

NTGD3149C

Power MOSFET

Complementary, 20 V, +3.5/-2.7 A,
TSOP-6 Dual

Features

- Complementary N-Channel and P-Channel MOSFET
- Small Size (3 x 3 mm) Dual TSOP-6 Package
- Leading Edge Trench Technology for Low On Resistance
- Reduced Gate Charge to Improve Switching Response
- Independently Connected Devices to Provide Design Flexibility
- This is a Pb-Free Device

Applications

- DC-DC Conversion Circuits
- Load/Power Switching with Level Shift

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	20	V
Gate-to-Source Voltage (N-Ch & P-Ch)			V_{GS}	± 8	V
N-Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 85^\circ\text{C}$	I_D	3.2 2.3	A
	$t \leq 5\text{ s}$	$T_A = 25^\circ\text{C}$		3.5	
P-Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$ $T_A = 85^\circ\text{C}$	I_D	2.4 1.7	A
	$t \leq 5\text{ s}$	$T_A = 25^\circ\text{C}$		2.7	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	P_D	0.9	W
	$t \leq 5\text{ s}$			1.1	
Pulsed Drain Current	N-Ch	$t_p = 10\text{ }\mu\text{s}$	I_{DM}	11	A
	P-Ch			8.0	
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 150	°C
Source Current (Body Diode)			I_S	0.8	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	140	°C/W
Junction-to-Ambient – $t \leq 5\text{ s}$ (Note 1)	$R_{\theta JA}$	110	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

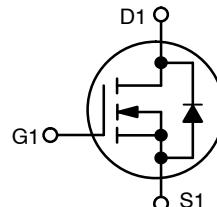
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

ON

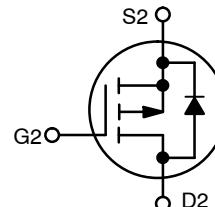
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
N-Ch 20 V	60 mΩ @ 4.5 V	3.5 A
	90 mΩ @ 2.5 V	
P-Ch -20 V	110 mΩ @ 4.5 V	-2.7 A
	145 mΩ @ 2.5 V	



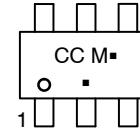
N-CHANNEL MOSFET



P-CHANNEL MOSFET



TSOP-6
CASE 318G
STYLE 13



MARKING
DIAGRAM

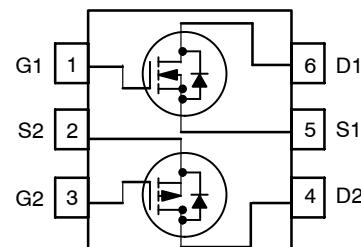
CC = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN CONNECTION



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

NTGD3149C

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	N/P	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS								
Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	N	$V_{\text{GS}} = 0 \text{ V}$	$I_D = 250 \mu\text{A}$	20			V
		P		$I_D = -250 \mu\text{A}$	-20			
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$	N				1.1		$\text{mV}/^\circ\text{C}$
		P				1.1		
Zero Gate Voltage Drain Current	I_{DSS}	N	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 16 \text{ V}$	$T_J = 25^\circ\text{C}$			1.0	μA
		P	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = -16 \text{ V}$				-1.0	
		N	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 16 \text{ V}$	$T_J = 85^\circ\text{C}$			10	
		P	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = -16 \text{ V}$				-10	
Gate-to-Source Leakage Current	I_{GSS}	N	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 8 \text{ V}$				± 100	nA
		P	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 8 \text{ V}$				± 100	

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	N	$V_{\text{GS}} = V_{\text{DS}}$	$I_D = 250 \mu\text{A}$	0.4		1.0	V
		P		$I_D = -250 \mu\text{A}$	-0.4		-1.0	
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	N	$V_{\text{GS}} = 4.5 \text{ V}, I_D = 3.5 \text{ A}$			41	60	$\text{m}\Omega$
		P	$V_{\text{GS}} = -4.5 \text{ V}, I_D = -2.7 \text{ A}$			83	110	
		N	$V_{\text{GS}} = 2.5 \text{ V}, I_D = 2.9 \text{ A}$			51	90	
		P	$V_{\text{GS}} = -2.5 \text{ V}, I_D = -2.4 \text{ A}$			104	145	
		N	$V_{\text{GS}} = 1.8 \text{ V}, I_D = 2.2 \text{ A}$			67	150	
		P	$V_{\text{GS}} = -1.8 \text{ V}, I_D = -1.9 \text{ A}$			143	220	
Forward Transconductance	g_{FS}	N	$V_{\text{DS}} = 10 \text{ V}, I_D = 3.5 \text{ A}$			4.7		S
		P	$V_{\text{DS}} = -10 \text{ V}, I_D = -2.7 \text{ A}$			5.1		

