

DESCRIPTION

The GLF74520 and GLF74521 are integrated power multiplexer switch with dual independent power switches connected to a single output pin to enable seamless transition between two input sources.

The GLF74520 and GLF74521 provide an automatic selection mode as well as a manual selection mode by the combination of the logic input pins of EN and SEL. The EN input pin is used along with the select (SEL) input pin to select the automatic switching function, select VIN1 only, select VIN2 only, or turn both switches off. In the automatic selection mode, the GLF74520 and GLF74521 automatically select the higher input voltage source out of two input DC power supplies.

The GLF74520 and GLF74521 feature an ultra-efficient I_{QSmart}^{TM} technology that supports the lowest R_{ON} , quiescent current (I_Q) and shutdown current (I_{SD}) in the industry. Low R_{ON} reduces conduction losses, while low I_Q and I_{SD} solutions help designers to reduce parasitic leakage current, improve system efficiency, and increase battery lifetime.

The GLF74520 and GLF74521 block any cross-conduction current between two input sources. When the switch is disabled, the GLF74520 and GLF74521 prevent the reverse current to the input source from the output at any higher V_{out} than V_{in} condition.

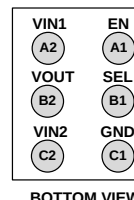
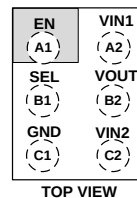
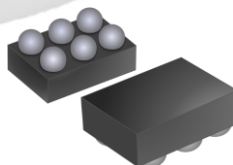
APPLICATIONS

- Wearables / Hearables
- Smart IoT Devices
- Portable Devices
- Backup Power System

FEATURES

- Two-Input and Single-Output Power Multiplexer
- Automatic and Manual Input Selection Mode
- Supply Voltage Range: 1.5 V to 5.5 V
6 V_{ABS} Max
- R_{ON} : 35 $m\Omega$ Typ. at 5.5 V_{IN1} or V_{IN2}
43 $m\Omega$ Typ. at 3.3 V_{IN1} or V_{IN2}
- 2.5 A Continuous Output Current Capability Per Channel
- Ultra-Low Supply Current at Operation
 I_Q : 4 μA Typ at 5.5 V_{IN}
- Ultra-Low Stand-by Current
 I_{SD} : 20 nA Typ at 5.5 V_{IN}
- Smart Control Pins
 I_{EN} and I_{SEL} : 3 nA Typ at V_{EN} or $V_{SEL} > V_{IH}$
 R_{EN} and R_{SEL} : 500 $k\Omega$ Typ
- Integrated Output Discharge Switch: GLF74521
- No Cross Conduction Between Two Inputs
- Reverse Current Blocking when Disabled
- Operating Temperature Range: -40 °C to 85 °C
- HBM: ± 6 kV, CDM: ± 2 kV

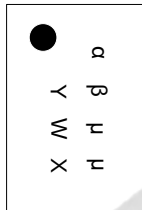
PACKAGE



0.97 mm x 1.47 mm x 0.55 mm, 0.5 mm pitch

DEVICE ORDERING AND MARKING INFORMATION

Part Number	Top Mark	R _{ON} at 5.5 V _{IN}	Output Discharge	Output Current, I _{OUT}	Ultra-low I _Q at 5.5 V _{IN}
GLF74520	AR	35 mΩ	NA	2.5 A	4 μA
GLF74521	SV		70 Ω		



αβ: 2 Alphanumeric characters device mark

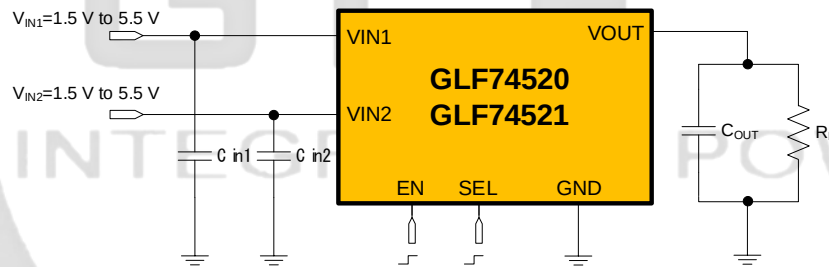
μμ: 2 Alphanumeric characters Lot run code mark

Y: Year Code

W: Week Code

X: Assembly plant code

APPLICATION DIAGRAM



FUNCTIONAL BLOCK DIAGRAM

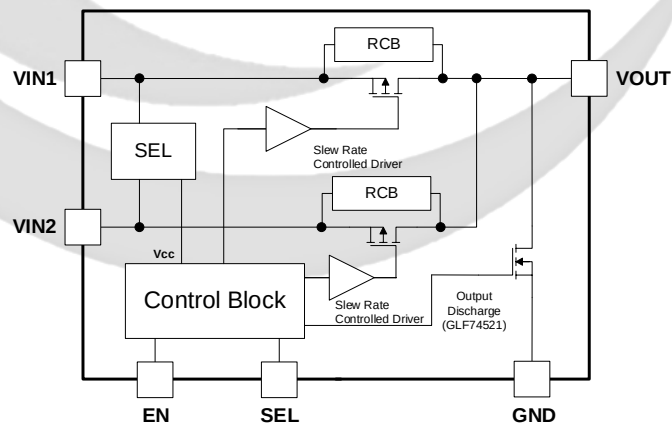


Figure 1. Functional Block Diagram

PIN CONFIGURATION

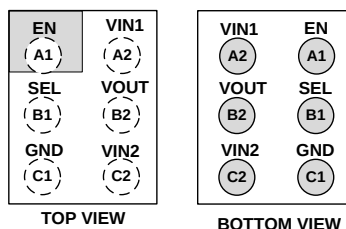


Figure 2. 0.97 mm x 1.47 mm x 0.55 mm WLCSP

PIN DEFINITION

Pin #	Name	Description
A1	EN	Enable to control the switch. Do not leave the EN pin floating.
A2	VIN1	Switch Input 1
B1	SEL	Input Source Selection. Do not leave the SEL pin floating.
B2	VOUT	Switch Output
C1	GND	Ground
C2	VIN2	Switch Input 2

