NVATS5A304PLZ

Power MOSFET
–60 V, 6.5 mΩ, –120 A, P-Channel

ON Semiconductor®

www.onsemi.com

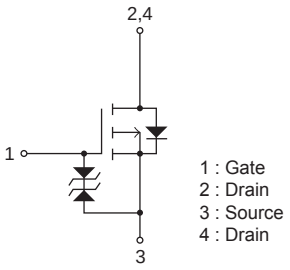
Automotive Power MOSFET designed for compact and efficient designs and including high thermal performance.
AEC-Q101 qualified MOSFET and PPAP capable suitable for automotive applications.

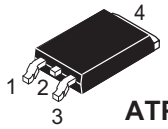
V_{DSS}	R_{DS}(on) Max	I_D Max
–60 V	6.5 mΩ @ –10 V	–120 A
	8.9 mΩ @ –4.5 V	

Features
- Low On-Resistance
- High Current Capability
- 100% Avalanche Tested
- AEC-Q101 qualified and PPAP capable
- ATPAK package is pin-compatible with DPAK (TO-252)
- Pb-Free, Halogen Free and RoHS compliance

Typical Applications
- Reverse Battery Protection
- Load Switch
- Automotive Front Lighting
- Automotive Body Controllers

ELECTRICAL CONNECTION
P-Channel





ATPAK

MARKING

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)	I_D	–120	A
Drain Current (Pulse) PW ≤ 10μs, duty cycle ≤ 1%	I_{DP}	–480	A
Power Dissipation Tc = 25°C	P_D	108	W
Operating Junction and Storage Temperature	Tj, Tstg	–55 to +175	°C
Avalanche Energy (Single Pulse) (Note 2)	E_{AS}	656	mJ
Avalanche Current (Note 3)	I_{AV}	–75	A

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.
2 : V_{DD} = –36 V, L = 100 μH, I_{AV} = –75 A (Fig.1)
3 : L ≤ 100 μH, Single pulse

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Case Steady State (Tc = 25°C)	$R_{\theta JC}$	1.38	°C/W
Junction to Ambient (Note 4)	$R_{\theta JA}$	77.2	°C/W

Note 4 : Surface mounted on FR4 board using a 130 mm^2, 1 oz. Cu pad.

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

ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 5)

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = −1 mA, V_{GS} = 0 V	−60			V
Zero-Gate Voltage Drain Current	I_{DSS}	V_{DS} = −60 V, V_{GS} = 0 V			−10	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V			±10	μA
Gate Threshold Voltage	V_{GS}(th)	V_{DS} = −10 V, I_D = −1 mA	−1.2		−2.6	V
Forward Transconductance	g_{FS}	V_{DS} = −10 V, I_D = −50 A		100		S
Static Drain to Source On-State Resistance	R_{DS}(on)1	I_D = −50 A, V_{GS} = −10 V		5.0	6.5	mΩ
	R_{DS}(on)2	I_D = −50 A, V_{GS} = −4.5 V		6.4	8.9	mΩ
Input Capacitance	Ciss	V_{DS} = −20 V, f = 1 MHz		13,000		pF
Output Capacitance	Coss			1,080		pF
Reverse Transfer Capacitance	Crss			760		pF
Turn-ON Delay Time	t_d(on)	See Fig.2		80		ns
Rise Time	t_r			650		ns
Turn-OFF Delay Time	t_d(off)			780		ns
Fall Time	t_f			460		ns
Total Gate Charge	Qg	V_{DS} = −36 V, V_{GS} = −10 V, I_D = −100 A		250		nC
Gate to Source Charge	Qgs			55		nC
Gate to Drain “Miller” Charge	Qgd			50		nC
Forward Diode Voltage	V_{SD}	I_S = −100 A, V_{GS} = 0 V		−1.0	−1.5	V
Reverse Recovery Time	t_{rr}	See Fig.3		90		ns
Reverse Recovery Charge	Q_{rr}	I_S = −100 A, V_{GS} = 0 V, di/dt = −100 A/μs		245		nC

Note 5 : 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 Unclamped Inductive Switching Test Circuit