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	N	$f = 1 \text{ MHz}, V_{\text{GS}} = 0 \text{ V}$	$V_{\text{DS}} = 10 \text{ V}$		387		pF		
Output Capacitance	C_{OSS}					73				
Reverse Transfer Capacitance	C_{RSS}					43				
Input Capacitance	C_{ISS}	P		$V_{\text{DS}} = -10 \text{ V}$		509				
Output Capacitance	C_{OSS}					76				
Reverse Transfer Capacitance	C_{RSS}					40				
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	N				4.6	5.5	nC		
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$					0.3				
Gate-to-Source Gate Charge	Q_{GS}					0.7				
Gate-to-Drain "Miller" Charge	Q_{GD}					1.2				
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	P				5.2	5.5			
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$					0.4				
Gate-to-Source Gate Charge	Q_{GS}					1.0				
Gate-to-Drain "Miller" Charge	Q_{GD}					1.2				

NTGD3149C

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

Parameter	Symbol	N/P	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 3)							
Turn-On Delay Time	t _{d(ON)}	N	V _{GS} = 4.5 V, V _{DD} = 10 V, I _D = 1.0 A, R _G = 6.0 Ω		6.5		ns
Rise Time	t _r				3.8		
Turn-Off Delay Time	t _{d(OFF)}				16.4		
Fall Time	t _f				2.4		
Turn-On Delay Time	t _{d(ON)}	P	V _{GS} = -4.5 V, V _{DD} = -10 V, I _D = -1.0 A, R _G = 6.0 Ω		7.0		
Rise Time	t _r				5.3		
Turn-Off Delay Time	t _{d(OFF)}				33.3		
Fall Time	t _f				29.5		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	N	V _{GS} = 0 V, T _J = 25 °C	I _S = 0.8 A		0.7	1.2	V
		P		I _S = -0.8 A		-0.7	-1.2	
Reverse Recovery Time	t _{RR}	N	V _{GS} = 0 V, dI _S / dt = 100 A/μs			7.7		ns
Charge Time	t _a					4.5		
Discharge Time	t _b					3.2		
Reverse Recovery Charge	Q _{RR}					1.9		nC
Reverse Recovery Time	t _{RR}	P	V _{GS} = 0 V, dI _S / dt = 100 A/μs			11.4		ns
Charge Time	t _a					7.5		
Discharge Time	t _b					3.9		
Reverse Recovery Charge	Q _{RR}					4.7		nC

2. Pulse Test: pulse width \leq 300 μs, duty cycle \leq 2%.

3. Switching characteristics are independent of operating junction temperatures.

ORDERING INFORMATION

Device	Package	Shipping [†]
NTGD3149CT1G	TSOP6 (Pb-Free)	3000 / 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.

TYPICAL CHARACTERISTICS (N-CHANNEL)

