High-Side Power Distribution Switch

Features

- **135mΩ High-Side MOSFET**
- **4 Versions of Current Limits with Foldback**
- **Operating Range:2.7V to 5.5V**
- **400μS Typical Rise Time**
- **Under voltage Lockout**
- **65μA Quiescent Supply Current**
- **1μA Maximum Standby Supply Current**
- **Logic Level Enable Pin, Available with Active-High or Active-Low Version**
- **No Reverse Current when Power Off**
- **SOT-23-5 Package**
- **UL Approved_#E232223**

Applications

- **High-Side Power Protection Switch**
- **USB Power Management**
- **USB Host and Self-Powered Bubs**
- **USB Bus-Powered Hubs**
- **Hot Plug-In Power Supplies**
- **Battery-Charger Circuits**

General Description

The G5240 is an integrated 135mΩ power switch for self-powered and bus-powered Universal Serial Bus (USB) applications.

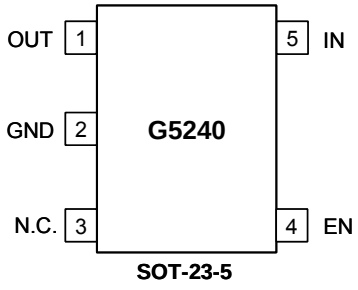
Several Protection features include current limiting with foldback, and thermal shutdown to prevent catastrophic switch failure caused by increasing power dissipation when continuous heavy loads or short circuit occurs. And a built-in charge pump is used to drive the N-channel MOSFET that is free of parasitic body diode to eliminate any reversed current flow across the switch when it is powered off.

Its low quiescent supply current and small package (SOT-23-5) is particularly suitable in battery-powered equipment, like PDA, mobile phone.

Ordering Information

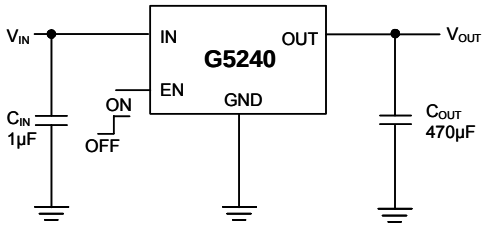
ORDER NUMBER	MARKING	ENABLE	CURRENT LIMIT	TEMP. RANGE	PACKAGE (Pb free)
G5240A1T1U	ECA1x	Active High	2A	-40°C to +85°C	SOT-23-5
G5240A2T1U	ECA2x	Active Low	2A	-40°C to +85°C	SOT-23-5
G5240B1T1U	ECB1x	Active High	1.5A	-40°C to +85°C	SOT-23-5
G5240B2T1U	ECB2x	Active Low	1.5A	-40°C to +85°C	SOT-23-5
G5240C1T1U	ECC1x	Active High	1A	-40°C to +85°C	SOT-23-5
G5240C2T1U	ECC2x	Active Low	1A	-40°C to +85°C	SOT-23-5
G5240D1T1U	ECD1x	Active High	0.75A	-40°C to +85°C	SOT-23-5
G5240D2T1U	ECD2x	Active Low	0.75A	-40°C to +85°C	SOT-23-5

Pin Configuration



SOT-23-5

Typical Application Circuit



Absolute Maximum Ratings

Supply Voltage (V_{IN})..... .....6V
Output Voltage (V_{OUT}).....6V
Output Current (I_{OUT}).....Internally Limited
Enable Input (V_{EN}).....-0.3V to 6V
Storage Temperature (T_S).....-65°C to +150°C
Reflow Temperature (soldering, 10sec).....260°C
ESD protection.....2kV

Operating Ratings

Supply Voltage (V_{IN}).....+3V to +5.5V
Operating Temperature (T_A).....-40°C to +85°C

Electrical Characteristics

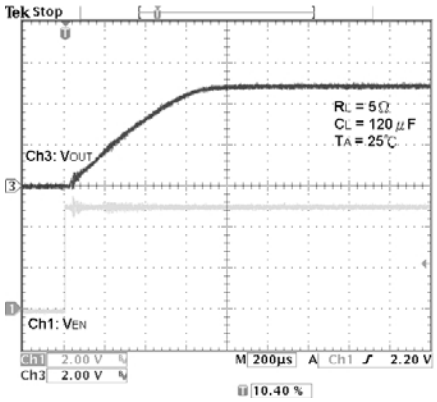
V_{IN} = 5V, C_{IN}=1µF, C_{OUT}=1µF, R_L=10Ω T_A = 25°C, unless otherwise noted.

