Product Change Notification

Part Number VLA539-01R
Last Time Buy Notification
: 2022-021 Rev.: 00

Date: December 13, 2022

Author: John Yurack

Parts Subject of Change:

VLA539-01R

Description of Change:

Production of the part number VLA539-01R will be discontinued and the part will be made End of Life (EOL).
Powerex is offering a last time buy opportunity for these parts.

The part number VLA552-01R is suggested for a replacement. However, it is not pin compatible with the VLA539-01R so it is not a drop-in replacement.

Reason for Change:

The optocoupler used in the construction of the VLA539-01R was made end of life by the supplier.

Identification of Change:

This section is not applicable.
Changes will be dependent on the part selected for a replacement.

Time Schedule for Change:

Please contact Powerex to negotiate your requirements and notify us of your intent to execute a last time purchase of the VLA539-01R

LTB Terms:

- Date for last order acceptance -- **February 24, 2023**
- Date for last order shipments -- **December 29, 2023 (subject to the availability of materials)**
- All LTB orders will be considered Non-Cancellable and Non-Returnable

Supporting Documentation:

Data sheets for the VLA539-01R and VLA552-01R

Quality Management system:

Parts are manufactured in a manufacturing partner facility that has a Quality Management System that is in compliance with the requirements of ISO9001.

Product Change Notification

Customer Approval for: PCN # 2022-021 Rev. 00

- Please check the appropriate box and return this form to Powerex or our manufacturing representative within 30 days.
- According to JEDEC Standard JESD46, a lack of response to this product change notification within 30 days constitutes the customer's acceptance of the change.

☐ We agree with this change and its schedule.

☐ We have objection(s) as noted here:

☐ We request additional information:

Customer: **Signature:**

Product Change Notification

PCN 2022-021

Comparison of VLA539-01R and VLA552-01R

Absolute Maximum Ratings, Ta = 25°C unless otherwise specified

Characteristics	Symbol	VLA539-01R	VLA552-01R	Units
Supply Voltage, DC	V_D	-1 ~ 16.5	-1 ~ 16.5	V
Input Signal Voltage (Applied between pin 6-7, 50% duty cycle, pulse width 1 ms)	V_i	-1 ~ 7	-7 ~ 7	V
Output Current (Pulse width 3µs)	I_{OHP}	-24	-24	A
	I_{OLP}	24	24	A
Isolation Voltage (sine wave voltage 60 Hz for 1 minute)	V_{ISO}	4000	4000	V_{RMS}
Case Temperature	T_C	100	100	°C
Operating Temperature (no condensation allowable)	T_{opr}	-20 to 60	-25 to 70	°C
Storage Temperature (no condensation allowable)	T_{stg}	-25 to 100	-40 to 100	°C
Fault Output Current (applied pin 28)	I_{FO}	20	20	mA
Input Voltage to Pin 30 (applied pin 30)	V_{R30}	60	60	V
Gate Drive Current	I_{drive}	210	210	mA

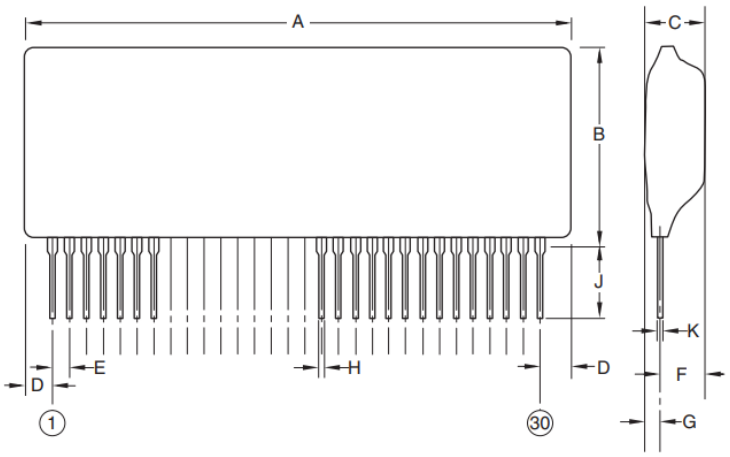
Electrical Characteristics (unless otherwise noted, T_a=25°C, V_D= 15V, R_g= 1Ω, C_L=1.6 µF, f=3kHZ)

			VLA539-01R			VLA552-01R			
Characteristics	**Symbol**	**Test conditions**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**
Supply Voltage	V_D	Recommended Range	14.2	15	15.8	14.2	15	15.8	V
Pull-up Voltage on Input Side	V_{IN}	Recommended Range	4.75	5	5.25	4.75	5	5.25	V
Input Signal Current	I_{IH}	Recommended Range	10	12	16	10	12	16	mA
Switching Frequency	f	Recommended Range	—	—	10	—	—	10	kHz
Gate Resistance	R_G	Recommended Range	0.33	—	—	0.33	—	—	Ω
Input Signal Current	I_H	V_{IN}= 5V, HCMOS Drive	—	12	—	—	12	—	mA
Gate Positive Supply Voltage	V_{CC}		15.2	16.5	17.5	15.2	16.5	17.5	V
Gate Negative Supply Voltage	V_{EE}		-6	-8	-11	-6	-8	-11	V
Gate Supply Efficiency	E_{ta}	Load Current = 210 mA	60	72	—	60	72	—	%
“H” Output Voltage	V_{OH}		14	15.3	16.5	14	15.3	16.5	V
“L” Output Voltage	V_{OL}		-5.5	-7	-11	-5.5	-7	-11	V
“L-H” Propagation Time	t_{PLH}	I_{IH} =12 mA	0.5	0.9	1.5	0.3	—	1	µs
“L-H” Rise Time	t_r	I_{IH} =12 mA	—	0.6	1.2	—	0.6	1.2	µs
“H-L” Propagation Time	t_{PHL}	I_{IH} =12 mA	0.5	1	1.5	0.3	—	1	µs
“H-L” Fall Time	tf	I_{IH} =12 mA	—	0.3	1.2	—	0.3	1.2	µs
Timer	t_{timer}	Between start and cancel (under input signal “OFF”)	1	—	2	1	—	2	ms
Fault Output Current	I_{FO}	Applied pin 28, R= 4.7kΩ	—	5	—	—	5	—	mA
Controlled Time Detect Short-Circuit 1	t_{trip1}	Pin 30: 15V and more, Pin 29: Open	—	3.5	—	—	3.5	—	µs
Controlled Time Detect Short-Circuit 2	t_{trip2}	Pin 30: 15V and more, Pin 29-21,22: 10pF (connective capacitance)	—	3.9	—	—	3.9	—	µs
Short Circuit Detect Voltage	V_{SC}	Collector voltage of IGBT module	15	—	—	15	—	—	V