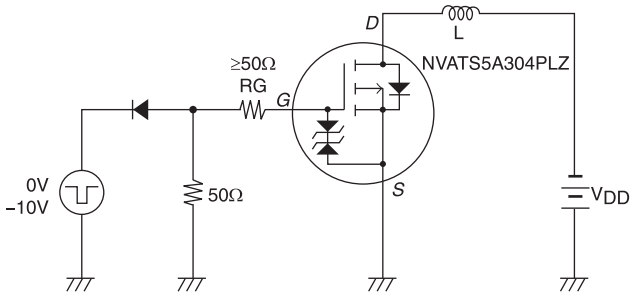


Fig.2 Switching Time Test Circuit

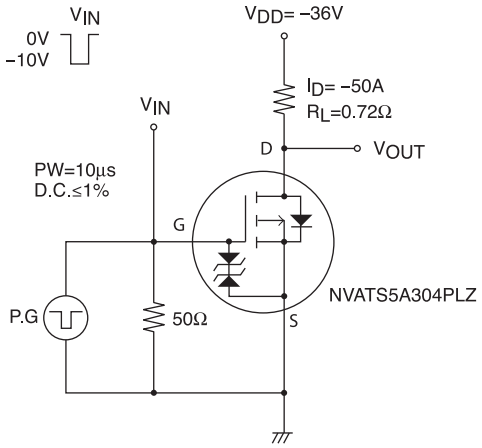
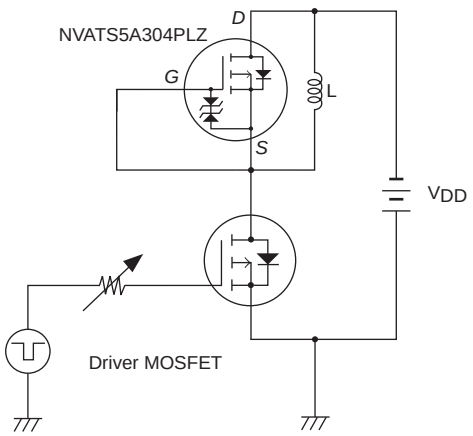
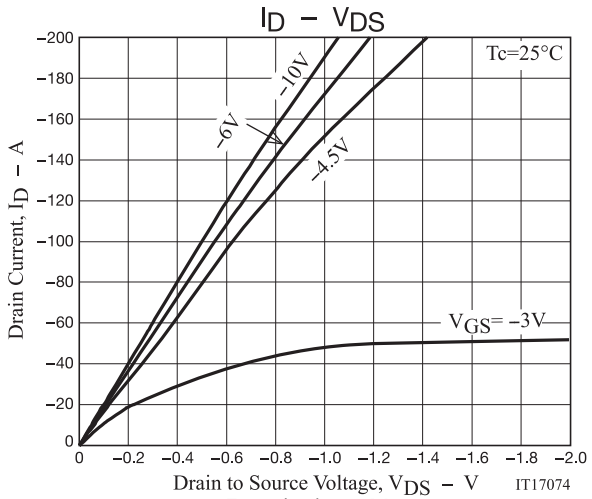
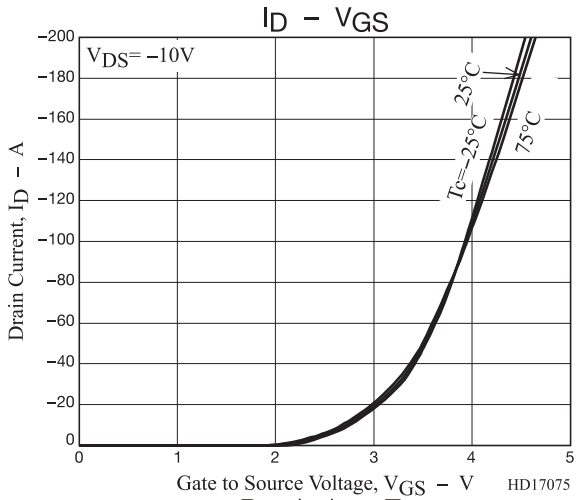
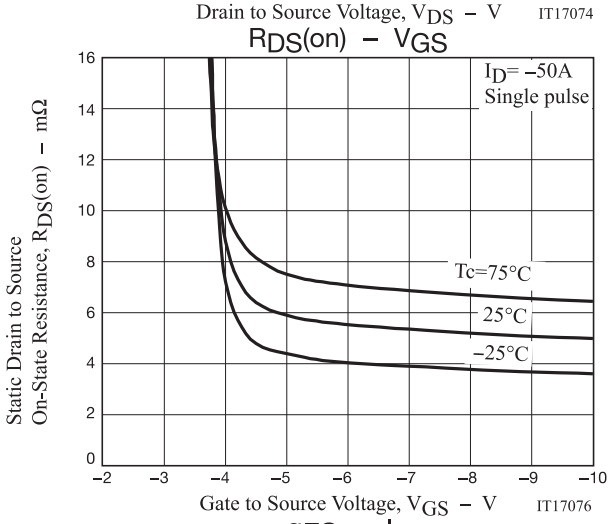