PARAMETER	CONDITION	MIN	TYP	MAX	UNITS
Input Voltage Rage		2.7	---	5.5	V
Output MOS $R_{DS(ON)}$	I_L=0.5A	---	120	140	mΩ
Supply Current		---	65	110	µA
Output Turn-on Rising Time	R_L=10Ω, 90% Settling	---	400	---	µs
Current Limit Threshold	G5240A1/G5240A2,V_{OUT}=4V	1.5	2	2.8	A
	G5240B1/G5240B2,V_{OUT}=4V	1.1	1.5	2.1	
	G5240C1/G5240C2,V_{OUT}=4V	0.7	1	1.4	
	G5240D1/G5240D2,V_{OUT}=4V	0.5	0.75	1.7	
Short-circuit Current	G5240A1/G5240A2,V_{OUT}=0V, 2.7V<V_{IN}<5.5V	0.2	1.3	1.9	A
	G5240B1/G5240B2,V_{OUT}=0V, 2.7V<V_{IN}<5.5V	0.2	1	1.4	
	G5240C1/G5240C2/,V_{OUT}=0V, 2.7V<V_{IN}<5.5V	0.2	0.67	1	
	G5240D1/G5240D2, V_{OUT}=0V, 2.7V<V_{IN}<5.5V	0.2	0.5	0.7	
EN Input Threshold		1.2	1.6	2	V
Shutdown Supply Current		---	---	1	µA
Output Leakage Current	EN="0", V_{OUT}=0V	---	---	1	µA
V_{IN} Under Voltage Lockout		2.1	2.3	2.65	V
V_{IN} Under Voltage Hysteresis		---	200	---	mV
Thermal Limit		---	135	---	°C
Thermal Limit Hysteresis		---	20	---	°C

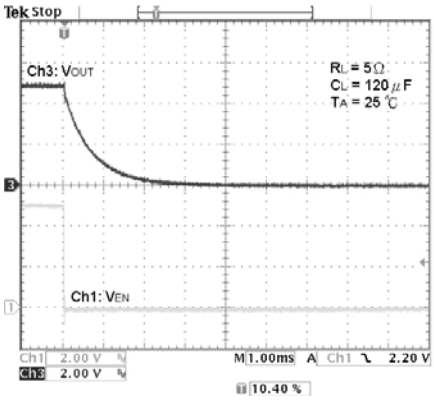
Typical Performance Characteristics

G5240B, V_{IN} = 5V, C_{IN}=1μF, C_{OUT}=1μF, V_{EN}=V_{IN}, T_A = 25°C, unless otherwise noted.

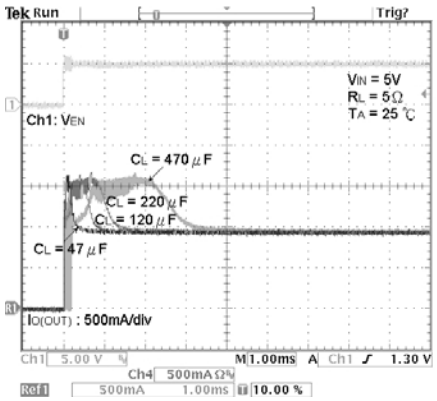
Turn on Delay Time and Rise Time



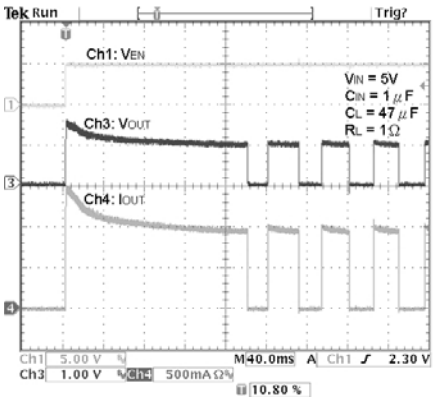
Turn off Delay Time and Fall Time



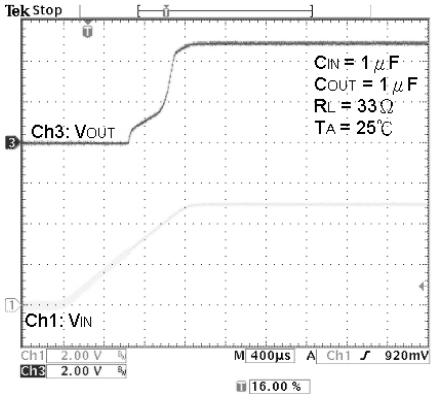
Inrush Current With Different Load Capacitance