Product Change Notification

PCN 2022-021

Comparison of VLA539-01R and VLA552-01R



VLA539-01R

Dimension	Inches	Millimeters
A	3.46 Max.	88.0 Max.
B	1.65 Max.	42.0 Max
C	0.67 Max.	17.0 Max.
D	0.31 Max.	8.0 Max.
E	0.1	2.54
F	0.45 Max.	11.5 Max.
G	0.24 Max.	6.0 Max.
H	0.03±0.004	0.75±0.1
J	0.14±0.04	3.5±1.0
K	0.028 Max.	0.7 Max.

VLA552-01R

Dimension	Inches	Millimeters
A	3.46 Max.	88.0 Max.
B	1.67 Max.	42.5 Max
C	0.67 Max.	17.0 Max.
D	0.31 Max.	8.0 Max.
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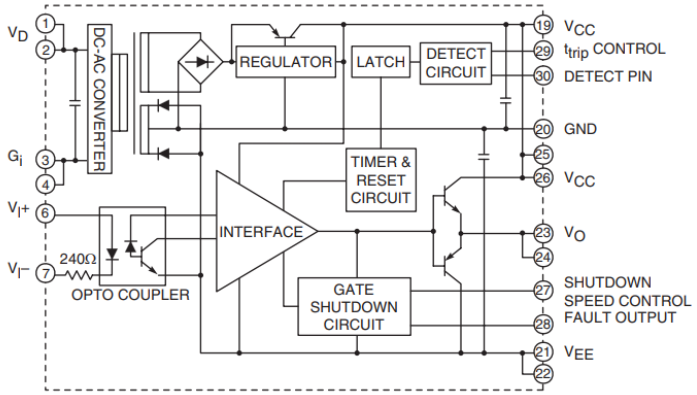
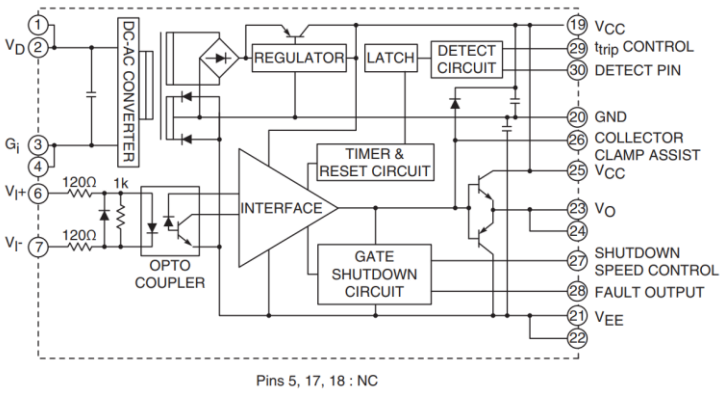
VLA539-01R Circuit Diagram



VLA552-01R Circuit Diagram



Pins 5, 17, 18 : NC

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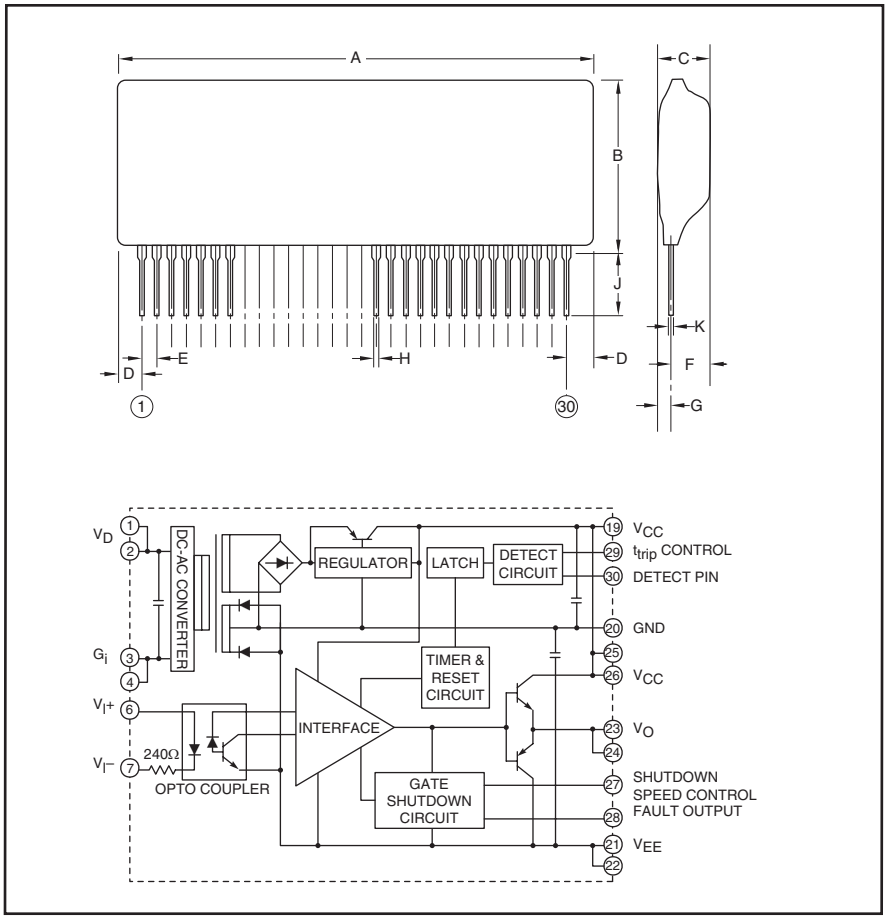
Hybrid IC IGBT Gate Driver + DC/DC Converter



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	3.46 Max.	88.0 Max.
B	1.65 Max.	42.0 Max.
C	0.67 Max.	17.0 Max.
D	0.31 Max.	8.0 Max.
E	0.1	2.54
F	0.45 Max.	11.5 Max.
G	0.24 Max.	6.0 Max.
H	0.03±0.004	0.75±0.1
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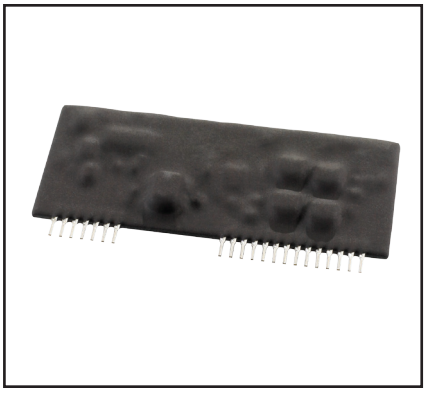
K	0.028 Max.	0.7 Max.