ABSOLUTE MAXIMUM RATINGS

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions; extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V _{IN1} , V _{IN2} V _{OUT} , V _{EN}	Each Pin Voltage Range to GND	-0.3	6	V
I _{OUT}	Maximum Continuous Switch Current		2.5	A
P _D	Power Dissipation at T _A = 25°C		1.0	W
T _{STG}	Storage Junction Temperature	-65	150	°C
θ _{JC}	Thermal Resistance, Junction to Case ⁽¹⁾		90	°C/W
θ _{JA}	Thermal Resistance, Junction to Ambient ⁽¹⁾		180	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	± 6	kV
		Charged Device Model, JESD22-C101	± 2	

Note: 1. The thermal resistance depends on the PCB layout and heat dissipation.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Max.	Unit
V _{IN1} , V _{IN2}	Supply Voltage	1.5	5.5	V
T _A	Ambient Operating Temperature	-40	+85	°C

ELECTRICAL CHARACTERISTICS

 $V_{IN1} = V_{IN2} = 1.5\text{ V to }5.5\text{ V}$ and $T_A = 25\text{ }^{\circ}\text{C}$. Unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Basic Operation						
I_{Q1}, I_{Q2}	Quiescent Current	$V_{IN1} = 5.5\text{ V}, V_{IN2} < V_{IN1}, I_{OUT} = 0\text{ mA},$ $EN = 0\text{ V}, SEL = V_{IN1}, V_{OUT} = V_{IN1}$ or $V_{IN2} = 5.5\text{ V}, V_{IN1} < V_{IN2}, I_{OUT} = 0\text{ mA},$ $EN = SEL = V_{IN2}, V_{OUT} = V_{IN2}$		4	5.0	μA
		As above, $T_A = 85\text{ }^{\circ}\text{C}$ ⁽¹⁾		4.7		
I_{SD1}, I_{SD2}	Shutdown Current	$V_{IN1,2} = 5.5\text{ V}, V_{OUT} = \text{GND}, V_{EN} = V_{SEL} = 0\text{ V}$		20	50	nA
		$V_{IN1,2} = 5.5\text{ V}, V_{OUT} = \text{GND}, V_{EN} = V_{SEL} = 0\text{ V},$ $T_A = 85\text{ }^{\circ}\text{C}$ ⁽¹⁾		500		
R_{ON}	On-Resistance	V_{IN1} or $V_{IN2} = 5.5\text{ V}, I_{OUT} = 500\text{ mA}$	$T_A = 25\text{ }^{\circ}\text{C}$	35	40	m Ω
			$T_A = 85\text{ }^{\circ}\text{C}$ ⁽¹⁾	40		
		V_{IN1} or $V_{IN2} = 4.5\text{ V}, I_{OUT} = 500\text{ mA}$	$T_A = 25\text{ }^{\circ}\text{C}$	37	42	
			$T_A = 85\text{ }^{\circ}\text{C}$ ⁽¹⁾	42		
		V_{IN1} or $V_{IN2} = 3.3\text{ V}, I_{OUT} = 500\text{ mA}$	$T_A = 25\text{ }^{\circ}\text{C}$	43	49	
			$T_A = 85\text{ }^{\circ}\text{C}$ ⁽¹⁾	50		
		V_{IN1} or $V_{IN2} = 2.5\text{ V}, I_{OUT} = 300\text{ mA}$	$T_A = 25\text{ }^{\circ}\text{C}$	51	57	
			$T_A = 85\text{ }^{\circ}\text{C}$ ⁽¹⁾	57		
V_{IH}	EN, SEL Input Logic High Voltage		1.3			V
V_{IL}	EN, SEL Input Logic Low Voltage				0.4	V
I_{EN}, I_{SEL}	EN, SEL Current	V_{EN} or $V_{SEL} > V_{IH}$, Enabled		3	20	nA
R_{EN}, R_{SEL}	EN, SEL Pulldown Resistance	V_{EN} or $V_{SEL} < V_{IL}$, Disabled		500		k Ω
I_{RVS}	Reverse Current ⁽¹⁾	$V_{IN1} = V_{IN2} = 0\text{ V}, V_{OUT} = 5.5\text{ V}, V_{EN} = V_{SEL} = 0\text{ V}$		2.6		μA
R_{DSC}	Output Discharge Resistance:	$V_{EN} = V_{SEL} = \text{Low}, I_{FORCE} = 10\text{ mA}, \text{GLF74521 Only}$		70		Ω
Switching Characteristics ⁽²⁾						
t_{dON}	Turn-On Delay	$V_{IN1} = 5.0\text{ V}, V_{IN2} = 3.3\text{ V}$ $R_L = 150\text{ }\Omega, C_{OUT} = 1.0\text{ }\mu\text{F}$		210		μs
t_R	V_{OUT} Rise Time			350		
T_{dHL}	High-low Delay ⁽¹⁾			3		
T_{fHL}	High-low Fall Time ⁽¹⁾			6		
V_{droop}	Voltage Droop ⁽¹⁾			160		mV
T_{dLH}	Low-high Delay ⁽¹⁾			7		μs
T_{rLH}	Low-high Rise Time ⁽¹⁾			4		
t_{dOFF}	Turn-Off Delay ⁽¹⁾ , GLF74520			18		
	Turn-Off Delay ⁽¹⁾ , GLF74521			5		
t_F	V_{OUT} Fall Time ⁽¹⁾ , GLF74520			350		
t_F	V_{OUT} Fall Time ⁽¹⁾ , GLF74521			110		

- Notes:**
- By design; characterized, not production tested.
 - $t_{ON} = t_{dON} + t_R, t_{OFF} = t_{dOFF} + t_F$

