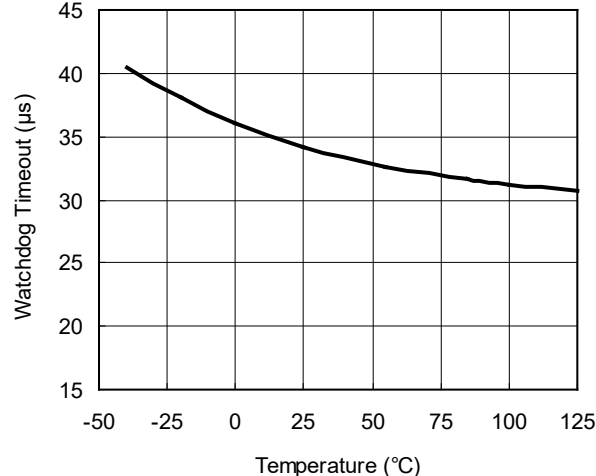
External Resistance vs. Required ET Product

Output Voltage vs. Output Current
(Typical Application Figure 8)Efficiency vs. Output Current
(Typical Application Figure 8)

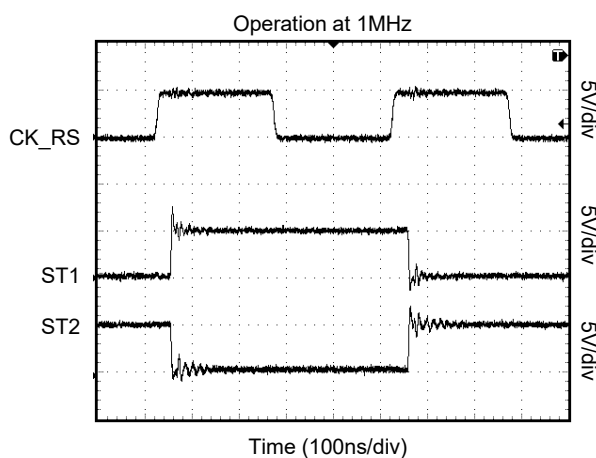
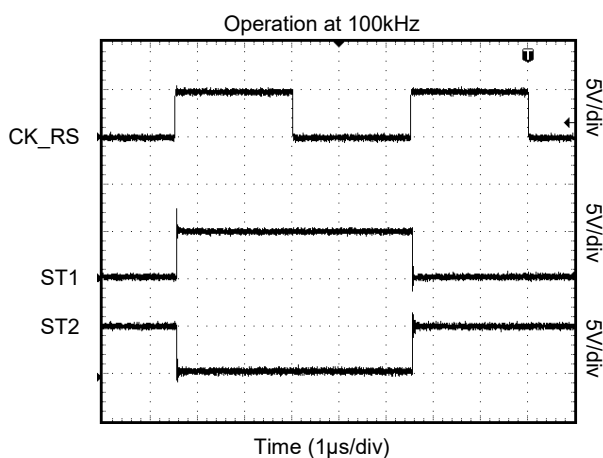
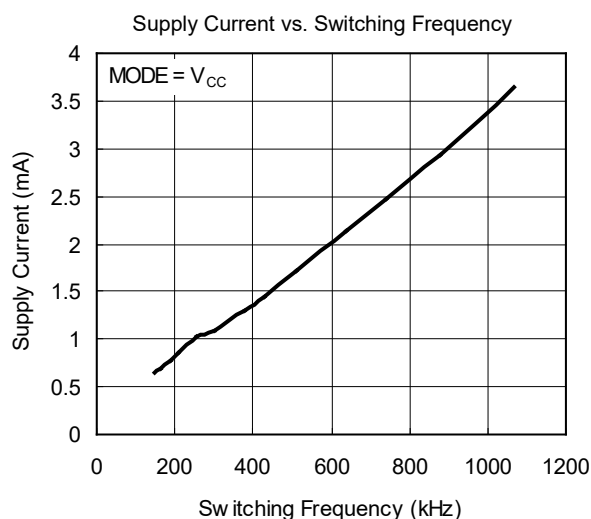
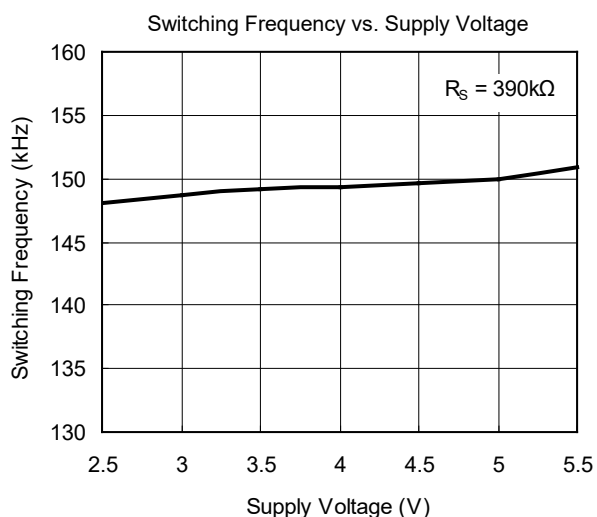
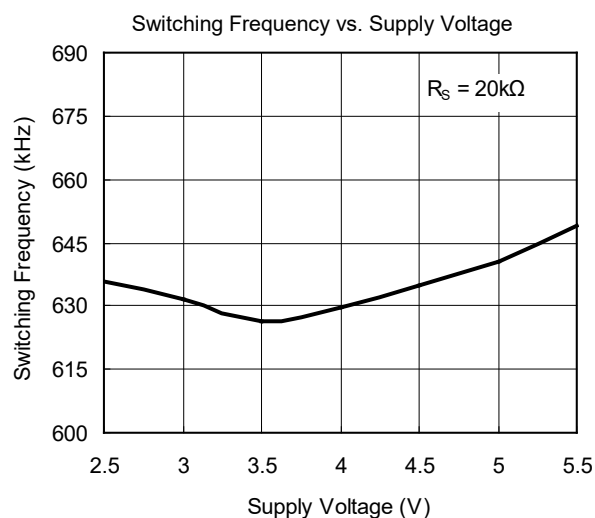
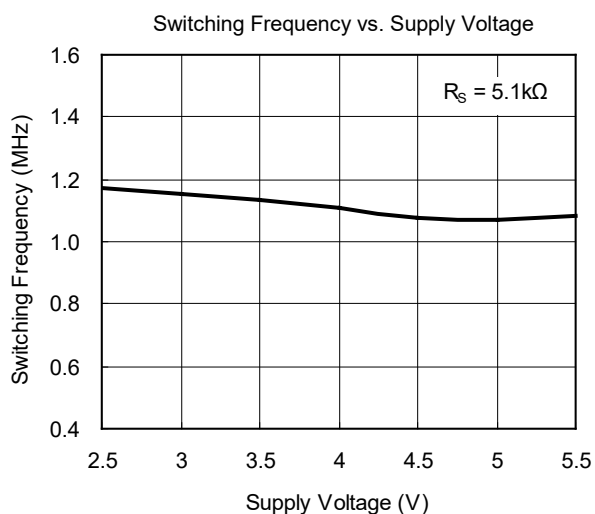
Driver Total Resistance vs. Temperature



