



40V +175°C N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

V _{(BR)DSS}	R _{DS(ON)}	I _D T _C = +25°C	
40V	$4.0 \text{m}\Omega$ @ $V_{GS} = 10V$	150A	

Features

- Low Input Capacitance
- Low Input/Output Leakage
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP Capable (Note 4)

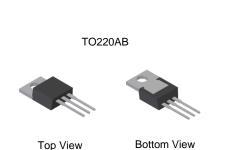
Description and Applications

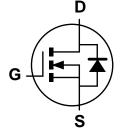
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

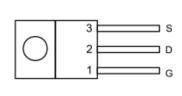
- Motor Control
- Backlighting
- DC-DC Converters
- Power Management Functions

Mechanical Data

- Case: TO220AB
- Case Material: Molded Plastic, "Green" Molding Compound.
 UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Finish Annealed over Copper Leadframe.
 Solderable per MIL-STD-202, Method 208 (3)
- Terminal Connections: See Diagram Below
- Weight: 1.85 grams (Approximate)







Equivalent Circuit

Top View Pin Out Configuration

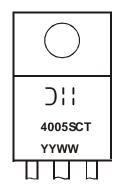
Ordering Information (Note 5)

Part Number	Case	Packaging					
DMNH4005SCTQ	TO220AB	50 Pieces/Tube					

otes: 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.

- 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 4. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
- 5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



4005SCT = Product Type Marking Code YYWW = Date Code Marking YY = Last Two Digits of Year (ex: 16 = 2016) WW = Week (01 to 53)



Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit		
Drain-Source Voltage			V_{DSS}	40	V
Gate-Source Voltage	V_{GSS}	20	V		
Continuous Drain Current V _{GS} = 10V	Steady State	$T_{C} = +25^{\circ}C$ $T_{C} = +100^{\circ}C$	I _D	150 100	А
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%	I _{DM}	90	Α		
Maximum Continuous Body Diode Forward Current (Note 6)			Is	80	Α
Avalanche Current (Note 7) L=1mH			I _{AS}	30	Α
Avalanche Energy (Note 7) L=1mH	E _{AS}	500	mJ		

Thermal Characteristics

Characteristic			Value	Unit	
Dower Dissination	$T_C = +25^{\circ}C$)	165	14/	
Power Dissipation	T _C = +70°C	P _D	100	W	
Thermal Resistance, Junction to Case			0.9	°C/W	
Operating and Storage Temperature Range			-55 to +175	°C	

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

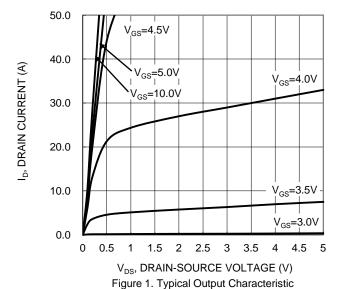
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 8)							
Drain-Source Breakdown Voltage	BV _{DSS}	40	-	_	V	$V_{GS} = 0V, I_D = 250\mu A$	
Zero Gate Voltage Drain Current	I _{DSS}	_	_	1	μA	$V_{DS} = 32V, V_{GS} = 0V$	
Gate-Source Leakage	I _{GSS}	_	-	±100	nA	$V_{GS} = \pm 16V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V _{GS(TH)}	1		3	V	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	
Static Drain-Source On-Resistance	R _{DS(ON)}	_	3.4	4.0	mΩ	$V_{GS} = 10V, I_D = 20A$	
Diode Forward Voltage	V_{SD}	_	_	1.2	V	$V_{GS} = 0V, I_{S} = 1A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C _{iss}	_	2,846	_		N 00V V 0V	
Output Capacitance	Coss	_	742	_	pF	$V_{DS} = 20V, V_{GS} = 0V$ f = 1.0MHz	
Reverse Transfer Capacitance	C _{rss}	_	242	_		1 = 1.0ivii iz	
Gate Resistance	R_{G}	_	1.9	_	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$	
Total Gate Charge (V _{GS} = 10V)	Q_{g}	_	48	_			
Total Gate Charge (V _{GS} = 4.5V)	Q_{g}	_	23	_	nC	Vpp = 20V. Ip = 20A	
Gate-Source Charge	Q_{gs}	_	9.5	_	110	VDD = 20V, ID = 20A	
Gate-Drain Charge	Q_{gd}	_	11.5	_			
Turn-On Delay Time	t _{D(ON)}		6.6	_			
Turn-On Rise Time	t _R	_	12.1	_	ns	$V_{DD} = 20V, V_{GS} = 10V,$	
Turn-Off Delay Time	t _{D(OFF)}		18.3		115	$R_G = 1\Omega$, $I_D = 20A$	
Turn-Off Fall Time	t _F	_	4.9	_			
Reverse Recovery Time	t _{RR}	_	29	_	ns	1 450 4:/4+ 4000/	
Reverse Recovery Charge	Q_{RR}	_	24	_	nC	I _F = 15A, di/dt = 100A/μs	

6. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided. 7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C. Notes:

Short duration pulse test used to minimize self-heating effect.
 Guaranteed by design. Not subject to product testing.