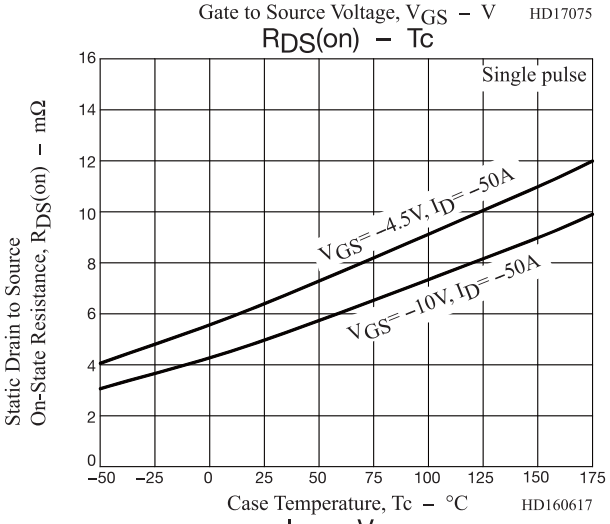
Fig.3 Reverse Recovery Time Test Circuit

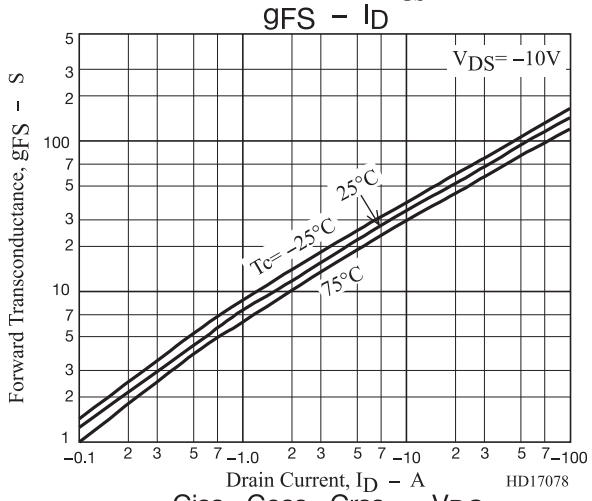


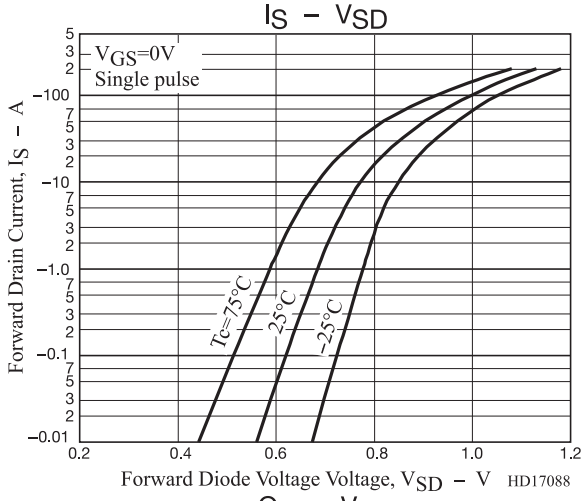

ID – VDS
Tc=25°C
–10V
–6V
–4.5V
VGS= –3V
Drain Current, ID – A
Drain to Source Voltage, VDS – V
IT17074

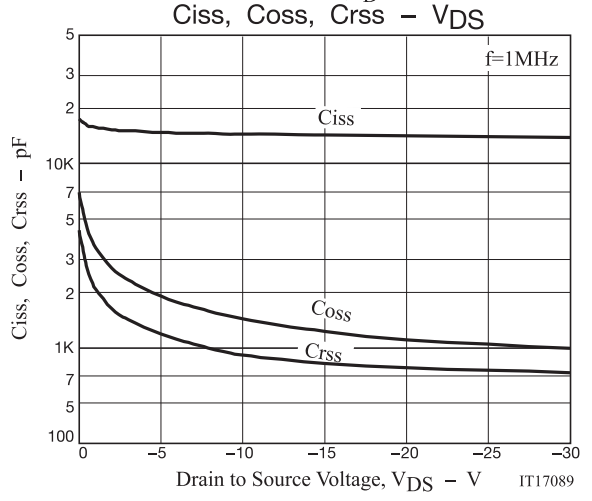

ID – VGS
VDS= –10V
25°C
Tc=–25°C
75°C
Drain Current, ID – A
Gate to Source Voltage, VGS – V
HD17075