TIMING DIAGRAM and TRUTH TABLE

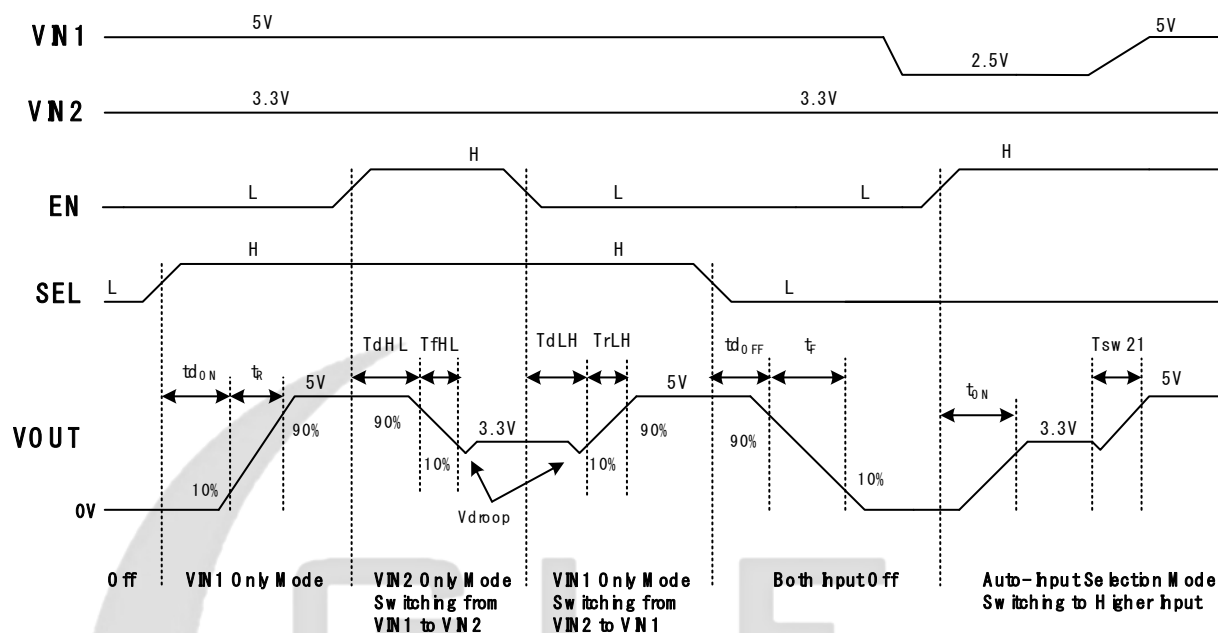


Figure 3. Timing Diagram

SEL	EN	Function	V _{OUT}
0	0	Both switches are off	GLF74520: High-Z GLF74521: GND
0	1	Auto-Input selection. V _{OUT} is connected to a higher input source automatically	Higher Input between V _{IN1} and V _{IN2}
1	0	Only V _{IN1} is selected	V _{IN1}
1	1	Only V _{IN2} is selected	V _{IN2}