Description:
VLA539-01R is a hybrid integrated circuit designed for driving IGBT modules. This device is a fully isolated gate drive circuit consisting of an optically isolated gate drive amplifier and an isolated DC-to-DC converter. The gate driver provides an over-current protection function based on desaturation detection.

Features:
- ☐ Built-in Isolated DC-DC Converter for Gate Drive
- ☐ SIP Outline Allows More Space on Mounting Area
- ☐ Built-in Short Circuit Protection (With a Pin for Fault Output)
- ☐ Variable Fall Time on Short-Circuit Protection
- ☐ Electrical Isolation Voltage Between Input and Output (4000 V_{rms} for 1 Minute)
- ☐ CMOS, TTL Compatible Input

Application:
To Drive IGBT modules for general industrial use apparatus.

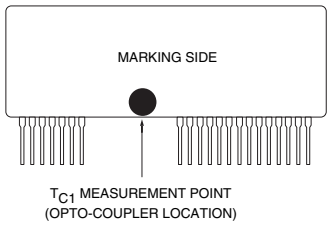
Recommended IGBT Modules:
V_{CES} = 600V Series Up to 600A
V_{CES} = 1200V Series Up to 3600A
V_{CES} = 1700V Series Up to 3600A

VLA539-01R
Hybrid IC Gate Driver +
DC/DC converter

Absolute Maximum Ratings, T_a = 25°C unless otherwise specified

Characteristics	Symbol	VLA539-01R	Units
Supply Voltage, DC	V_D	-1 ~ 16.5	Volts
Input Signal Voltage (Applied between Pin 6-7, 50% Duty Cycle, Pulse Width 1ms)	V_i	-1 ~ 7	Volts
Output Current (Pulse Width 3µs)	I_{OHP}	-24	Amperes
	I_{OLP}	24	Amperes
Isolation Voltage (Sine Wave Voltage 60HZ, for 1 Minute, R.H. <60%)	V_{ISO}	4000	V_{rms}
Case Temperature1 (Surface Temperature Opto-coupler Location)***	T_{C1}	85	°C
Case Temperature2 (Surface Temperature Except Opto-coupler Location)	T_{C2}	100	°C
Operating Temperature (No Condensation Allowable)	T_{opr}	-20 to 60	°C
Storage Temperature (No Condensation Allowable)	T_{stg}	-25 to 100*	°C
Fault Output Current (Applied Pin 28)	I_{FO}	20	mA
Input Voltage to Pin 30 (Applied Pin 30)	V_{R30}	60	Volts
Gate Drive Current (Average)	I_{drive}	210**	mA

*Differs from temperature cycle condition.
**Refer to I_{drive} VS. T_a CHARACTERISTICS (TYPICAL) graph. (Needs Derating)
***T_{C1} Measurement Point (opto-coupler location)



Electrical and Mechanical Characteristics,

T_a = 25°C unless otherwise specified, V_D = 15V, R_G = 1Ω, CL = 1.6µF, f= 3kHz

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_D	Recommended Range	14.2	15	15.8	Volts
Pull-up Voltage on Input Side	V_{IN}	Recommended Range	4.75	5	5.25	Volts
Input Signal Current	I_{IH}	Recommended Range	10	12	16	mA
Switching Frequency	f	Recommended Range	—	—	10	kHz
Gate Resistance	R_G	Recommended Range	0.33	—	—	Ω
Input Signal Current	I_{IH}	V_{IN} = 5V, HCMOS Drive	—	12	—	mA
Gate Positive Supply Voltage	V_{CC}	—	15.2	16.5	17.5	Volts
Gate Negative Supply Voltage	V_{EE}	—	-6	-8	-11.5	Volts
Gate Supply Efficiency	E_{ta}	Load Current = 210mA $E_{ta} = (V_{CC} + \|V_{EE}\|) \times 0.21 / (15 \times I_D) \times 100$	60	75	—	%
"H" Output Voltage	V_{OH}	10kΩ Connected Between Pin 23-20	14	15.3	16.5	Volts
"L" Output Voltage	V_{OL}	10kΩ Connected Between Pin 23-20	-5.5	-7	-11	Volts
"L-H" Propagation Time	t_{PLH}	I_{IH} = 12mA	0.5	0.9	1.5	µs
"L-H" Rise Time	t_r	I_{IH} = 12mA	—	0.6	1.2	µs
"H-L" Propagation Time	t_{PHL}	I_{IH} = 12mA	0.5	1.0	1.5	µs
"H-L" Fall Time	t_f	I_{IH} = 12mA	—	0.3	1.2	µs
Timer	t_{timer}	Between Start and Cancel (Under Input Sign "L")	1	—	2	ms
Fault Output Current	I_{FO}	Applied Pin 28, R = 4.7kΩ	—	5	—	mA
Controlled Time Detect Short-Circuit 1	t_{trip1}	Pin 30 : 15V and More, Pin 29 : Open	—	3.5	—	µs
Controlled Time Detect Short-Circuit 2*	t_{trip2}	Pin 30 : 15V and More, Pin 29-21, 22 : 10pF (Connective Capacitance)	—	3.9	—	µs
SC Detect Voltage	V_{SC}	Collector Voltage of IGBT	15	—	—	Volts

*Length of wiring from C_{trip} to Pins 21, 22, and 29 must be less than 5cm.

