NCV8450, NCV8450A

Self-Protected High Side Driver with Temperature and Current Limit

The NCV8450/A is a fully protected High−Side Smart Discrete device with a typical $R_{DS(on)}$ of 1.0 Ω and an internal current limit of 0.8 A typical. The device can switch a wide variety of resistive, inductive, and capacitive loads.

Features

- Short Circuit Protection
- Thermal Shutdown with Automatic Restart
- Overvoltage Protection
- Integrated Clamp for Inductive Switching
- Loss of Ground Protection
- ESD Protection
- Slew Rate Control for Low EMI
- Very Low Standby Current
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Automotive
- Industrial

PRODUCT SUMMARY

Symbol	Characteristics	Value	Unit
V_{IN_CL}	Overvoltage Protection	54	V
$V_{D(on)}$	Operation Voltage	4.5 − 45	V
R_{on}	On−State Resistance	1.0	Ω

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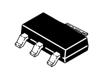
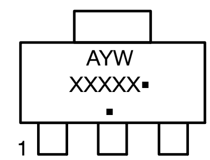
MARKING DIAGRAM



SOT−223 (TO−261) CASE 318E



XXXXX = V8450 or 8450A
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

October, 2018 − Rev. 6

Publication Order Number:
NCV8450/D

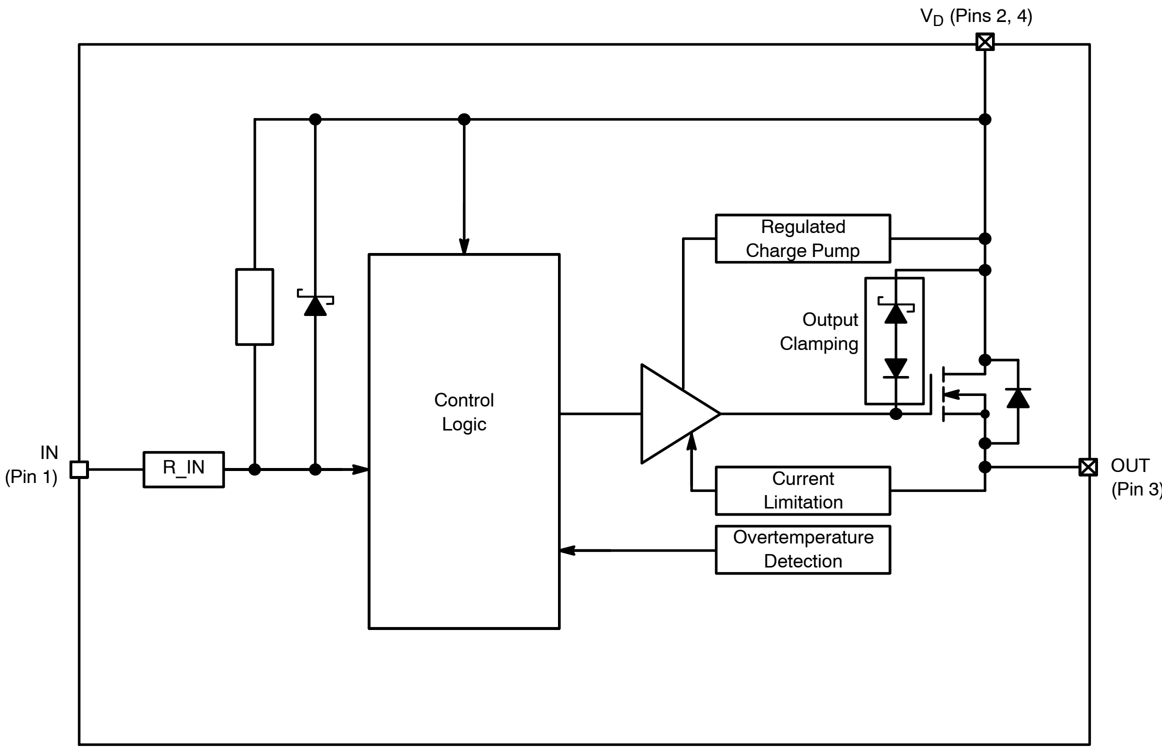


Figure 1. Block Diagram

PACKAGE PIN DESCRIPTION

Pin #	Symbol	Description
1	IN	Control Input, Active Low
2	V_D	Supply Voltage
3	OUT	Output
4	V_D	Supply Voltage

