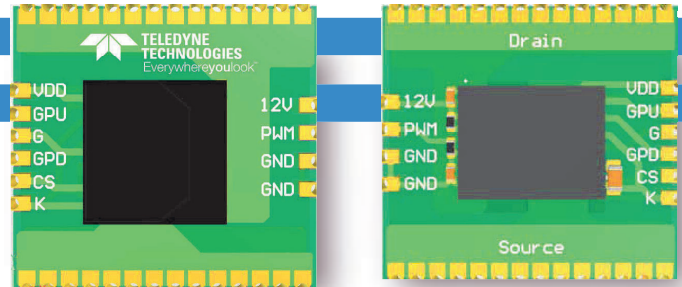


# TDGM650LS60

## Load Switch: Isolated Driver with 650V 60A Integrated GaN Transistor



### Functional Description

The TDGM650LS60 is a load switch, enabling or disabling the power flow to the load. This is controlled by an external enable signal or the PWM input by a microcontroller or by control logic. The module is designed for applications with high voltage and high current demand. Using advanced GaN technology, the module achieves stable 25 mΩ  $R_{DSon}$  and can withstand a  $V_{ds}$  voltage to 650 V.

The TDGM650LS60 can be switched on and off either with the PWM input or the enable pin set to “high”.

The maximum current of 60 A and the fast response time makes the device ideal for applications like load switches, security relays, half-bridge switches, and full-bridge switches.

### Features

- 650 V – 60A e-mode GaN power switch
- Switch Resistance – (full on) 25 mΩ
- Solder-down Castellations for SMD style mount
- PWM input for Inrush current limit – Soft Start Capable
- Continuous ON capability once started
- Self-powered Intermediate Driver Stage
- UVLO of 10 V or 7 V on Primary and Secondary drive side

- 50 ns Propagation Delay
- Current Sense Function (non-resistive source path)
- High Reliability (-55 °C to 125 °C)
- Radiation Tolerant TID – 100 krad and SEE LET > 46 MeV
- 21.5 mm x 21.5 mm footprint
- 5 kV Isolation

### Target Applications

- High Power Load Switch
- Solid State Relay
- High- or Low-side High Current Driver
- Parallel Capable for higher currents
- Series Capable for higher voltages
- Half Bridge Applications
- Motor Drivers
- SMPS



