MOSFET – Small Signal, Complementary, SOT-963, 1.0 x 1.0 mm

20 V, 220 mA / -200 mA

NTUD3169CZ

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	I_D Max
N-Channel 20 V	1.5 Ω @ 4.5 V	0.22 A
	2.0 Ω @ 2.5 V	
	3.0 Ω @ 1.8 V	
	4.5 Ω @ 1.5 V	
P-Channel 20 V	5.0 Ω @ −4.5 V	−0.2 A
	6.0 Ω @ −2.5 V	
	7.0 Ω @ −1.8 V	
	10 Ω @ −1.5 V	

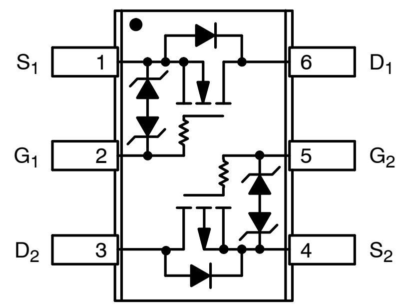
Features

- Complementary MOSFET Device
- Offers a Low $R_{DS(on)}$ Solution in the Ultra Small 1.0x1.0 mm Package
- 1.5 V Gate Voltage Rating
- Ultra Thin Profile (< 0.5 mm) Allows It to Fit Easily into Extremely Thin Environments such as Portable Electronics.
- This is a Pb-Free Device

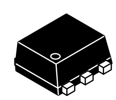
Applications

- Load Switch with Level Shift
- Optimized for Power Management in Ultra Portable Equipment

PINOUT: SOT-963

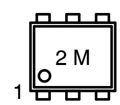


Top View



SOT-963
CASE 527AD

MARKING DIAGRAM



2 = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
NTUD3169CZT5G	SOT-963 (Pb-Free)	8000 / Tape & Reel

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

MAXIMUM RATINGS (T_J = 25 °C unless otherwise specified)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	20	V
Gate-to-Source Voltage			V_{GS}	±8	V
N-Channel Continuous Drain Current (Note 1)	Steady State	T_A = 25 °C	I_D	220	mA
		T_A = 85 °C		160	
	t ≤ 5 s	T_A = 25 °C		280	
P-Channel Continuous Drain Current (Note 1)	Steady State	T_A = 25 °C		−200	
		T_A = 85 °C		−140	
	t ≤ 5 s	T_A = 25 °C		−250	
Power Dissipation (Note 1)	Steady State	T_A = 25 °C	P_D	125	mW
	t ≤ 5 s			200	
Pulsed Drain Current	N-Channel	t_p = 10 μs	I_{DM}	800	mA
	P-Channel			−600	
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°C
Source Current (Body Diode) (Note 2)			I_S	200	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°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. Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz. Cu.
2. Pulse Test: pulse width ≤300 μs, duty cycle ≤2%

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State, Minimum Pad (Note 3)	$R_{\theta JA}$	1000	°C/W
Junction-to-Ambient – t ≤ 5 s (Note 3)		600	

3. Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz. Cu.

ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified)