MAXIMUM RATINGS

Rating	Symbol	Value Min	Value Max	Unit
DC Supply Voltage (Note 1)	V_D	−16	45	V
Load Dump Protection (Rl = 2 Ω, t_d = 400 ms, V_{IN} = 0, 10 V, I_L = 150 mA, V_{bb} = 13.5 V)	$V_{Loaddump}$		85	V
Input Current	I_{in}	−15	15	mA
Output Current (Note 1)	I_{out}		Internally Limited	A
Total Power Dissipation @ T_A = 25°C (Note 2) @ T_A = 25°C (Note 3)	P_D	 1.13 1.60		W
Electrostatic Discharge (Note 4) (Human Body Model (HBM) 100 pF/1500 Ω) Input All other			 1 5	kV
Single Pulse Inductive Load Switching Energy (Note 4) (V_{DD} = 13.5 V, I = 465 mApk, L = 200 mH, T_{JStart} = 150°C)	E_{AS}		29	mJ
Operating Junction Temperature	T_J	−40	+150	°C
Storage Temperature	$T_{storage}$	−55	+150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Reverse Output current has to be limited by the load to stay within absolute maximum ratings and thermal performance.
2. Minimum Pad.
3. 1 in square pad size, FR−4, 1 oz Cu.
4. Not subjected to production testing.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max Value	Unit
Thermal Resistance (Note 5) Junction−to−Ambient (Note 2) Junction−to−Ambient (Note 3)	 $R_{\theta JA}$ $R_{\theta JA}$	 110 78.3	K/W

5. Not subjected to production testing.

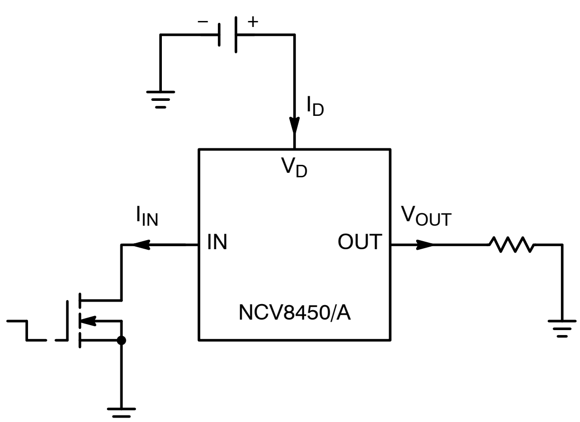


Figure 2. Applications Test Circuit

ELECTRICAL CHARACTERISTICS (6 ≤ V_D ≤ 45 V; −40°C < T_J < 150°C unless otherwise specified)