Watchdog Timeout vs. Temperature



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

 $V_{CC} = 5V$, $T_A = +25^\circ C$, unless otherwise noted.

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

APRIL 2020 – REV.A.1 to REV.A.2

Updated Absolute Maximum Ratings section.....	2
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JUNE 2018 – REV.A to REV.A.1

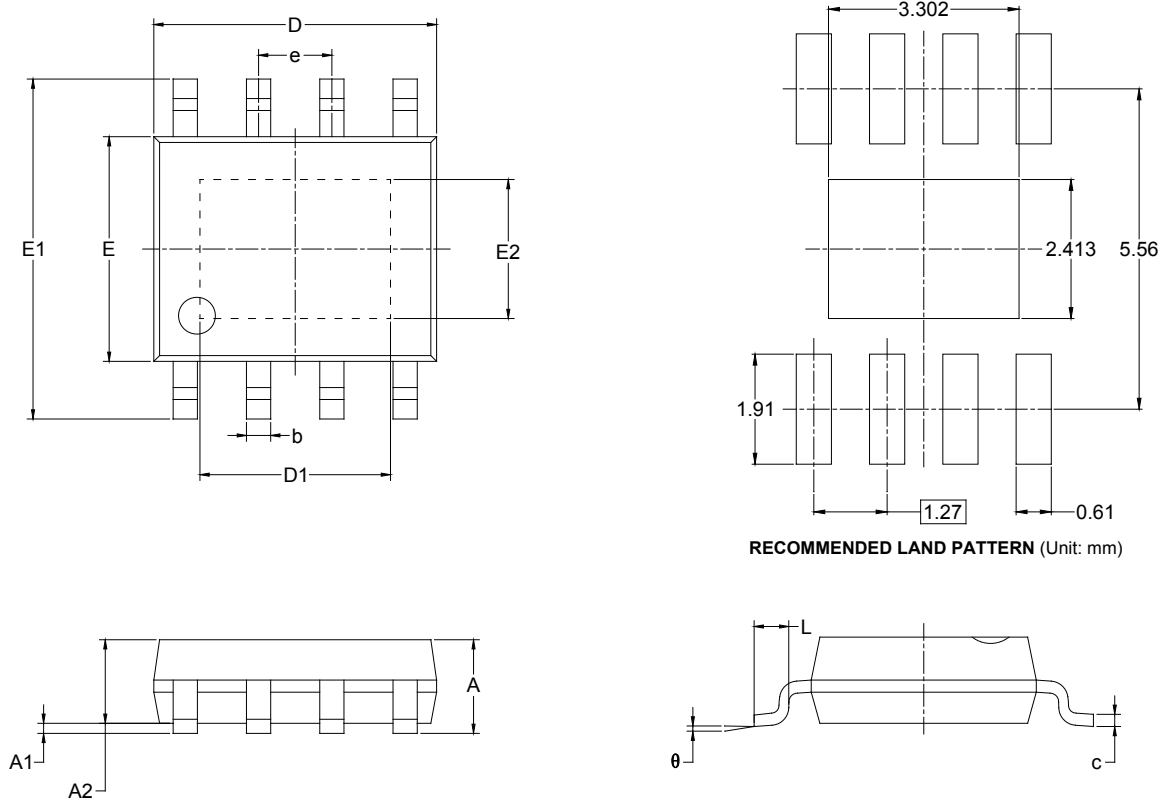
Added TDFN-2×3-8BL Package	All
Changed Electrical Characteristics/Timing Characteristics sections.....	4