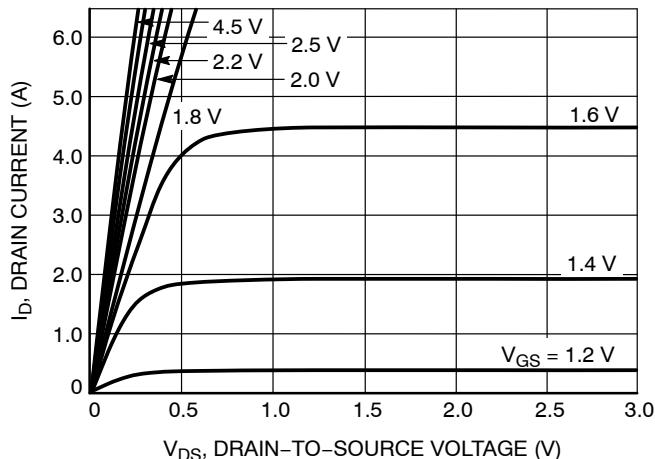


Figure 1. Nch On-Region Characteristics

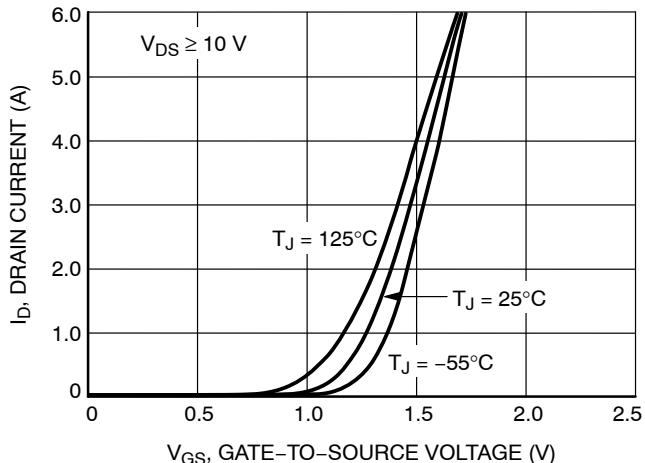


Figure 2. Nch Transfer Characteristics

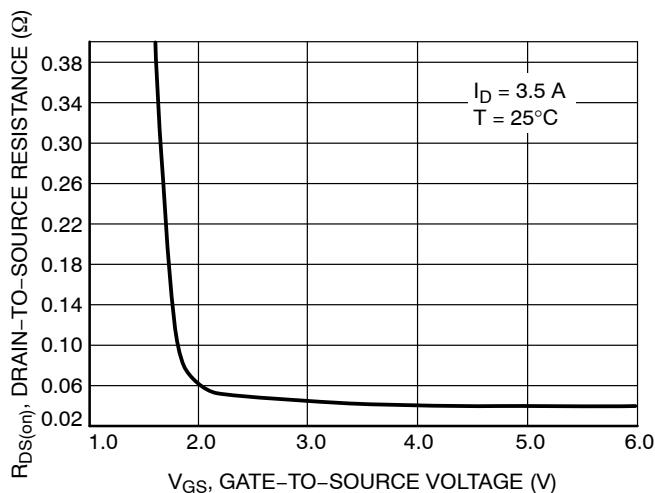


Figure 3. Nch On-Resistance vs. Gate Voltage

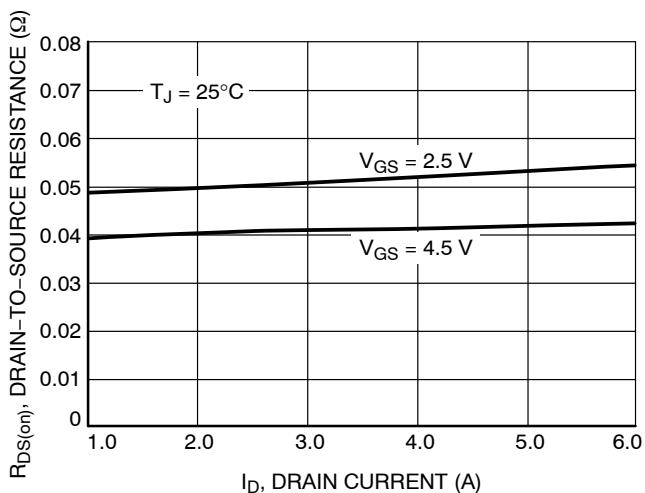


Figure 4. Nch On-Resistance vs. Drain Current and Gate Voltage

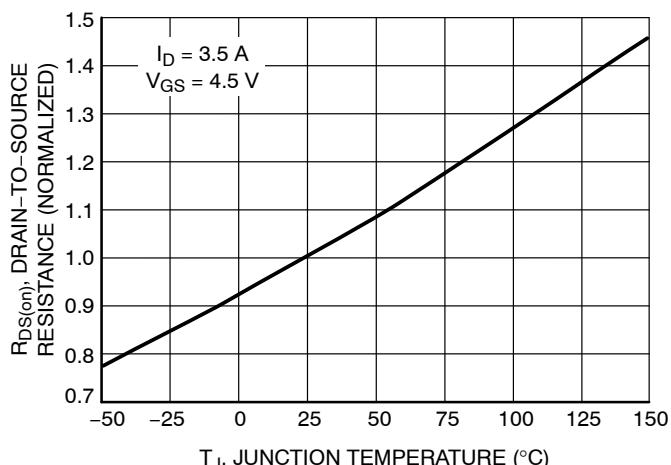


Figure 5. Nch On-Resistance Variation with Temperature

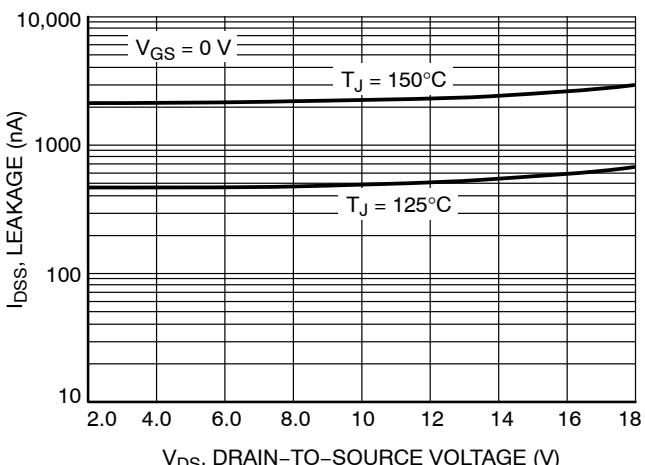


Figure 6. Nch Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (N-CHANNEL)