Rating	Symbol	Conditions	Value Min	Value Typ	Value Max	Unit
OUTPUT CHARACTERISTICS						
Operating Supply Voltage	V_{SUPPLY}		4.5	–	45	V
On Resistance (Pin 1 Connected to GND)	R_{ON}	T_J = 25°C , I_{OUT} = 150 mA, V_D = 7 V – 45 V T_J = 150°C, I_{OUT} = 150 mA, V_D = 7 V – 45 V (Note 6) T_J = 25°C , I_{OUT}= 150 mA, V_D = 6 V		1.0 1.4 1.1	2 3 2.1	Ω
Standby Current (Pin 1 Open)	I_D	V_D ≤ 20 V V_D > 20 V		0.6	10 100	μA
INPUT CHARACTERISTICS						
Input Current – Off State	I_{IN_OFF}	V_{OUT} ≤ 0.1 V, R_L = 270 Ω, T_J = 25°C V_{OUT} ≤ 0.1V, R_L = 270 Ω, T_J = 150°C (Note 6)	−50 −40			μA
Input Current – On State (Pin 1 Grounded)	I_{IN_ON}			1.5	3	mA
Input Resistance (Note 6)	R_{IN}			1		kΩ
SWITCHING CHARACTERISTICS						
Turn−On Time (Note 7) (V_{IN} = V_D to 0 V) to 90% V_{OUT}	t_{ON}	R_L = 270 Ω (Note 6) V_D = 13.5 V, R_L = 270 Ω, T_J = 25°C		30	125 100	μs
Turn−Off Time (Note 7) (V_{IN} = 0 V to V_D) to 10% V_{OUT}	t_{OFF}	R_L = 270 Ω (Note 6) V_D = 13.5 V, R_L = 270 Ω, T_J = 25°C		60	175 150	μs
Slew Rate On (Note 7) (V_{IN} = V_D to 0V) 10% to 30% V_{OUT}	dV/dt_{ON}	R_L = 270 Ω (Note 6) V_D = 13.5 V, R_L = 270 Ω, T_J = 25°C		0.7	4 4	V/μs
Slew Rate Off (Note 7) (V_{IN} = 0 V to V_D) 70% to 40% V_{OUT}	dV/dt_{OFF}	R_L = 270 Ω (Note 6) V_D = 13.5 V, R_L = 270 Ω, T_J = 25°C		0.9	4 4	V/μs
OUTPUT DIODE CHARACTERISTICS (Note 6)						
Drain−Source Diode Voltage	V_F	I_{OUT} = −0.2 A		0.6		V
Continuous Reverse Drain Current	I_S	T_J = 25°C			0.2	A
PROTECTION FUNCTIONS (Note 8)						
Temperature Shutdown (Note 6)	T_{SD}		150	175	–	°C
Temperature Shutdown Hysteresis (Note 6)	T_{SD_HYST}			5		°C
Output Current Limit	I_{LIM}	T_J = −40°C, V_D = 13.5 V, t_m = 100 μs (Note 6) T_J = 25 °C, V_D = 13.5 V, t_m = 100 μs T_J = 150 °C , V_D = 13.5 V, t_m = 100 μs (Note 6)	0.5	0.8	1.5	A
Output Clamp Voltage (Inductive Load Switch Off) At V_{OUT} = V_D − V_{CLAMP}	V_{CLAMP}	I_{OUT} = 4 mA	45	52		V
Overvoltage Protection	V_{IN_CL}	I_{CLAMP} = 4 mA	50	54		V

6. Not subjected to production testing
7. Only valid with high input slew rates
8. Protection functions are not designed for continuous repetitive operation and are considered outside normal operating range

