features

- **Dual-Input, Single-Output MOSFET Switch With No Reverse Current Flow (No Parasitic Diodes)**
- **IN1 . . . 250-mΩ, 500-mA N-Channel; 18-μA Supply Current**
- **IN2 . . . 1.3-Ω, 100-mA P-Channel; 0.75-μA Supply Current (V_{AUX} Mode)**
- **Advanced Switch Control Logic**
- **CMOS and TTL Compatible Enable Input**
- **Controlled Rise, Fall, and Transition Times**
- **2.7 V to 5.5 V Operating Range**
- **SOT-23-5 and SOIC-8 Package**
- **–40°C to 85°C Ambient Temperature Range**
- **2-kV Human Body Model, 750-V Charged Device Model, 200-V Machine-Model ESD Protection**

typical applications

- **Notebook and Desktop PCs**
- **Cell phone, Palmtops, and PDAs**
- **Battery Management**

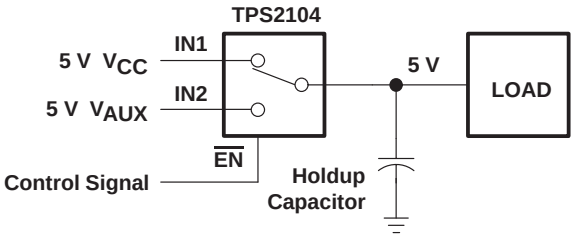


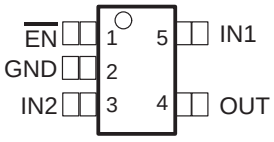
Figure 1. Typical Dual-Input Single-Output Application

description

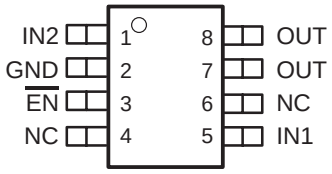
The TPS2104 and TPS2105 are dual-input, single-output power switches designed to provide uninterrupted output voltage when transitioning between two independent power supplies. Both devices combine one n-channel (250 mΩ) and one p-channel (1.3 Ω) MOSFET with a single output. The p-channel MOSFET (IN2) is used with auxiliary power supplies that deliver lower current for standby modes. The n-channel MOSFET (IN1) is used with a main power supply that delivers higher current required for normal operation. Low on-resistance makes the n-channel the ideal path for higher main supply current when power-supply regulation and system voltage drops are critical. When using the p-channel MOSFET, quiescent current is reduced to 0.75 μA to decrease the demand on the standby power supply. The MOSFETs in the TPS2104 and TPS2105 do not have the parasitic diodes, typically found in discrete MOSFETs, thereby preventing back-flow current when the switch is off.

TPS2104

DBV PACKAGE (TOP VIEW)

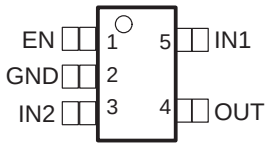


D PACKAGE (TOP VIEW)

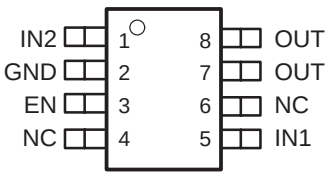


TPS2105

DBV PACKAGE (TOP VIEW)



D PACKAGE (TOP VIEW)



NC – No internal connection

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

Selection Guide, V_{AUX} Power-Distribution Switches

DEVICE	ENABLE	OPERATING VOLTAGE RANGE (V)	MAXIMUM INPUT CURRENT, IN1 (mA)	MAXIMUM INPUT CURRENT, IN2 (mA)	AMBIENT TEMPERATURE RANGE (°C)
TPS2100	$\overline{EN}$	2.7 to 4	500	10	–40 to 70
TPS2101	EN	2.7 to 4	500	10	–40 to 70
TPS2102	$\overline{EN}$	2.7 to 4	500	100	–40 to 70
TPS2103	EN	2.7 to 4	500	100	–40 to 70
TPS2104	$\overline{EN}$	2.7 to 5.5	500	100	–40 to 85
TPS2105	EN	2.7 to 5.5	500	100	–40 to 85

AVAILABLE OPTIONS FOR TPS2104, TPS2105

T_A	DEVICE	ENABLE	PACKAGED DEVICES	
			SOT-23-5 (DBV)†	SOIC-8 (D)
–40°C to 85°C	TPS2104	$\overline{EN}$	TSP2104DBV†	TPS2104D
	TPS2105	EN	TPS2105DBV†	TPS2105D

Both packages are available left-end taped and reeled. Add an R suffix to the D device type (e.g., TPS2105DR).

† Add T (e.g., TPS2104DBVT) to indicate tape and reel at order quantity of 250 parts.
Add R (e.g., TPS2104DBVR) to indicate tape and reel at order quantity of 3000 parts.

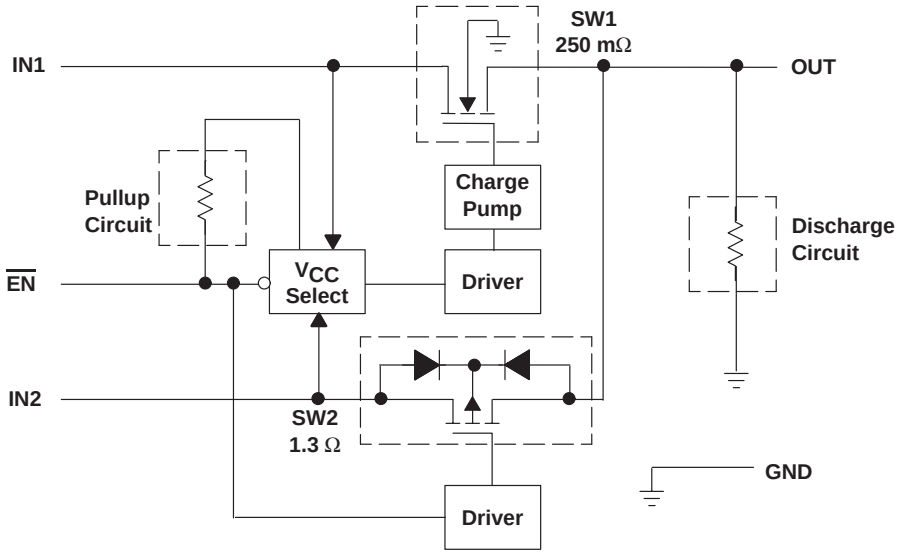
Function Tables

TPS2104			
VIN1	VIN2	$\overline{EN}$	OUT
0 V	0 V	XX	GND
0 V	5 V	L	GND
5 V	0 V	L	VIN1
5 V	5 V	L	VIN1
0 V	5 V	H	VIN2
5 V	0 V	H	VIN2
5 V	5 V	H	VIN2