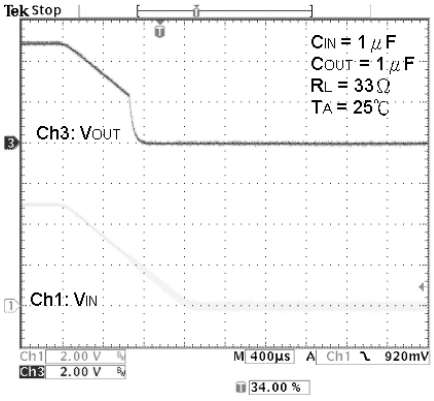
Thermal Shutdown Response



UVLO Protection at Rising

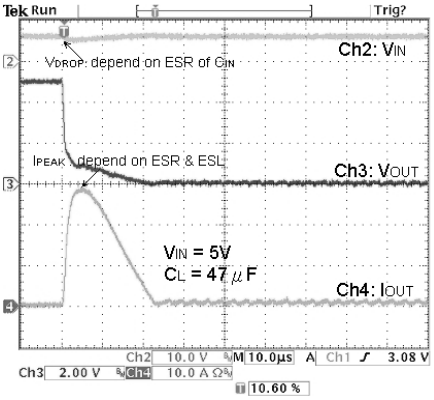


UVLO Protection at Falling

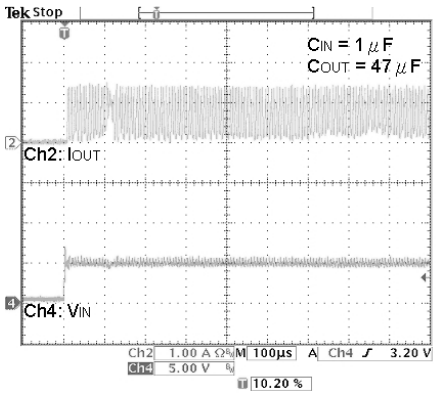


Typical Performance Characteristics (continued)

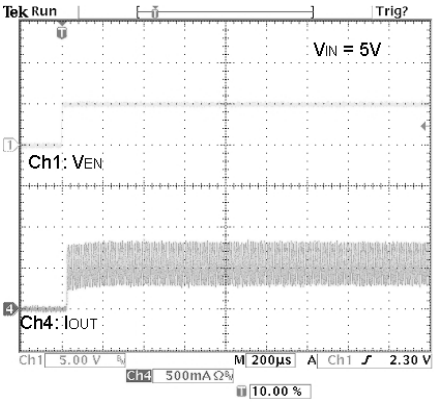
Inrush Short Circuit Response



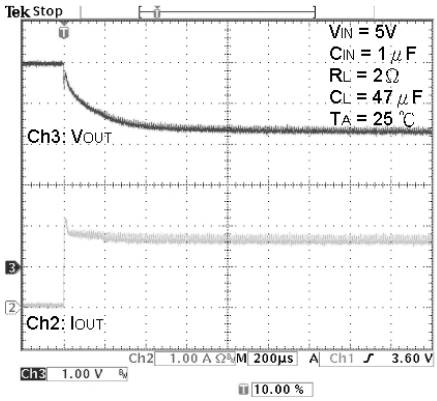
Short Circuit Response at Start up



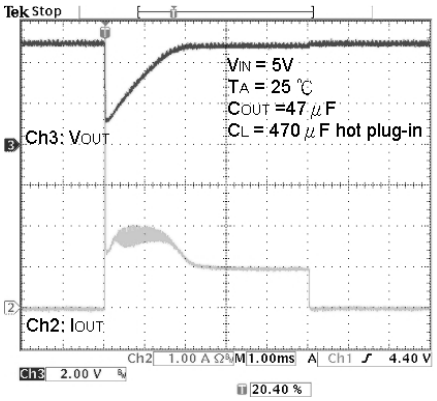
Short-Circuit Current, Device Enable into Short



