# NVC3S5A51PLZ

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

ON Semiconductor®

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

### Features

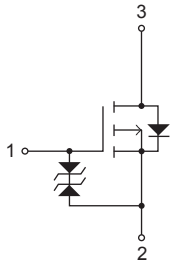
- 4V drive
- High ESD protection
- Low On-Resistance
- AEC-Q101 qualified and PPAP capable
- Pb-Free, Halogen Free and RoHS compliance

### Typical Applications

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

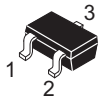
| $V_{DSS}$ | $R_{DS}$(on) Max | $I_D$ Max |
|---|---|---|
| –60V | 250mΩ@ –10V | –1.8A |
| | 330mΩ@ –4.5V | |
| | 350mΩ@ –4.0V | |

**ELECTRICAL CONNECTION**
**P-Channel**

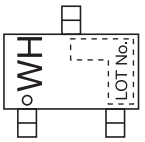



1 : Gate
2 : Source
3 : Drain

**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)<br>PW ≤ 10μs, duty cycle ≤ 1% | $I_{DP}$ | –7.2 | A |
| Power Dissipation<br>Ta=25°C(Note 2) | $P_D$ | 1.2 | W |
| Power Dissipation<br>Ta=25°C(Note 3) | | 0.8 | W |
| Junction Temperature and<br>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.

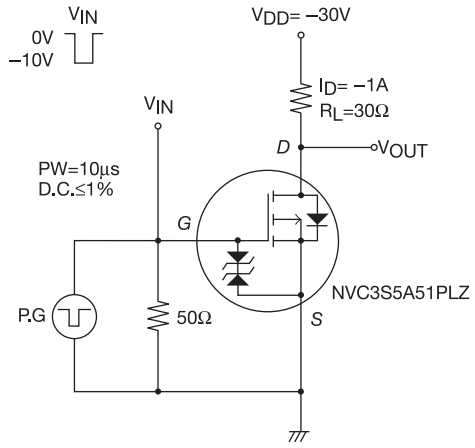
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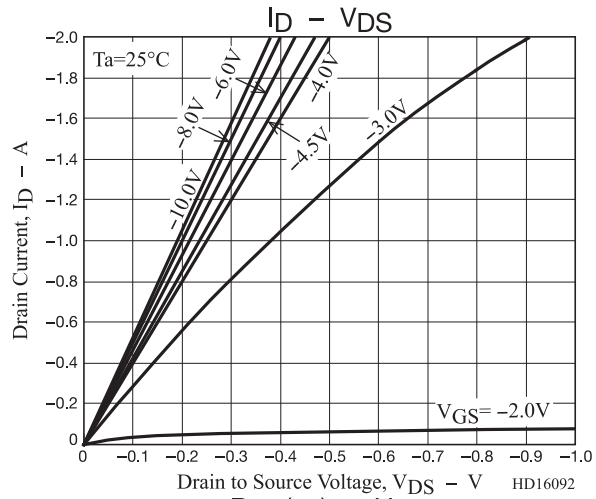
**ELECTRICAL CHARACTERISTICS** at Ta = 25°C (Note 4)

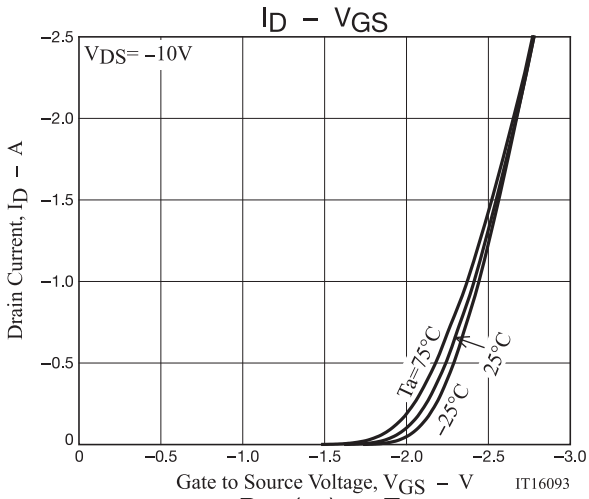
| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=−1mA, $V_{GS}$=0V | −60 | | | V |
| Zero-Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=−60V, $V_{GS}$=0V | | | −1 | μA |
| Gate 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 |

