NVC3S5A51PLZ

Power MOSFET
–60V, 250mΩ, –1.8A, P-Channel

ON Semiconductor®

www.onsemi.com

Automotive Power MOSFET designed to minimize gate charge and low on resistance. AEC-Q101 qualified MOSFET and PPAP capable suitable for automotive applications.

V_{DSS}	R_{DS}(on) Max	I_D Max
–60V	250mΩ@ –10V	–1.8A
	330mΩ@ –4.5V	
	350mΩ@ –4.0V	

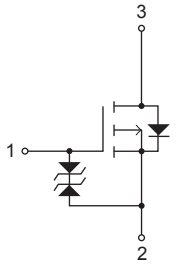
Features

- 4V drive
- High ESD protection
- Low On-Resistance
- AEC-Q101 qualified and PPAP capable
- Pb-Free, Halogen Free and RoHS compliance

Typical Applications

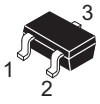
- Reverse Battery Protection
- High Side Load Switch
- Automotive Body Controllers

ELECTRICAL CONNECTION
P-Channel

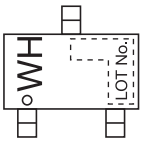


1 : Gate
2 : Source
3 : Drain

MARKING



CPH3



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

SPECIFICATIONS

ABSOLUTE MAXIMUM RATING at Ta = 25°C (Note 1)

Parameter	Symbol	Value	Unit
Drain to Source Voltage	V_{DSS}	–60	V
Gate to Source Voltage	V_{GSS}	±20	V
Drain Current (DC) (Note 2)	I_D	–1.8	A
Drain Current (DC) (Note 3)		–1.7	A
Drain Current (Pulse) PW ≤ 10μs, duty cycle ≤ 1%	I_{DP}	–7.2	A
Power Dissipation Ta=25°C(Note 2)	P_D	1.2	W
Power Dissipation Ta=25°C(Note 3)		0.8	W
Junction Temperature and Storage Temperature	Tj, Tstg	–55 to +175	°C

Note 1 : 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.

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Value	Unit
Junction to Ambient	(Note 2)	$R_{\theta JA}$	125	°C/W
	(Note 3)		182	°C/W

Note 2 : Surface mounted on ceramic substrate(900mm^2 × 0.8mm).

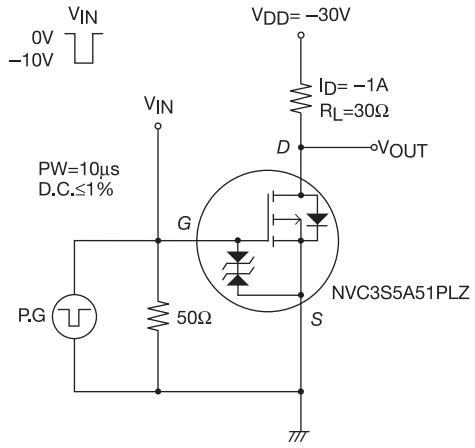
Note 3 : Surface mounted on FR4 board using a 92mm^2, 1 oz. Cu pad.

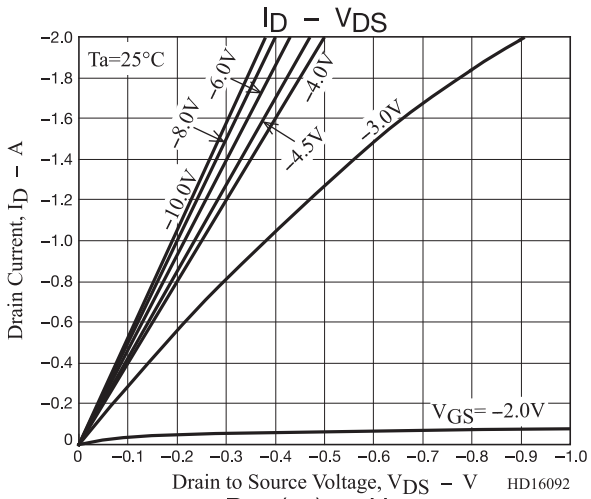
ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 4)