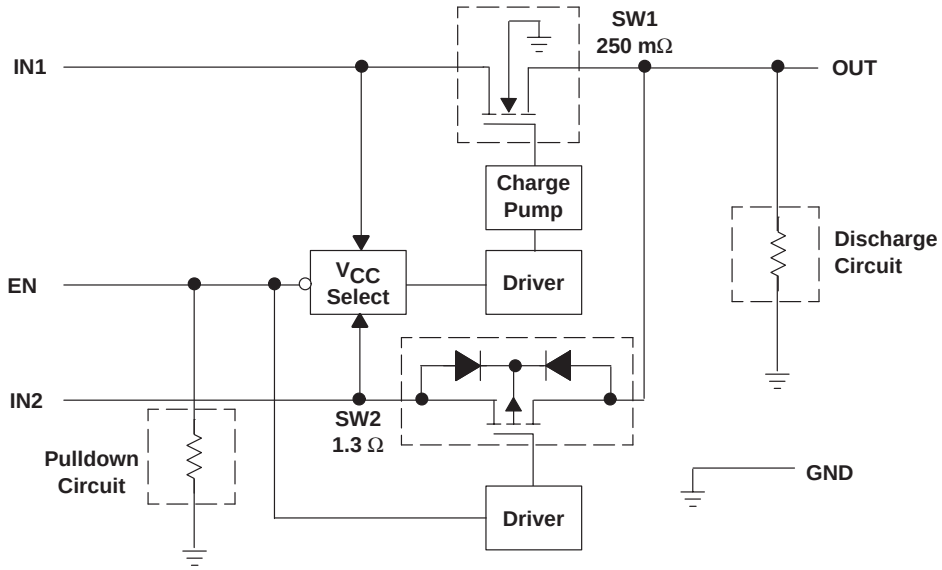
XX = don't care

TPS2105			
VIN1	VIN2	EN	OUT
0 V	0 V	XX	GND
0 V	5 V	H	GND
5 V	0 V	H	VIN1
5 V	5 V	H	VIN1
0 V	5 V	L	VIN2
5 V	0 V	L	VIN2
5 V	5 V	L	VIN2

TPS2104 functional block diagram



TPS2105 functional block diagram



Terminal Functions

TERMINAL					I/O	DESCRIPTION
NAME	NO.					
	TPS2104		TPS2105			
	DBV	D	DBV	D		
EN			1	3	I	Active-high enable for IN1-OUT switch
$\overline{EN}$	1	3			I	Active-low enable for IN1-OUT switch
GND	2	2	2	2	I	Ground
IN1†	5	5	5	5	I	Main input voltage, NMOS drain (250 mΩ), require 0.22 μF bypass
IN2†	3	1	3	1	I	Auxilliary input voltage, PMOS drain (1.3 Ω), require 0.22 μF bypass
OUT	4	7, 8	4	7, 8	O	Power switch output
NC		4, 6		4, 6		No connection

† Unused INx should not be grounded.

detailed description

power switches

n-channel MOSFET

The IN1-OUT n-channel MOSFET power switch has a typical on-resistance of 250 mΩ at 5-V input voltage, and is configured as a high-side switch.

p-channel MOSFET

The IN2-OUT p-channel MOSFET power switch has a typical on-resistance of 1.3 Ω at 5-V input voltage and is configured as a high-side switch. When operating, the p-channel MOSFET quiescent current is reduced to typically 0.75 μA.

charge pump

An internal charge pump supplies power to the driver circuit and provides the necessary voltage to pull the gate of the MOSFET above the source. The charge pump operates from input voltages as low as 2.7 V and requires very little supply current.

driver

The driver controls the gate voltage of the IN1-OUT and IN2-OUT power switches. To limit large current surges and reduce the associated electromagnetic interference (EMI) produced, the drivers incorporate circuitry that controls the rise times and fall times of the output voltage.

enable

The logic enable will turn on the IN2-OUT power switch when a logic high is present on $\overline{EN}$ (TPS2104) or logic low is present on EN (TPS2105). A logic low input on $\overline{EN}$ (TPS2104) or logic high on EN (TPS2105) restores bias to the drive and control circuits and turns on the IN1-OUT power switch. The enable input is compatible with both TTL and CMOS logic levels.

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Input voltage range, $V_{I(IN1)}$ (see Note 1) . . . . . –0.3 V to 6 V
Input voltage range, $V_{I(IN2)}$ (see Note 1) . . . . . –0.3 V to 6 V
Input voltage range, V_I at $\overline{EN}$ or EN (see Note 1) . . . . . –0.3 V to 6 V
Output voltage range, V_O (see Note 1) . . . . . –0.3 V to 6 V
Continuous output current, $I_{O(IN1)}$ . . . . . 700 mA
Continuous output current, $I_{O(IN2)}$ . . . . . 140 mA
Continuous total power dissipation . . . . . See dissipation rating table
Operating virtual junction temperature range, T_J . . . . . –40°C to 125°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature soldering 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C
Electrostatic discharge (ESD) protection: Human body model . . . . . 2 kV
Machine model . . . . . 200 V
Charged device model . . . . . 750 V

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltages are with respect to GND.

DISSIPATION RATING TABLE

PACKAGE	T_A < 25°C POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING	T_A = 85°C POWER RATING
DBV	309 mW	3.1 mW/°C	170 mW	123 mW
D	568 mW	5.7 mW/°C	313 mW	227 mW

recommended operating conditions

	MIN	MAX	UNIT
Input voltage, $V_{I(INx)}$	2.7	5.5	V
Input voltage, V_I at $\overline{EN}$ and EN	0	5.5	V
Continuous output current, $I_{O(IN1)}$		500	mA
Continuous output current, $I_{O(IN2)}$		100‡	mA
Operating virtual junction temperature, T_J	–40	125	°C

‡ The device can deliver up to 220 mA at $I_{O(IN2)}$. However, operation at the higher current levels will result in greater voltage drop across the device, and greater voltage droop when switching between IN1 and IN2.

electrical characteristics over recommended operating junction temperature range, $V_{I(IN1)} = V_{(IN2)} = 5$ V, I_O = rated current (unless otherwise noted)

power switch

PARAMETER		TEST CONDITIONS†	MIN	TYP	MAX	UNIT
$r_{DS(on)}$ On-state resistance	IN1-OUT	T_J = 25°C		250		mΩ
		T_J = 125°C		350	435	
	IN2-OUT	T_J = 25°C		1.3		Ω
		T_J = 125°C		1.5	2.4	

† Pulse-testing techniques maintain junction temperature close to ambient termperature; thermal effects must be taken into account separately.

electrical characteristics over recommended operating junction temperature range, $V_{I(IN1)} = V_{(IN2)} = 5$ V, I_O = rated current (unless otherwise noted) (continued)

enable input ($\overline{EN}$ and EN)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{IH}	High-level input voltage	2.7 V ≤ $V_{I(INx)}$ ≤ 5.5 V		2			V
V_{IL}	Low-level input voltage	2.7 V ≤ $V_{I(INx)}$ ≤ 5.5 V				0.8	V
I_I	Input current	TPS2104	$\overline{EN}$ = 0 V or $\overline{EN}$ = $V_{I(INx)}$	–0.5		0.5	µA
		TPS2105	EN = 0 V or EN = $V_{I(INx)}$	–0.5		0.5	µA

supply current

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
I_I	Supply current	TPS2104	$\overline{EN}$ = H, IN2 selected	T_J = 25°C		0.75		µA
				–40°C ≤ T_J ≤ 125°C			1.5	
			$\overline{EN}$ = L, IN1 selected	T_J = 25°C		18		µA
				–40°C ≤ T_J ≤ 125°C			35	
		TPS2105	EN = L, IN2 selected	T_J = 25°C		0.75		µA
				–40°C ≤ T_J ≤ 125°C			1.5	
			EN = H, IN1 selected	T_J = 25°C		18		µA
				–40°C ≤ T_J ≤ 125°C			35	

switching characteristics, T_J = 25°C, $V_{I(IN1)} = V_{I(IN2)}$ = 5 V (unless otherwise noted)†

PARAMETER			TEST CONDITIONS†		MIN	TYP	MAX	UNIT
t_r	Output rise time	IN1-OUT	$V_{I(IN2)}$ = 0	C_L = 1 µF, I_L = 500 mA		340		µs
				C_L = 10 µF, I_L = 500 mA		340		
				C_L = 1 µF, I_L = 100 mA		312		
		IN2-OUT	$V_{I(IN1)}$ = 0	C_L = 1 µF, I_L = 100 mA		3.4		
				C_L = 10 µF, I_L = 100 mA		34		
				C_L = 1 µF, I_L = 10 mA		3.5		
t_f	Output fall time	IN1-OUT	$V_{I(IN2)}$ = 0	C_L = 1 µF, I_L = 500 mA		6		µs
				C_L = 10 µF, I_L = 500 mA		108		
				C_L = 1 µF, I_L = 100 mA		8		
		IN2-OUT	$V_{I(IN1)}$ = 0	C_L = 1 µF, I_L = 100 mA		100		
				C_L = 10 µF, I_L = 100 mA		990		
				C_L = 1 µF, I_L = 10 mA		1000		
t_{PLH}	Propagation delay time, low-to-high output	IN1-OUT	$V_{I(IN2)}$ = 0	C_L = 10 µF, I_L = 100 mA		55		µs
		IN2-OUT	$V_{I(IN1)}$ = 0			1		
t_{PHL}	Propagation delay time, high-to-low output	IN1-OUT	$V_{I(IN2)}$ = 0	C_L = 10 µF, I_L = 100 mA		1.5		µs
		IN2-OUT	$V_{I(IN1)}$ = 0			50		

† All timing parameters refer to Figure 2.