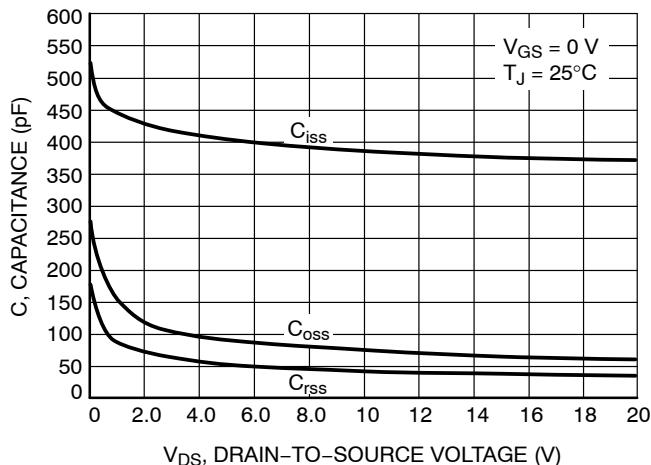


Figure 7. Nch Capacitance Variation

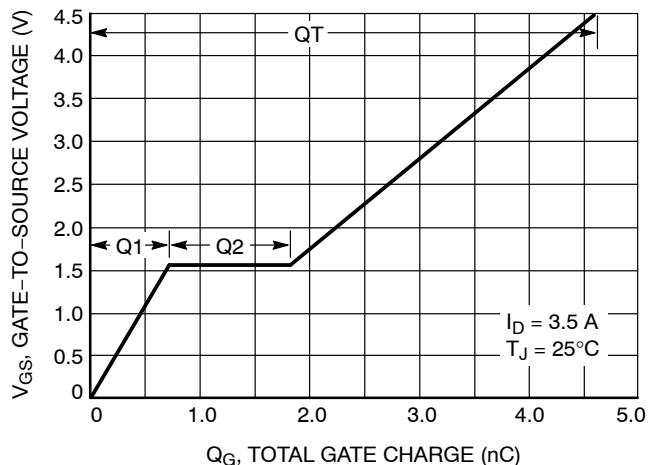


Figure 8. Nch Gate-to-Source Voltage vs. Total Charge

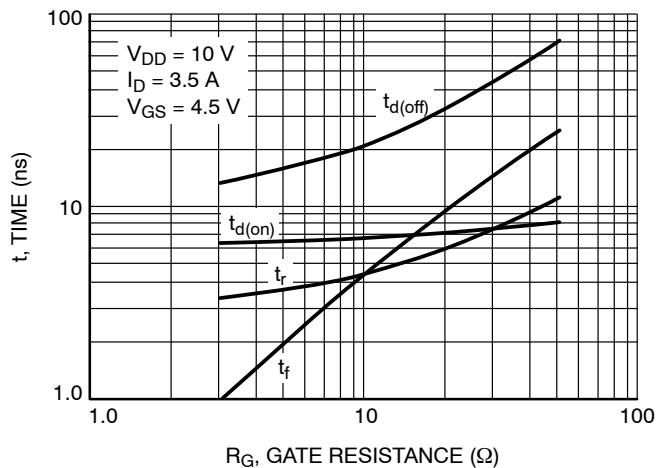


Figure 9. Nch Resistive Switching Time Variation vs. Gate Resistance

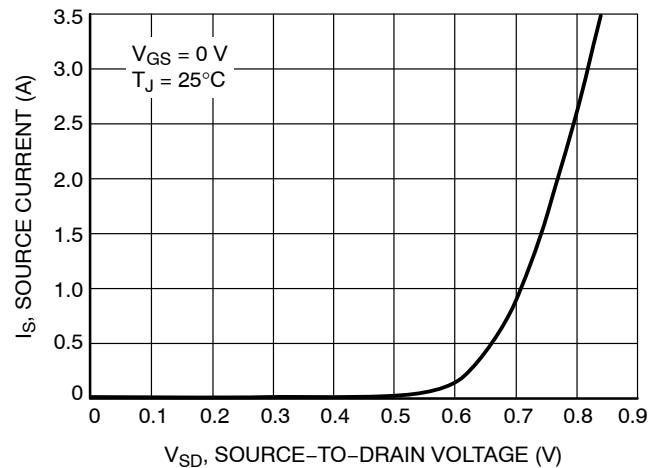


Figure 10. Nch Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS (P-CHANNEL)