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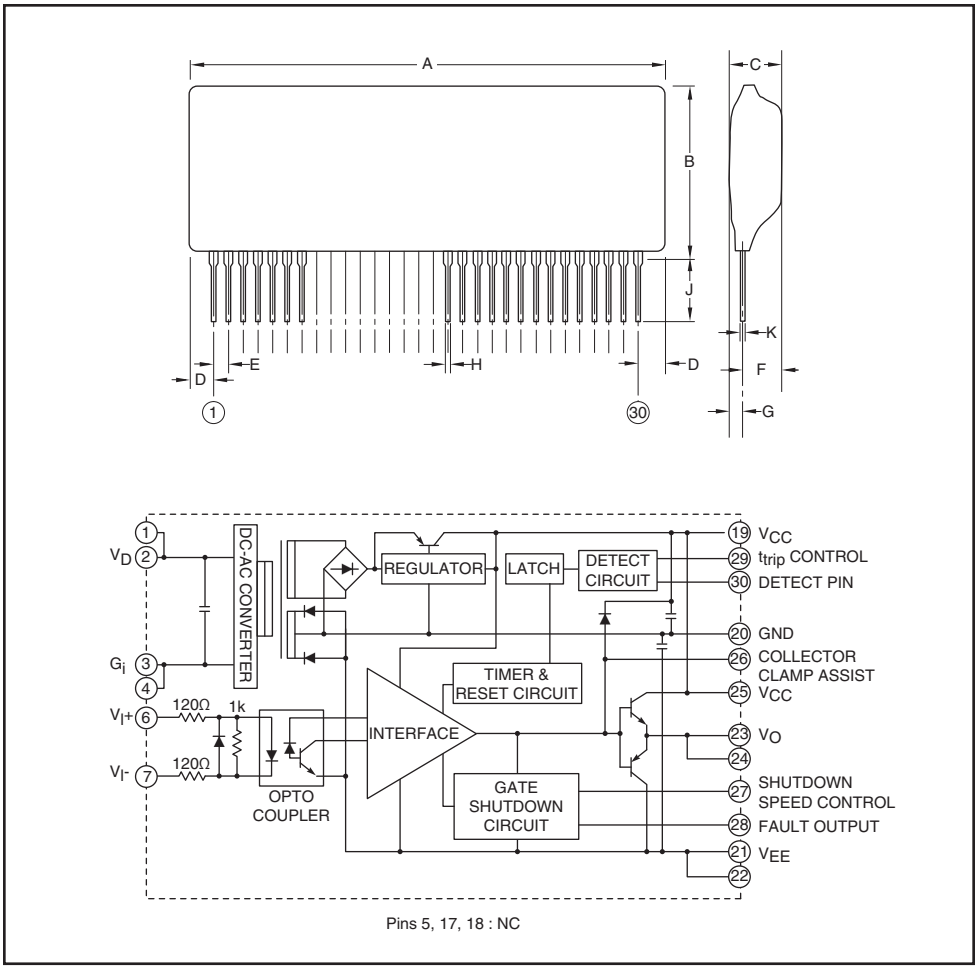
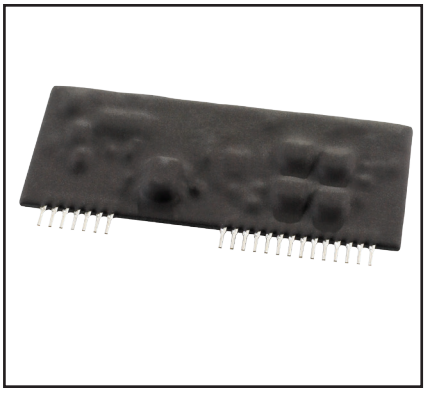
VLA552-01R

IGBT Gate Driver + DC/DC Converter



Circuit Diagram

Dimensions	Inches	Millimeters
A	3.46 Max.	88.0 Max.
B	1.67 Max.	42.5 Max.
C	0.67 Max.	17.0 Max.
D	0.31 Max.	8.0 Max.
E	0.1	2.54
F	0.45 Max.	11.5 Max.
G	0.24 Max.	6.0 Max.
H	0.03±0.004	0.75±0.1
J	0.14±0.04	3.5±1.0
K	0.028 Max.	0.7 Max.



Description:
VLA552-01R is a hybrid integrated circuit designed for driving n-channel IGBT modules in any gate-amplifier application. This device is a fully isolated gate drive circuit consisting of an optically isolated gate drive amplifier and an isolated DC-DC converter. The gate driver provides an over-current protection function based on desaturation detection.

Features:
- ☐ Built in Isolated DC-DC Converter for Gate Drive
- ☐ SIP Outline Allows More Space
- ☐ Built in Short Circuit Protection with a pin for Fault Output
- ☐ Built in Collector Clamp Circuit
- ☐ Variable Fall Time on Short-Circuit Protection
- ☐ Electrical Isolation Voltage 4000 V_{rms} (for 1 Minute)
- ☐ CMOS Compatible Input Interface

Applications:
- ☐ To Drive IGBT Modules for General Industrial Use.

Recommended IGBT Modules:
V_{CES} = 1200V Series up to 3600A Class
V_{CES} = 1700V Series up to 3600A Class

Absolute Maximum Ratings, T_a = 25°C unless otherwise specified

Characteristics	Symbol	Rating	Units
Supply Voltage (DC)	V_D	-1 ~ 16.5	Volts
Input Signal Voltage (Applied Between Pins 6-7, 50% Duty Cycle, Pulse Width 1ms)	V_I	-7 ~ +7	Volts
Output Peak Current (Pulse Width 3µs)	I_{OHP}	-24	Amperes
	I_{OLP}	24	Amperes
Isolation Voltage (Sine Wave Voltage 60Hz, for 1 min., R.H. <60%)	V_{iso}	4000	V_{rms}
Case Temperature (Surface Temperature)	T_C	100	°C
Operating Temperature (No Condensation Allowable)	T_{opr}	-25 ~ 70	°C
Storage Temperature (No Condensation Allowable)	T_{stg}	-40 ~ 100*1	°C
Fault Output Current (Applied at Pin 28)	I_{FO}	20	mA
Input Voltage to Pin 30 (Applied at Pin 30)	V_{R30}	60	Volts
Gate Drive Current (Gate Average Current)	I_{drive}	210*2	mA

Electrical Characteristics, T_a = 25°C, V_D = 15V, R_G = 1Ω, C_L = 1.6µF, f = 3kHz unless otherwise specified