PARAMETER MEASUREMENT INFORMATION

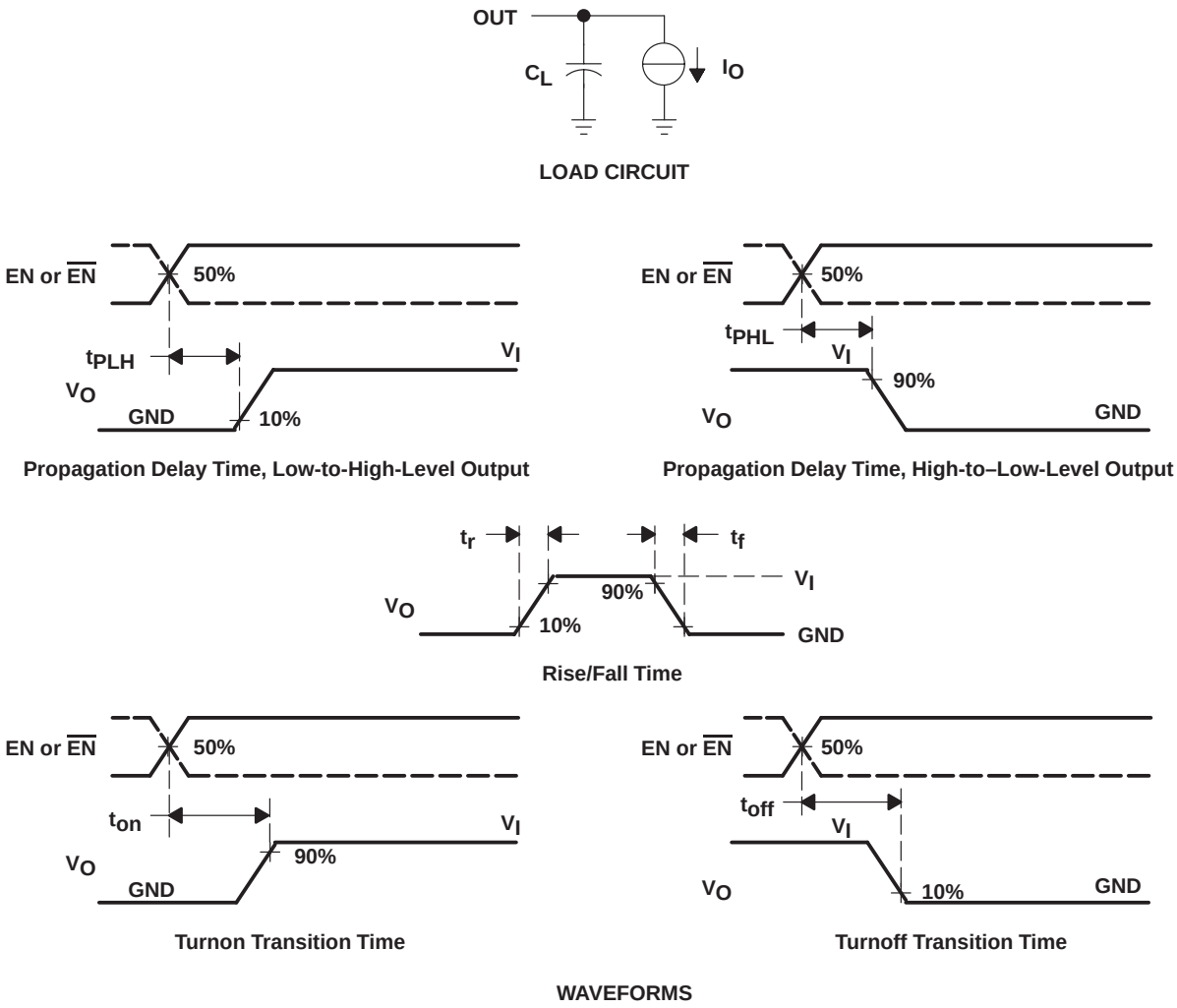


Figure 2. Test Circuit and Voltage Waveforms

Table of Timing Diagrams†

	FIGURE
Propagation Delay and Rise Time With 1-µF Load, IN1	3
Propagation Delay and Rise Time With 1-µF Load, IN2	4
Propagation Delay and Fall Time With 1-µF Load, IN1	5
Propagation Delay and Fall Time With 1-µF Load, IN2	6