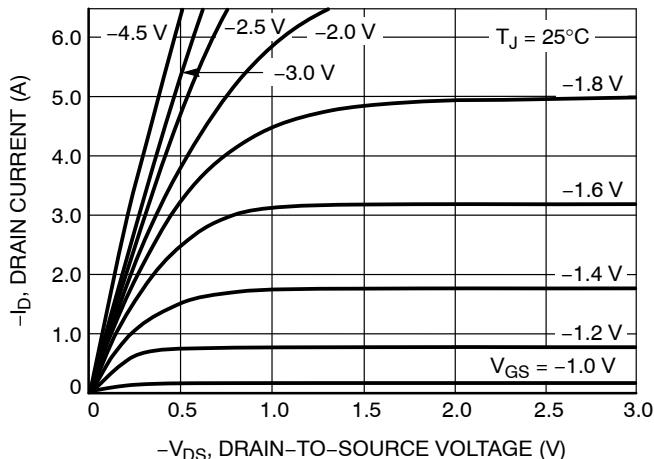


Figure 11. Pch On-Region Characteristics

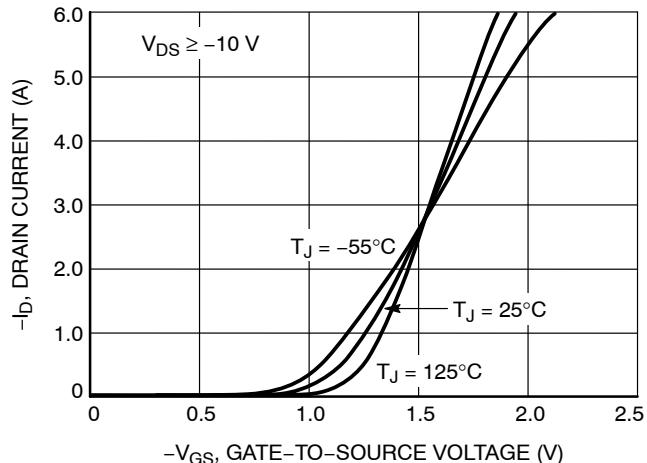


Figure 12. Pch Transfer Characteristics

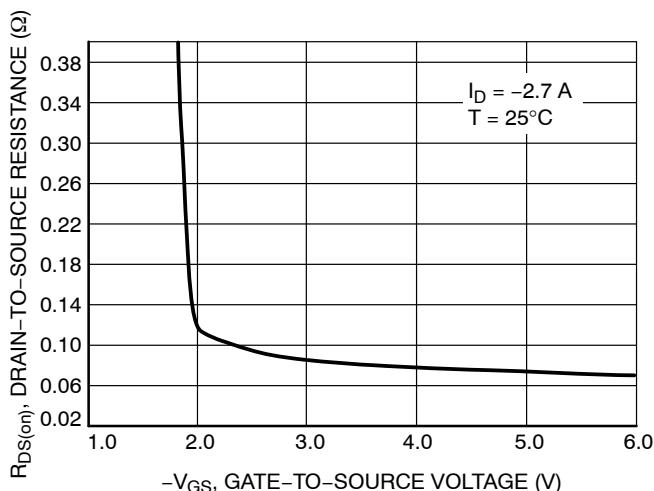


Figure 13. Pch On-Resistance vs. Gate Voltage

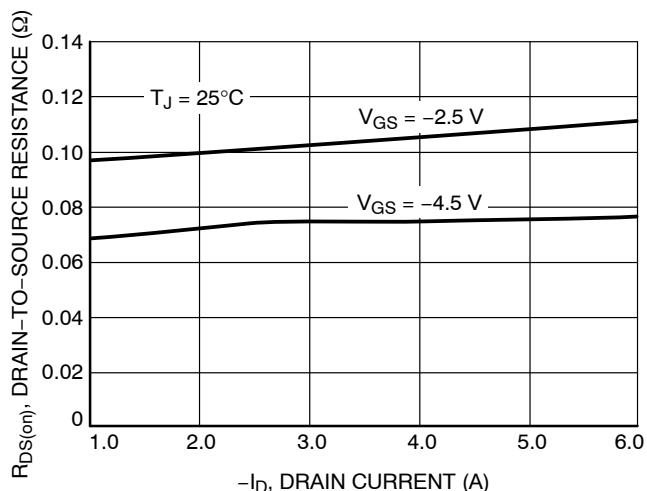