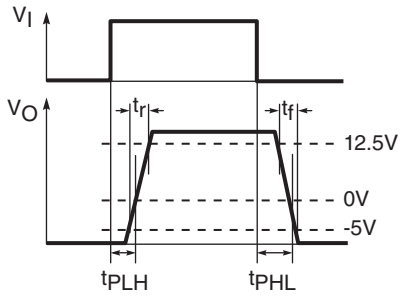
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_D	Recommended Range	14.2	15	15.8	Volts
Pull-up Voltage on Input Side	V_{IN}	Recommended Range	4.75	5	5.25	Volts
Input Signal Current	I_{IH}	Recommended Range	10	12	16	mA
Switching Frequency	f	Recommended Range	—	—	10	kHz
Gate Resistance	R_G	Recommended Range	0.33	—	—	Ω
Input Signal Current	I_{IH}	V_{IN} = 5V, HCMOS Drive	—	12	—	mA
Gate Positive Supply Voltage	V_{CC}		15.2	16.5	17.5	Volts
Gate Negative Supply Voltage	V_{EE}		-6	-8	-11.5	Volts
Gate Supply Efficiency	η	Load Current = 210mA, $E_{ta} = (V_{CC} + \|V_{EE}\|) \times 0.21 / (15 \times I_D) \times 100$	60	72	—	%
"H" Output Voltage	V_{OH}	10kΩ Connected Between Pins 23-20	14	15.3	16.5	Volts
"L" Output Voltage	V_{OL}	10kΩ Connected Between Pins 23-20	-5.5	-7	-11	Volts
"L-H" Propagation Time	t_{PLH}	I_{IH} = 12mA	0.3	—	1	µs
"L-H" Rise Time	t_r	I_{IH} = 12mA	—	0.6	1.2	µs
"H-L" Propagation Time	t_{PHL}	I_{IH} = 12mA	0.3	—	1	µs
"H-L" Fall Time	t_f	I_{IH} = 12mA	—	0.3	1.2	µs
Timer	t_{timer}	Between Start and Cancel (Under Input Sign "OFF")	1	—	2	ms
Fault Output Current	I_{FO}	Applied Pin 28, R = 4.7kΩ	—	5	—	mA
Controlled Time Detect Short Circuit 1	t_{trip1}	Pin 30: 15V and more, Pin 29: Open	—	3.5	—	µs
Controlled Time Detect Short Circuit 2*3	t_{trip2}	Pin 30: 15V and more, Pins 29-21, 22: 10pF (Connective Capacitance)	—	3.9	—	µs
SC Detect Voltage	V_{SC}	Collector Voltage of IGBT	15	—	—	Volts

*1 Differs from H/C condition.
*2 Refer to I_{drive}-T_a characteristics.
*3 Length of wiring of condenser controlled time detect short-circuit is within 5cm from Pins 21, 22 and 29 coming and going.

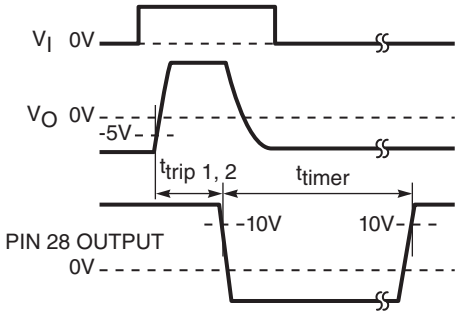
VLA552-01R
IGBT Gate Driver + DC/DC Converter

Definition of Characteristics

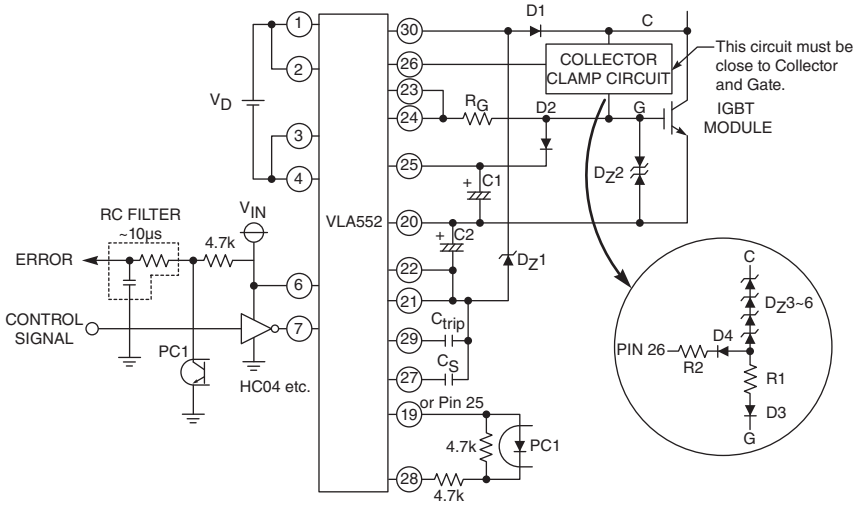
SWITCHING OPERATION



OPERATION OF SHORT CIRCUIT PROTECTION



Application Example



V_D = 15V ±5%
V_{IN} = 5V ±5%
PC1 : TLP781 (TOSHIBA) etc.
C_{trip} : Depends on R_G
CS : Depends on Surge Voltage
D_Z1 : 30V, 0.5W~1W
D_Z2 : 18V, Bidirectional
D1 : Fast Recovery Diode (t_{rr} : 200ns max.)
RP1H (SanKen) etc.
C1, C2 : 470μF, 35V (Low Impedance)

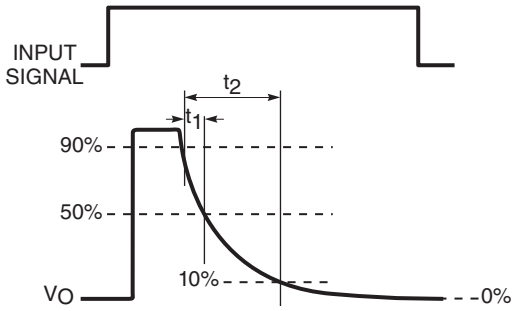
V2~4 : SBD V_{RM} = 60V, IF_{SM} > 60A Class
R1 : 1Ω, 1W Class
R2 : 10Ω, 1/4W Class
D_Z3~6 : Vpn < Total V_Z < V_{CES} of IGBT
Rough guide of total V_Z is as follows:
For V_{CES} 1200V Series → 900~1000V
For V_{CES} 1700V Series → 1300~1400V
It depends on Vpn, $I_{C(max)}$, R_G, snubber circuit inductance of power main circuit, and kind of main condenser.