Parameter	Symbol	N/P	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS								
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	N	V_{GS} = 0 V	I_D = 250 μA	20			V
		P		I_D = –250 μA	–20			
Zero Gate Voltage Drain Current	I_{DSS}	N	V_{GS} = 0 V, V_{DS} = 5.0 V	T_J = 25 °C			50	nA
				T_J = 85 °C			200	
		P	V_{GS} = 0 V, V_{DS} = –5.0 V	T_J = 25 °C			–50	
				T_J = 85 °C			–200	
Zero Gate Voltage Drain Current	I_{DSS}	N	V_{GS} = 0 V, V_{DS} = 16 V	T_J = 25 °C			100	nA
		P	V_{GS} = 0 V, V_{DS}= –16 V				–100	
Gate-to-Source Leakage Current	I_{GSS}	N	V_{DS} = 0 V, V_{GS} = ±5.0 V				±100	nA
		P					±100	
ON CHARACTERISTICS (Note 4)								
Gate Threshold Voltage	$V_{GS(TH)}$	N	V_{GS} = V_{DS}	I_D = 250 μA	0.4		1.0	V
		P		I_D = –250 μA	–0.4		–1.0	
Drain-to-Source On Resistance	$R_{DS(on)}$	N	V_{GS} = 4.5 V, I_D = 100 mA			0.75	1.5	Ω
		P	V_{GS} = –4.5V, I_D = –100 mA			2.0	5.0	
		N	V_{GS} = 2.5 V, I_D = 50 mA			1.0	2.0	
		P	V_{GS} = –2.5V, I_D = –50 mA			2.6	6.0	
		N	V_{GS} = 1.8 V, I_D = 20 mA			1.4	3.0	
		P	V_{GS} = –1.8V, I_D = –20 mA			3.4	7.0	
		N	V_{GS} = 1.5 V, I_D = 10 mA			1.8	4.5	
		P	V_{GS} = –1.5 V, I_D = –10 mA			4.0	10	
		N	V_{GS} = 1.2 V, I_D = 1.0 mA			2.8		
		P	V_{GS} = –1.2 V, I_D = –1.0 mA			6.0		
Forward Transconductance	g_{FS}	N	V_{DS} = 5.0 V, I_D = 125 mA			0.48		S
		P	V_{DS} = –5.0 V, I_D = –125 mA			0.35		
Source-Drain Diode Voltage	V_{SD}	N	V_{GS} = 0 V, I_S = 10 mA	T_J = 25 °C		0.6	1.0	V
		P	V_{GS} = 0 V, I_S = –10 mA			–0.6	–1.0	
CAPACITANCES								
Input Capacitance	C_{ISS}	N	f = 1 MHz, V_{GS} = 0 V V_{DS} = 15 V			12.5		pF
Output Capacitance	C_{OSS}					3.6		
Reverse Transfer Capacitance	C_{RSS}					2.6		
Input Capacitance	C_{ISS}	P	f = 1 MHz, V_{GS} = 0 V V_{DS} = –15 V			13.5		
Output Capacitance	C_{OSS}					3.8		
Reverse Transfer Capacitance	C_{RSS}					2.0		

4. Switching characteristics are independent of operating junction temperatures

ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified)

Parameter	Symbol	N/P	Test Condition	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)							
Turn-On Delay Time	$t_{d(ON)}$	N	V_{GS} = 4.5 V, V_{DD} = 10 V, I_D = 200 mA, R_G = 2.0 Ω		16.5		ns
Rise Time	t_r				25.5		
Turn-Off Delay Time	$t_{d(OFF)}$				142		
Fall Time	t_f				80		
Turn-On Delay Time	$t_{d(ON)}$	P	V_{GS} = −4.5 V, V_{DD} = −15 V, I_D = −200 mA, R_G = 2.0 Ω		26		
Rise Time	t_r				46		
Turn-Off Delay Time	$t_{d(OFF)}$				196		
Fall Time	t_f				145		

4. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS (N-CHANNEL)