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## Functional Block Diagram

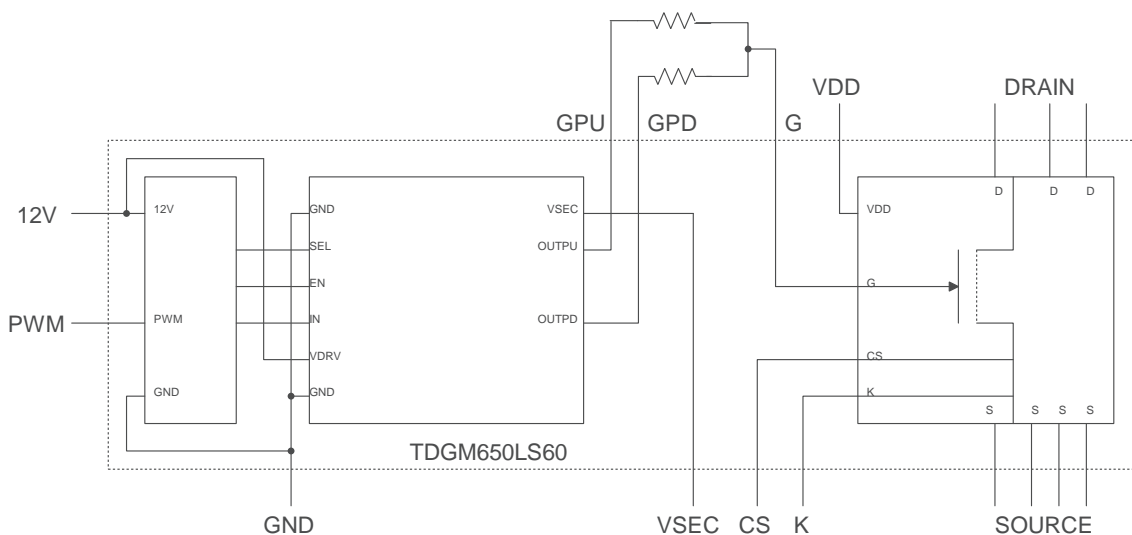


FIGURE 1. TDGM650LS60 Block Diagram

## Part Number Key

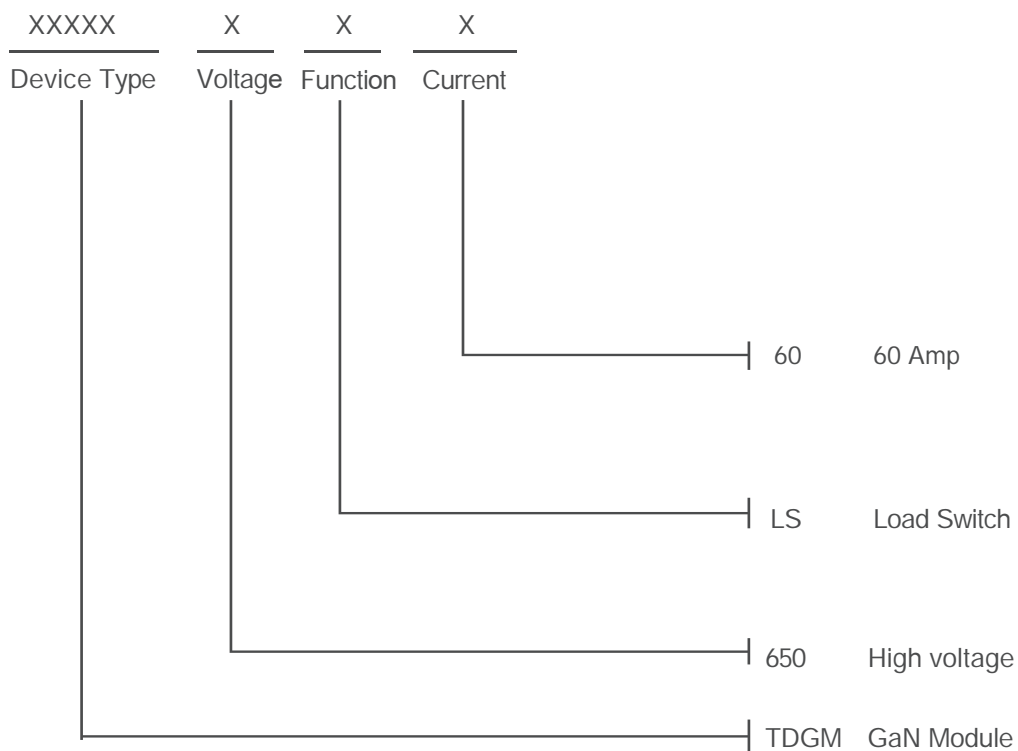
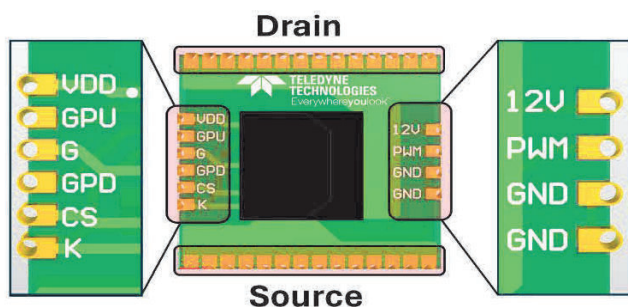


FIGURE 2. Part Number Key

## Pin Configuration



Pin Name	Description
VDD	Power supply for ISO driver and GaN IC. This pin should be connected to an external 12V isolated power supply.
GPU	Gate drive pull-up. Connect an external resistor between GPU and G to set the turn-on gate current and speed.
G	Gate of GaN IC.
GPD	Gate drive pull-down. Connect an external resistor between GPD and G to set the turn-off gate current and delay.
CS	Current sense output. Connect an external resistor between CS and K to set the current sense sensitivity. (Note: CS pin will not exist on this product any longer.)
K	Kelvin source of GaN IC.
12V	12V power supply with reference to the logic signal ground.
PWM	Logic input to the gate driver.
GND	Reference ground for the logic input.
Source	Source of GaN IC
Drain	Drain of GaN IC