NOTE:
1. Decoupling capacitors should be located as close as possible to the Hybrid IC pins.
2. The gate circuit path should be kept as short as possible to minimize influence of switching noise.
3. D1 requires approximately the same blocking voltage as the IGBT modules.
4. When recovery current flows in D1, Pin 30 sees high voltage. A zener diode between Pin 21 and Pin 30 is necessary as shown in above diagram.
5. If the short-circuit protection circuit is not used, please connect a 4.7k ohm resistor between Pin 30 and pin 20. (D1 and DZ1 are not required.)
6. If the collector clamp circuit is activated repeatedly, it may be destroyed as a result of overheating. For this reason, power dissipation of the zener diode should be determined by testing in the actual inverter.

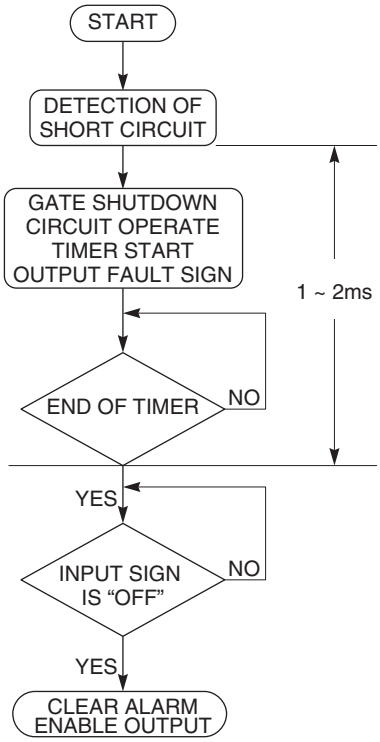
Operation of Protection Circuit

1. When an "ON" input signal is applied for a period longer than Ttrip and the collector voltage is high, the hybrid IC will recognize the condition as a short-circuit and immediately reduce the gate voltage. It will also produce a low voltage fault signal at the respective Pin 29 or Pin 16 alerting that the protection circuit is in operation.
2. The protection circuit will reset if an "OFF" input signal is applied and the minimum 1~2ms shutdown time has passed. "OFF" signal must be 10µs or more.
3. The controlled time to detect a short-circuit (Ttrip) should be set so that the IGBT can be fully turned "ON" before a short-circuit condition can be detected. It is possible to adjust Ttrip by connecting a capacitor (Ctrip) between Pins 18 and 21, as well as Pins 27 and 24.
4. When the short-circuit protection is activated, the soft gate shutdown circuit reduces the collector surge voltage on the IGBT. The gate shut down speed can be slowed even more by adding a capacitor to the CS terminal (between Pins 15 and 18; Pins 27 and 30).

Adjustment of Output Fall Time

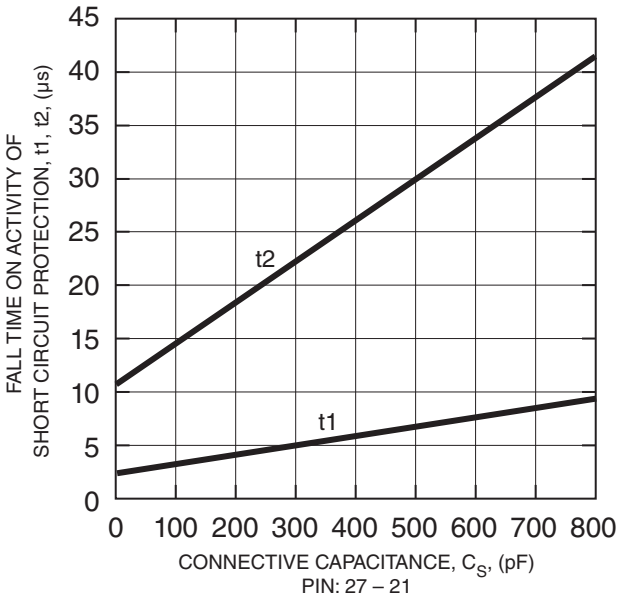


Operation Flow on Detecting Short Circuit

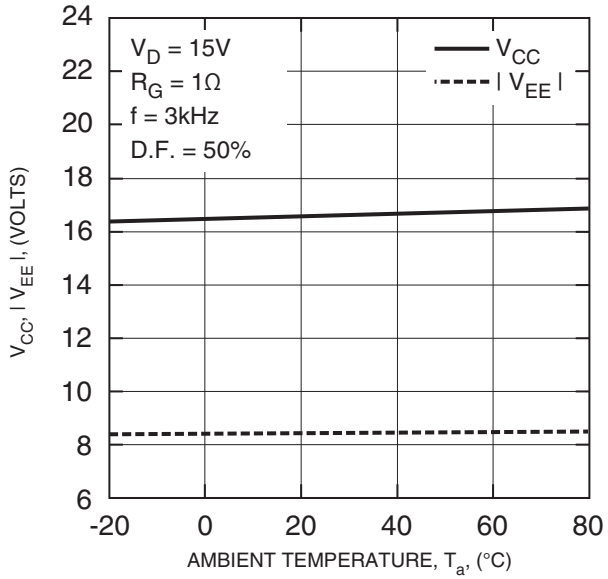


NOTE: Output voltage with protection circuit operating is about $-|V_{EE}| + 2V$

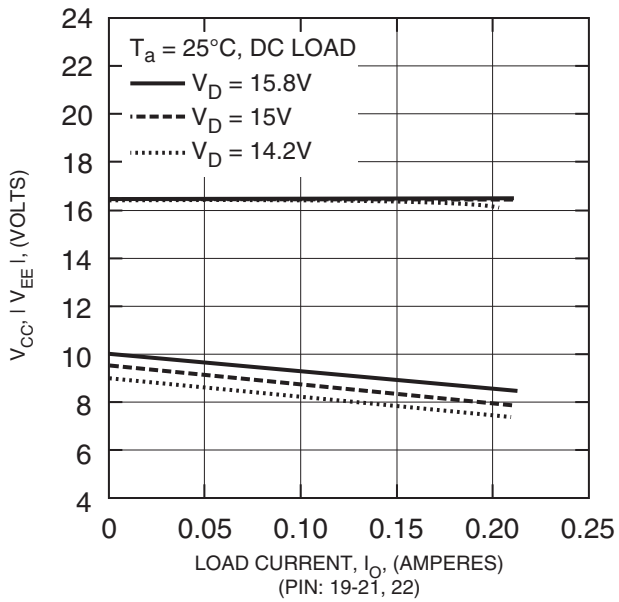
t1, t2 vs C_S CHARACTERISTICS (TYPICAL)