TYPICAL CHARACTERISTIC CURVES

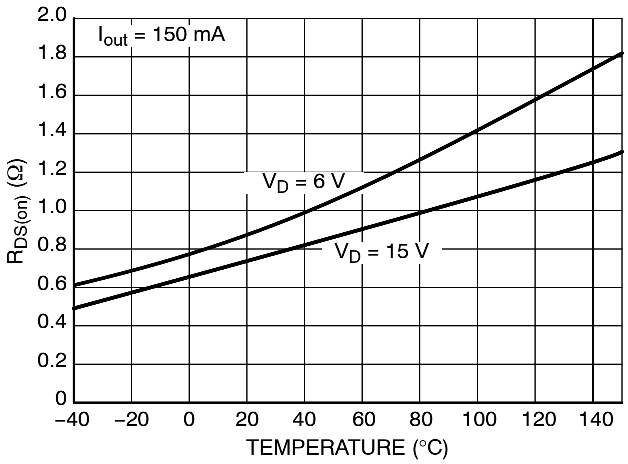


Figure 3. $R_{DS(on)}$ vs. Temperature

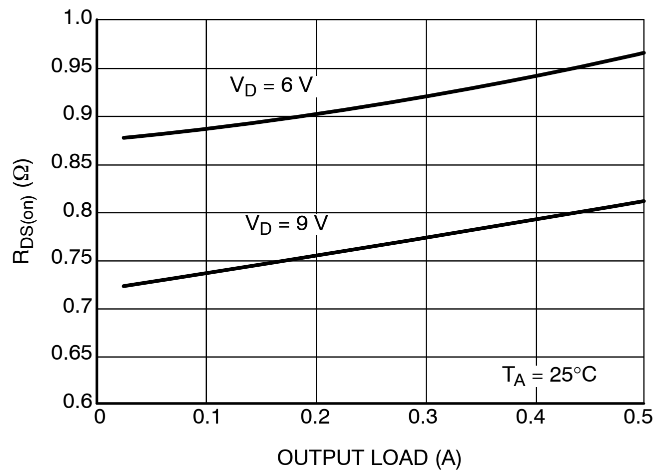


Figure 4. $R_{DS(on)}$ vs. Output Load

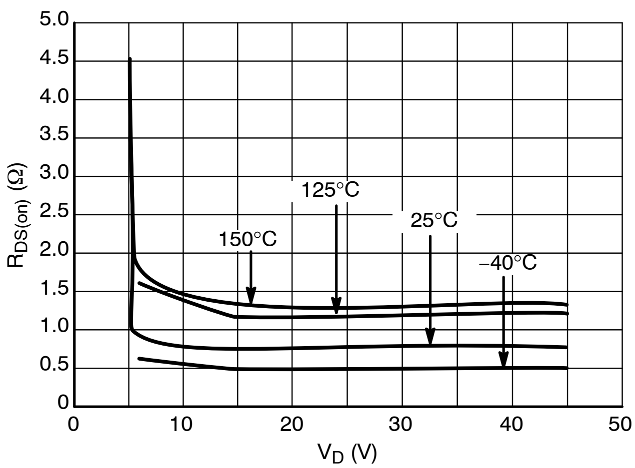


Figure 5. $R_{DS(on)}$ vs. V_D

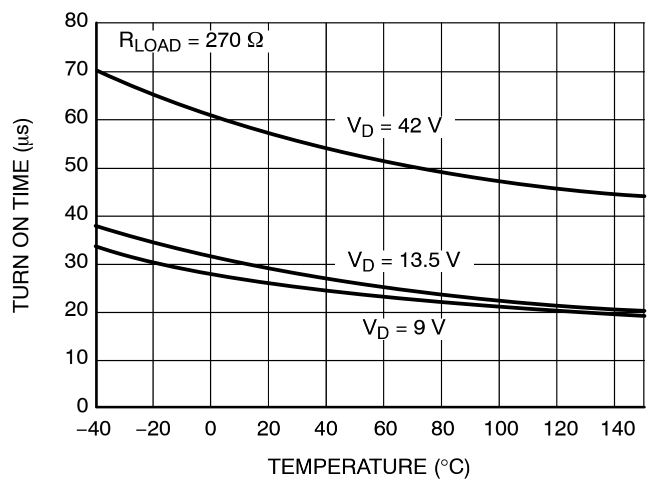


Figure 6. Turn On Time vs. Temperature

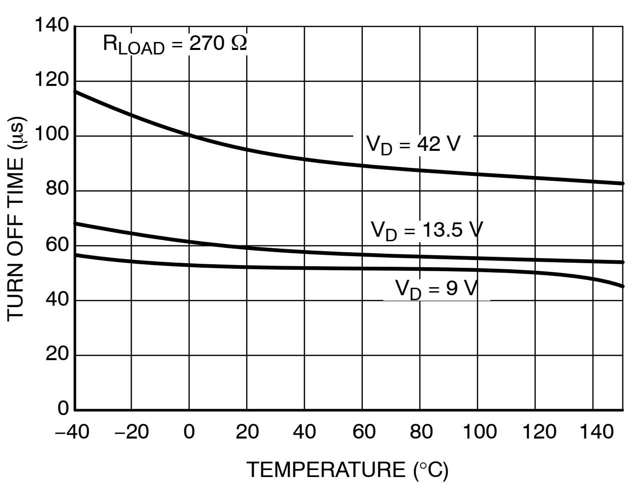


Figure 7. Turn Off Time vs. Temperature

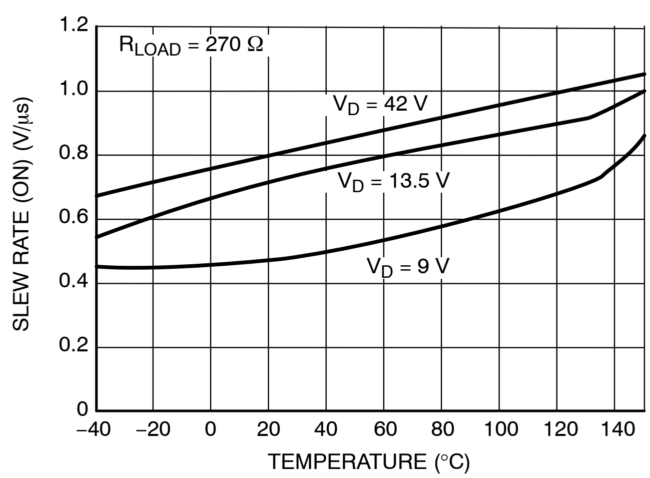


