

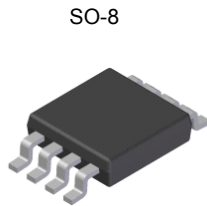
## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ\text{C}$
-20V	38m $\Omega$ @ $V_{GS} = -4.5\text{V}$	-6.5A
	56m $\Omega$ @ $V_{GS} = -2.5\text{V}$	-5.0A

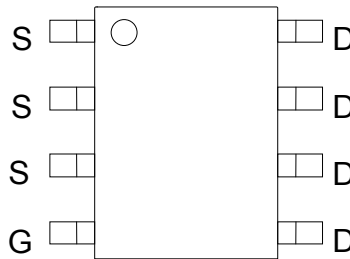
## Description and Applications

This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

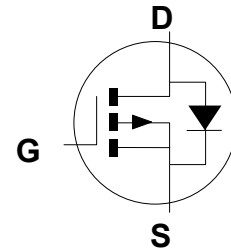
- Backlighting
- Power Management Functions
- DC-DC Converters



Top View



Top View  
Pin-Out



Equivalent Circuit

## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 standards for High Reliability**

## Mechanical Data

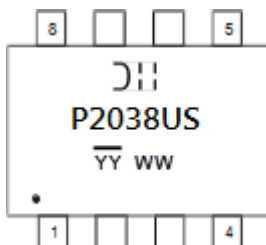
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208  $\text{\textcircled{3}}$
- Weight: 0.072g (approximate)

## Ordering Information (Note 4)

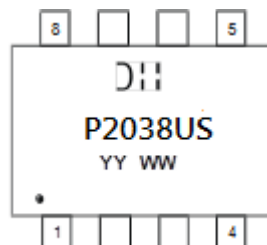
Part Number	Case	Packaging
DMP2038USS-13	SO-8	2500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



Chengdu A/T Site



Shanghai A/T Site

- DII = Manufacturer's Marking  
 P2038US = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or YYY = Year (ex: 13 = 2013)  
 WW = Week (01 - 53)  
 YY = Date Code Marking for SAT (Shanghai Assembly/ Test site)  
 YY = Date Code Marking for CAT (Chengdu Assembly/ Test site)

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	-20	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Drain Current (Note 6)	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-6.5 -5.2	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I <sub>DM</sub>	-25	A
Maximum Continuous Body Diode Forward Current (Note 6)			I <sub>S</sub>	2	A
Avalanche Current (Note 7) L=0.3mH			I <sub>AS</sub>	13.2	A
Avalanche Energy (Note 7) L=0.3mH			E <sub>AS</sub>	26	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	P <sub>D</sub>	2.5	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	50	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250µA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	µA	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.4	—	-1.1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	24	38	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A
		—	33	56		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -4.3A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -2.1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iSS</sub>	—	1496	—	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	130	—	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	—	116	—	pF	
Total Gate Charge	Q <sub>g</sub>	—	14.4	—	nC	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V I <sub>D</sub> = -4.5A
Gate-Source Charge	Q <sub>gs</sub>	—	2.6	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	2.7	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	13.7	—	ns	V <sub>DD</sub> = -10V, V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 6Ω, R <sub>L</sub> = 10Ω, I <sub>D</sub> = -1A
Turn-On Rise Time	t <sub>r</sub>	—	14.0	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	79.1	—		
Turn-Off Fall Time	t <sub>f</sub>	—	35.5	—		

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
  - I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