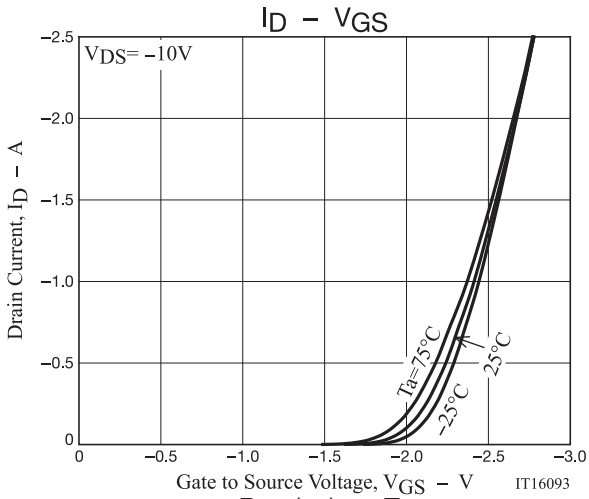
Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=−1mA, V_{GS}=0V	−60			V
Zero-Gate Voltage Drain Current	I_{DSS}	V_{DS}=−60V, V_{GS}=0V			−1	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS}=±16V, V_{DS}=0V			±10	μA
Gate Threshold Voltage	V_{GS}(th)	V_{DS}=−10V, I_D=−1mA	−1.2		−2.6	V
Forward Transconductance	g_{FS}	V_{DS}=−10V, I_D=−1A		2.7		S
Static Drain to Source On-State Resistance	R_{DS}(on)	I_D=−1A, V_{GS}=−10V		190	250	mΩ
		I_D=−0.5A, V_{GS}=−4.5V		235	330	mΩ
		I_D=−0.5A, V_{GS}=−4V		250	350	mΩ
Input Capacitance	Ciss	V_{DS}=−20V, f=1MHz		262		pF
Output Capacitance	Coss			29		pF
Reverse Transfer Capacitance	Crss			19		pF
Turn-ON Delay Time	t_d(on)	See Fig.1		5.1		ns
Rise Time	t_r			5.4		ns
Turn-OFF Delay Time	t_d(off)			34		ns
Fall Time	t_f			19		ns
Total Gate Charge	Qg	V_{DS}=−30V, V_{GS}=−10V, I_D=−1.8A		6.0		nC
Gate to Source Charge	Qgs			0.83		nC
Gate to Drain “Miller” Charge	Qgd			1.3		nC
Forward Diode Voltage	V_{SD}	I_S=−1.8A, V_{GS}=0V		−0.82	−1.2	V

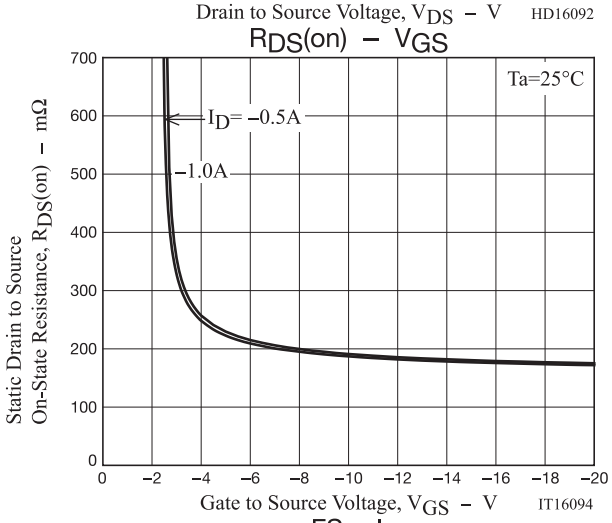
Note 4 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