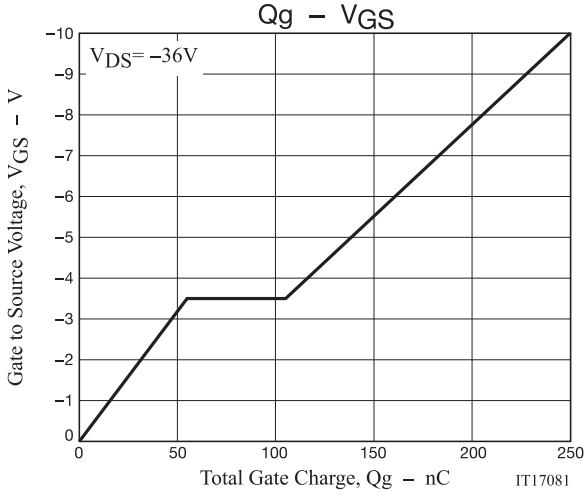

RDS(on) – VGS
ID= –50A
Single pulse
Tc=75°C
25°C
–25°C
Static Drain to Source
On-State Resistance, RDS(on) – mΩ
Gate to Source Voltage, VGS – V
IT17076


RDS(on) – Tc
Single pulse
VGS= –4.5V, ID= –50A
VGS= –10V, ID= –50A
Static Drain to Source
On-State Resistance, RDS(on) – mΩ
Case Temperature, Tc – °C
HD160617

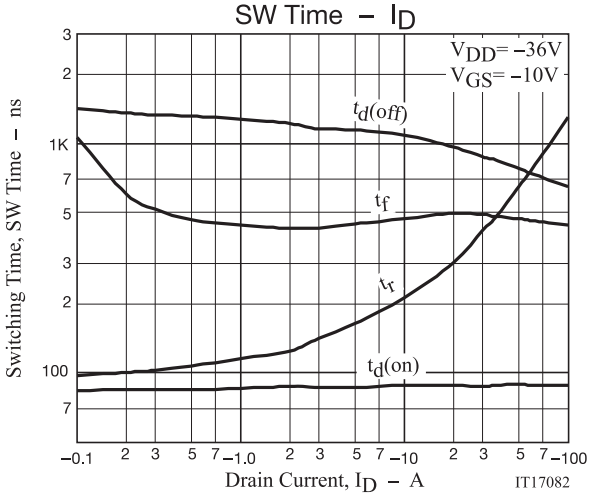

gFS – ID
VDS= –10V
25°C
Tc= –25°C
75°C
Forward Transconductance, gFS – S
Drain Current, ID – A
HD17078


IS – VSD
VGS=0V
Single pulse
Tc=75°C
25°C
–25°C
Forward Drain Current, IS – A
Forward Diode Voltage Voltage, VSD – V
HD17088

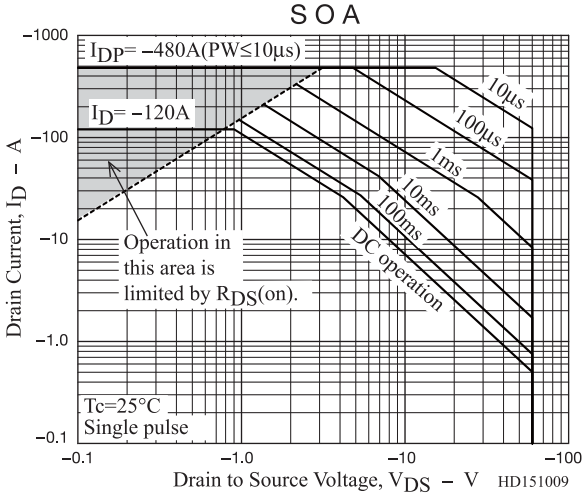

Ciss, Coss, Crss – VDS
f=1MHz
Ciss
Coss
Crss
Ciss, Coss, Crss – pF
Drain to Source Voltage, VDS – V
IT17089


Qg – VGS
VDS= –36V
Gate to Source Voltage, VGS – V
Total Gate Charge, Qg – nC
IT17081