Figure 14. Pch On-Resistance vs. Drain Current and Gate Voltage

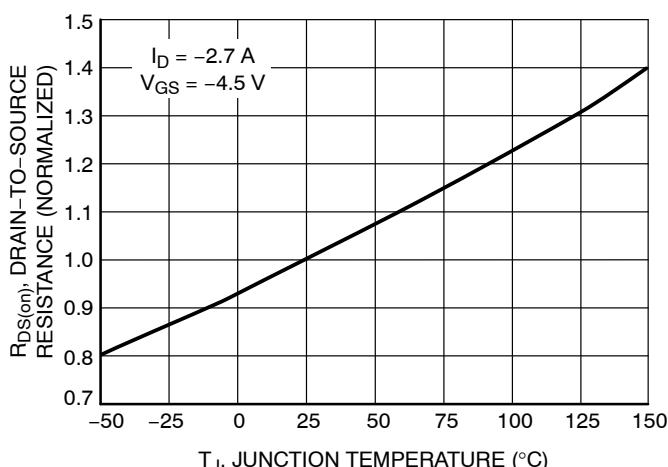


Figure 15. Pch On-Resistance Variation with Temperature

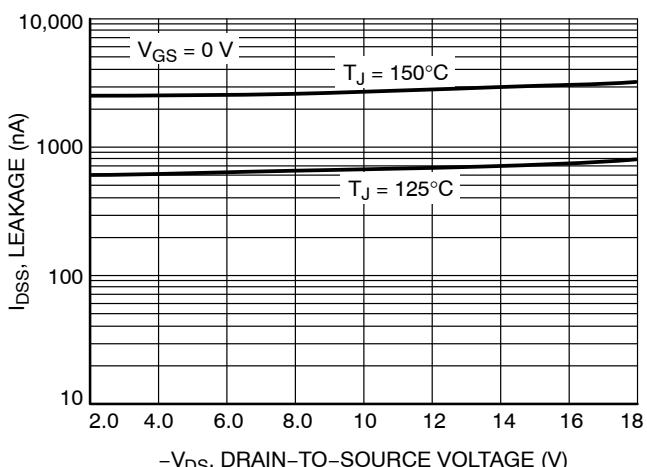


Figure 16. Pch Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (P-CHANNEL)