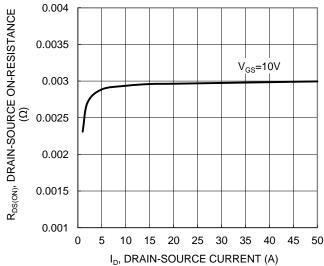


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

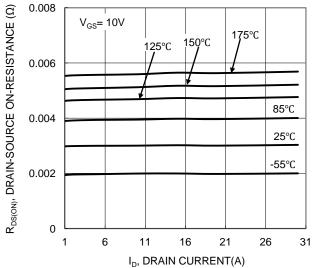
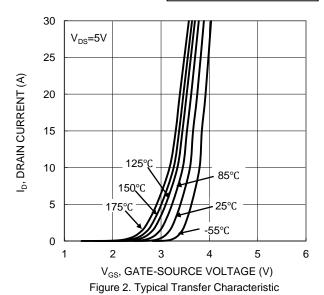
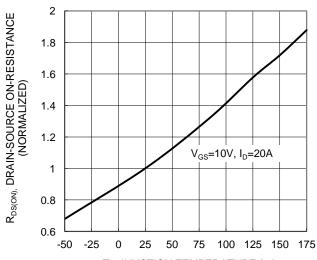


Figure 5. Typical On-Resistance vs. Drain Current and **Junction Temperature**



0.06 $R_{\mathrm{DS}(ON)},$ DRAIN-SOURCE ON-RESISTANCE (Ω) 0.05 0.04 0.03 0.02 I_D=20A 0.01 0 0 4 8 12 16 20 V_{GS} , GATE-SOURCE VOLTAGE (V)

Figure 4. Typical Transfer Characteristic



T_J, JUNCTION TEMPERATURE (°C) Figure 6. On-Resistance Variation with Junction Temperature





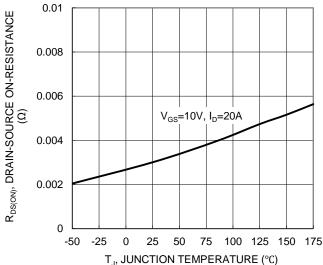


Figure 7. On-Resistance Variation with Junction Temperature

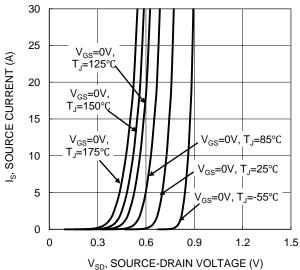
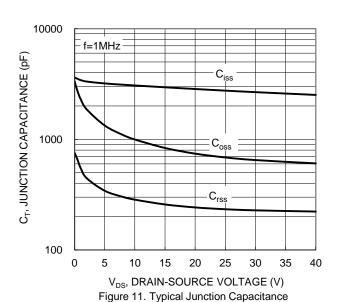
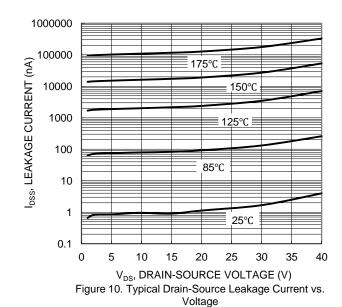


Figure 9. Diode Forward Voltage vs. Current



4 V_{GS(TH),} GATE THRESHOLD VOLTAGE (V) 3.5 3 I_D=1mA 2.5 2 I_D=250μA 1.5 1 0.5 0 -25 75 100 125 150 175 -50 25 50 T., JUNCTION TEMPERATURE (°C)

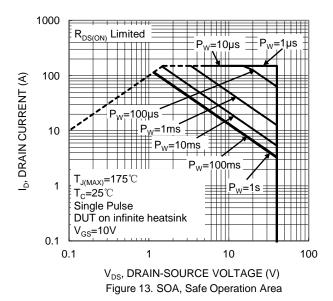
Figure 8. Gate Threshold Variation vs. Junction Temperature



10 8 6 $V_{GS}(V)$ V_{DS}=20V, I_D=20A 4 2 0 10 20 30 0 40 50 Q_q (nC)

Figure 12. Gate Charge





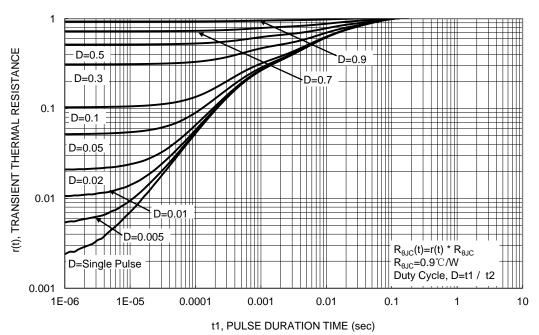


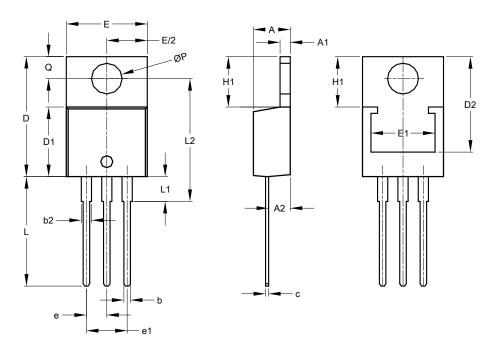
Figure 14. Transient Thermal Resistance



Package Outline Dimensions

 $Please see \ http://www.diodes.com/package-outlines.html \ for \ the \ latest \ version.$

TO220AB



TO220AB						
Dim	Min	Max	Тур			
Α	3.56	4.82	-			
A1	0.51	1.39	-			
A2	2.04	2.92	-			
b	0.39	1.01	0.81			
b2	1.15	1.77	1.24			
С	0.356	0.61	-			
D	14.22	16.51	-			
D1	8.39	9.01	-			
D2	11.45	12.87	-			
е	-		2.54			
e1	-	1	5.08			
Е	9.66	10.66	-			
E1	6.86	8.89	-			
H1	5.85	6.85	-			
L	12.70	14.73	-			
L1	-	6.35	-			
L2	15.80	16.20	16.00			
Р	3.54	4.08	-			
Q	2.54	3.42	-			
All Dimensions in mm						



IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

- A. Life support devices or systems are devices or systems which:
 - 1. are intended to implant into the body, or
 - 2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.
- B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated

www.diodes.com