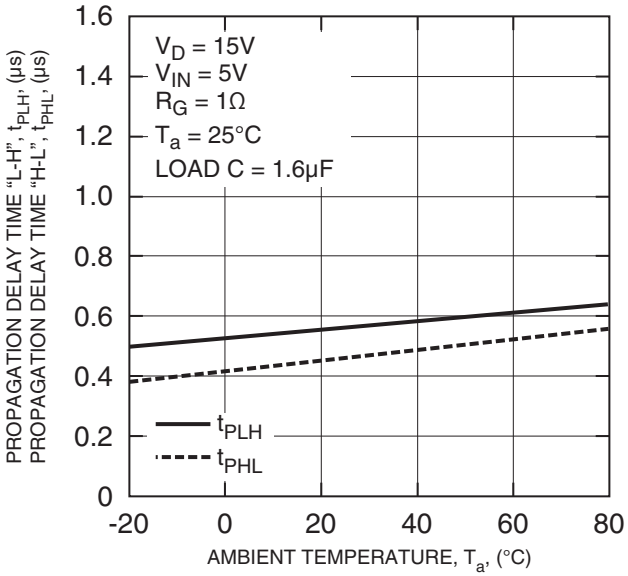
V_{CC}, | V_{EE} | -T_a CHARACTERISTICS (TYPICAL)



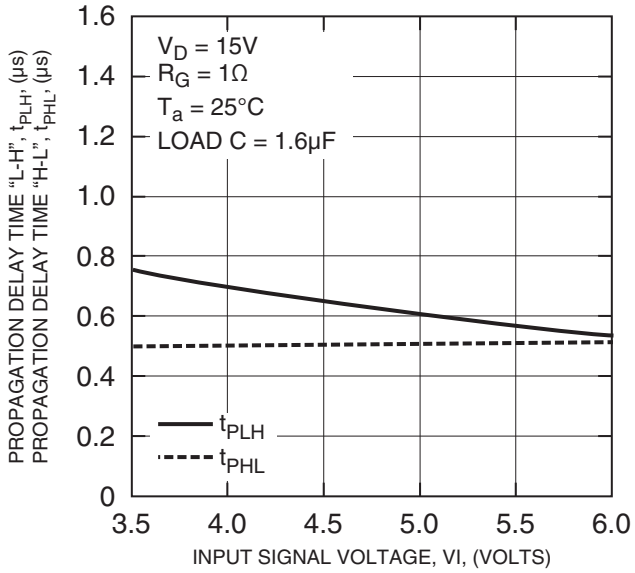
V_{CC}, | V_{EE} | -I_O CHARACTERISTICS (TYPICAL)



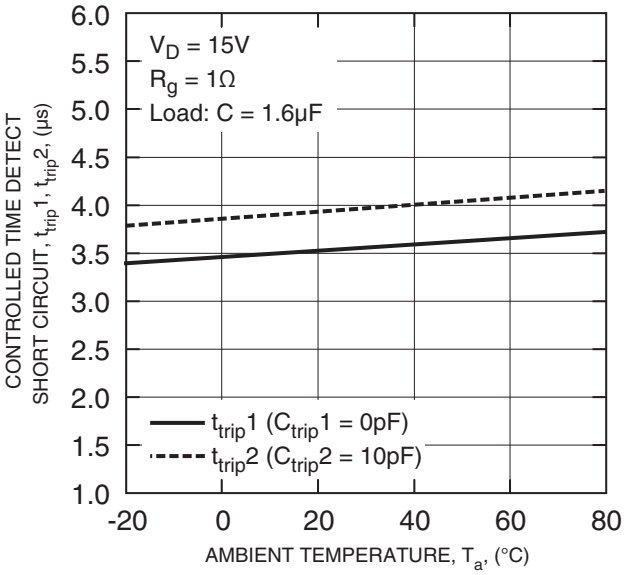
t_{PLH}, t_{PHL}-T_a CHARACTERISTICS (TYPICAL)



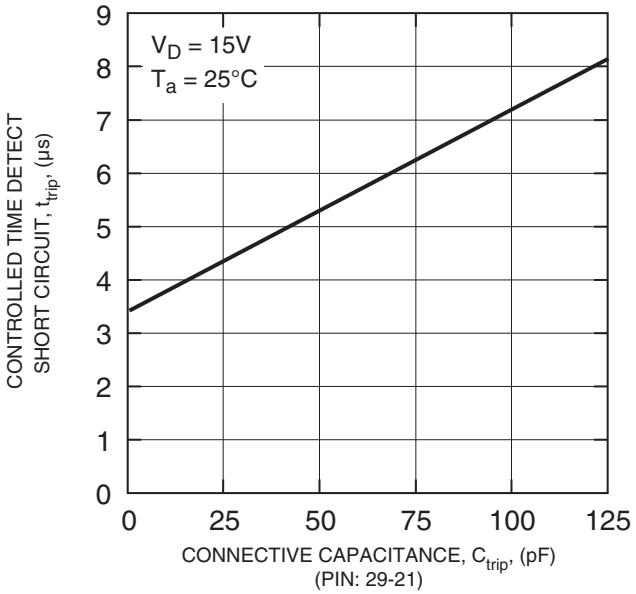
t_{PLH}, t_{PHL}-VI CHARACTERISTICS (TYPICAL)