† Waveforms shown in Figures 3–6 refer to TPS2104 at T_J = 25°C

PARAMETER MEASUREMENT INFORMATION

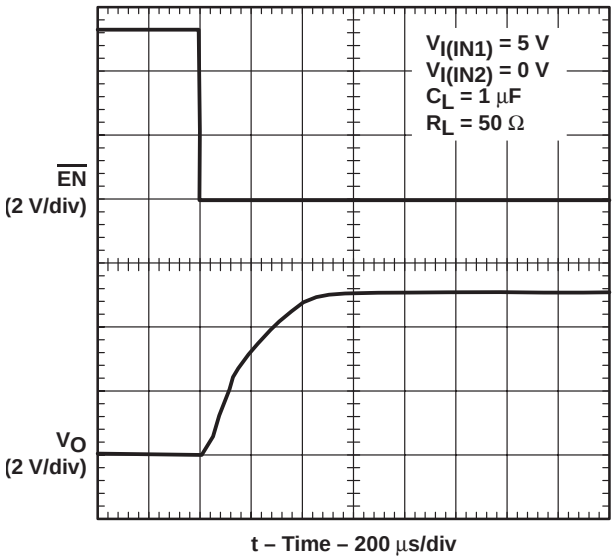


Figure 3. Propagation Delay and Rise Time With 1-μF Load, IN1 Turnon

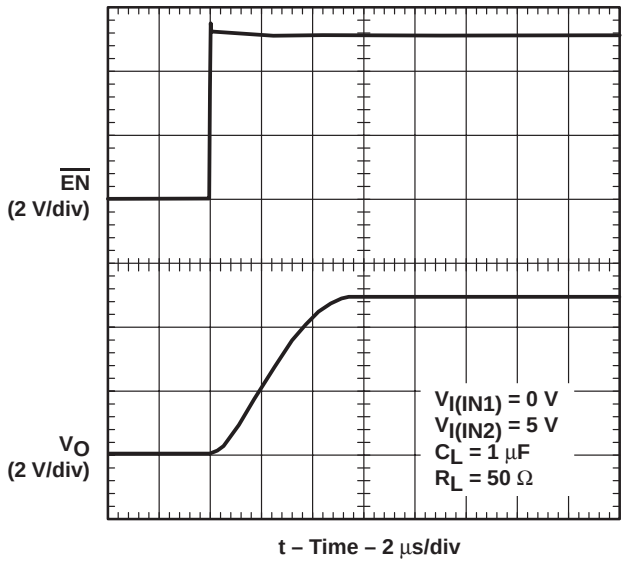


Figure 4. Propagation Delay and Rise Time With 1-μF Load, IN2 Turnon

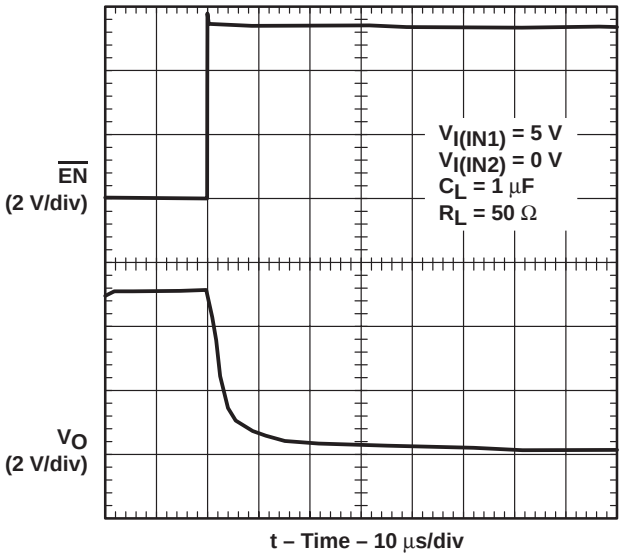


Figure 5. Propagation Delay and Fall Time With 1-μF Load, IN1 Turnoff

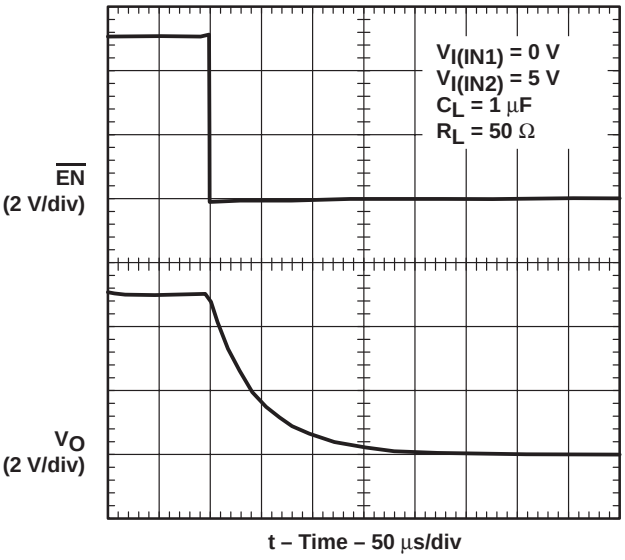


Figure 6. Propagation Delay and Fall Time With 1-μF Load, IN2 Turnoff

TYPICAL CHARACTERISTICS

Table of Graphs

		FIGURE
IN1 Switch Rise Time	vs Output Current	7
IN2 Switch Fall Time	vs Output Current	8
IN1 Switch Fall Time	vs Output Current	9
IN2 Switch Fall Time	vs Output Current	10
Output Voltage Droop	vs Output Current When Output Is Switched From IN2 to IN1	11
Inrush Current	vs Output Capacitance	12
IN1 Supply Current	vs Junction Temperature (IN1 Enabled)	13
IN1 Supply Current	vs Junction Temperature (IN1 Disabled)	14
IN2 Supply Current	vs Junction Temperature (IN2 Enabled)	15
IN2 Supply Current	vs Junction Temperature (IN2 Disabled)	16
IN1-OUT On-State Resistance	vs Junction Temperature	17
IN2-OUT On-State Resistance	vs Junction Temperature	18