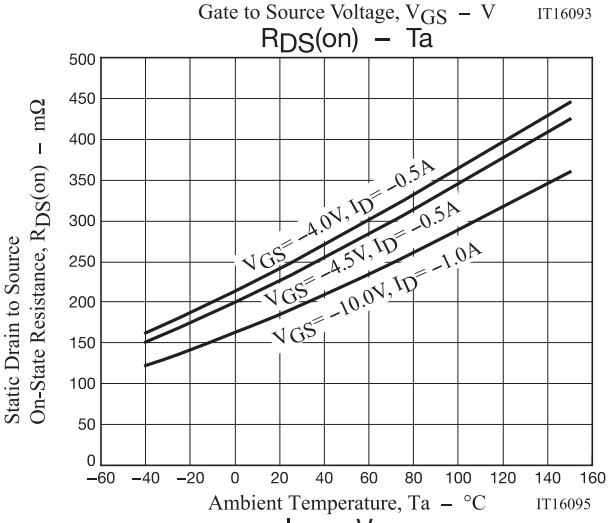
Fig.1 Switching Time Test Circuit

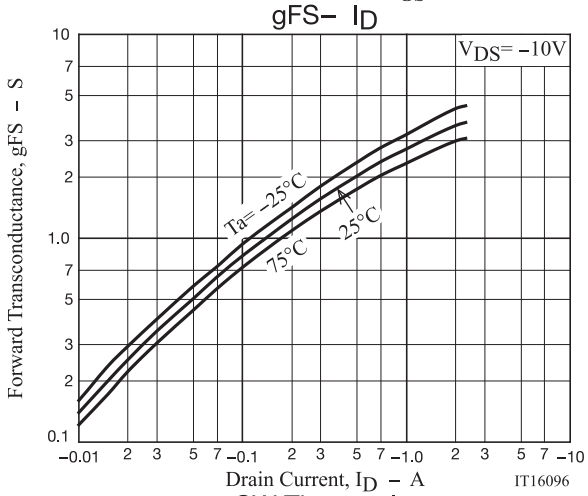


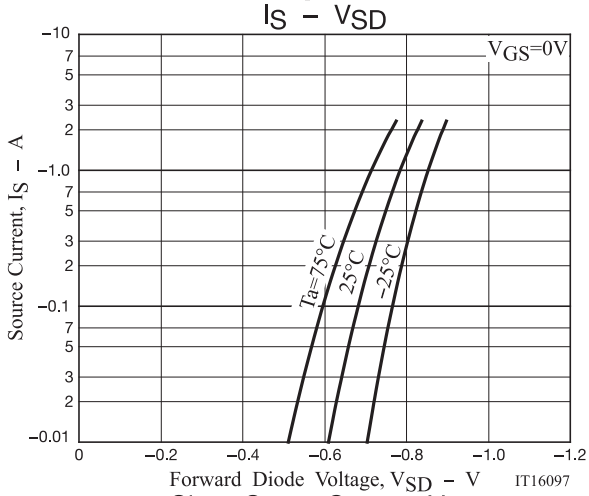

ID – VDS
Ta=25°C
–6.0V
–4.0V
–8.0V
–4.5V
–3.0V
–10.0V
VGS= –2.0V
Drain Current, ID – A
Drain to Source Voltage, VDS – V
HD16092

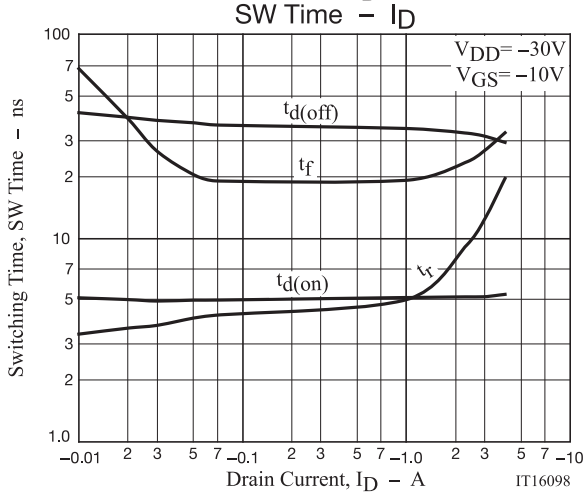

ID – VGS
VDS= –10V
Ta=75°C
25°C
–25°C
Drain Current, ID – A
Gate to Source Voltage, VGS – V
IT16093