Table 1. Truth Table of Input Source Selection

TYPICAL PERFORMANCE CHARACTERISTICS

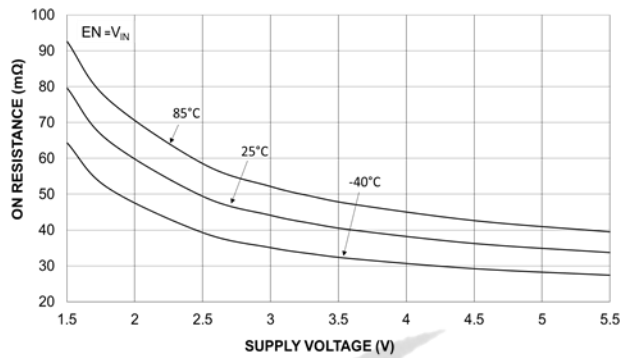


Figure 4. On-Resistance vs. Supply Voltage

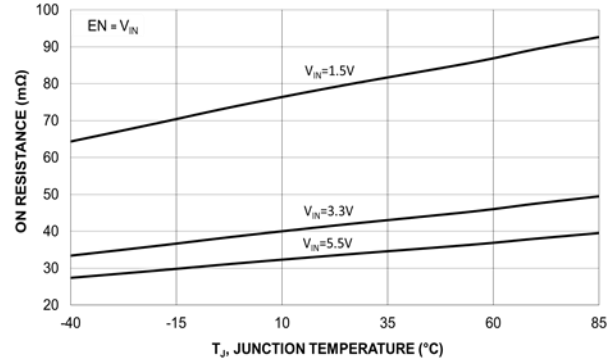


Figure 5. On-Resistance vs. Temperature

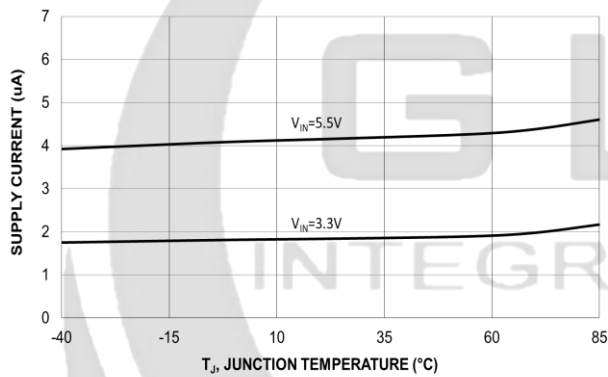


Figure 6. Quiescent Current vs. Temperature

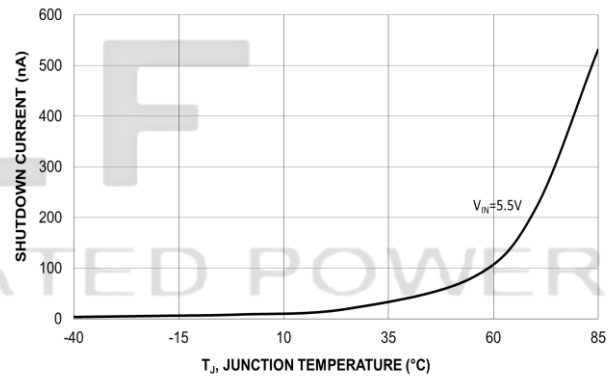


Figure 7. Shutdown Current vs. Temperature

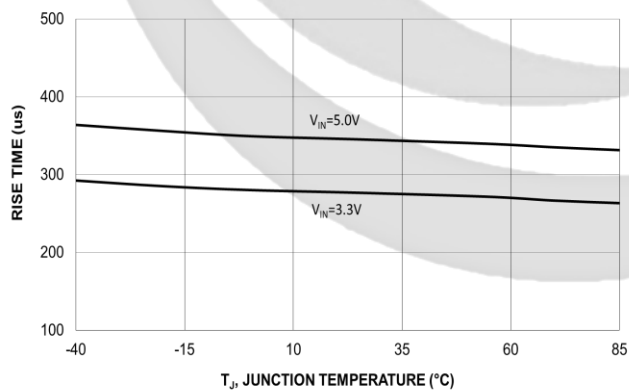


Figure 8. V_{OUT} Rise Time vs. Temperature

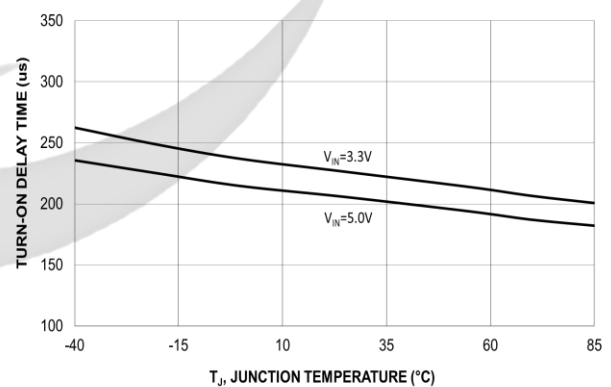


Figure 9. Turn-On Delay Time vs. Temperature

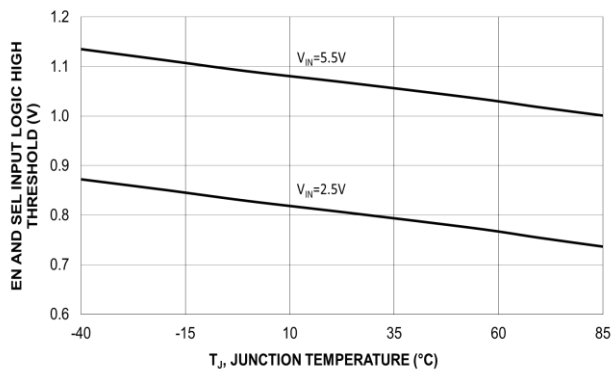


Figure 10. EN and SEL Input Logic High Threshold Vs. Temperature

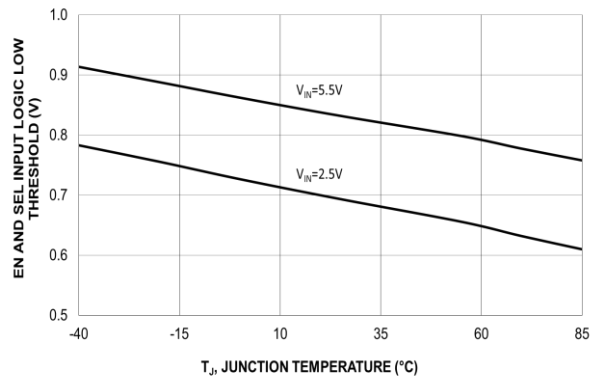


Figure 11. EN and SEL Input Logic Low Threshold Vs. Temperature

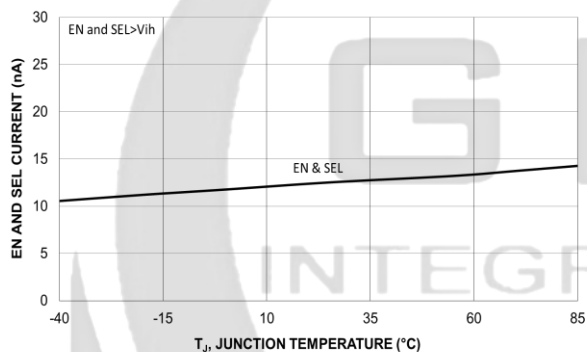


Figure 12. EN and SEL Current vs. Temperature

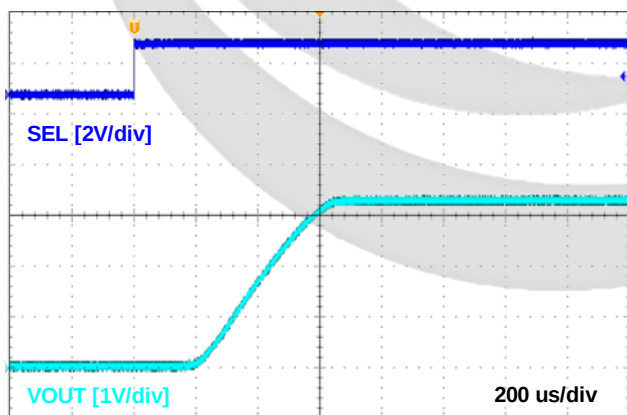


Figure 13. Turn-On Response, GLF74520
V_{IN1}=3.3 V, C_{IN}=0.1 μF, C_{OUT}=1.0 μF, R_L=150 Ω