IN1 SWITCH RISE TIME vs OUTPUT CURRENT

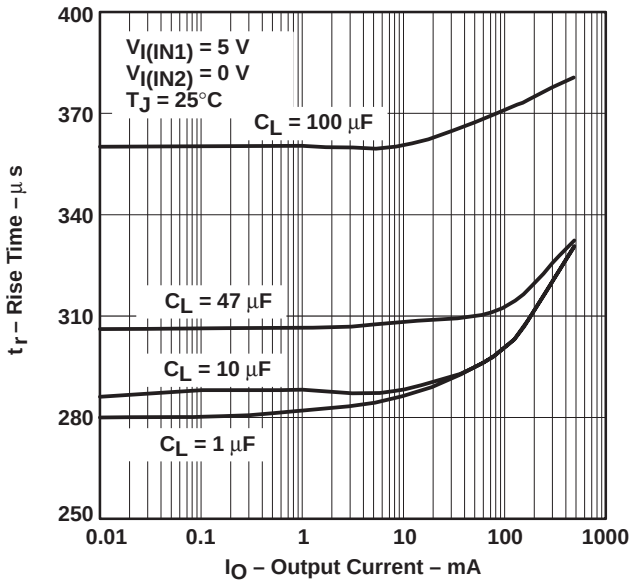


Figure 7

IN2 SWITCH RISE TIME vs OUTPUT CURRENT

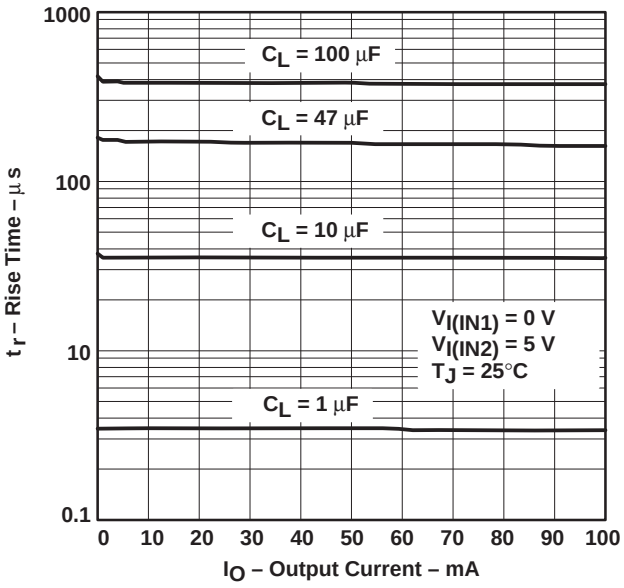


Figure 8

TYPICAL CHARACTERISTICS

IN1 SWITCH FALL TIME vs OUTPUT CURRENT

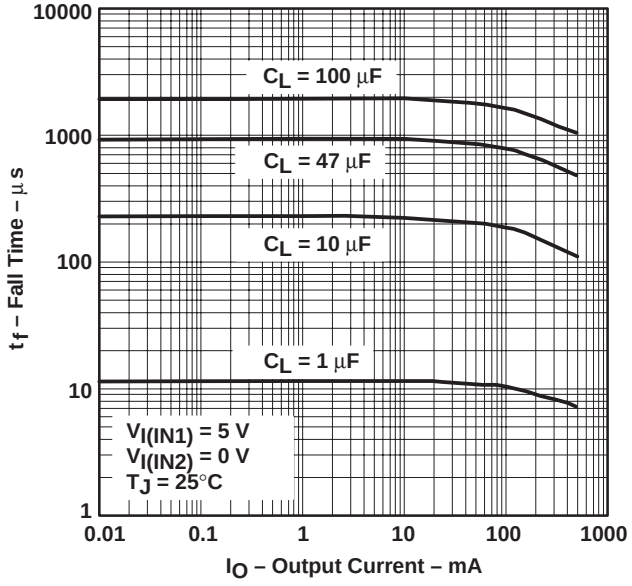


Figure 9

IN2 SWITCH FALL TIME vs OUTPUT CURRENT

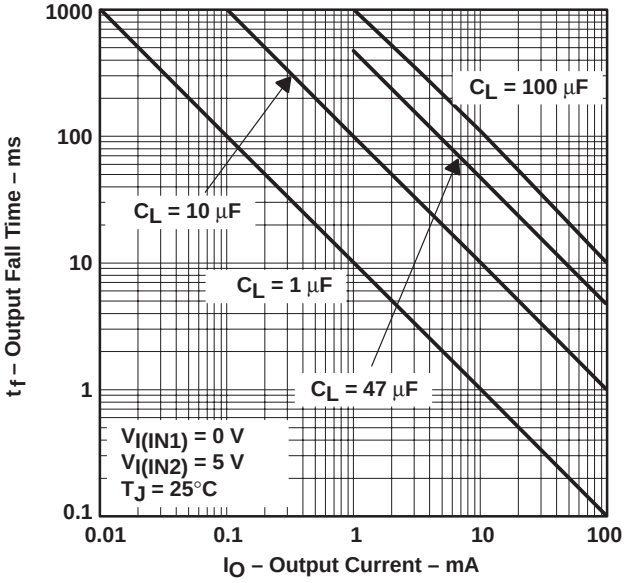


Figure 10

OUTPUT VOLTAGE DROOP vs OUTPUT CURRENT WHEN OUTPUT IS SWITCHED FROM IN2 TO IN1†

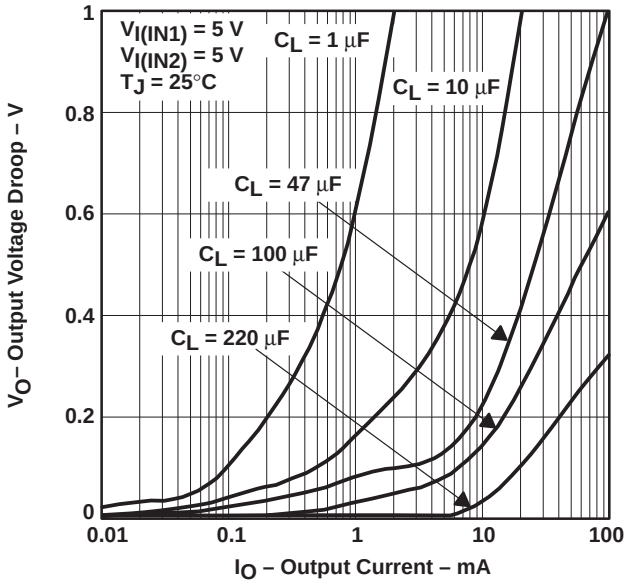


Figure 11

INRUSH CURRENT vs OUTPUT CAPACITANCE

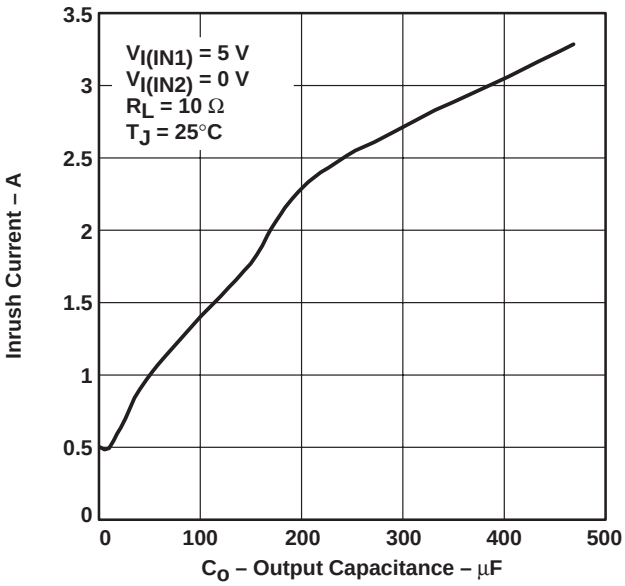


Figure 12

† If switching from IN1 to IN2, the voltage droop is much smaller. Therefore, the load capacitance should be chosen according to the curves in Figure 15.

TYPICAL CHARACTERISTICS

IN1 SUPPLY CURRENT vs JUNCTION TEMPERATURE (IN1 ENABLED)

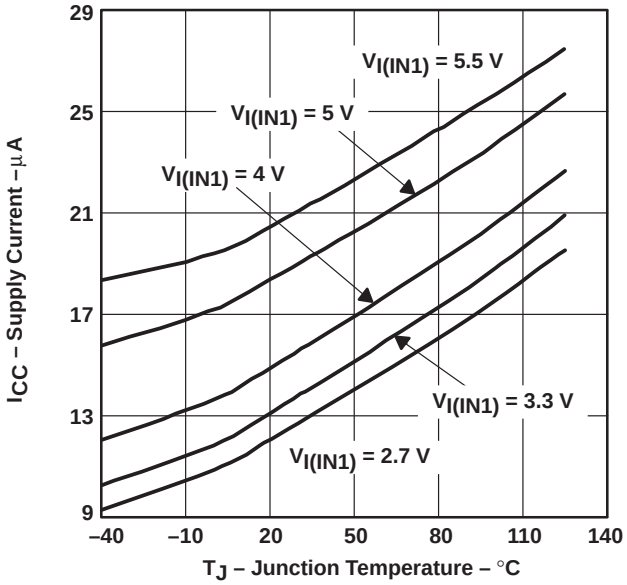


Figure 13

IN1 SUPPLY CURRENT vs JUNCTION TEMPERATURE (IN1 DISABLED)

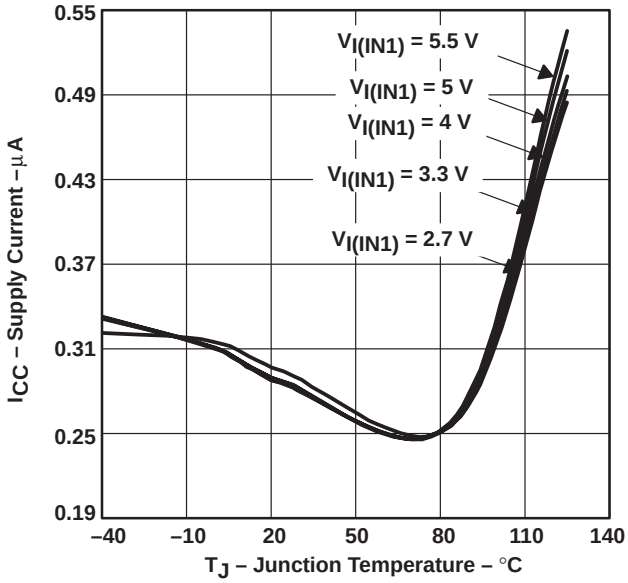


Figure 14

IN2 SUPPLY CURRENT vs JUNCTION TEMPERATURE (IN2 ENABLED)

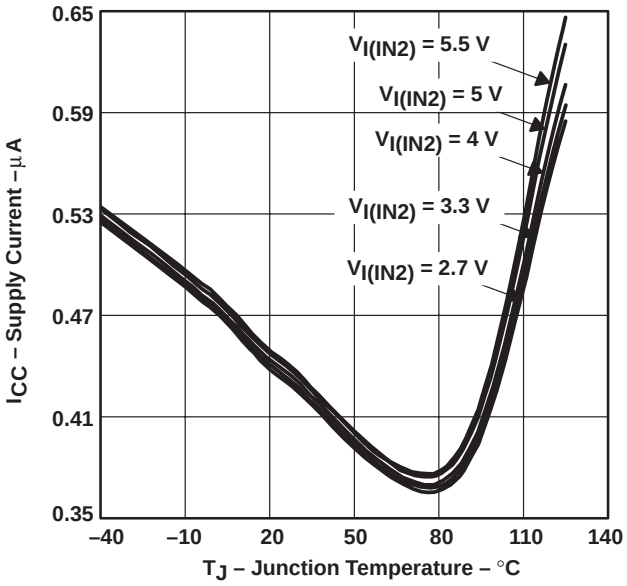


Figure 15

IN2 SUPPLY CURRENT vs JUNCTION TEMPERATURE (IN2 DISABLED)