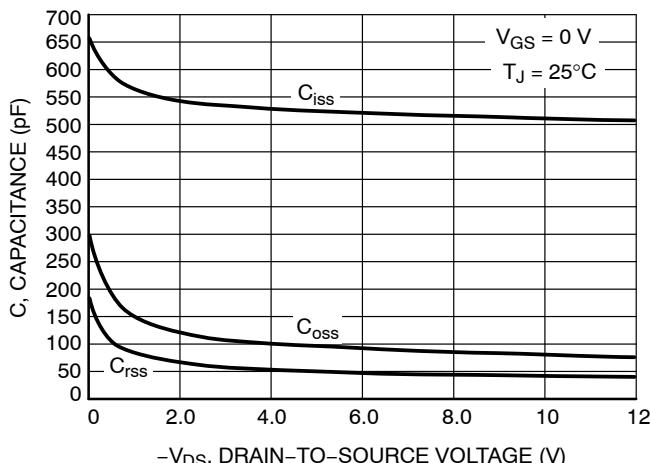


Figure 17. Pch Capacitance Variation

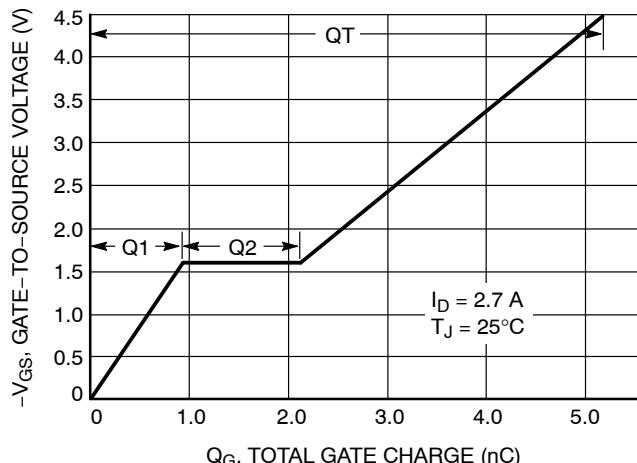


Figure 18. Pch Gate-to-Source Voltage vs. Total Charge

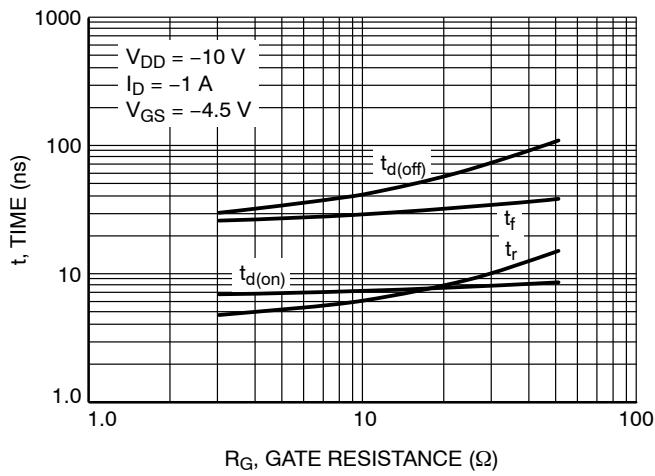


Figure 19. Pch Resistive Switching Time Variation vs. Gate Resistance

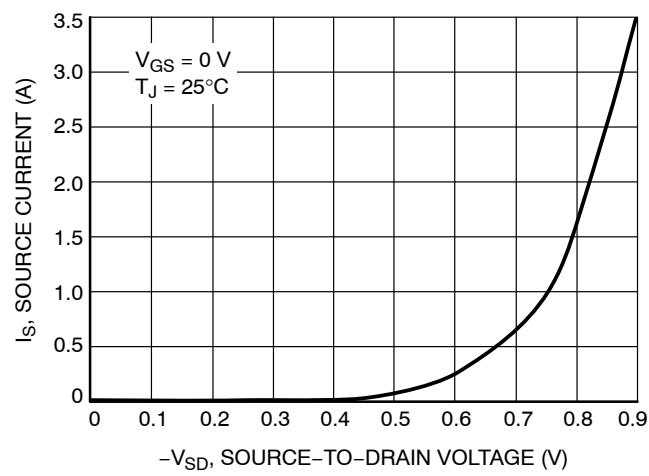


Figure 20. Pch Diode Forward Voltage vs. Current

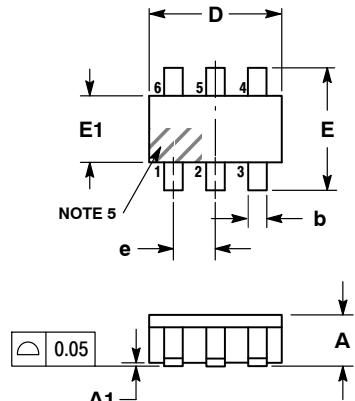
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 2:1



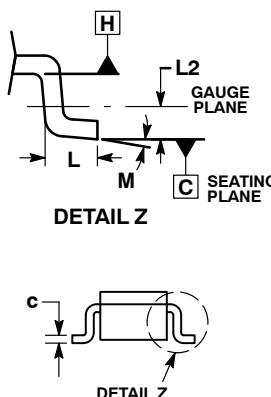
TSOP-6 CASE 318G-02 ISSUE V

DATE 12 JUN 2012

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	—	10°



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

STYLE 2:
PIN 1. Emitter 2
2. Base 1
3. Collector 1
4. Emitter 1
5. Base 2
6. Collector 2

STYLE 3:
PIN 1. ENABLE
2. N/C
3. R BOOST
4. Vz
5. Vin
6. Vout

STYLE 4:
PIN 1. N/C
2. Vin
3. NOT USED
4. Ground
5. ENABLE
6. LOAD

STYLE 5:
PIN 1. Emitter 2
2. Base 2
3. Collector 1
4. Emitter 1
5. Base 1
6. Collector 2

STYLE 6:
PIN 1. Collector
2. Collector
3. Base
4. Emitter
5. Collector
6. Collector

STYLE 7:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. N/C
5. COLLECTOR
6. Emitter

STYLE 8:
PIN 1. Vbus
2. D(in)
3. D(in)+
4. D(out)+