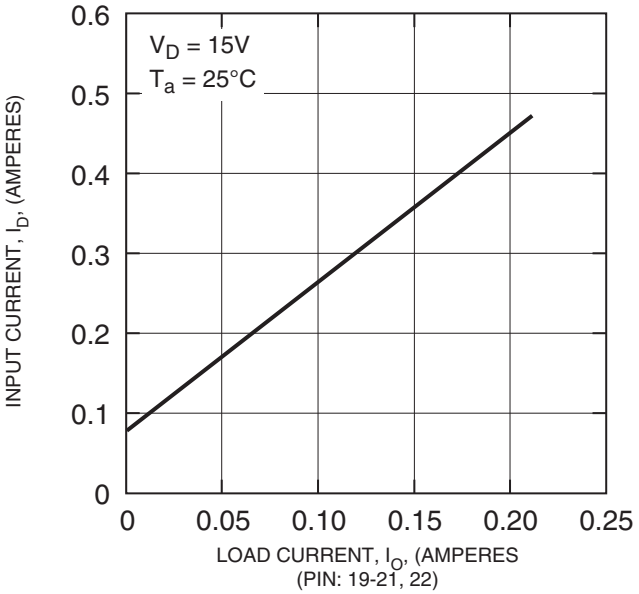
t_{trip}-T_a CHARACTERISTICS (TYPICAL)



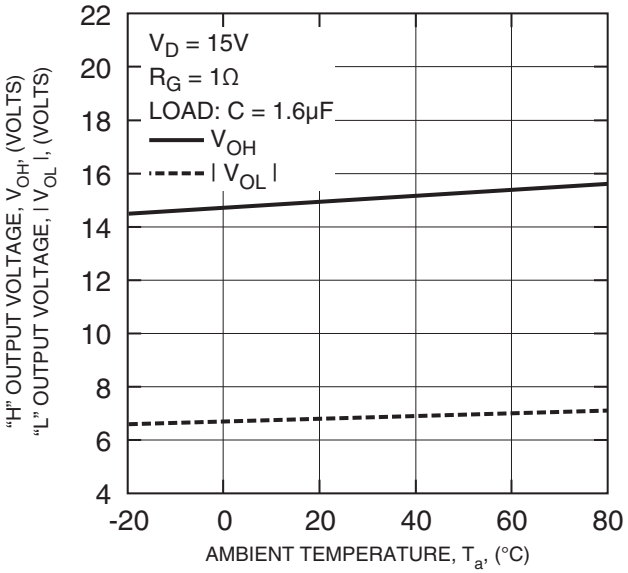
t_{trip}-C_{trip} CHARACTERISTICS (TYPICAL)



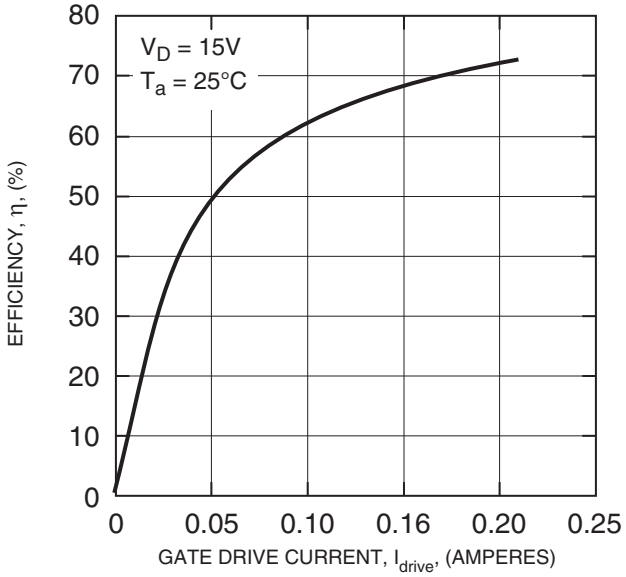
I_D-I_O CHARACTERISTICS (TYPICAL)



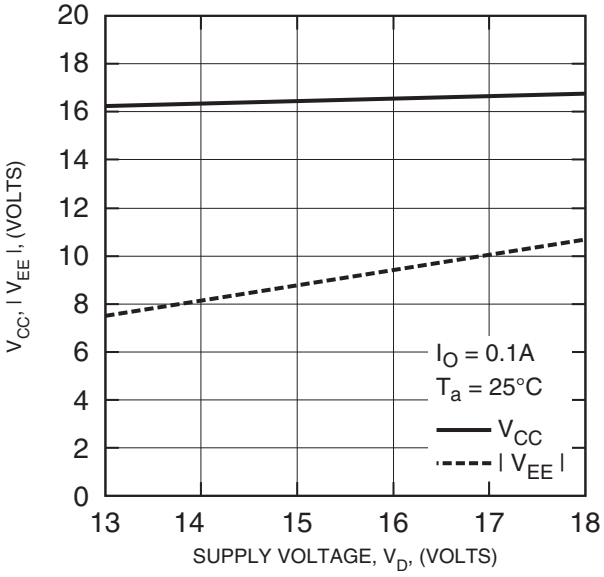
V_{OH}, | V_{OL} | -T_a CHARACTERISTICS (TYPICAL)



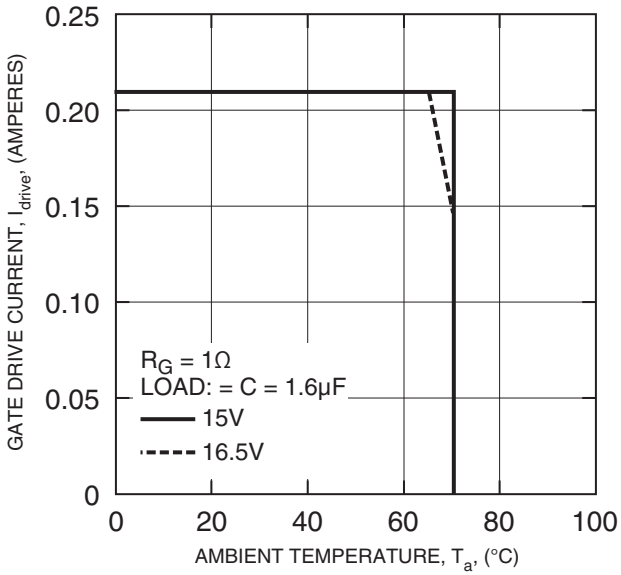
η-I_{drive} CHARACTERISTICS (TYPICAL)



V_{CC}, | V_{EE} | -V_D CHARACTERISTICS (TYPICAL)



I_{drive}-T_a CHARACTERISTICS (TYPICAL)



η-V_D CHARACTERISTICS (TYPICAL)