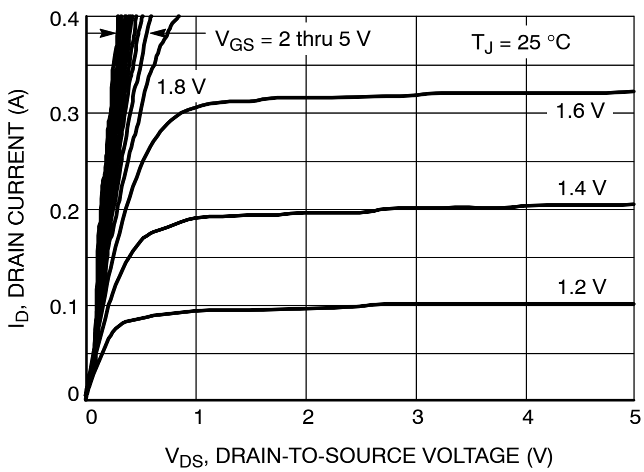


Figure 1. On-Region Characteristics

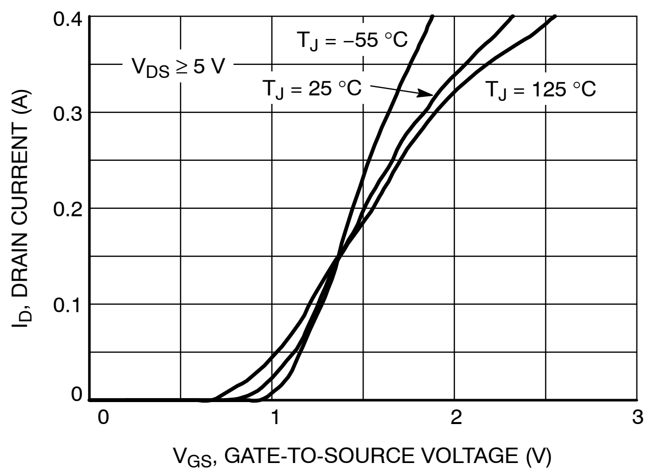


Figure 2. Transfer Characteristics

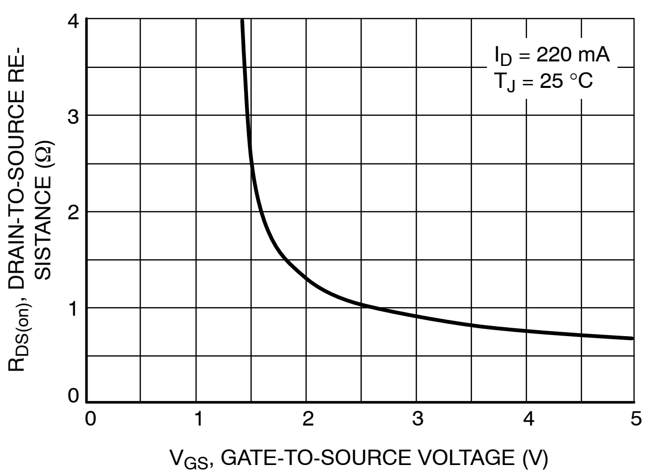


Figure 3. On-Resistance vs. Gate Voltage

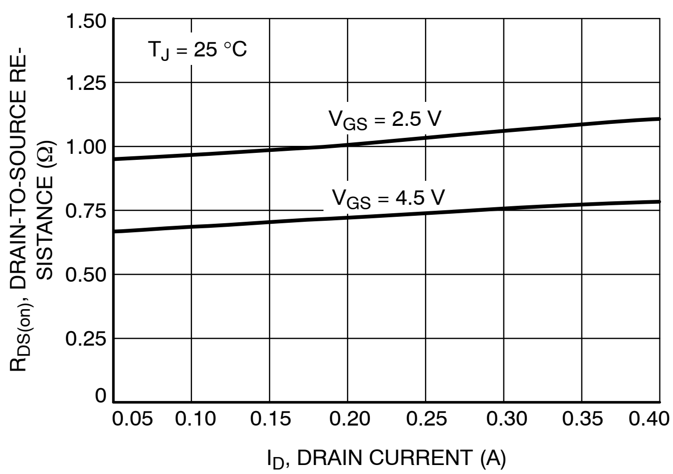


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

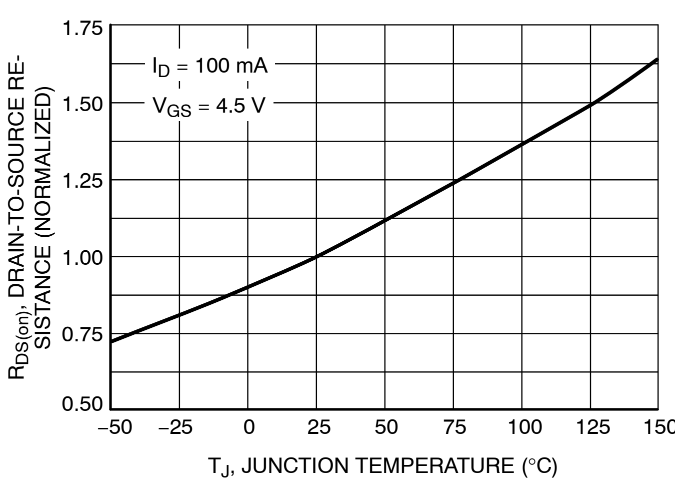


Figure 5. On-Resistance Variation with Temperature