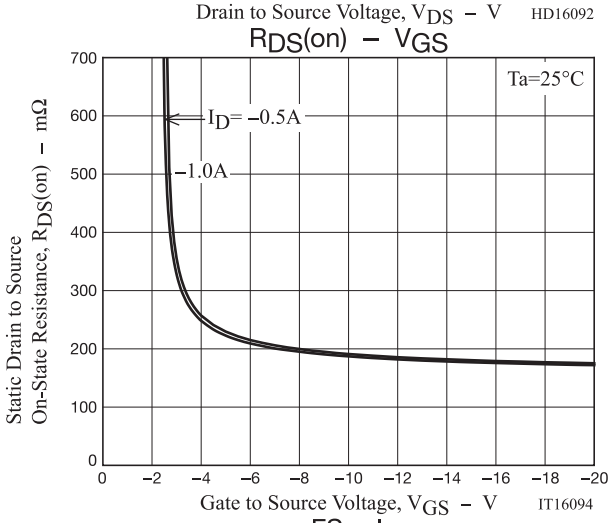
Note 4 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

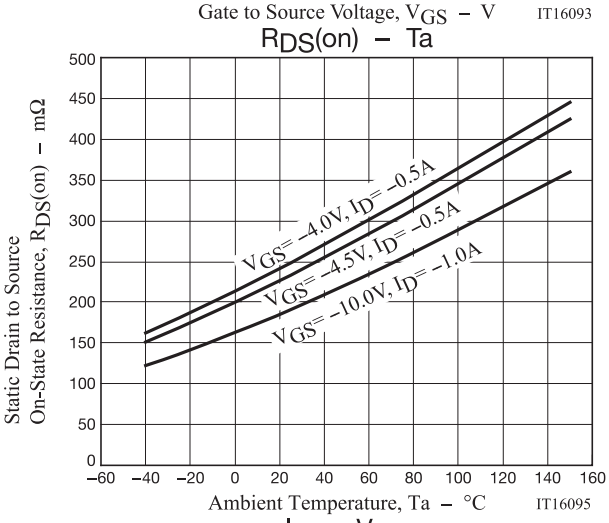
**Fig.1 Switching Time Test Circuit**

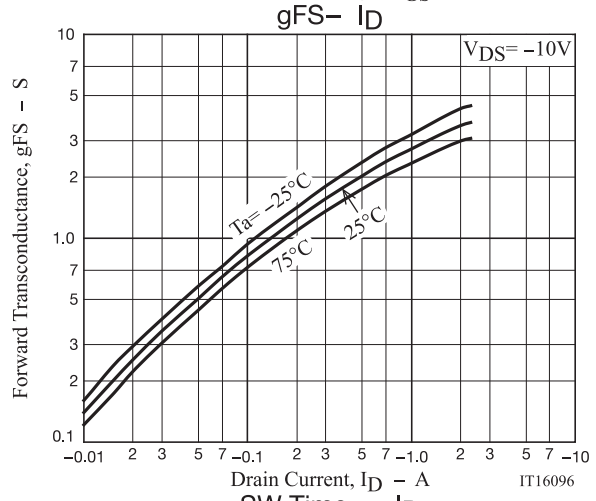


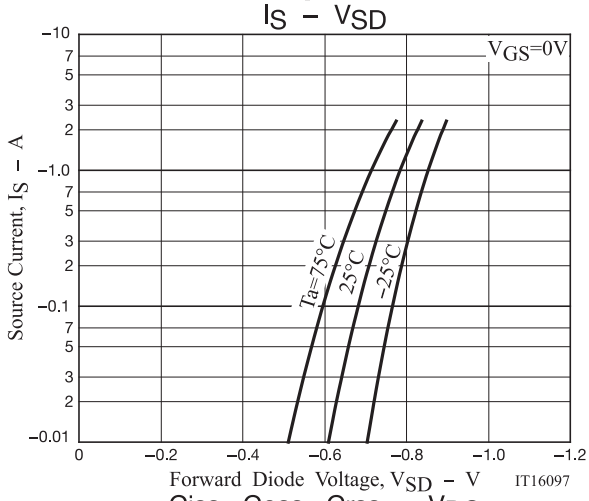

ID – VDS
Ta=25°C
–6.0V
–4.0V
–8.0V
–4.5V
–3.0V
–10.0V
VGS= –2.0V
Drain Current, ID – A
Drain to Source Voltage, VDS – V
HD16092