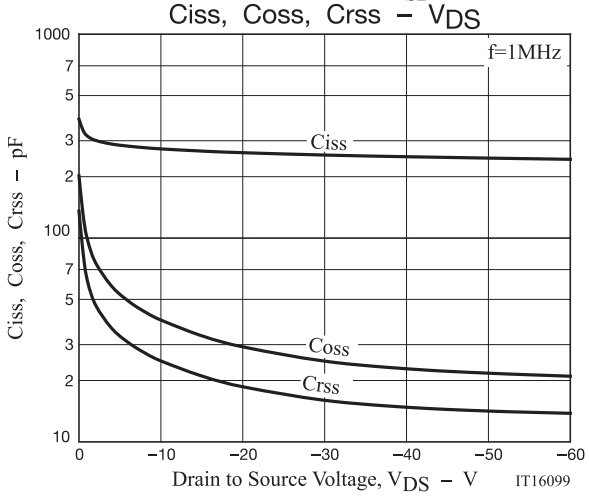

RDS(on) – VGS
Ta=25°C
ID= –0.5A
–1.0A
Static Drain to Source On-State Resistance, RDS(on) – mΩ
Gate to Source Voltage, VGS – V
IT16094

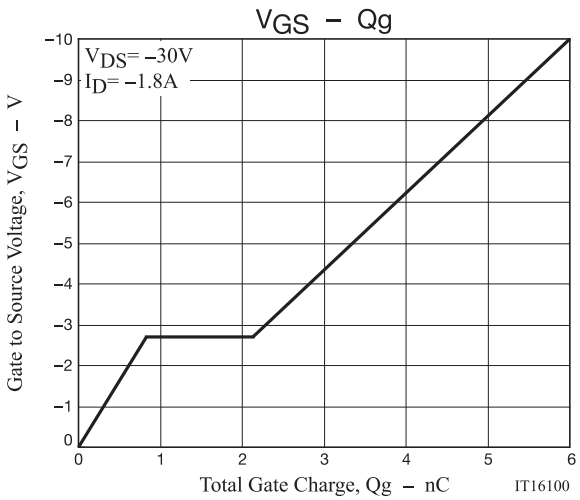

RDS(on) – Ta
VGS= –4.0V, ID= –0.5A
VGS= –4.5V, ID= –0.5A
VGS= –10.0V, ID= –1.0A
Static Drain to Source On-State Resistance, RDS(on) – mΩ
Ambient Temperature, Ta – °C
IT16095

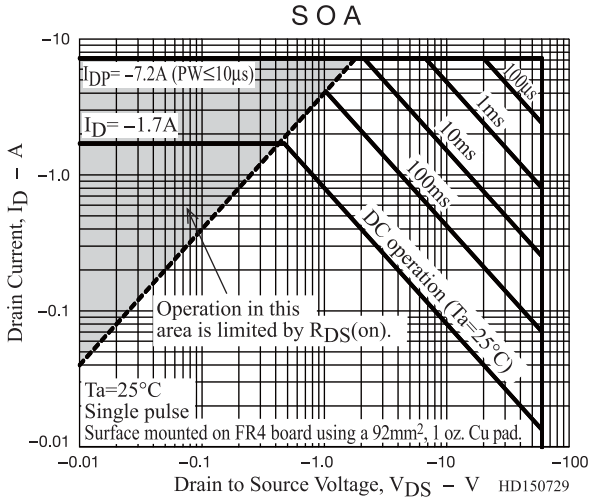

gFS– ID
VDS= –10V
Ta= –25°C
25°C
75°C
Forward Transconductance, gFS – S
Drain Current, ID – A
IT16096