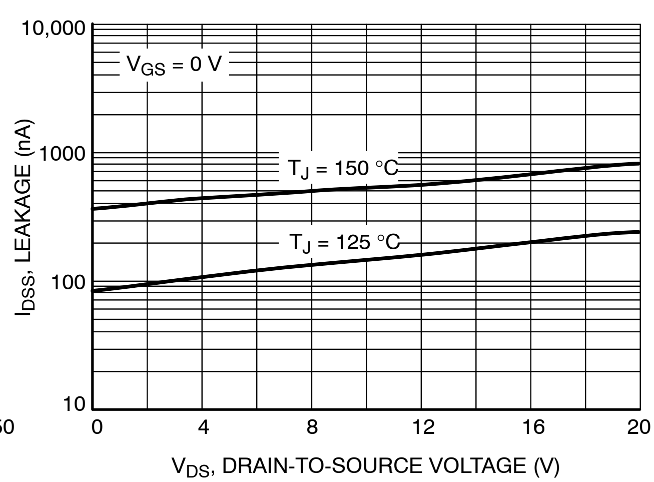


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (N-CHANNEL)

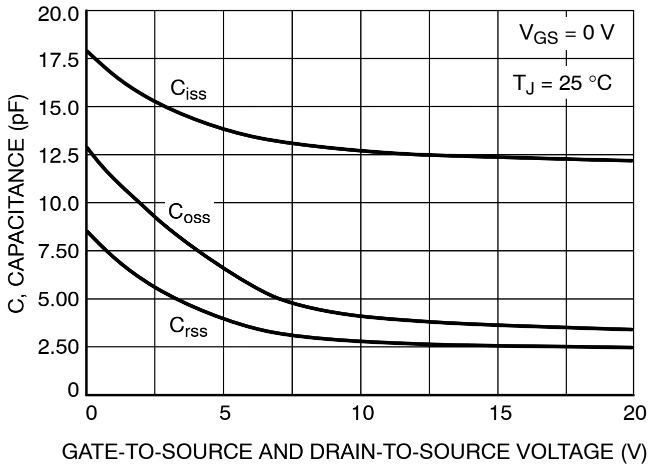


Figure 7. Capacitance Variation

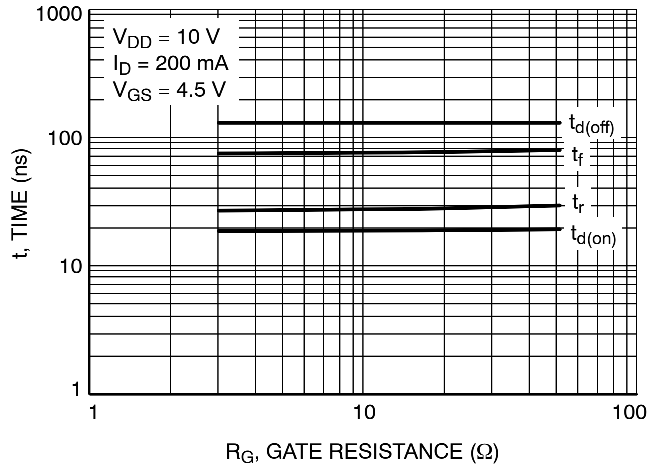


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

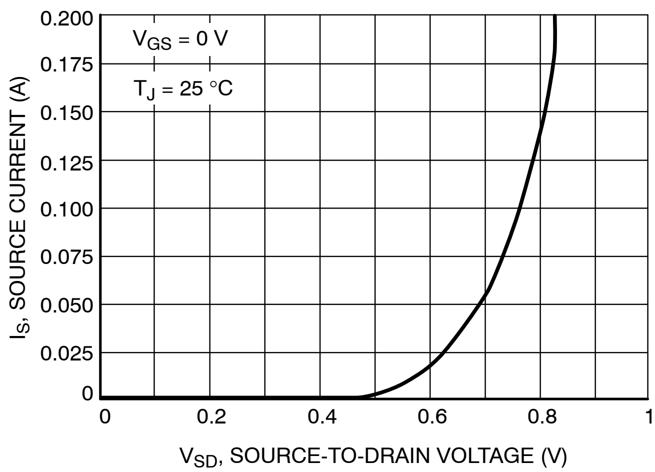


Figure 9. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS (P-CHANNEL)