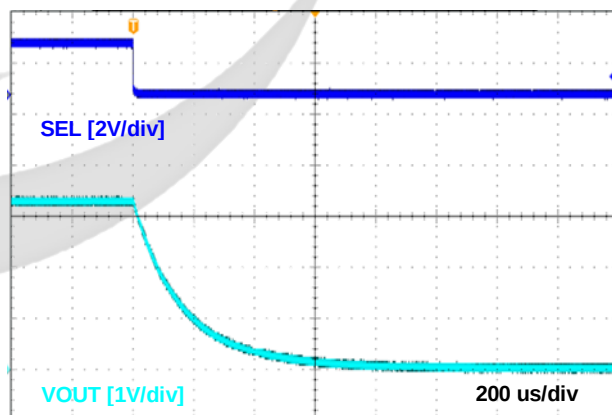


Figure 14. Turn-Off Response, GLF74520
V_{IN1}=3.3 V, C_{IN}=0.1 μF, C_{OUT}=1.0 μF, R_L=150 Ω

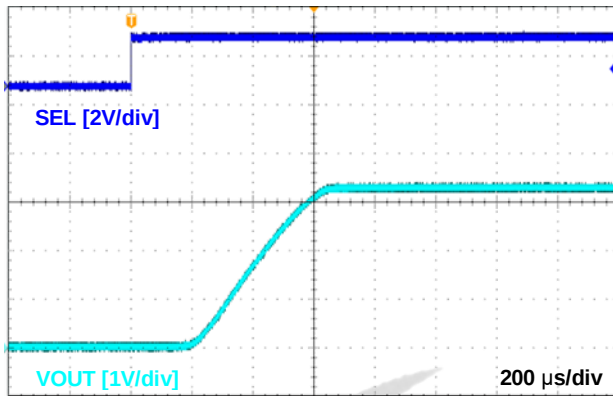


Figure 15. Turn-On Response, GLF74521
 $V_{IN1}=3.3\text{ V}$, $C_{IN}=0.1\text{ }\mu\text{F}$, $C_{OUT}=1.0\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

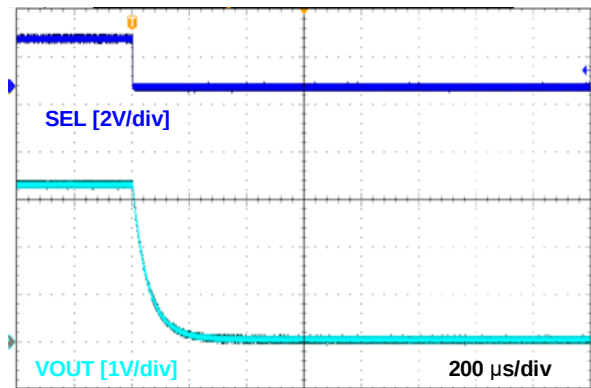


Figure 16. Turn-Off Response, GLF74521
 $V_{IN1}=3.3\text{ V}$, $C_{IN}=0.1\text{ }\mu\text{F}$, $C_{OUT}=1.0\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

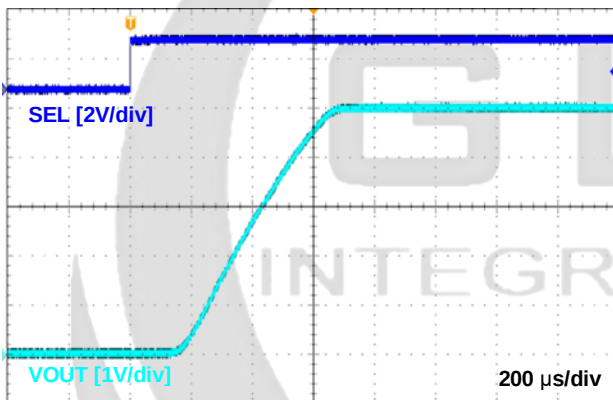


Figure 17. Turn-On Response, GFL74520
 $V_{IN1}=5.0\text{ V}$, $C_{IN}=0.1\text{ }\mu\text{F}$, $C_{OUT}=1.0\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

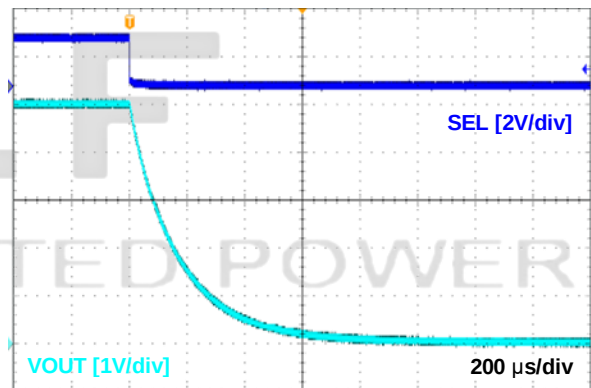


Figure 18. Turn-Off Response, GFL74520
 $V_{IN1}=5.0\text{ V}$, $C_{IN}=0.1\text{ }\mu\text{F}$, $C_{OUT}=1.0\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

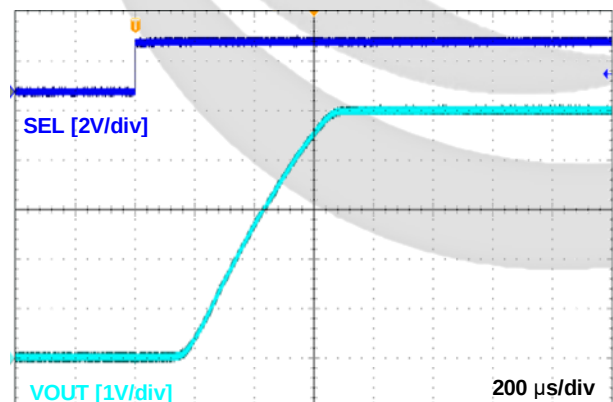


Figure 19. Turn-On Response, GLF74521
 $V_{IN1}=5.0\text{ V}$, $C_{IN}=0.1\text{ }\mu\text{F}$, $C_{OUT}=1.0\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