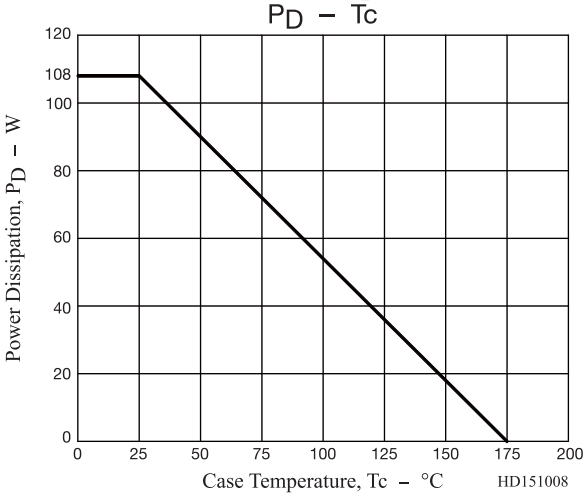
SW Time – I_D



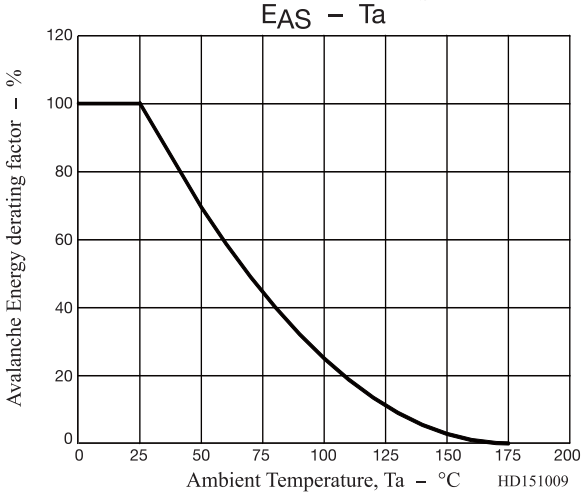
S O A



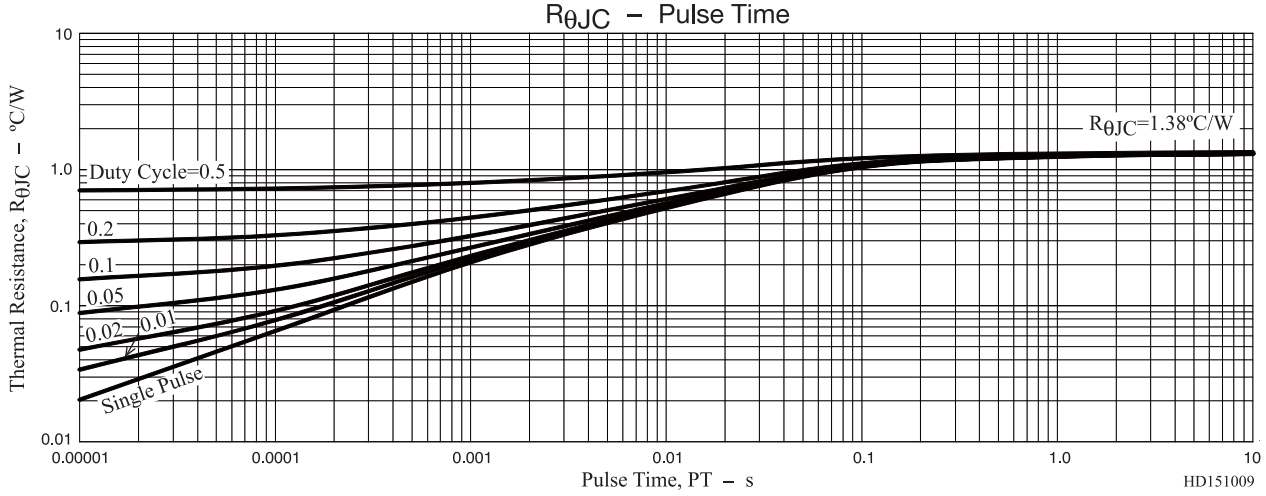
P_D – Tc



E_{AS} – Ta

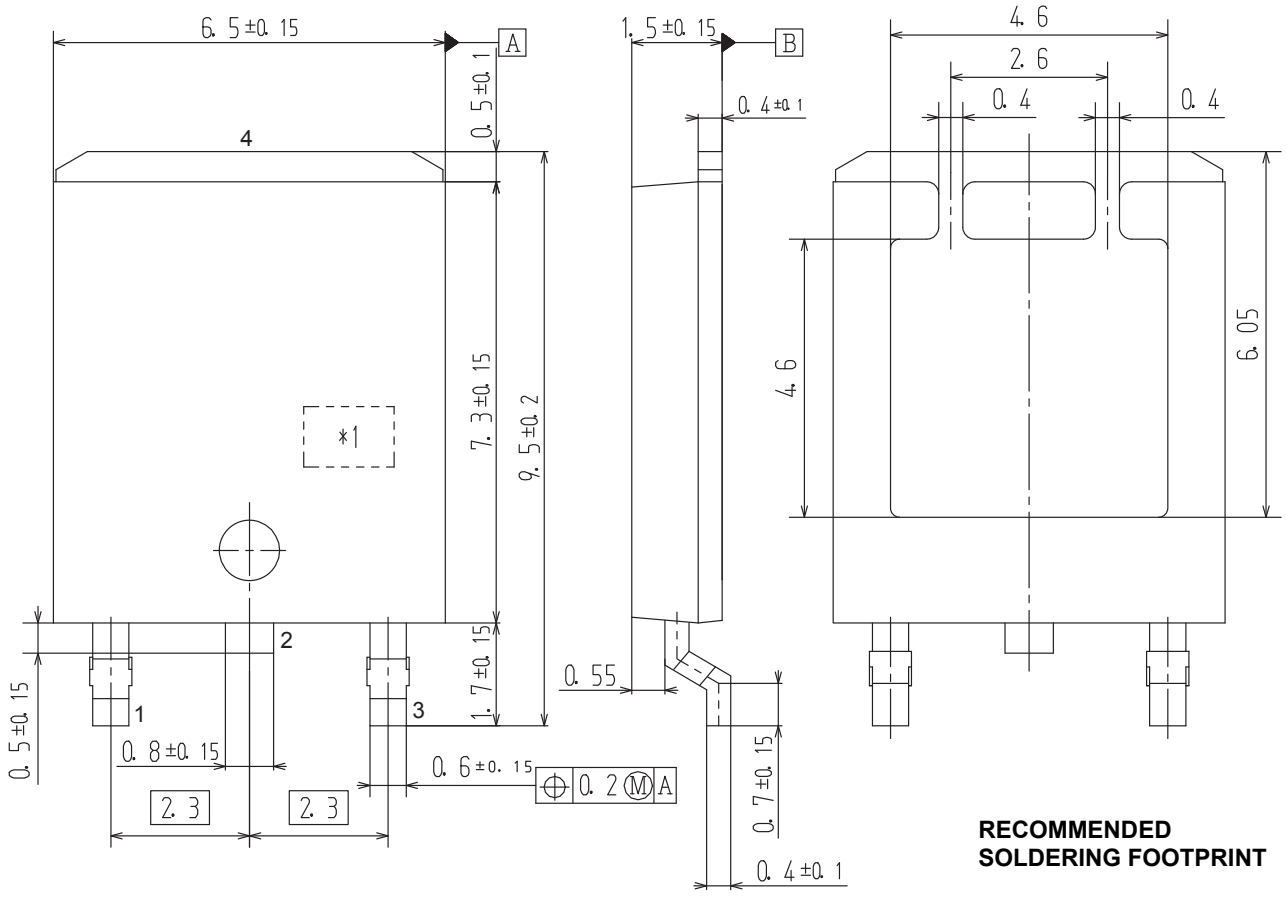


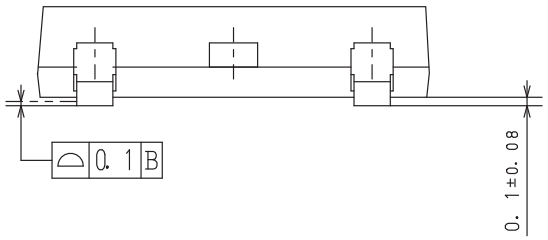
$R_{\theta JC}$ – Pulse Time



PACKAGE DIMENSIONS
unit : mm

DPAK (Single Gauge) / ATPAK
CASE 369AM
ISSUE O



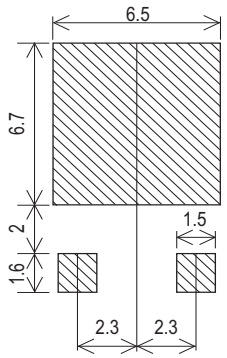


Pin2 is idle pin with electrical designation only carried

*1:Lot indication

1 : Gate
2 : Drain
3 : Source
4 : Drain

RECOMMENDED SOLDERING FOOTPRINT



ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing)
NVATS5A304PLZT4G	ATP304	DPAK (Single Gauge) / ATPAK (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 NVATS5A304PLZ is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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