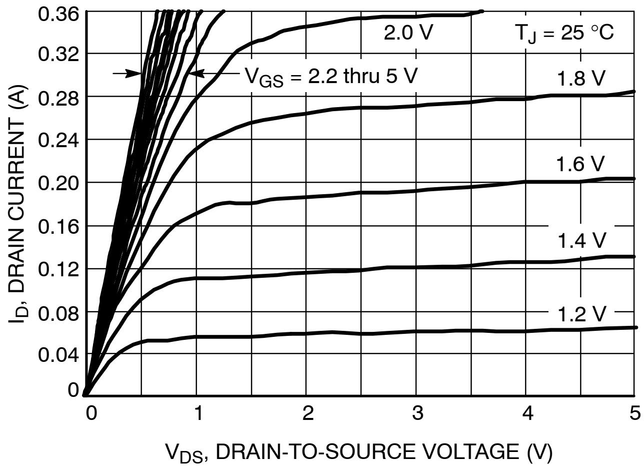


Figure 10. On-Region Characteristics

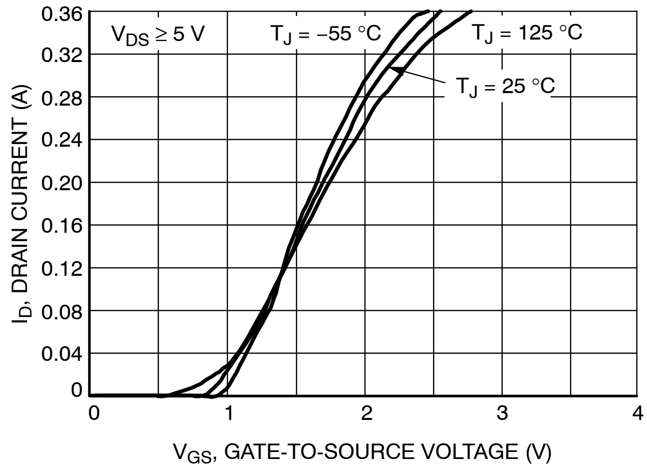


Figure 11. Transfer Characteristics

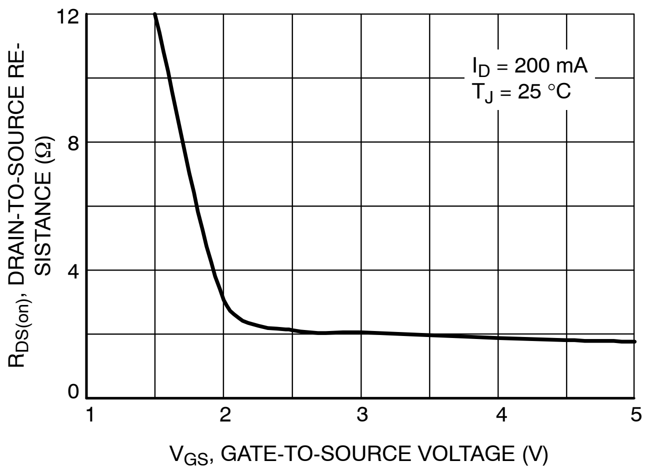


Figure 12. On-Resistance vs. Gate Voltage

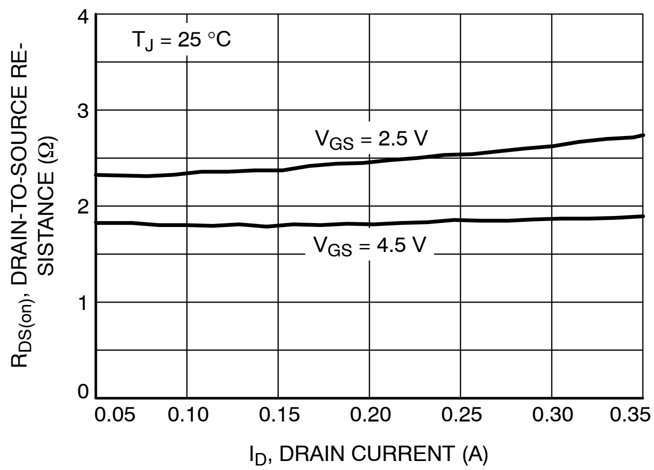


Figure 13. On-Resistance vs. Drain Current and Gate Voltage

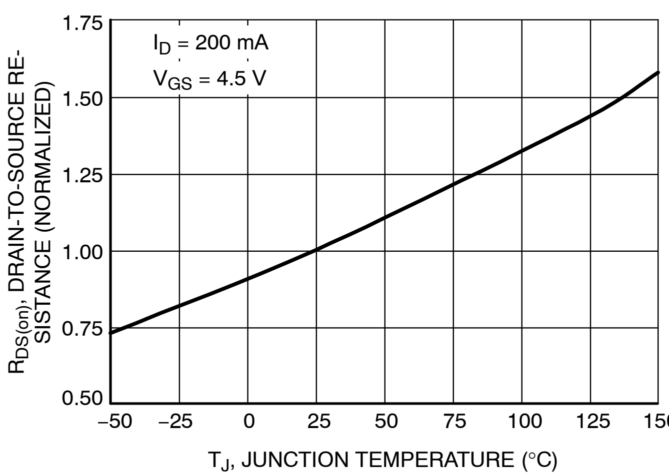


Figure 14. On-Resistance Variation with Temperature

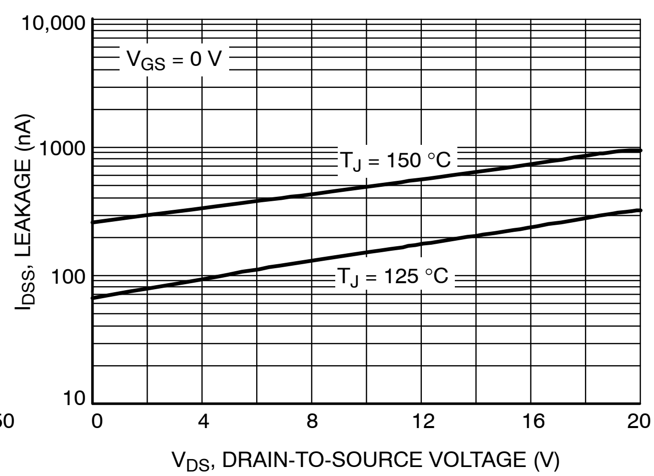


Figure 15. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (P-CHANNEL)