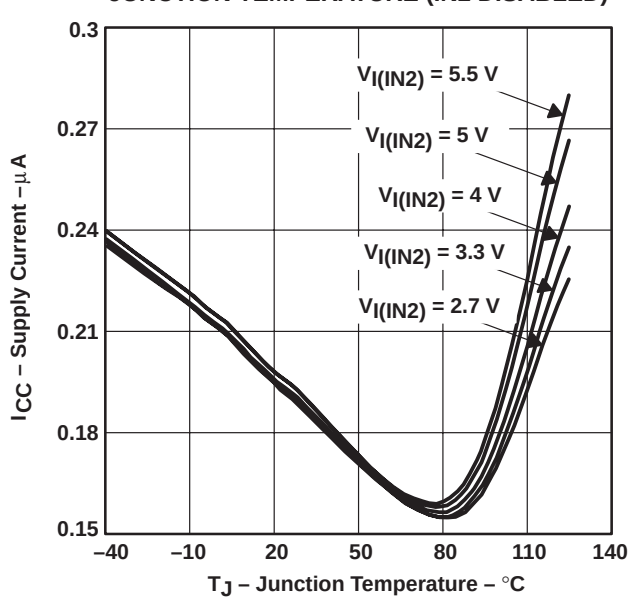


Figure 16

TYPICAL CHARACTERISTICS

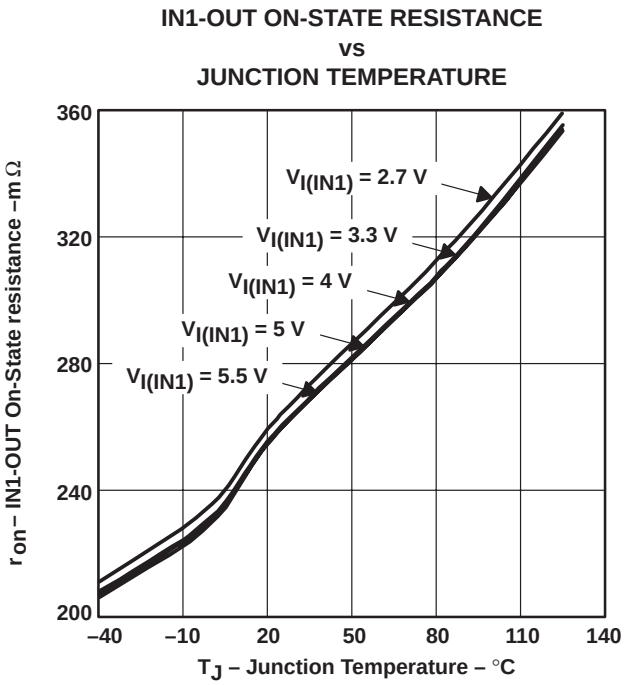


Figure 17

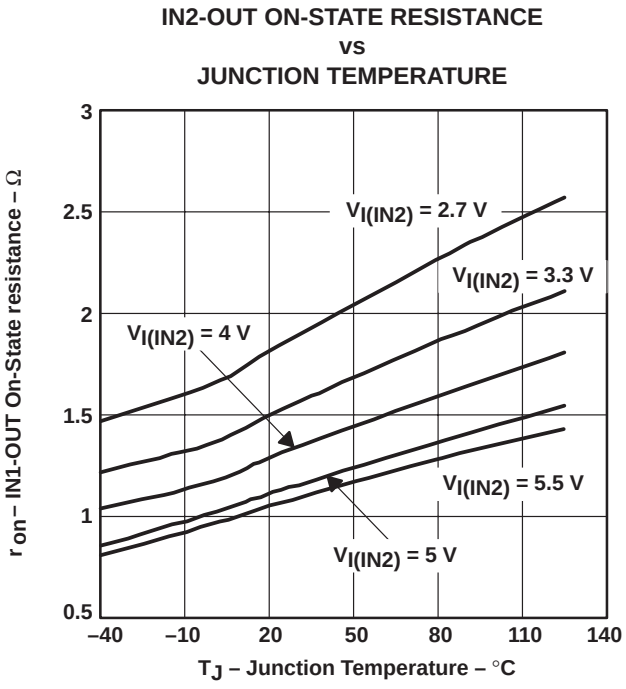


Figure 18

APPLICATION INFORMATION

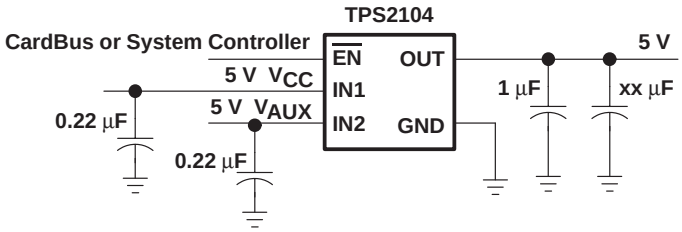


Figure 19. Typical Application

power-supply considerations

A 0.22-μF ceramic bypass capacitor between IN and GND, close to the device is recommended. The output capacitor should be chosen based on the size of the load during the transition of the switch. A 220-μF capacitor is recommended for 100-mA loads. Typical output capacitors (xx μF, shown in Figure 19) required for a given load can be determined from Figure 11 which shows the output voltage droop when output is switched from IN2 to IN1. The output voltage droop is insignificant when output is switched from IN1 to IN2. Additionally, bypassing the output with a 1-μF ceramic capacitor improves the immunity of the device to short-circuit transients.

APPLICATION INFORMATION

power supply considerations (continued)

switch transition

The n-channel MOSFET on IN1 uses a charge pump to create the gate-drive voltage, which gives the IN1 switch a rise time of approximately 0.4 ms. The p-channel MOSFET on IN2 has a simpler drive circuit that allows a rise time of approximately 4 μs. Because the device has two switches and a single enable pin, these rise times are seen as transition times, from IN1 to IN2, or IN2 to IN1, by the output. The controlled transition times help limit the surge currents seen by the power supply during switching.

thermal protection

Thermal protection provided on the IN1 switch prevents damage to the IC when heavy-overload or short-circuit faults are present for extended periods of time. The increased dissipation causes the junction temperature to rise to dangerously high levels. The protection circuit senses the junction temperature of the switch and shuts it off at approximately 145°C (T_J). The switch remains off until the junction temperature has dropped approximately 10°C. The switch continues to cycle in this manner until the load fault or input power is removed.

undervoltage lockout

An undervoltage lockout function is provided to ensure that the power switch is in the off state at power up. Whenever the input voltage falls below approximately 2 V, the power switch quickly turns off. This function facilitates the design of hot-insertion systems that may not have the capability to turn off the power switch before input power is removed. Upon reinsertion, the power switch will be turned on with a controlled rise time to reduce EMI and voltage overshoots.

power dissipation and junction temperature

The low on-resistance on the n-channel MOSFET allows small surface-mount packages, such as SOIC, to pass large currents. The thermal resistances of these packages are high compared to those of power packages; it is good design practice to check power dissipation and junction temperature. First, find r_{on} at the input voltage and operating temperature. As an initial estimate, use the highest operating ambient temperature of interest and read r_{on} from Figure 17 or Figure 18. Next calculate the power dissipation using:

$$P_D = r_{on} \times I^2$$

Finally, calculate the junction temperature:

$$T_J = P_D \times R_{\theta JA} + T_A$$

Where:

T_A = Ambient temperature

$R_{\theta JA}$ = Thermal resistance

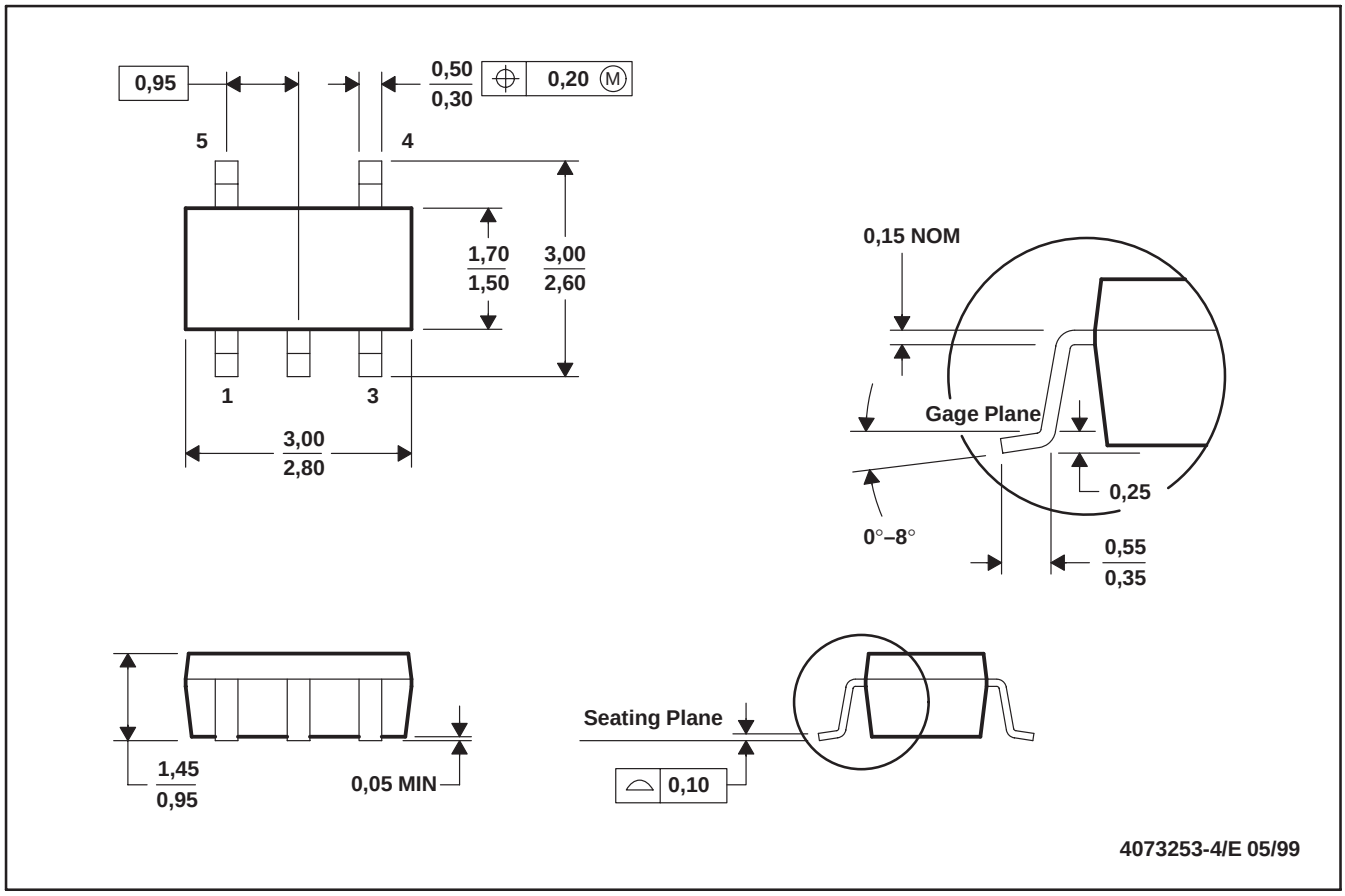
Compare the calculated junction temperature with the initial estimate. If they do not agree within a few degrees, repeat the calculation using the calculated value as the new estimate. Two or three iterations are generally sufficient to obtain a reasonable answer.

ESD protection

All TPS2104 and TPS2105 terminals incorporate ESD-protection circuitry designed to withstand a 2-kV human-body-model, 750-V CDM, and 200-V machine-model discharge as defined in MIL-STD-883C.

MECHANICAL DATA

DBV (R-PDSO-G5) **PLASTIC SMALL-OUTLINE**

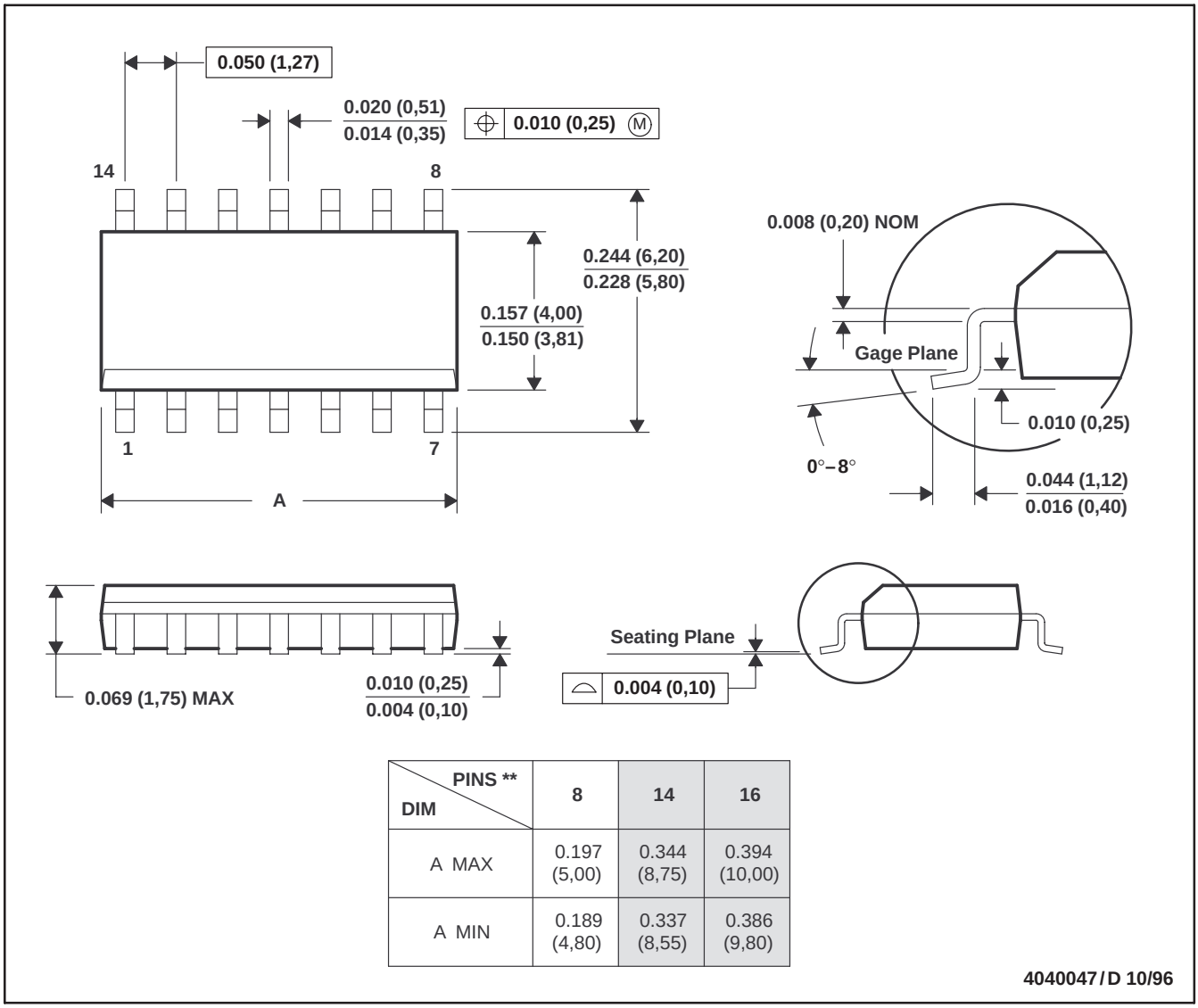


NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion.
D. Falls within JEDEC MO-178