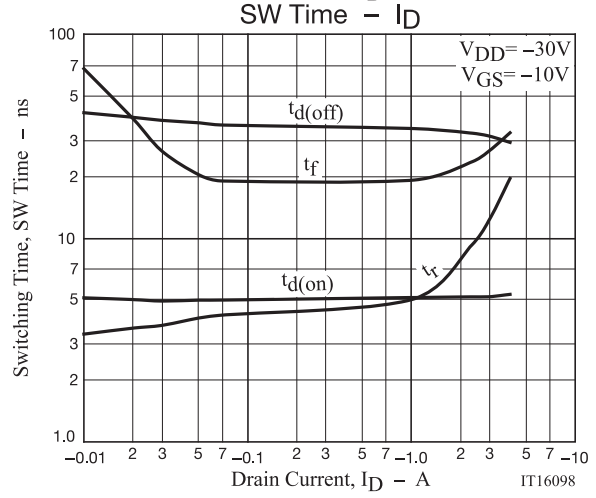

ID – VGS
VDS= –10V
Ta=75°C
25°C
–25°C
Drain Current, ID – A
Gate to Source Voltage, VGS – V
IT16093

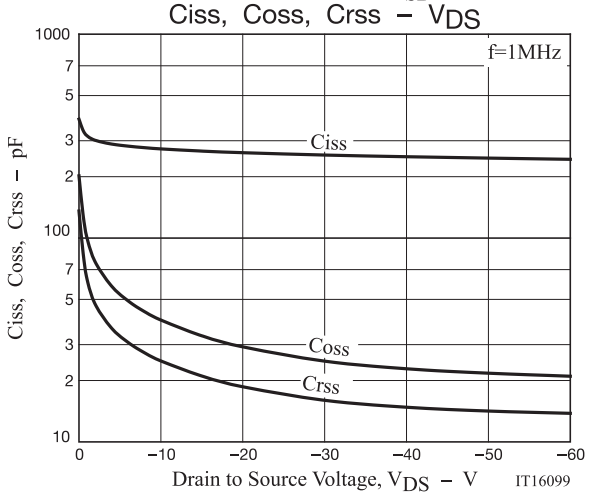

RDS(on) – VGS
Ta=25°C
ID= –0.5A
–1.0A
Static Drain to Source On-State Resistance, RDS(on) – mΩ
Gate to Source Voltage, VGS – V
IT16094

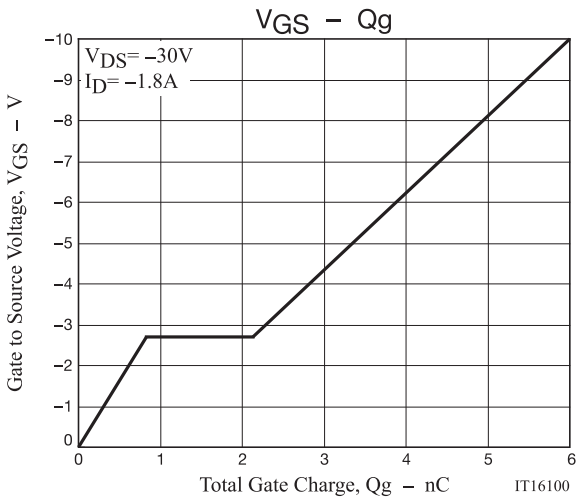

RDS(on) – Ta
VGS= –4.0V, ID= –0.5A
VGS= –4.5V, ID= –0.5A
VGS= –10.0V, ID= –1.0A
Static Drain to Source On-State Resistance, RDS(on) – mΩ
Ambient Temperature, Ta – °C
IT16095

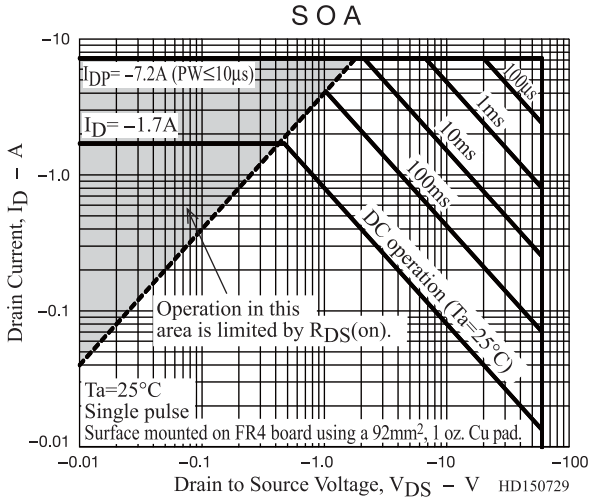

gFS– ID
VDS= –10V
Ta= –25°C
25°C
75°C
Forward Transconductance, gFS – S
Drain Current, ID – A
IT16096