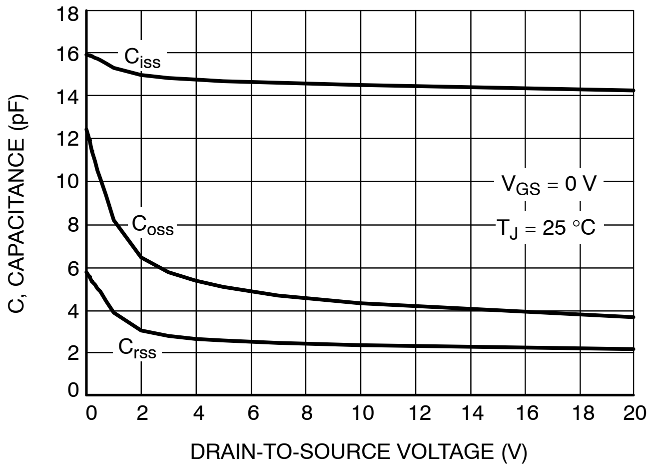


Figure 16. Capacitance Variation

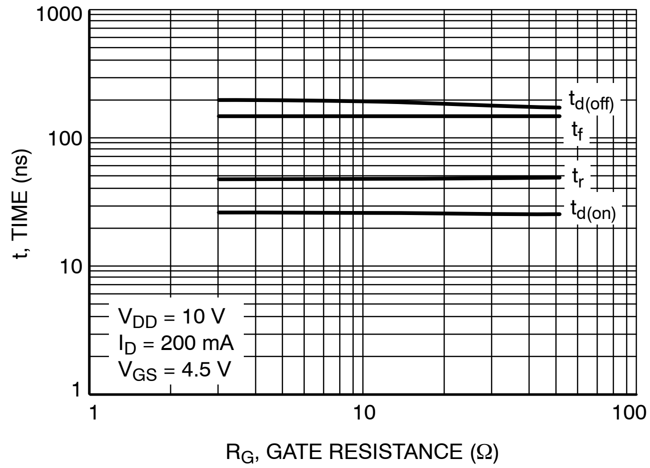


Figure 17. Resistive Switching Time Variation vs. Gate Resistance

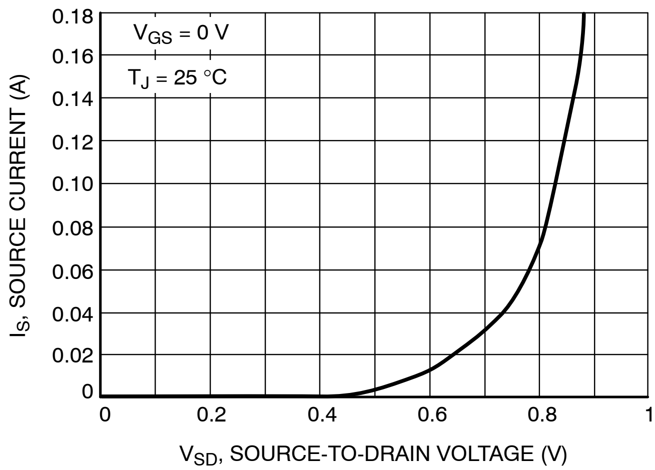
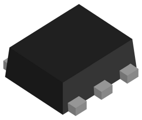


Figure 18. Diode Forward Voltage vs. Current

REVISION HISTORY

Revision	Description of Changes	Date
2	Rebranded the Data Sheet to **onsemi** format.	6/12/2025

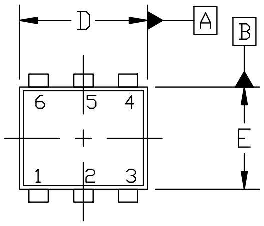


SOT−963 1.00x1.00x0.37, 0.35P
CASE 527AD
ISSUE F

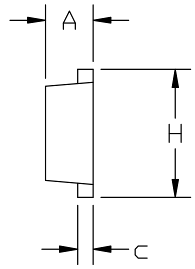
DATE 20 FEB 2024

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

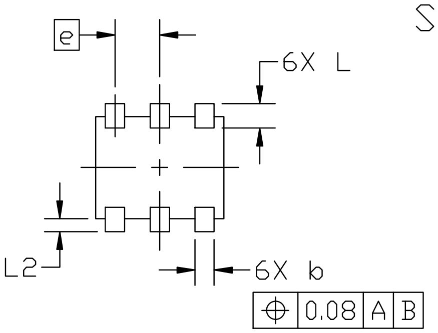
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.34	0.37	0.40
b	0.10	0.15	0.20
c	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H	0.95	1.00	1.05
L	0.19 REF		
L2	0.05	0.10	0.15



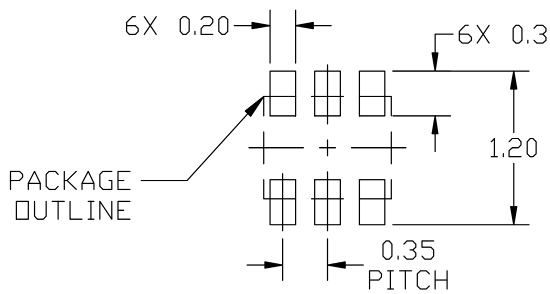
TOP VIEW



SIDE VIEW



BOTTOM VIEW



RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference manual, SOLDERRM/D.

STYLE 1:
PIN 1. EMITTER 1
2. BASE 1
3. COLLECTOR 2
4. EMITTER 2
5. BASE 2
6. COLLECTOR 1

STYLE 2:
PIN 1. EMITTER 1
2. EMITTER2
3. BASE 2
4. COLLECTOR 2
5. BASE 1
6. COLLECTOR 1

STYLE 3:
PIN 1. CATHODE 1
2. CATHODE 1
3. ANODE/ANODE 2
4. CATHODE 2
5. CATHODE 2
6. ANODE/ANODE 1

STYLE 4:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 5:
PIN 1. CATHODE
2. CATHODE
3. ANODE
4. ANODE
5. CATHODE
6. CATHODE

STYLE 6:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

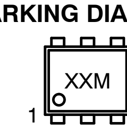
STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

STYLE 8:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 9:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 10:
PIN 1. CATHODE 1
2. N/C
3. CATHODE 2
4. ANODE 2
5. N/C
6. ANODE 1

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Month Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	**98AON26456D**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**SOT−963 1.00x1.00x0.37, 0.35P**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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