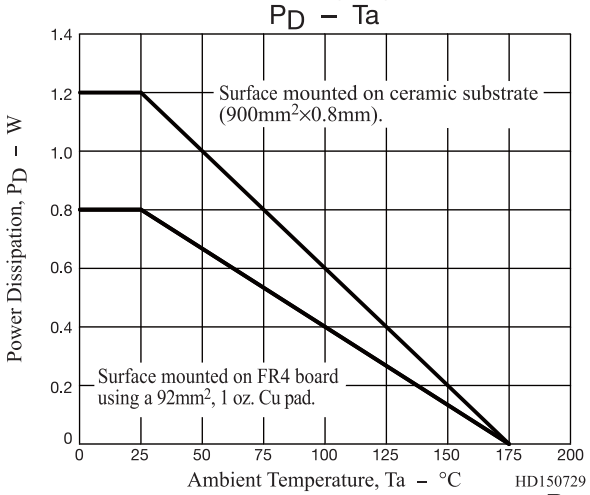

IS – VSD
VGS=0V
Ta=75°C
25°C
–25°C
Source Current, IS – A
Forward Diode Voltage, VSD – V
IT16097

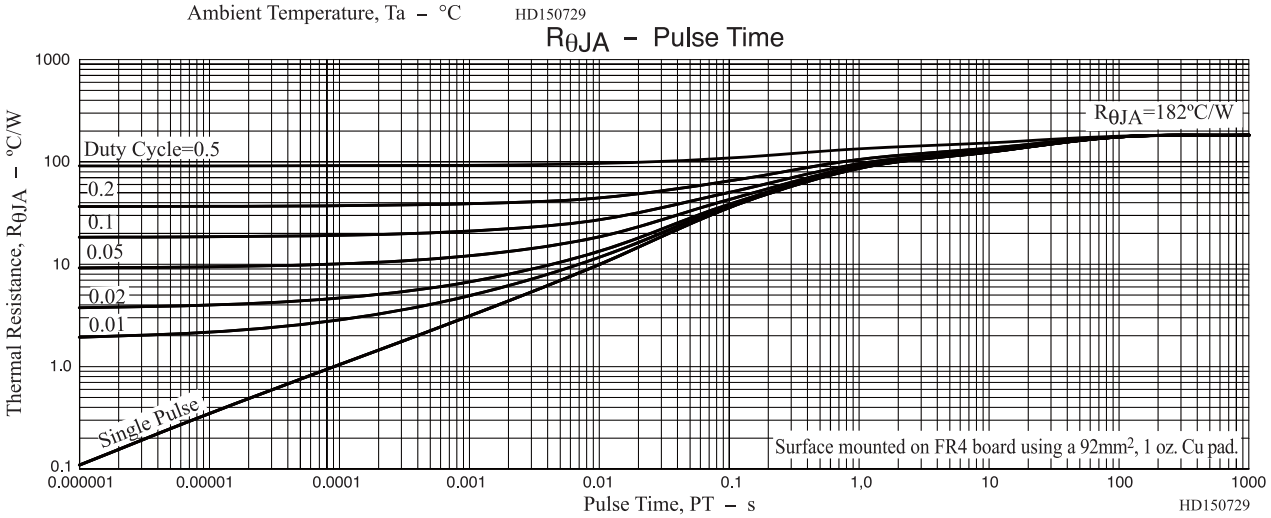

SW Time – ID
VDD= –30V
VGS= –10V
td(off)
tf
tr
td(on)
Switching Time, SW Time – ns
Drain Current, ID – A
IT16098


Ciss, Coss, Crss – VDS
f=1MHz
Ciss
Coss
Crss
Ciss, Coss, Crss – pF
Drain to Source Voltage, VDS – V
IT16099


VGS – Qg
VDS= –30V
ID= –1.8A
Gate to Source Voltage, VGS – V
Total Gate Charge, Qg – nC
IT16100