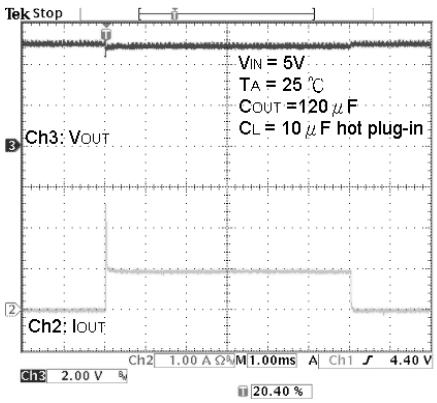
Resistance Load Inrush Response



Capacitance Load Inrush Response

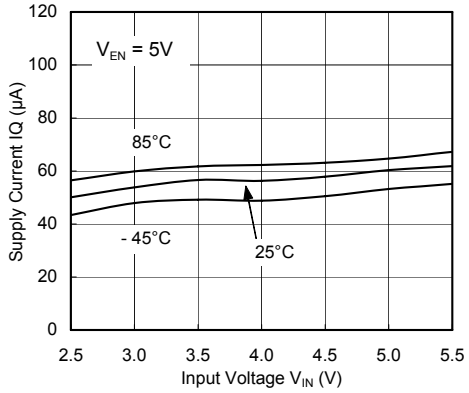


Capacitance Load Inrush Response

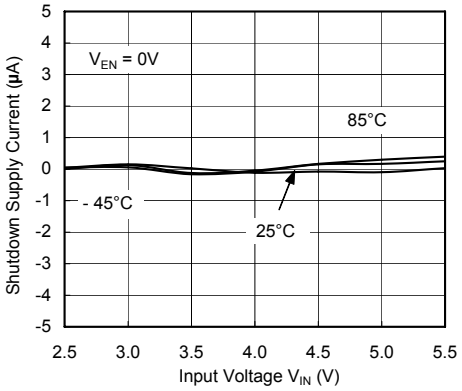


Typical Performance Characteristics (continued)

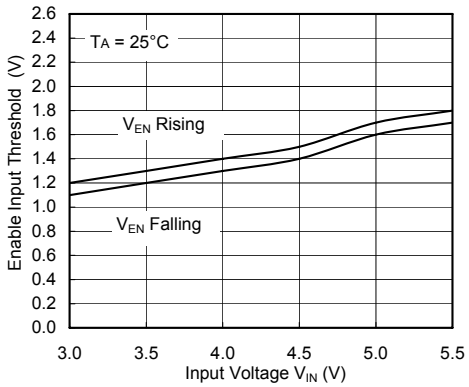
Supply Current vs. Input Voltage



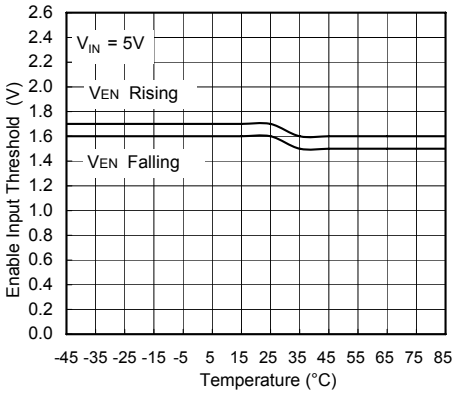
Shutdown Supply Current vs. Input Voltage



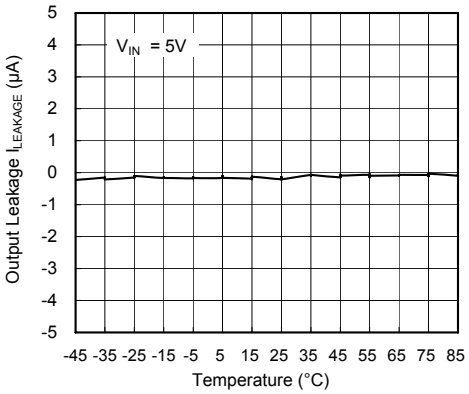
Enable Input Threshold vs. Input Voltage