FIGURE 3. Connection Diagram and Pin Descriptions

## Absolute Maximum Operating Conditions

Parameter	Conditions	Min	Typ	Max	Unit
VDD		-0.5		15	V
GPU		-0.5		14	V
G		-0.5		14	V
GPD		-0.5		14	V
CS		-0.5		0.3	
K		-0.5		0.3	
12V		-0.5		14	
PWM	PWM Input DC to 1MHz	-0.5		15	V
GND		-0.5		+0.5	V
Source	$V_{GS}=0V$	-0.5		0	V
Drain	$V_{GS}=0V$	-0.5		650	V
Operating Temperature	$T_{CASE}$	-55		125	°C
Storage Temperature		-55		175	°C
Maximum Junction Temperature				150	°C

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## Recommended Operating Conditions

Parameter	Conditions	Min	Typ	Max	Unit
VDD		10.5	12	13	V
GPU		0	12	13.2	V
G		0	12	13.2	V
GPD		0	12	13.2	V
CS		-0.3	12	0.3	
K		-0.3		0.3	
12V		0		13.2	
PWM	PWM Input DC to 1MHz	0		$V_{12VP}$	V
GND		-0.3		+0.3	V
Source	$V_{GS}=0V$	-0.3		0	V
Drain	$V_{GS}=0V$	-0.3		650	V
Operating Temperature	$T_{CASE}$	-55		125	°C
Storage Temperature		-55		175	°C
Maximum Junction Temperature				150	°C

## Electrical Performance

Electrical performance characteristics:  $T_{CASE} = -55\text{ }^{\circ}\text{C}$  to  $125\text{ }^{\circ}\text{C}$

Parameter	Conditions	Min	Typ	Max	Unit
VDD Disable current	$V_{IN}=0, V_{EN}=0$		0.45	0.75	mA
VDD Quiescent Current	$V_{IN}=0, V_{EN}=HIGH$		2	3.4	mA
VDD Switching Current	$F_S=100kHz, V_{DD}=12V, V_{EN}=HIGH$		7.5	11	mA
PWM input voltage, low				0.8	V
PWM input voltage, high		2.0			V
PWM input voltage hysteresis			400		mV
Propagation delay, PWM to GPU, GPD, high to low			50	100	nsec
Propagation delay, PWM to GPU, GPD, low to high			50	100	nsec
Rise Time			9	15	nsec
Fall Time			7	15	nsec
Wait Time Before First PWM Edge is Delivered After 12V is Within Specification				250	$\mu\text{sec}$
Drain-to-Source Blocking Voltage	$V_{GS}=0V, I_{DSS}\leq 120\mu A$	650			V
Drain current		60			A
Operating frequency			100		kHz
Output Capacitance	$V_{DS}=400V, V_{GS}=0V, f=100kHz$		127		pF