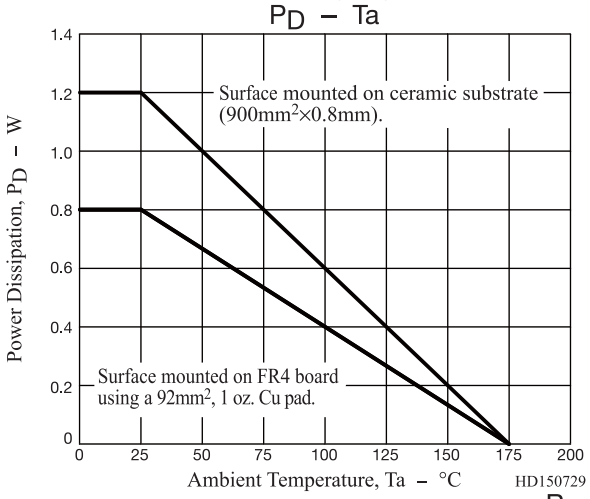

IS – VSD
VGS=0V
Ta=75°C
25°C
–25°C
Source Current, IS – A
Forward Diode Voltage, VSD – V
IT16097

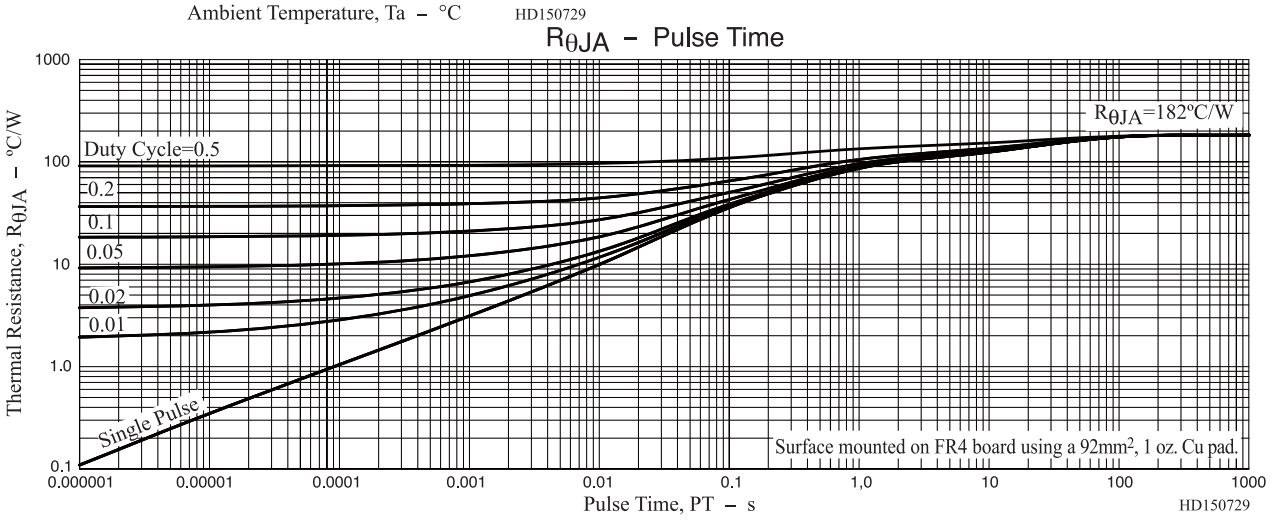

SW Time – ID
VDD= –30V
VGS= –10V
td(off)
tf
tr
td(on)
Switching Time, SW Time – ns
Drain Current, ID – A
IT16098