Changes from Original (JANUARY 2016) to REV.A

Changed from product preview to production data.....	All
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PACKAGE OUTLINE DIMENSIONS

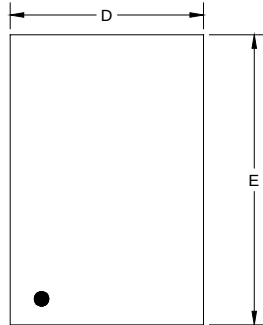
SOIC-8 (Exposed Pad)



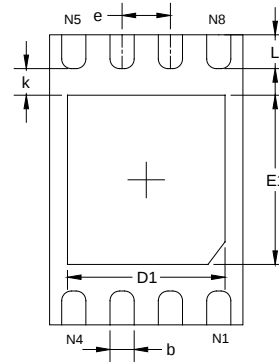
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.700		0.067
A1	0.000	0.150	0.000	0.006
A2	1.250	1.650	0.049	0.065
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.100	3.500	0.122	0.137
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.200	2.600	0.086	0.102
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

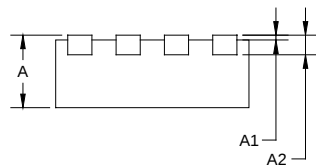
TDFN-2×3-8BL



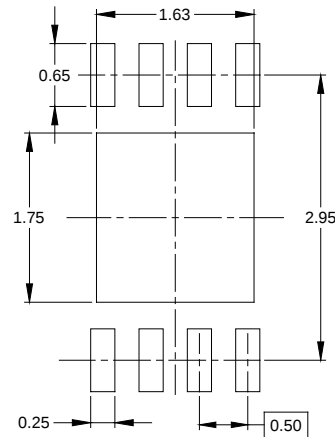
TOP VIEW



BOTTOM VIEW



SIDE VIEW



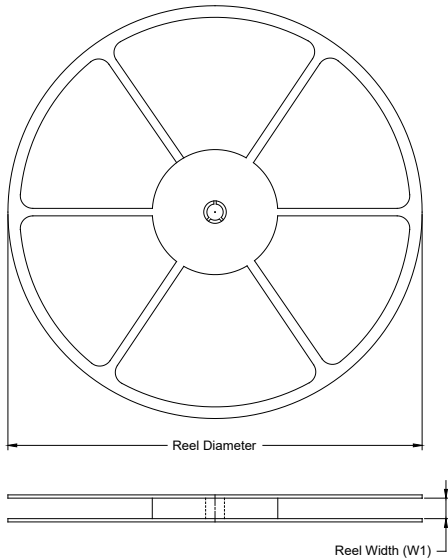
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.950	2.050	0.077	0.081
D1	1.530	1.730	0.060	0.068
E	2.950	3.050	0.116	0.120
E1	1.650	1.850	0.065	0.073
b	0.200	0.300	0.008	0.012
e	0.500 BSC		0.020 BSC	
k	0.250 REF		0.010 REF	
L	0.300	0.450	0.012	0.018

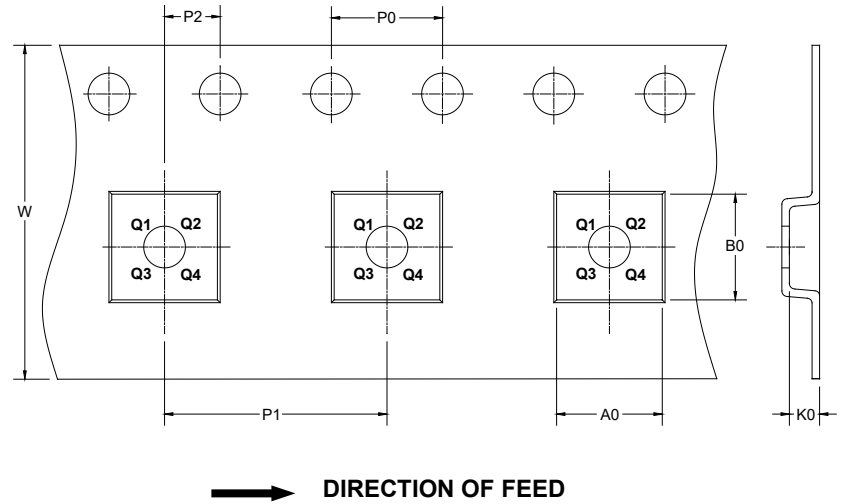
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOIC-8 (Exposed Pad)	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
TDFN-2×3-8BL	7"	9.5	2.30	3.30	1.10	4.0	4.0	2.0	8.0	Q2

DD0001

PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002