MECHANICAL DATA

D (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14 PINS SHOWN



DIM \ PINS **	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

4040047/D 10/96

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
D. Falls within JEDEC MS-012

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TPS2104DBVR	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDLI
TPS2104DBVR.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDLI
TPS2104DBVT	Active	Production	SOT-23 (DBV) | 5	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDLI
TPS2104DBVT.A	Active	Production	SOT-23 (DBV) | 5	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDLI
TPS2105D	Active	Production	SOIC (D) | 8	75 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	2105
TPS2105D.A	Active	Production	SOIC (D) | 8	75 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	2105
TPS2105DBVR	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDMI
TPS2105DBVR.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDMI
TPS2105DBVT	Active	Production	SOT-23 (DBV) | 5	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDMI
TPS2105DBVT.A	Active	Production	SOT-23 (DBV) | 5	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDMI

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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OTHER QUALIFIED VERSIONS OF TPS2105 :

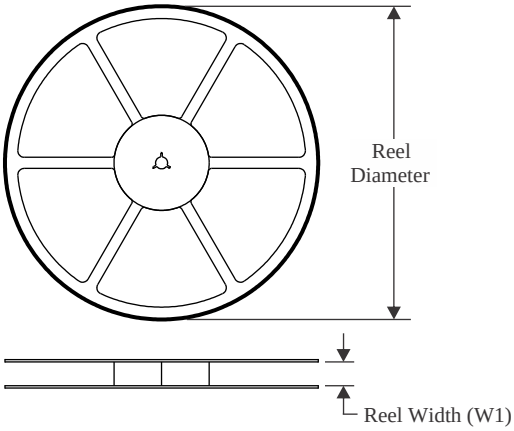
- Enhanced Product : TPS2105-EP

NOTE: Qualified Version Definitions:

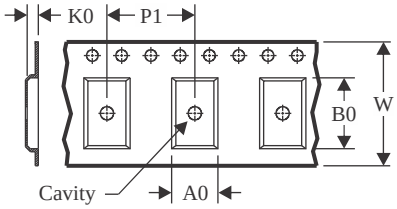
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

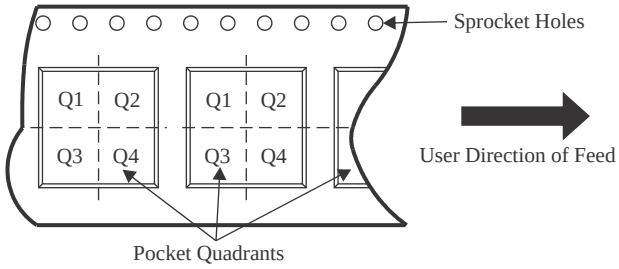


TAPE DIMENSIONS



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
P1	Pitch between successive cavity centers

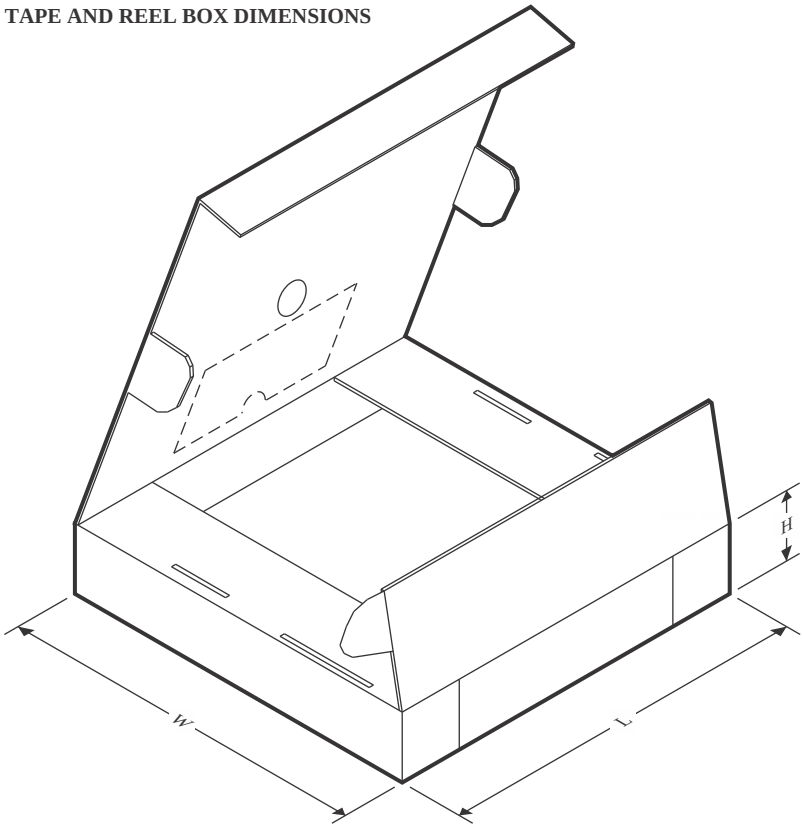
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TPS2104DBVR	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS2104DBVT	SOT-23	DBV	5	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS2105DBVR	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS2105DBVT	SOT-23	DBV	5	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3

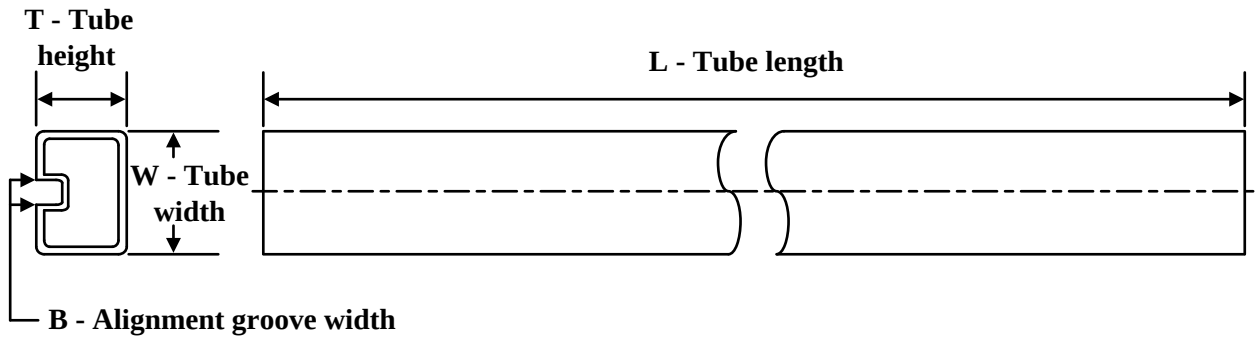
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS2104DBVR	SOT-23	DBV	5	3000	182.0	182.0	20.0
TPS2104DBVT	SOT-23	DBV	5	250	182.0	182.0	20.0
TPS2105DBVR	SOT-23	DBV	5	3000	182.0	182.0	20.0
TPS2105DBVT	SOT-23	DBV	5	250	182.0	182.0	20.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
TPS2105D	D	SOIC	8	75	505.46	6.76	3810	4
TPS2105D.A	D	SOIC	8	75	505.46	6.76	3810	4

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