Figure 8. Slew Rate (ON) vs. Temperature

TYPICAL CHARACTERISTIC CURVES

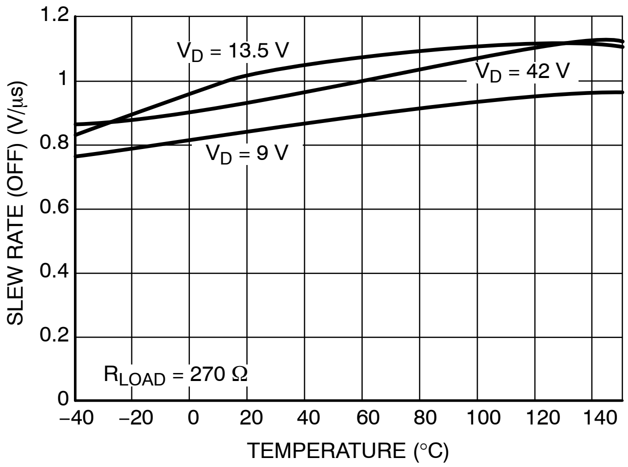


Figure 9. Slew Rate (OFF) vs. Temperature

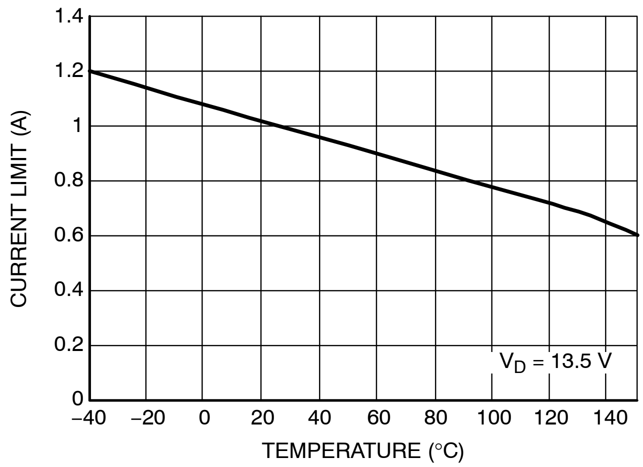


Figure 10. Current Limit vs. Temperature

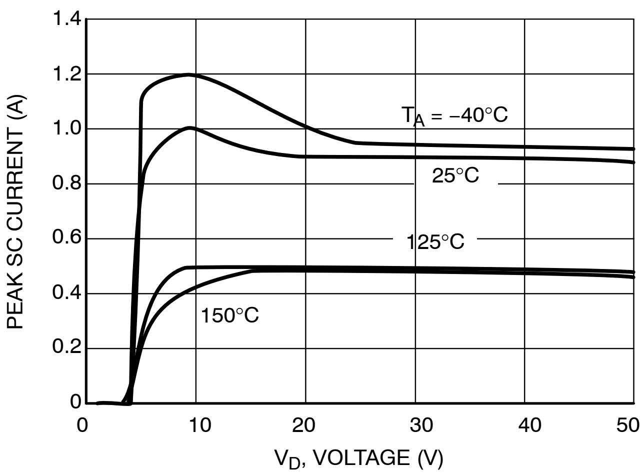


Figure 11. Peak Short Circuit Current vs. V_D Voltage

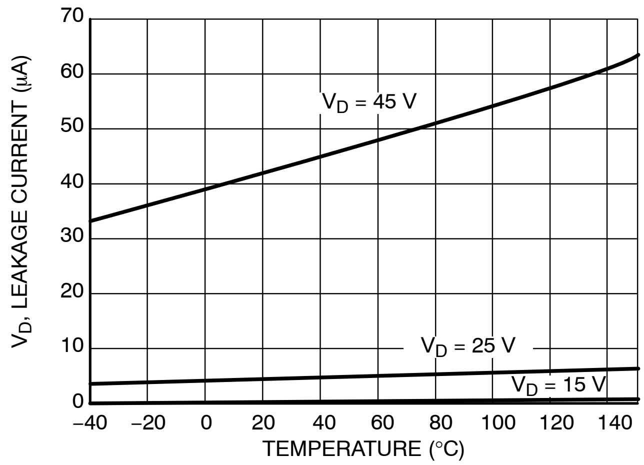


Figure 12. V_D Leakage Current vs. Temperature Off−State