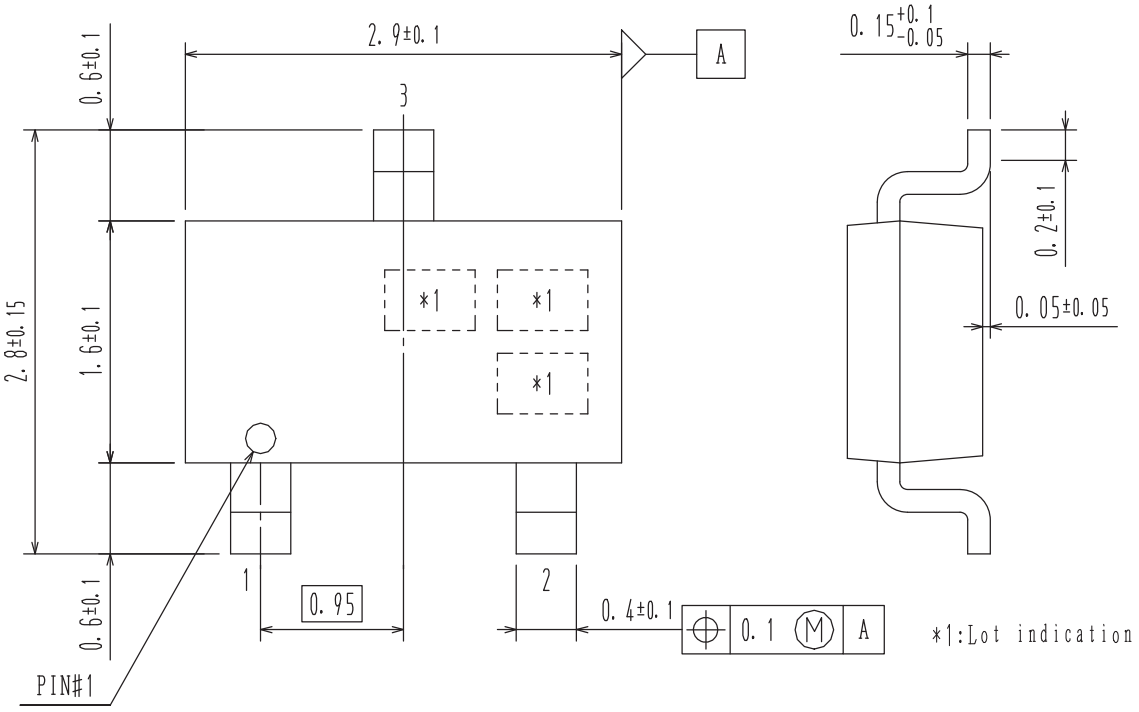

S O A
IDP= –7.2A (PW≤10μs)
ID= –1.7A
100μs
1ms
10ms
100ms
DC operation (Ta=25°C)
Operation in this area is limited by RDS(on).
Ta=25°C
Single pulse
Surface mounted on FR4 board using a 92mm2, 1 oz. Cu pad.
Drain Current, ID – A
Drain to Source Voltage, VDS – V
HD150729

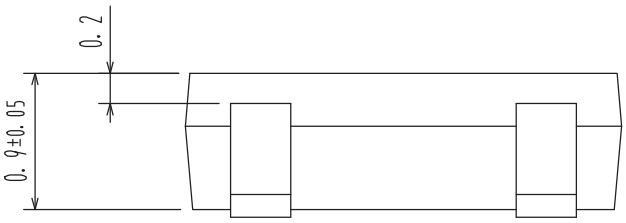

PD – Ta
Surface mounted on ceramic substrate (900mm2×0.8mm).
Surface mounted on FR4 board using a 92mm2, 1 oz. Cu pad.
Power Dissipation, PD – W
Ambient Temperature, Ta – °C
HD150729


RθJA – Pulse Time
RθJA=182°C/W
Duty Cycle=0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Surface mounted on FR4 board using a 92mm2, 1 oz. Cu pad.
Thermal Resistance, RθJA – °C/W
Pulse Time, PT – s
HD150729

PACKAGE DIMENSIONS
unit : mm

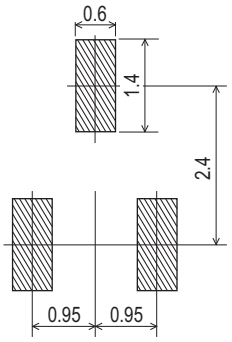
CPH3
CASE 318BA
ISSUE O





1 : Gate
2 : Source
3 : Drain

RECOMMENDED SOLDERING FOOTPRINT



ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing)
NVC3S5A51PLZT1G	WH	CPH3 (Pb-Free / Halogen Free)	3,000 / 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. http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF

Note on usage : Since the NVC3S5A51PLZ is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.