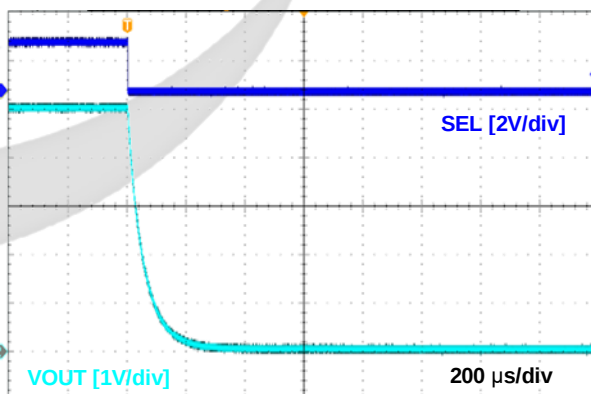


Figure 20. Turn-Off Response, GLF74521
 $V_{IN1}=5.0\text{ V}$, $C_{IN}=0.1\text{ }\mu\text{F}$, $C_{OUT}=1.0\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

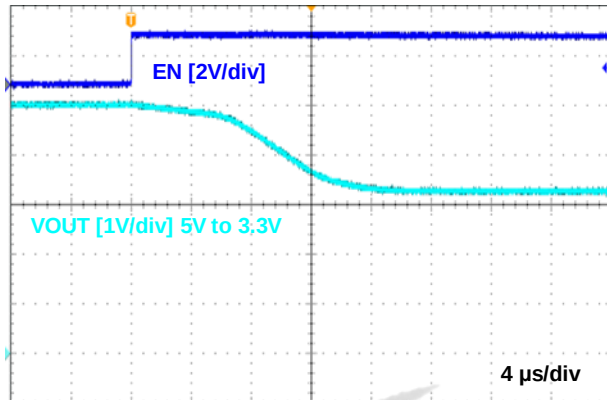


Figure 21. V_{OUT} Switchover from 5 V to 3.3V
V_{IN1}=5.0 V, V_{IN2}=3.3 V C_{IN}=1.0 μF, C_{OUT}=1.0 μF, R_L=150 Ω

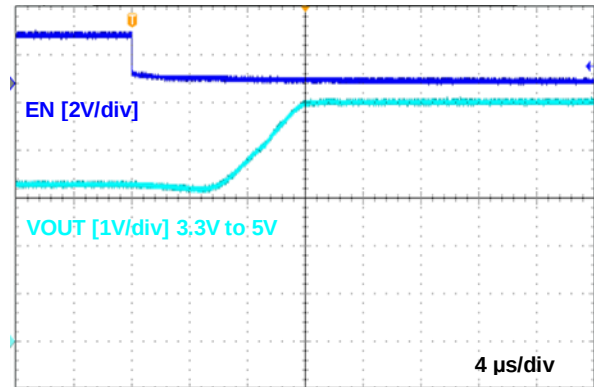


Figure 22. V_{OUT} Switchover from 3.3 V to 5 V
V_{IN1}=5.0 V, V_{IN2}=3.3 V C_{IN}=1.0 μF, C_{OUT}=1.0 μF, R_L=150 Ω

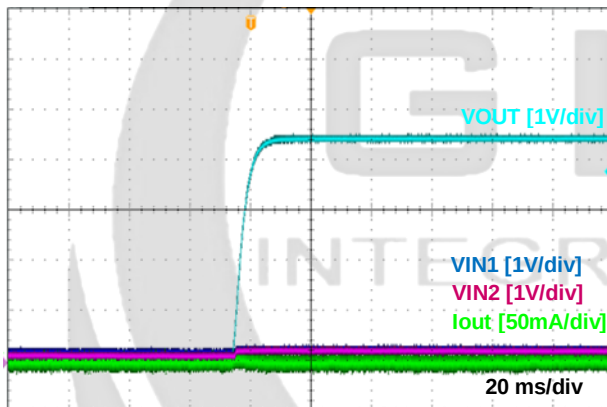


Figure 23. Reverse Current Blocking When Disabled
V_{IN1} = V_{IN2} = 0 V, V_{OUT}=0 V to 4.5 V, C_{IN}=1.0 μF, C_{OUT}=1.0 μF,
EN=SEL=0 V