5. D(out)
6. GND

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

STYLE 10:
PIN 1. D(OUT)+
2. GND
3. D(OUT)-
4. D(IN)-
5. VBUS
6. D(IN)+

STYLE 11:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1/GATE 2

STYLE 12:
PIN 1. I/O
2. GROUND
3. I/O
4. I/O
5. VCC
6. I/O

STYLE 13:
PIN 1. GATE 1
2. SOURCE 2
3. GATE 2
4. DRAIN 2
5. SOURCE 1
6. DRAIN 1

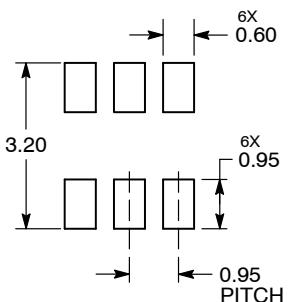
STYLE 14:
PIN 1. ANODE
2. SOURCE
3. GATE
4. CATHODE/DRAIN
5. CATHODE/DRAIN
6. CATHODE/DRAIN

STYLE 15:
PIN 1. ANODE
2. SOURCE
3. GATE
4. DRAIN
5. N/C
6. CATHODE

STYLE 16:
PIN 1. ANODE/CATHODE
2. BASE
3. Emitter
4. COLLECTOR
5. ANODE
6. CATHODE

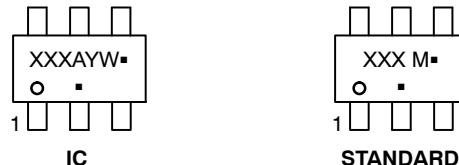
STYLE 17:
PIN 1. Emitter
2. Base
3. ANODE/CATHODE
4. ANODE
5. CATHODE
6. COLLECTOR

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
■ = Pb-Free Package

XXX = Specific Device Code
M = Date Code
■ = Pb-Free Package

*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.

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

DOCUMENT NUMBER:	98ASB14888C	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TSOP-6	PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, ONSEMI, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative