7.8 mΩ, 9 A Load Switch with Discharge and Reverse Current Blocking

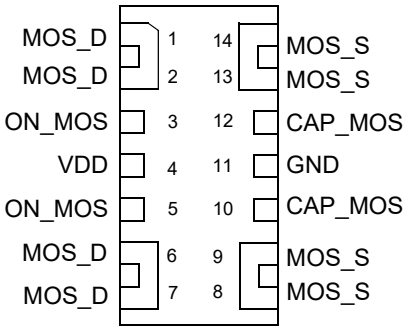
General Description

The SLG59M1600V is designed for load switching application. The part comes with one 9 A rated MOSFET switched on by an ON control pin. MOSFET turn on time is independently adjusted by an external capacitor.

Features

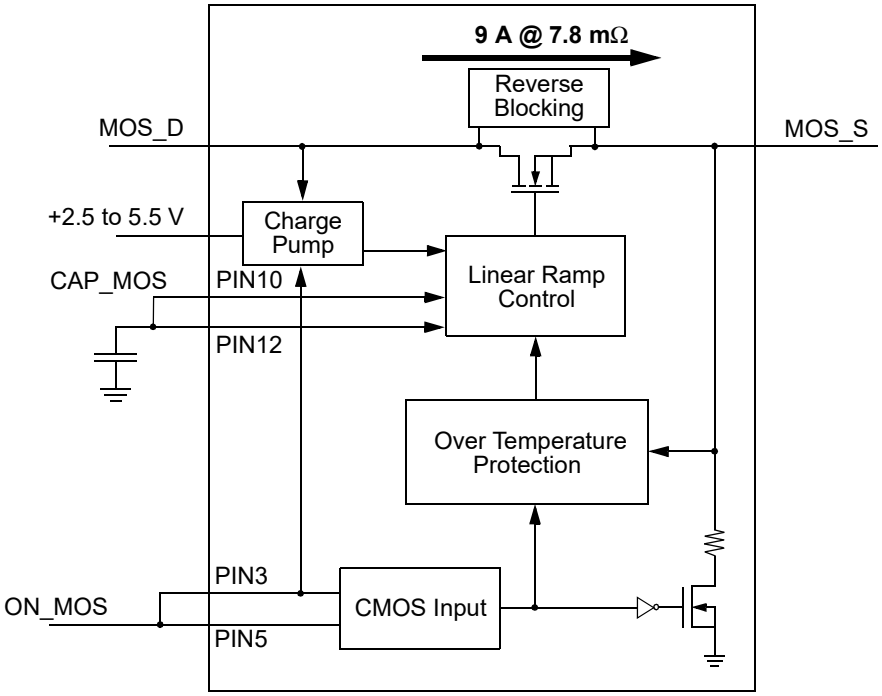
- One 9 A independent MOSFET with reverse current blocking
- Integrated VGS Charge Pump
- Internal discharge for gate and source
- Ramp Control
- Protected by thermal shutdown
- Pb-Free / RoHS Compliant
- Halogen-Free
- STDFN 14L, 1 x 3 x 0.55 mm

Pin Configuration



14-pin STDFN
(Top View)

Block Diagram



Pin Description

Pin #	Pin Name	Type	Pin Description
1	MOS_D	MOSFET	Drain of MOSFET
2	MOS_D	MOSFET	Drain of MOSFET
3	ON_MOS	Input	Turns on MOS (4 MΩ pull down resistor). Tied to Pin 5 on PCB.
4	VDD	VDD	+5VDD Power
5	ON_MOS	Input	Turns on MOS (4 MΩ pull down resistor). Tied to Pin 3 on PCB.
6	MOS_D	MOSFET	Drain of MOSFET
7	MOS_D	MOSFET	Drain of MOSFET
8	MOS_S	MOSFET	Source of MOSFET
9	MOS_S	MOSFET	Source of MOSFET
10	CAP_MOS	Input	Sets ramp and turn on time for MOSFET. Tied to Pin 12 on PCB.
11	GND	GND	Ground
12	CAP_MOS	Input	Sets ramp and turn on time for MOSFET. Tied to Pin 10 on PCB.
13	MOS_S	MOSFET	Source of MOSFET
14	MOS_S	MOSFET	Source of MOSFET

Ordering Information

Part Number	Type	Production Flow
SLG59M1600V	STDFN 14L	Industrial, -40 °C to 85 °C
SLG59M1600VTR	STDFN 14L (Tape and Reel)	Industrial, -40 °C to 85 °C

Absolute Maximum Ratings

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_D	Power Supply		--	--	6	V
T_S	Storage Temperature		-65	--	150	°C
ESD_{HBM}	ESD Protection	Human Body Model	2000	--	--	V
ESD_{CDM}	ESD Protection	Charged Device Model	1000	--	--	V
MSL	Moisture Sensitivity Level		1			
θ_{JA}	Package Thermal Resistance, Junction-to-Ambient	1mm x 3mm 14L STDFN; Determined using 1 in^2, 1.2 oz. copper pads under VIN and VOUT on FR4 pcb material	--	71	--	°C/W
W_{DIS}	Package Power Dissipation		--	--	1.2	W
IDS_{MAX}	Max Operating Current				9	A
MOSFET IDS_{PK}	Peak Current from Drain to Source	For no more than 10 continuous seconds out of every 100 seconds	--	--	12	A

Note: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Electrical Characteristics

T_A = -40 °C to 85 °C (unless otherwise stated)

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Power Supply Voltage		2.5	--	5.5	V
I_{DD}	Power Supply Current when OFF		--	0.1	1	µA
	Power Supply Current, ON_MOS_1 & ON_MOS_2 (Steady State)		--	40	70	µA
RDS_{ON}	ON Resistance	T_A 25°C MOSFET @100 mA	--	7.8	10.5	mΩ
		T_A 70°C MOSFET @100 mA	--	8.4	12.1	mΩ
		T_A 85°C MOSFET @100 mA	--	9.0	12.7	mΩ
MOSFET IDS	Current from Drain to Source for each MOSFET	Continuous	--	--	9	A
IDS_{LKG}	IDS Leakage (Reverse Blocking enabled)	V_S = 1.0 V to 5.0 V, V_{DD} = V_D = 0 V, ON_MOS = LOW, Full temp range	--	0.5	5.0	µA
V_D	Drain Voltage		0.85	5.0	V_{DD}	V
T_{ON_Delay}	ON pin Delay Time	50% ON to Ramp Begin, R_L = 20 Ω, no C_L	0	270	500	µs
T_{Total_ON}	Total Turn On Time	50% ON to 90% V_S	Configurable [1]			ms
		Example: CAP (Pin 10 & 12) share a single 4nF capacitor, V_{DD} = V_D = 5 V, Source_Cap = 10 µF, R_L = 20 Ω	--	1.1	--	ms
$T_{SLEWRATE}$	Slew Rate	10% V_S to 90% V_S	Configurable [1]			V/ms
		Example: CAP (Pin 10 & 12) share a single 4nF capacitor, V_{DD} = V_D = 5 V, Source_Cap = 10 µF, R_L = 20 Ω	--	6.0	--	V/ms
CAP_{SOURCE}	Source Cap	Source to GND	--	--	1000	µF
R_{DIS}	Discharge Resistance		50	113	150	Ω
ON_V_{IH}	High Input Voltage on ON pin		0.85	--	V_{DD}	V
ON_V_{IL}	Low Input Voltage on ON pin		-0.3	0	0.3	V
$THERM_{ON}$	Thermal shutoff turn-on temperature		--	125	--	°C
$THERM_{OFF}$	Thermal shutoff turn-off temperature		--	100	--	°C

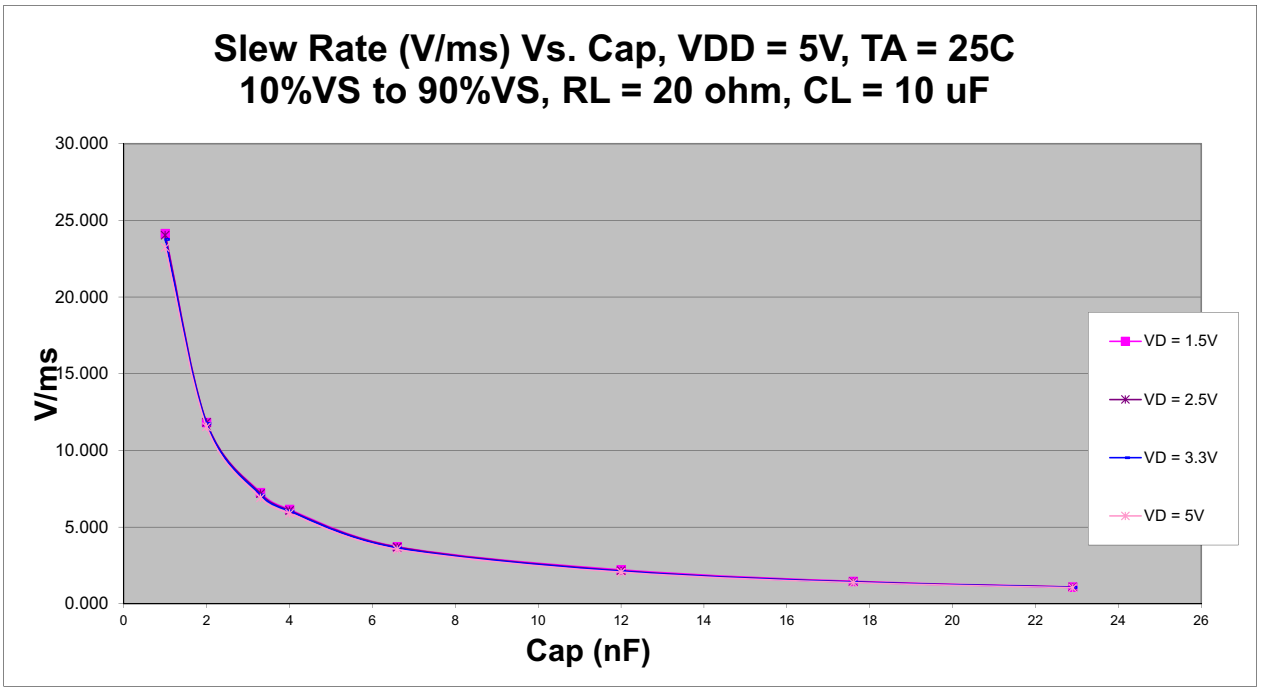
Electrical Characteristics (continued)

T_A = -40 °C to 85 °C (unless otherwise stated)

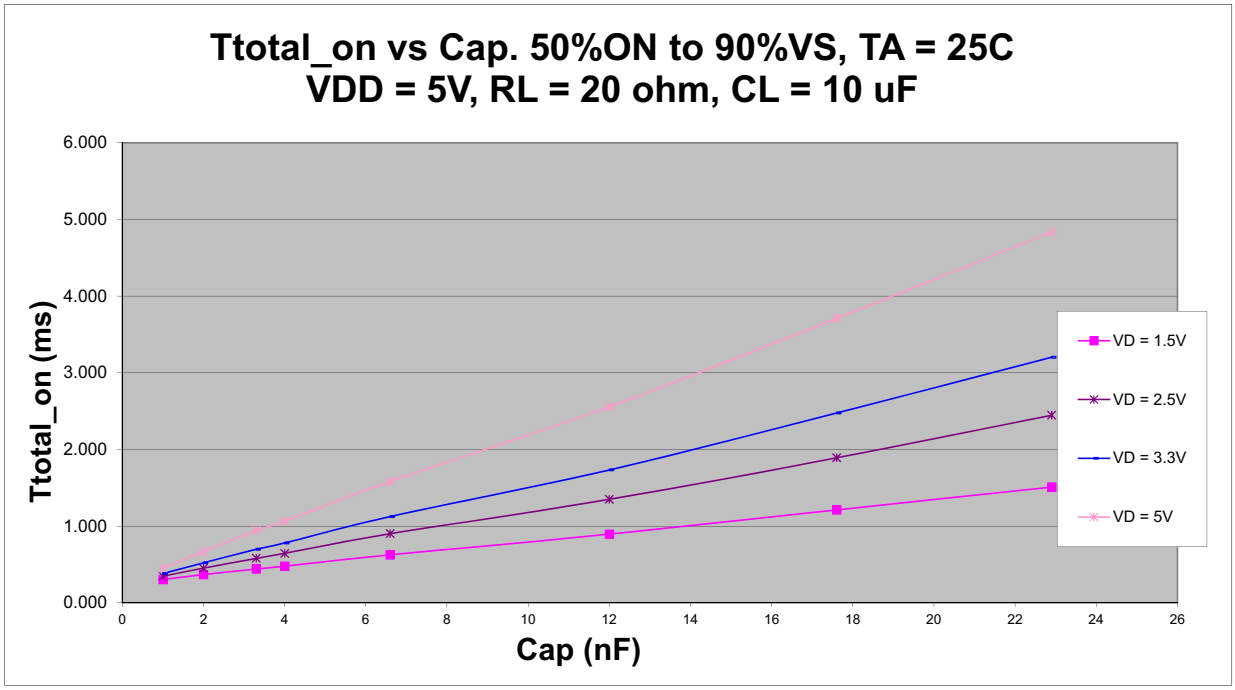
Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
$THERM_{TIME}$	Thermal shutoff time		--	--	1	ms
T_{OFF_Delay}	OFF Delay Time	50% ON to V_S Fall, V_{DD} = V_D = 5 V, R_L = 20 Ω, no C_L	--	1.7	3	µs

Notes:
1. Refer to table for configuration details.

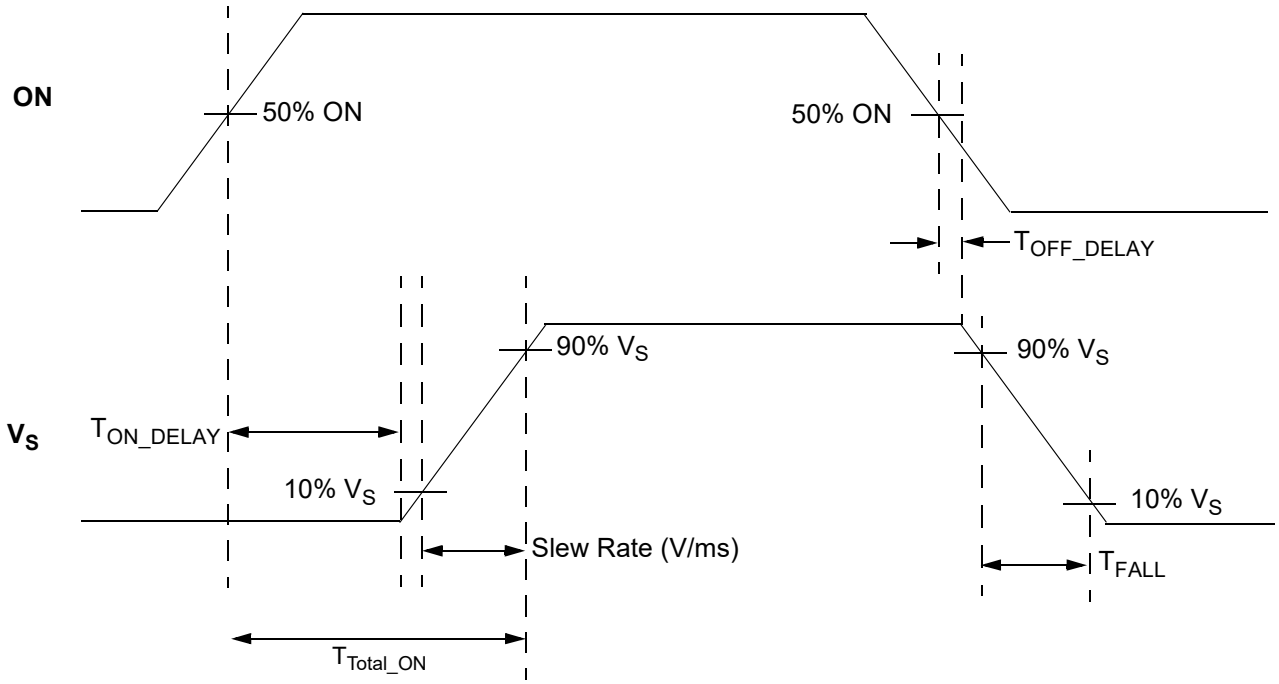
T_{SLEW} vs. CAP



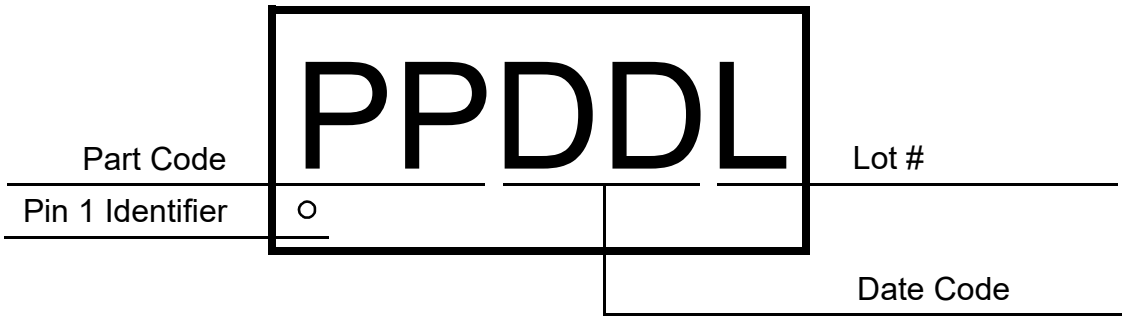
T_{TOTAL_ON} vs. CAP



T_{Total_ON}, T_{ON_Delay} and Slew Rate Measurement

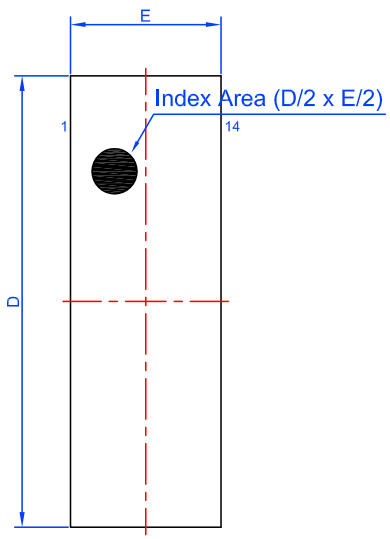


Package Top Marking System Definition

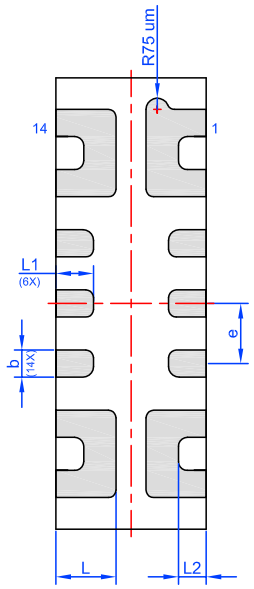


Package Drawing and Dimensions

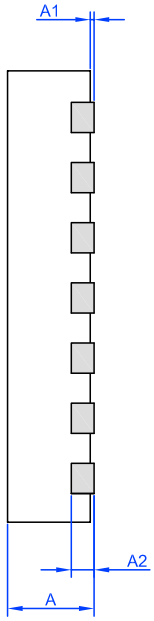
14 Lead STDFN Package 1 mm x 3 mm (Fused Lead)



Top View



BTM View



SIDE View

Unit: mm

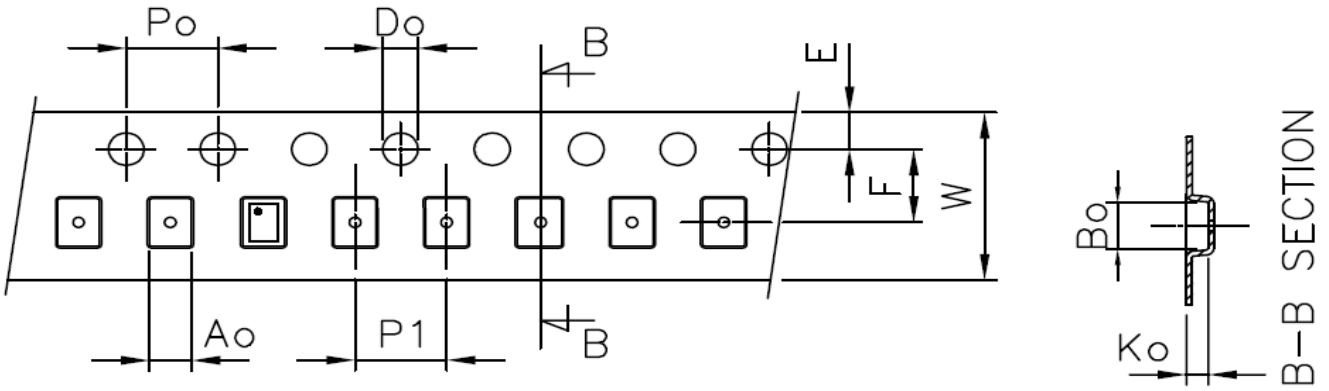
Symbol	Min	Nom.	Max	Symbol	Min	Nom.	Max
A	0.50	0.55	0.60	D	2.95	3.00	3.05
A1	0.005	-	0.050	E	0.95	1.00	1.05
A2	0.10	0.15	0.20	L	0.35	0.40	0.45
b	0.13	0.18	0.23	L1	0.20	0.25	0.30
e	0.40 BSC			L2	0.06	0.11	0.16

Tape and Reel Specifications

Package Type	# of Pins	Nominal Package Size	Units per Reel	Max Units per Box	Reel & Hub Size (mm)	Trailer A		Leader B		Pocket Tape (mm)	
						Pockets	Length (mm)	Pockets	Length (mm)	Width	Pitch
STDFN 14L 1x3mm 0.4P FC	14	1x3x0.55mm	3000	3000	178/60	100	400	100	400	8	4

Carrier Tape Drawing and Dimensions

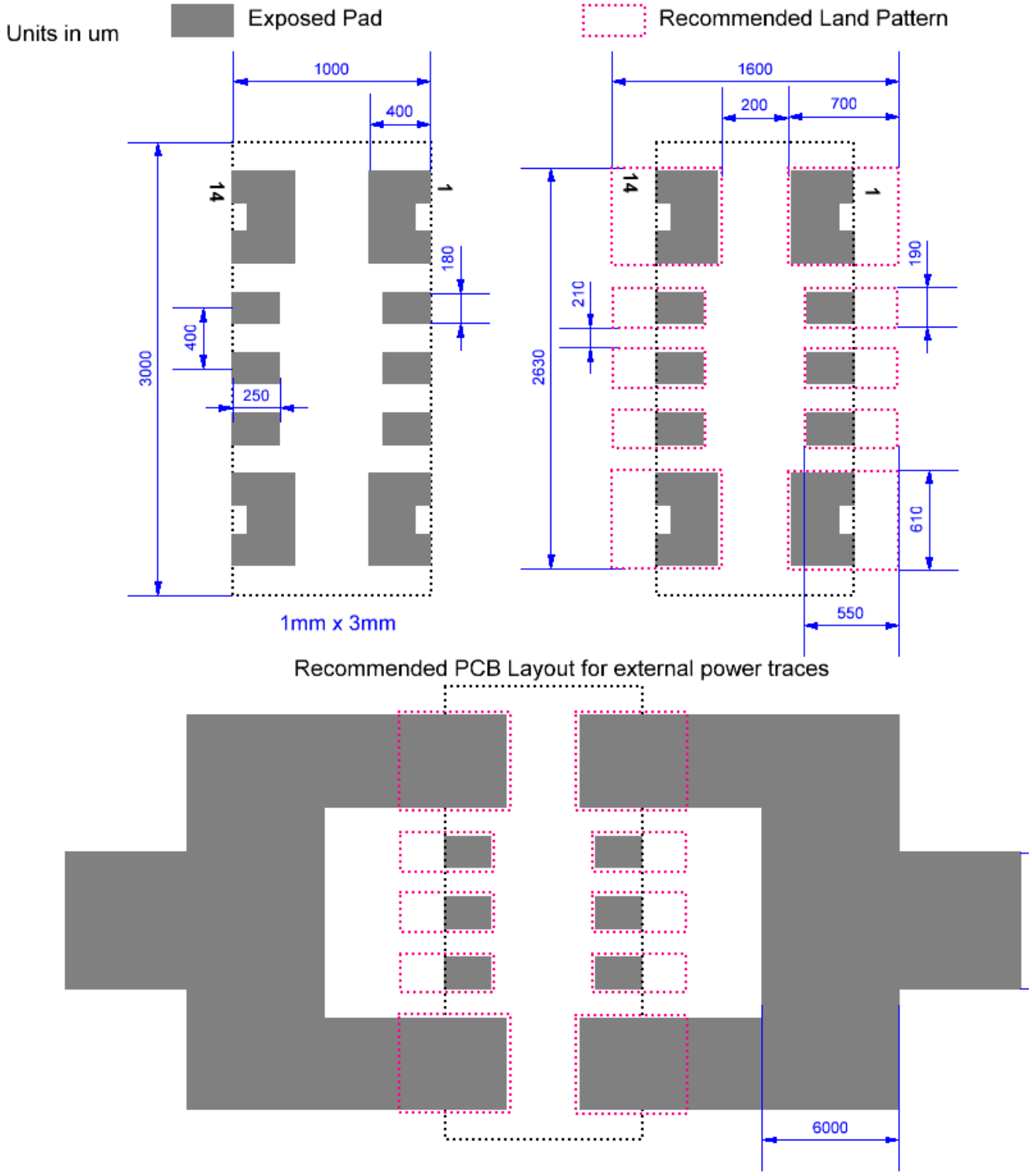
Package Type	Pocket BTM Length [mm]	Pocket BTM Width [mm]	Pocket Depth [mm]	Index Hole Pitch [mm]	Pocket Pitch [mm]	Index Hole Diameter [mm]	Index Hole to Tape Edge [mm]	Index Hole to Pocket Center [mm]	Tape Width [mm]
	A0	B0	K0	P0	P1	D0	E	F	W
STDFN 14L 1x3mm 0.4P FC	1.15	3.15	0.7	4	4	1.5	1.75	3.5	8



Recommended Reflow Soldering Profile

Please see IPC/JEDEC J-STD-020: latest revision for reflow profile based on package volume of 1.65 mm^3 (nominal). More information can be found at www.jedec.org.

Recommended Land Pattern and PCB Layout



Revision History

Date	Version	Change
2/10/2022	1.04	Renesas rebranding Fixed typos
3/15/2016	1.03	Fixed RDSon values
11/30/2015	1.02	Updated Abs. Max and Electrical Characteristics Tables
9/29/2015	1.01	Updated Block Diagram

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