## Switching Waveforms

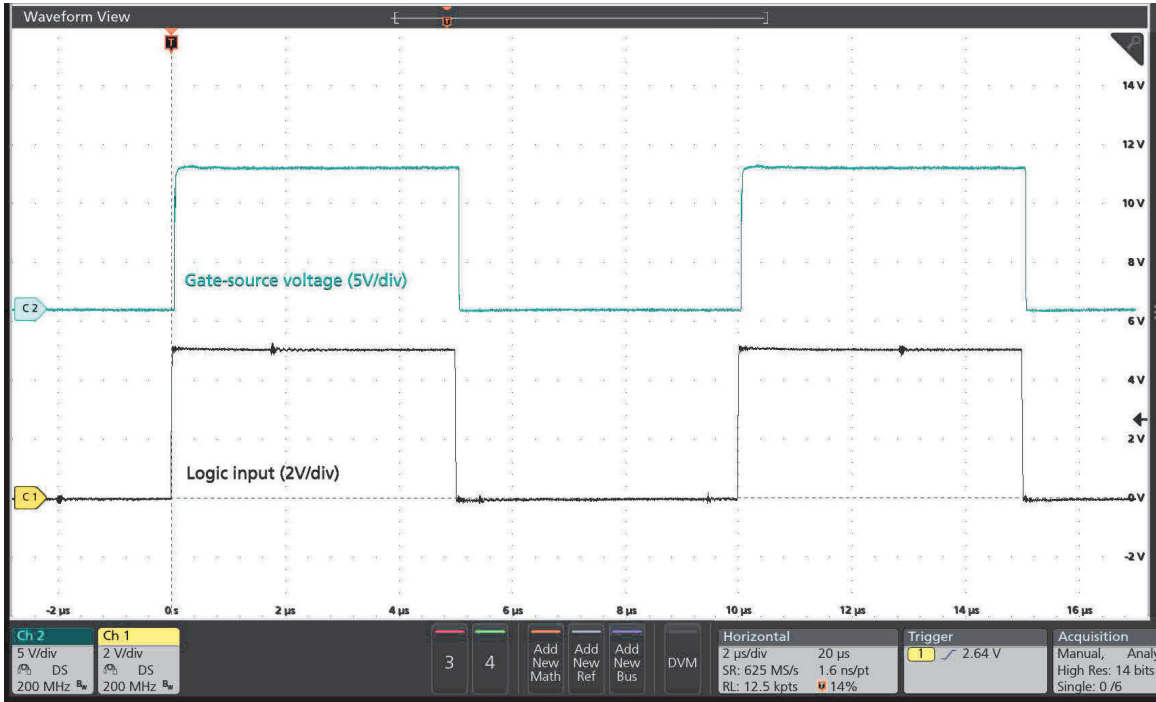


FIGURE 4. Input Switching Waveforms

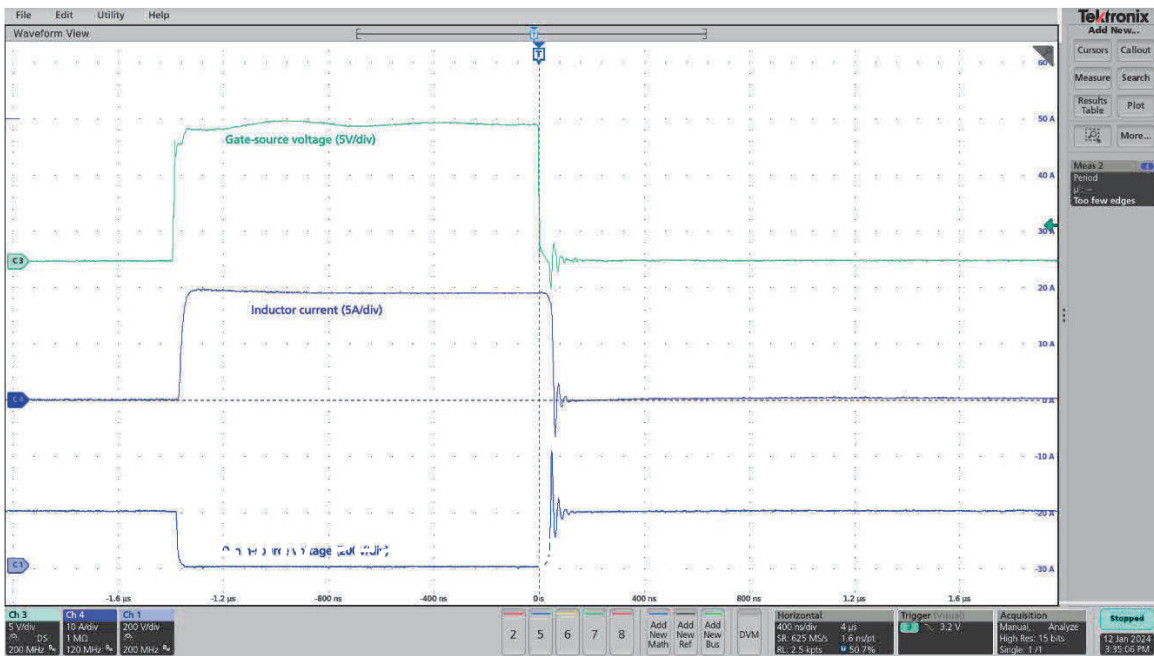


FIGURE 5. Output Switching Waveforms

Top trace: Clean gate-source signal  
 Middle trace: 20 A load current  
 Bottom trace: 400 V peak voltage. Spike due to parasitic inductance of wire.

## Ordering Information

Order Code	Description	Package	Shipping Method
TDGM650LS60	GaN Isolated Power Load Switch	TBD	TBD

## Document Revision History

Document	Description / Date	Change / Revision Details
TDGM650LS60	TDGM650LS60 Preliminary Data Sheet	03_2024 Rev- / Initial Release

## Document Categories/Definitions:

### Advance Information

The product is in a formative or design stage. The data sheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

### Preliminary Specification

The data sheet contains preliminary data. Additional data may be added at a later date. Teledyne e2v HiRel Electronics reserves the right to change specifications at any time without notice in order to supply the best possible product.

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