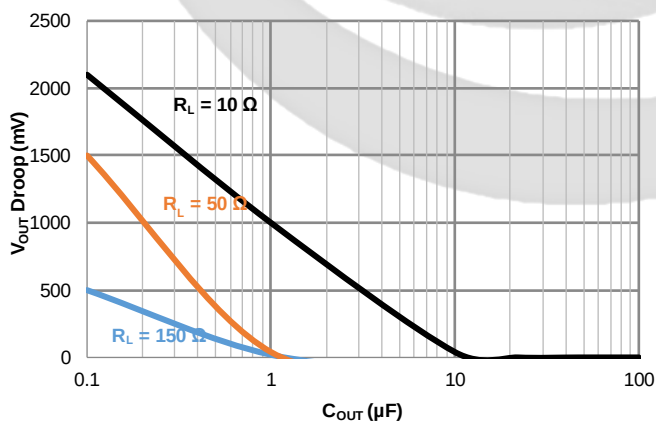


**Figure 24. Output Voltage Droop at Switching Over
from V_{IN1} (5 V) to V_{IN2} (3.3 V)**

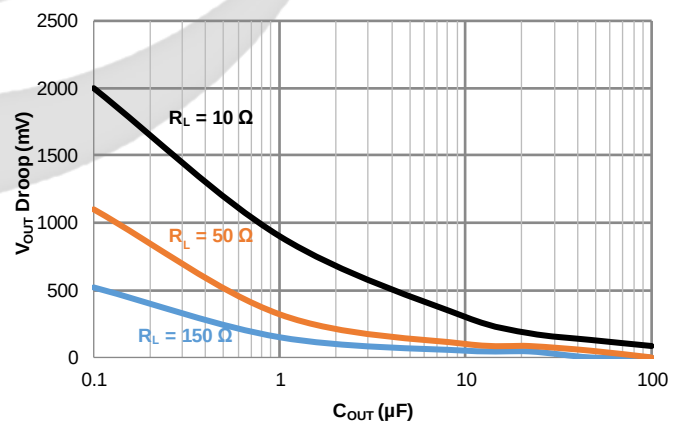


**Figure 25. Output Voltage Droop at Switching Over
from V_{IN2} (3.3 V) to V_{IN1} (5 V)**

APPLICATION INFORMATION

The GLF74520 and GLF74521 are a fully integrated 2.5 A Power Mux with a fixed slew rate control to limit the inrush current during device turn on. The device also has a wide voltage operating range from 1.5 V to 5.5 V. In the off state, the device consumes very low leakage current to avoid unwanted power drain from limited input power supplies. The device utilizes a chip scale technology package with 6 bumps in a 0.97 mm x 1.47 mm x 0.55 mm package size with a 0.55 mm bump pitch.

Input Source Selection

By changing the state of the SEL and EN pins, the GLF74520 and GLF74521 offer the automatic, as well as the manual input selection mode. In each mode, the V_{OUT} connects to one input source.

Input Capacitor and Output Capacitor

A capacitor is recommended to be placed close to the V_{IN} pin to reduce the voltage drop on the input power rail caused by transient inrush current at start-up. A higher input capacitor value can be used to further attenuate the input drop voltage. An output capacitor is recommended to minimize voltage undershoot on the output pin during the transition when the switch is turned off. Undershoot can be caused by parasitic inductance from board traces or intentional load inductances. If load inductances do exist, use of an output capacitor can improve output voltage stability and system reliability. The C_{OUT} capacitor should be placed close to the V_{OUT} and GND pins.

Reverse Current Blocking

The GLF74520 and GLF74521 prevent the reverse current from the output voltage when both switches are turned off at $V_{EN} = V_{SEL} = 0$ V.

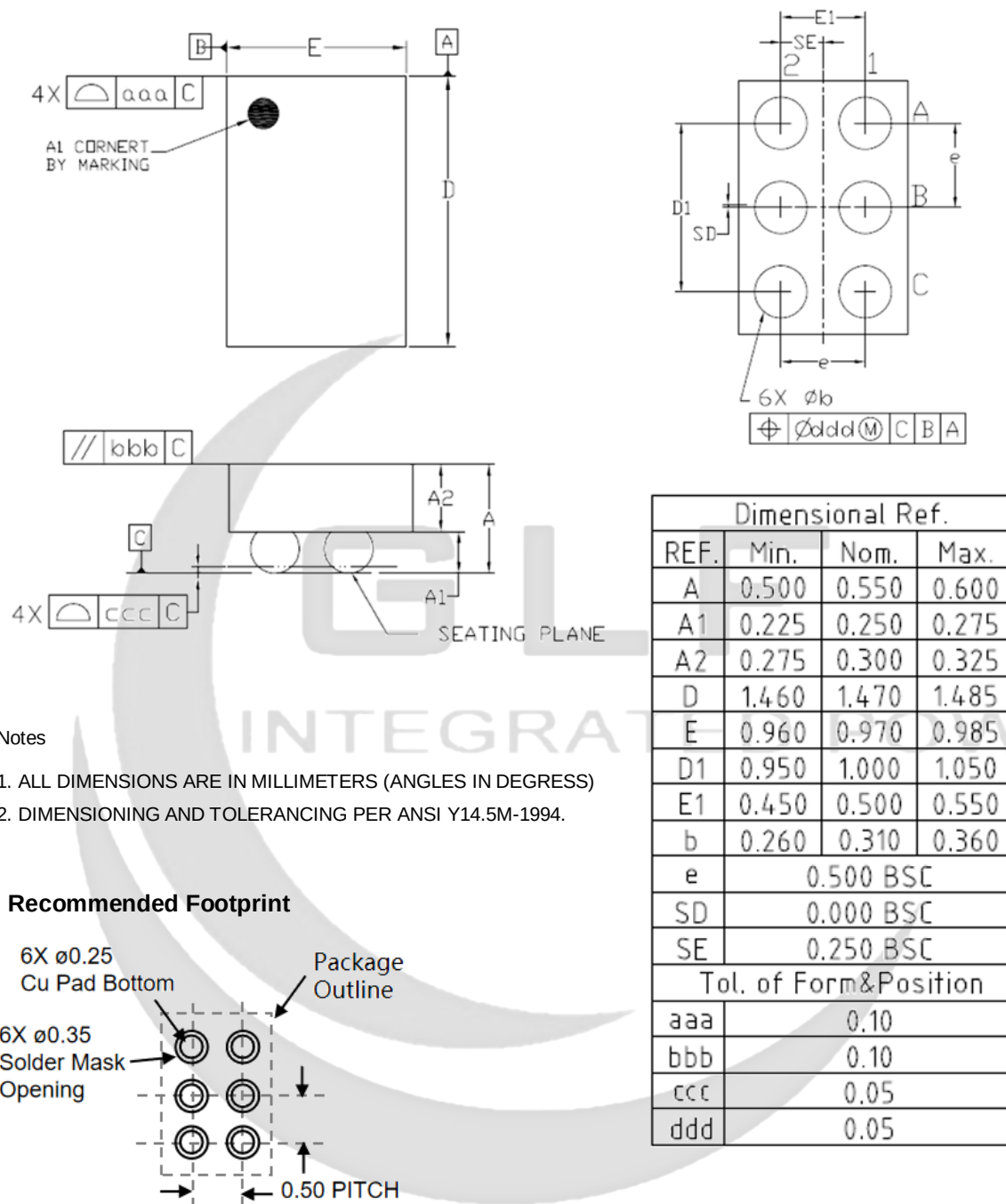
Output Discharge Function

When both channels (V_{IN1} and V_{IN2}) of the GLF74521 are disabled at the condition of $V_{EN} = V_{SEL} = 0$ V or $< V_{IL}$, an internal NMOS turns on to discharge an output capacitor quickly.