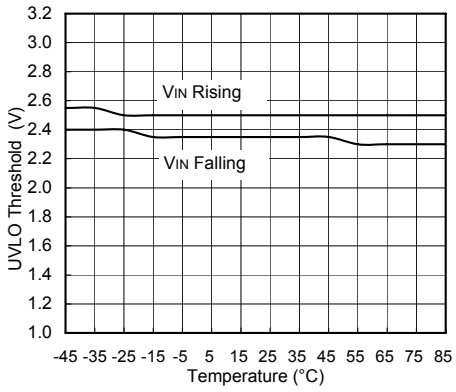
Enable Input Threshold vs. Temperature



Output Leakage Current vs. Temperature

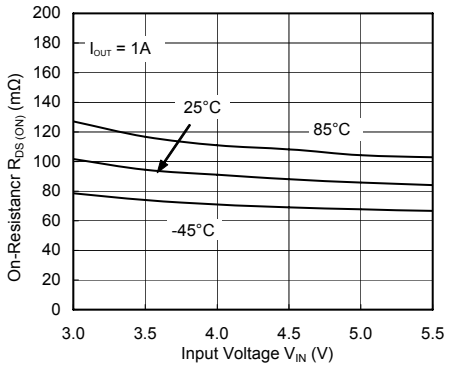


UVLO Threshold vs. Temperature

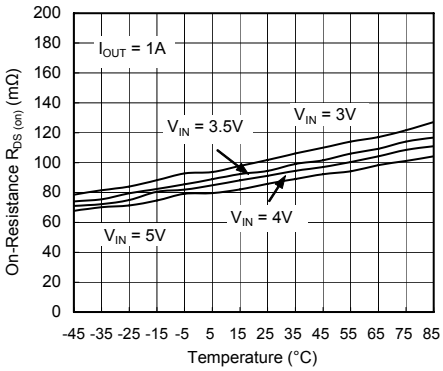


Typical Performance Characteristics (continued)

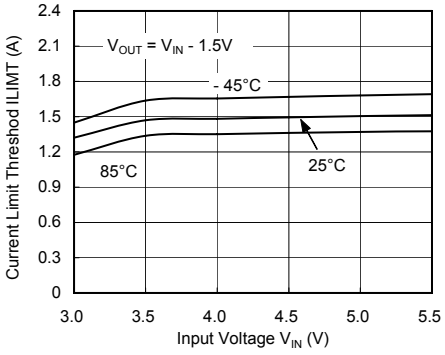
ON-Resistance vs. Input Voltage



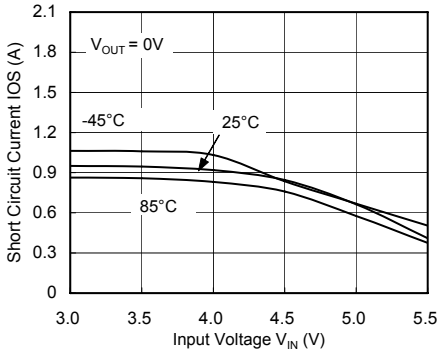
ON-Resistance vs. Temperature



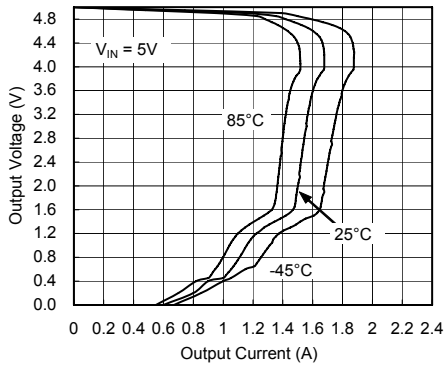
Current Limit Threshold vs. Input Voltage