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

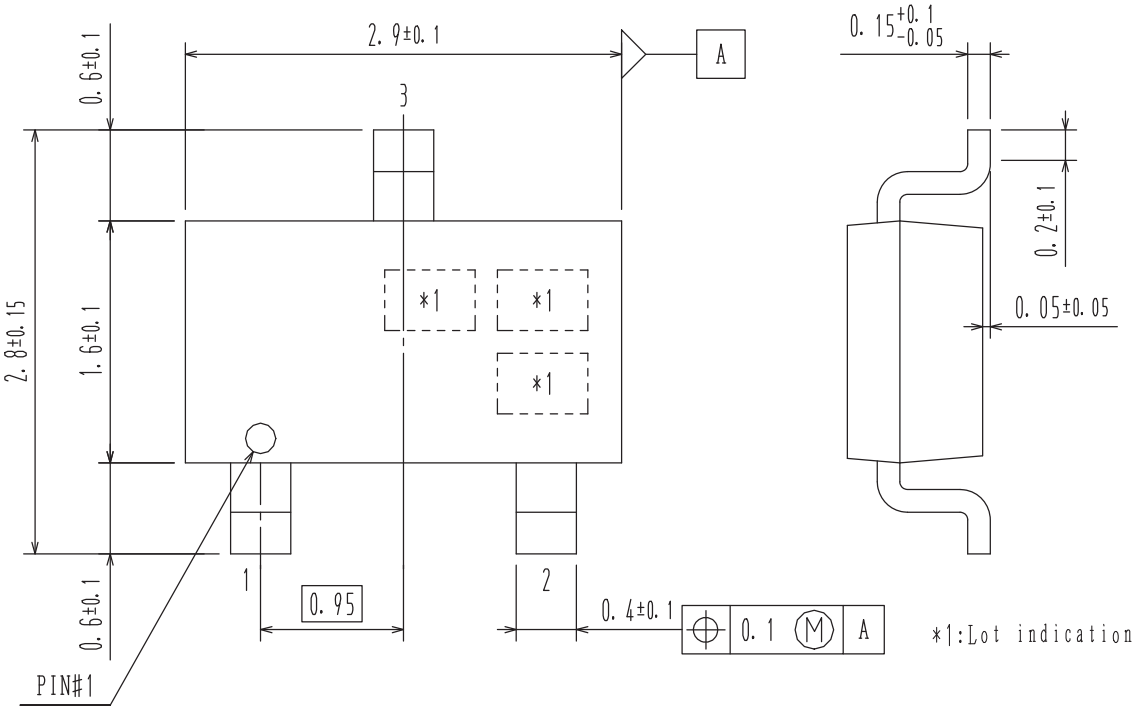

S O A
IDP= –7.2A (PW≤10μs)
ID= –1.7A
100μs
1ms
10ms
100ms
DC operation (Ta=25°C)
Operation in this area is limited by RDS(on).
Ta=25°C
Single pulse
Surface mounted on FR4 board using a 92mm2, 1 oz. Cu pad.
Drain Current, ID – A
Drain to Source Voltage, VDS – V
HD150729

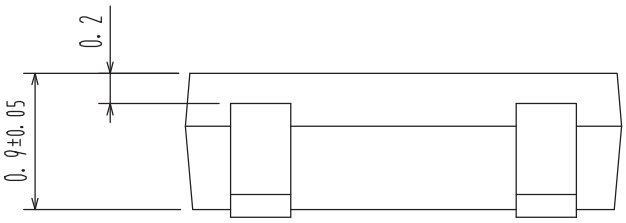

PD – Ta
Surface mounted on ceramic substrate (900mm2×0.8mm).
Surface mounted on FR4 board using a 92mm2, 1 oz. Cu pad.
Power Dissipation, PD – W
Ambient Temperature, Ta – °C
HD150729


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

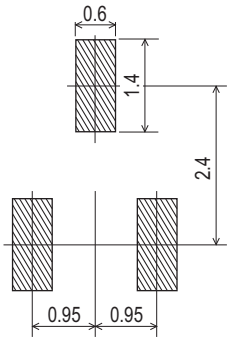
**PACKAGE DIMENSIONS**
unit : mm

**CPH3**
CASE 318BA
ISSUE O




**RECOMMENDED SOLDERING FOOTPRINT**




1 : Gate
2 : Source
3 : Drain

## ORDERING INFORMATION

| Device | Marking | Package | Shipping (Qty / Packing) |
|---|---|---|---|
| NVC3S5A51PLZT1G | WH | CPH3<br>(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.

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