Board Layout

All traces should be as short as possible to minimize parasitic inductance effect. Wide traces for V_{IN} , V_{OUT} , and GND will help reduce signal degradation and parasitic effects during dynamic operations as well as improve the thermal performance at high load current.

PACKAGE OUTLINE

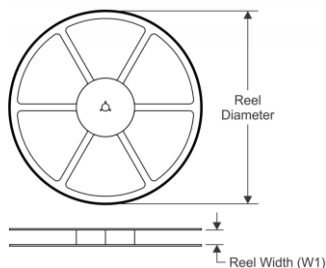


PACKAGING INFORMATION

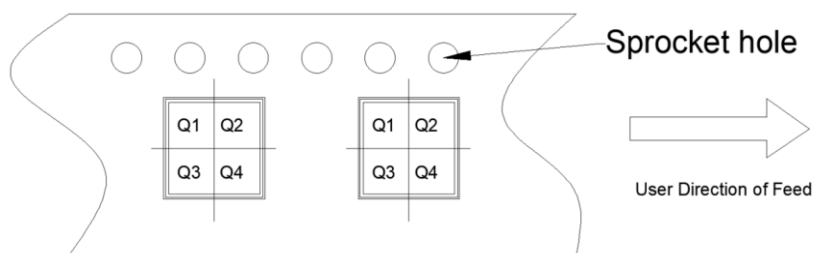
Part Number	Package	Pins	Pitch	Top Mark	Moisture Sensitivity Level	Environmental Information
GLF74520	WLCSP	6	0.50mm	AR	MSL1	ROHS+HF
GLF74521	WLCSP	6	0.50mm	SV	MSL1	ROHS+HF

TAPE AND REEL INFORMATION

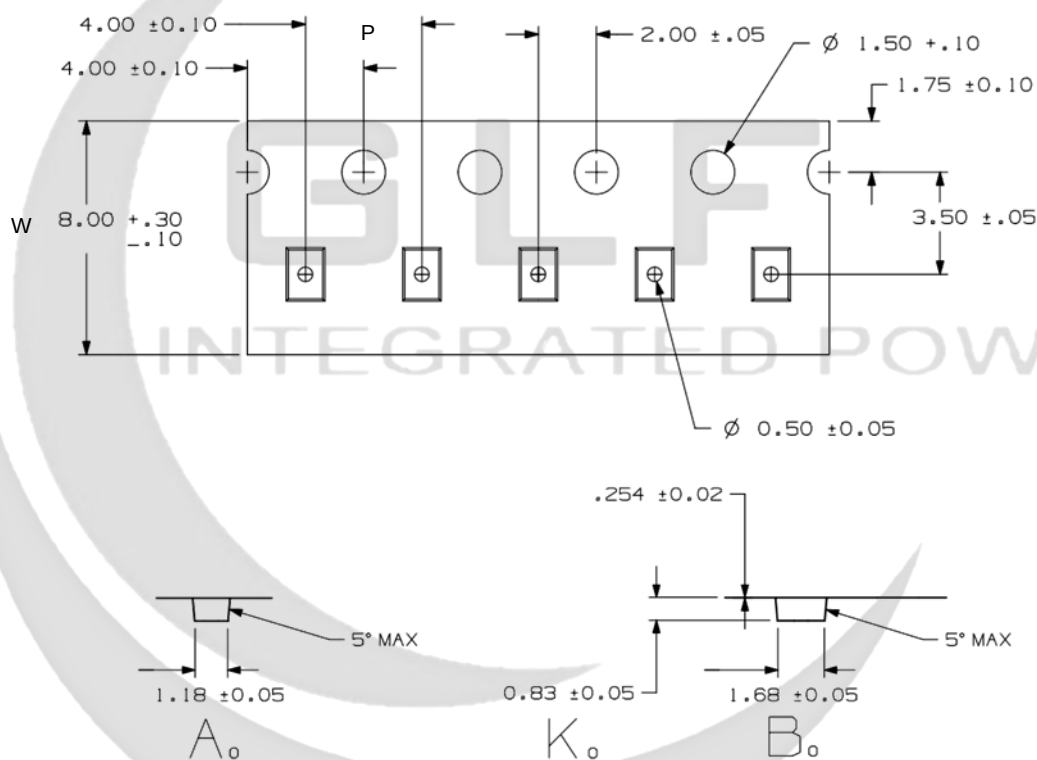
REEL DIMENSIONS



QUANRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P	W	Pin1
GLF74520	WLCSP	6	3000	180	9	1.18	1.68	0.83	4	8	Q1
GLF74521	WLCSP	6	3000	180	9	1.18	1.68	0.83	4	8	Q1

Remark:

- A0: Dimension designed to accommodate the component width
- B0: Dimension designed to accommodate the component length
- K0: Dimension designed to accommodate the component thickness
- W: Overall width of the carrier tape
- P: Pitch between successive cavity centers

SPECIFICATION DEFINITIONS

Document Type	Meaning	Product Status
Target Specification	This is a target specification intended to support exploration and discussion of critical needs for a proposed or target device. Parameters including the typical, minimum, and maximum values are desired, or target. GLF reserves the right to change contents at any time without warning or notification. A target specification will not guarantee the future production of the device.	Design / Development
Preliminary Specification	This is a draft version of a product specification which is under internal review and subject to change. GLF reserves the right to change the specification at any time without warning or notification. A preliminary specification will not guarantee the future production of the device.	Qualification
Product Specification	This document represents the characteristics of the device.	Production

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