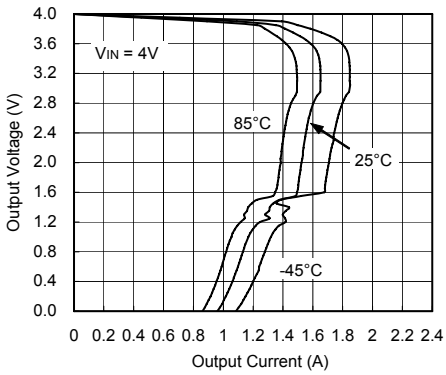
Short Circuit Current vs. Input Voltage



Overcurrent Protection Characteristics

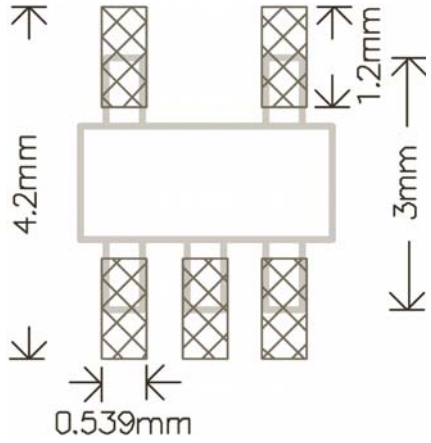


Overcurrent Protection Characteristics



Recommended Minimum Footprint

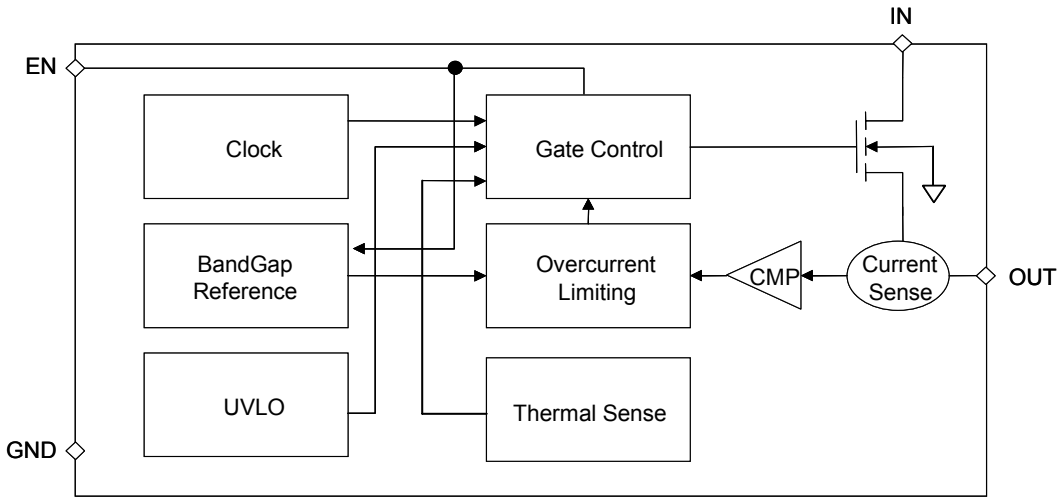
SOT-23-5



Pin Description

PIN	NAME	PIN FUNCTION
1	OUT	**Switch Output**: Output MOSFET Source. Typically connect to switched side of load.
2	GND	**Ground**
3	N.C	**No Connection**
4	EN	**Enable**: Logic level enable input. Make sure EN pin never floating.
5	IN	**Input Supply**: Output MOSFET Drain, which also supplies IC's internal circuitry. Connect to positive supply.

Block Diagrams



Functional Description

Input and Output

IN (input) is the power supply connection to the logic circuitry and the drain of the output MOSFET. OUT (output) is the source of the output MOSFET. In a typical application, current flows through the switch from IN to OUT toward the load. Both OUT pins must be connected together to the load.

Thermal Shutdown

Thermal shutdown protects G5240 from excessive power dissipation. If the die temperature exceeds 135°C, the MOSFETS switch is shut off. 20°C of hysteresis prevents the switch from turning on until the die temperature drops to 115°C. Thermal shutdown circuit functions only when the switch is enabled.

Undervoltage Lockout

UVLO (undervoltage lockout) prevents the output MOSFET from turning on until IN (input voltage) exceeds 2.5V typically. After the switch turns on, if the voltage drops below 2.3V typically, UVLO shuts off the output MOSFET.

Current Limiting

The typical current limit value of G5240 is 2A, 1.5A, 1A, 0.75A for G5240A/G5240B/G5240C/G5240D respectively. There is foldback of current limit when V_{OUT} < 1.5V (See Typical Performance Characteristics).

Applications Information

Supply Filtering

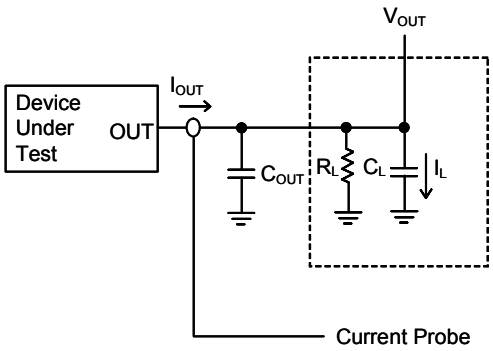
A 1µF bypass capacitor from IN to GND, located near the G5240, is strongly recommended to control supply transients. Without a bypass capacitor, an output short may cause sufficient ringing on the input (from supply lead inductance) to damage internal control circuitry.

Input transients must not exceed the absolute maximum supply voltage ($V_{IN\ max}$ = 6V) even for a short duration.