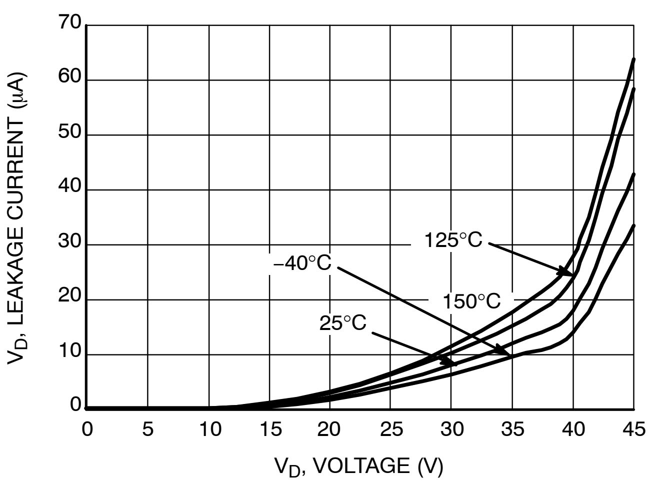


Figure 13. V_D Leakage Current vs. V_D Voltage Off−State

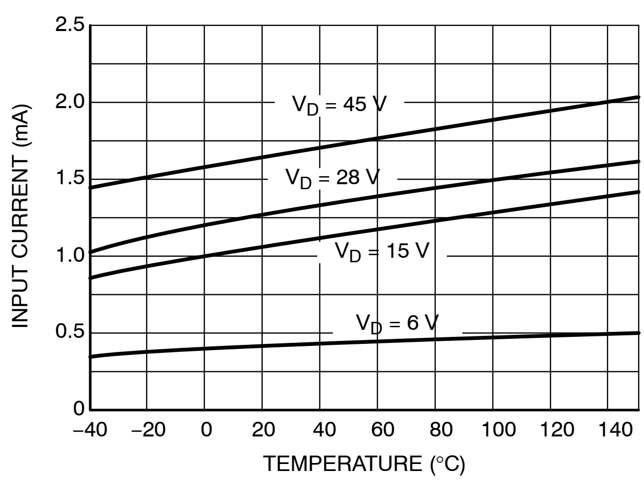


Figure 14. On−State Input Current vs. Temperature

TYPICAL CHARACTERISTIC CURVES

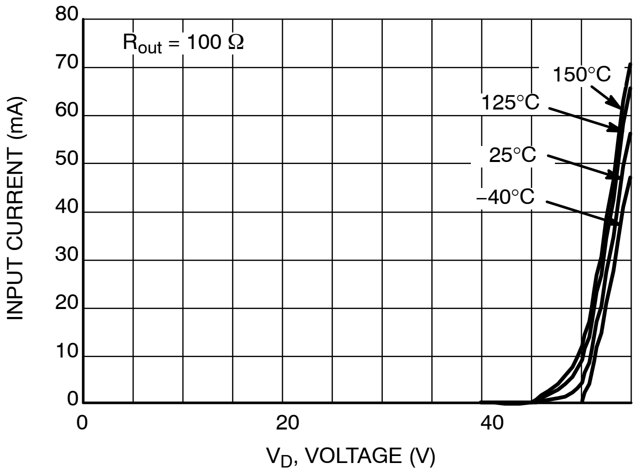


Figure 18. Input Current vs. V_D Voltage Off−State

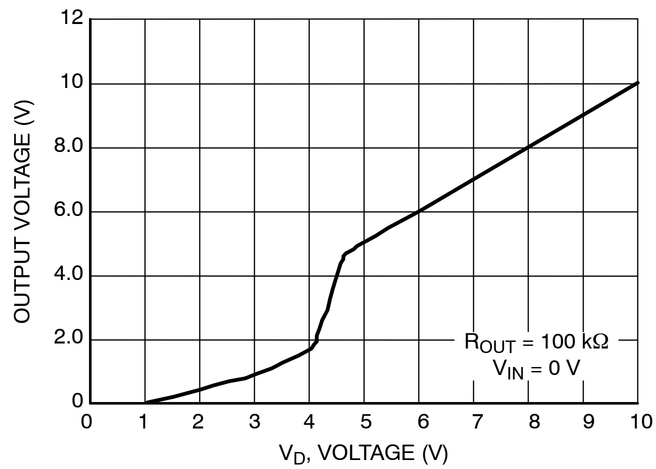


Figure 15. Output Voltage vs. V_D Voltage

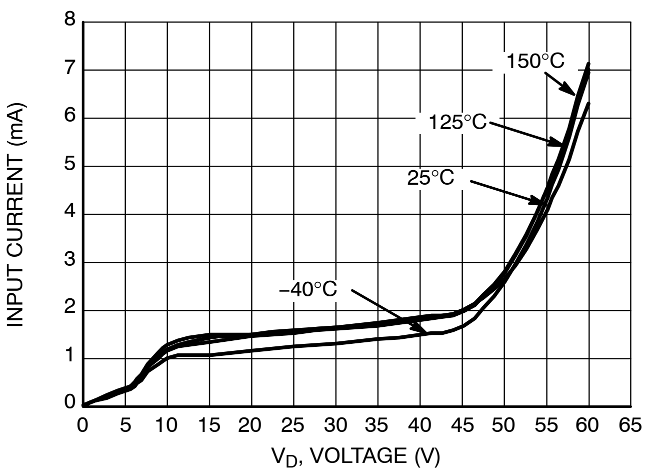