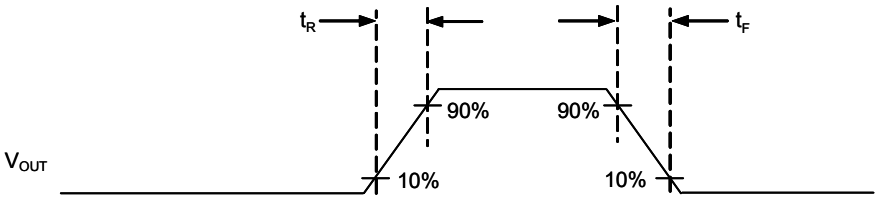
EN, the Enable Input

EN must be driven logic high or logic low for a clearly defined input. Floating the input may cause unpredictable operation. EN should not be allowed to go negative with respect to GND.

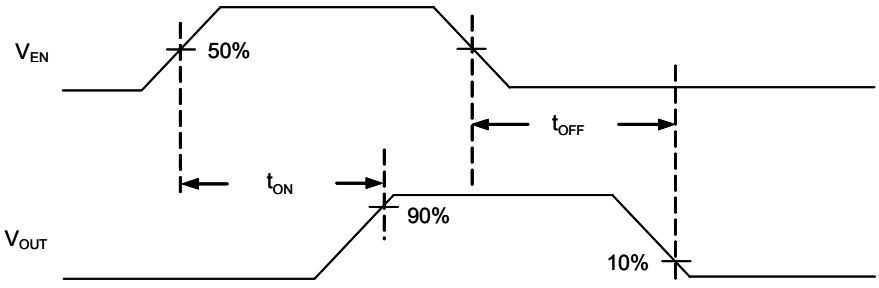
Test Circuit



Timing Diagrams

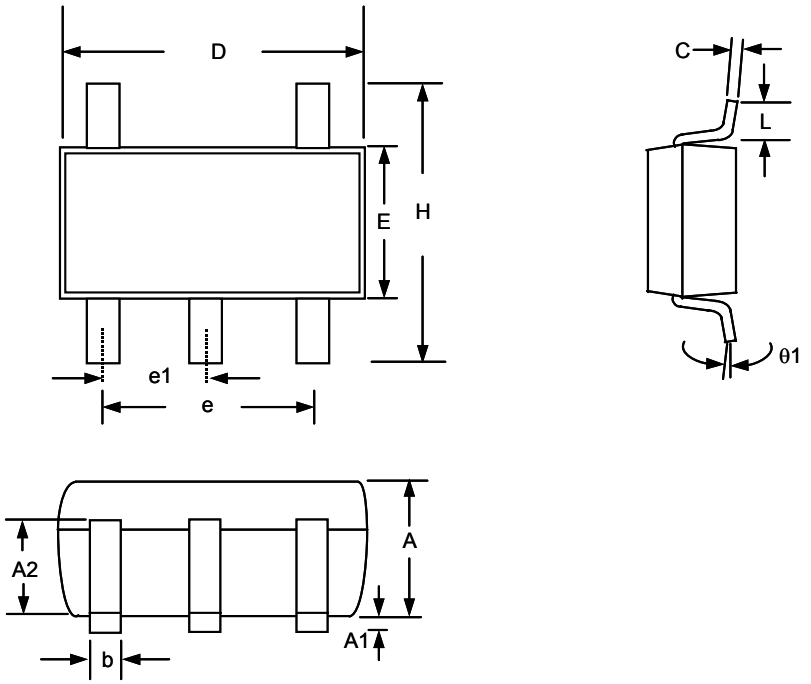


Output Rise and Fall Times



Switch Delay Times

Package Information

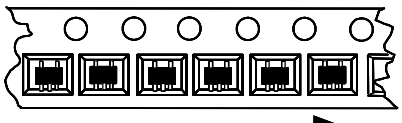


Note:

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance ±0.1000 mm (4mil) unless otherwise specified
3. Coplanarity: 0.1000mm
4. Dimension L is measured in gage plane

SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	-----	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
e	-----	1.90(TYP)	-----
e1	-----	0.95	-----
H	2.60	2.80	3.00
L	0.37	------	-----
θ1	1°	5°	9°

Taping Specification



Feed Direction

SOT-23-5 Package Orientation

PACKAGE	Q'TY/REEL
SOT-23-5	3,000 ea