Figure 16. Input Current vs. V_D Voltage On−State

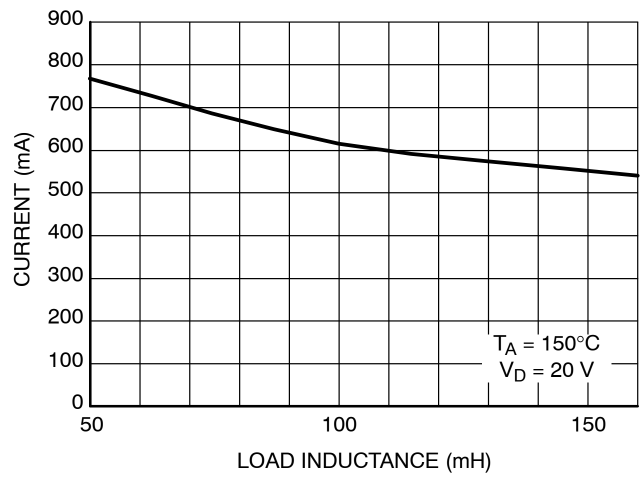


Figure 17. Single Pulse Maximum Switch−off Current vs. Load Inductance

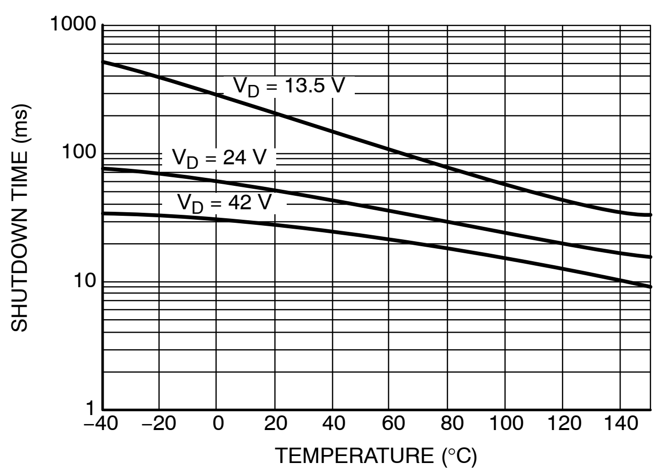


Figure 19. Initial Short−Circuit Shutdown Time vs. Temperature

TYPICAL CHARACTERISTIC CURVES

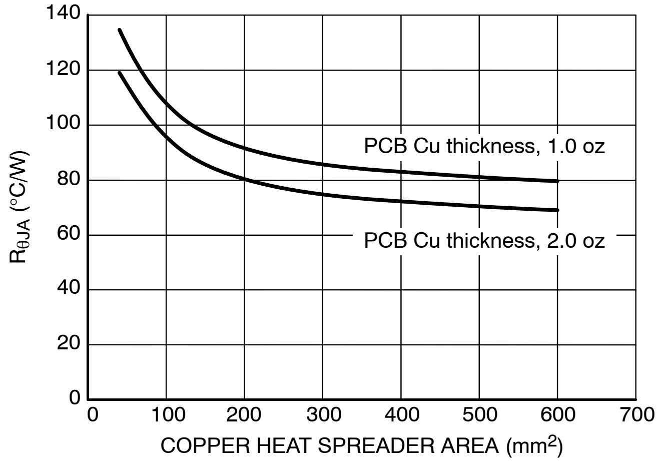


Figure 20. $R_{\theta JA}$ vs. Copper Area

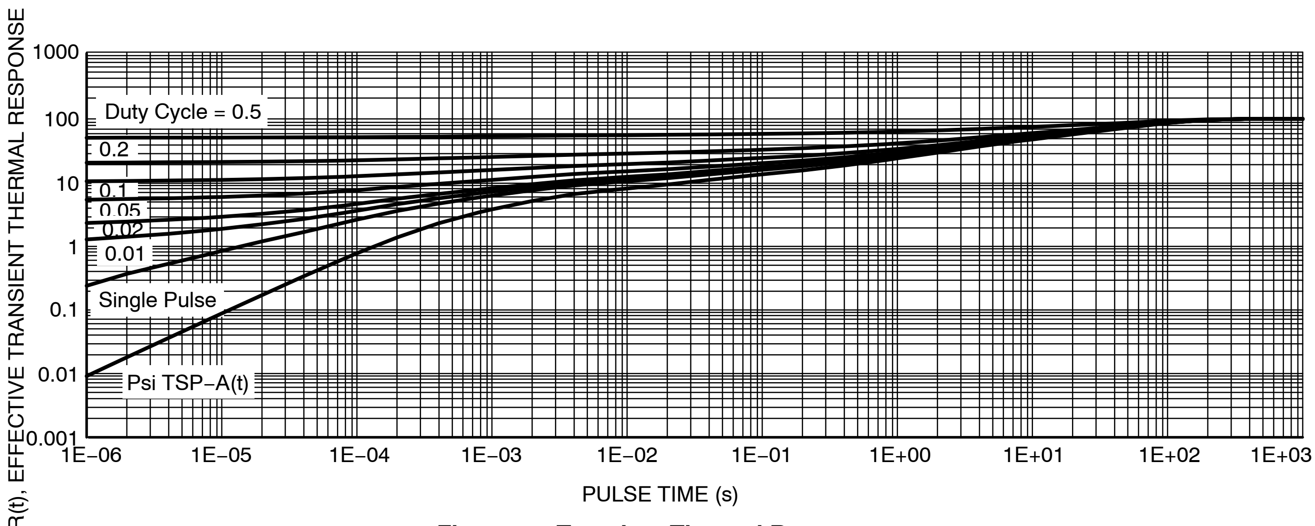


Figure 21. Transient Thermal Response

ISO PULSE TEST RESULTS

Test Pulse	Test Level	Test Results	Pulse Cycle Time and Generator Impedance
1	200 V	C	500 ms, 10 Ω
2	150 V	C	500 ms, 10 Ω
3a	200 V	C	100 ms, 50 Ω
3b	200 V	C	100 ms, 50 Ω
5	175 V	E(100 V)	400 ms, 2 Ω

ORDERING INFORMATION

Device	Package	Shipping†
NCV8450STT3G	SOT−223 (Pb−Free)	4000 / Tape & Reel
NCV8450ASTT3G	SOT−223 (Pb−Free)	4000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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