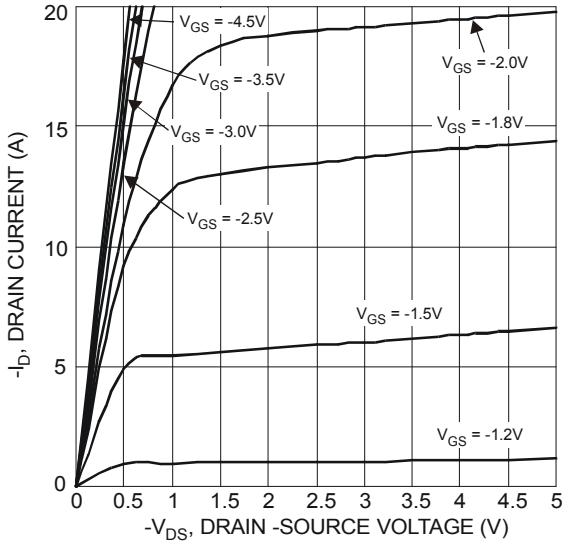


Figure 1 Typical Output Characteristics

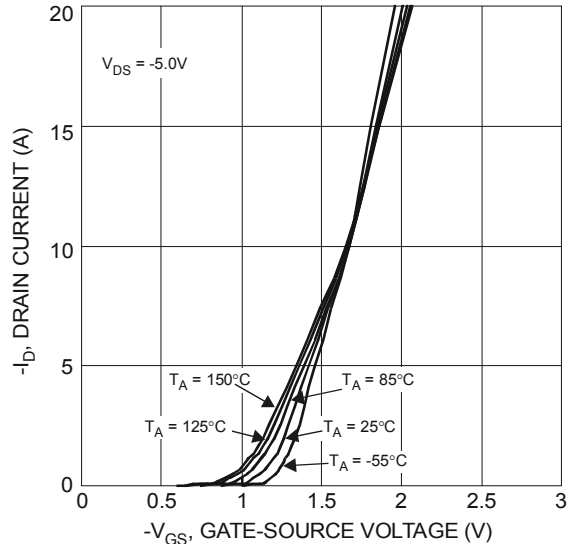


Figure 2 Typical Transfer Characteristics

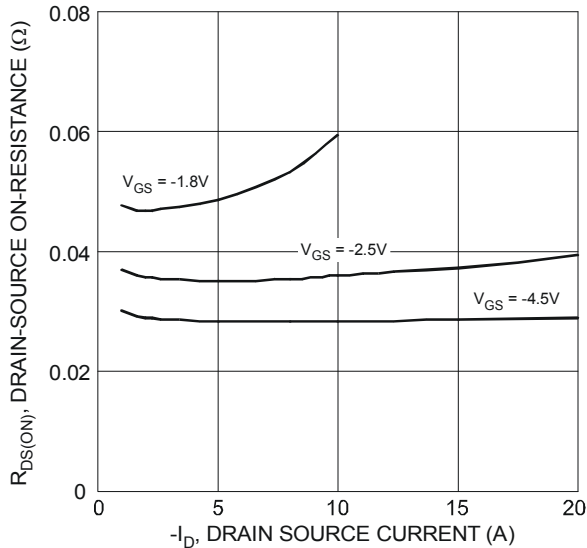


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

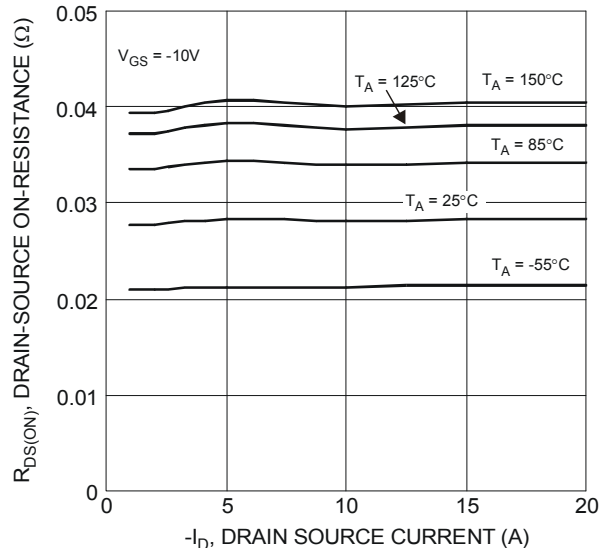


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

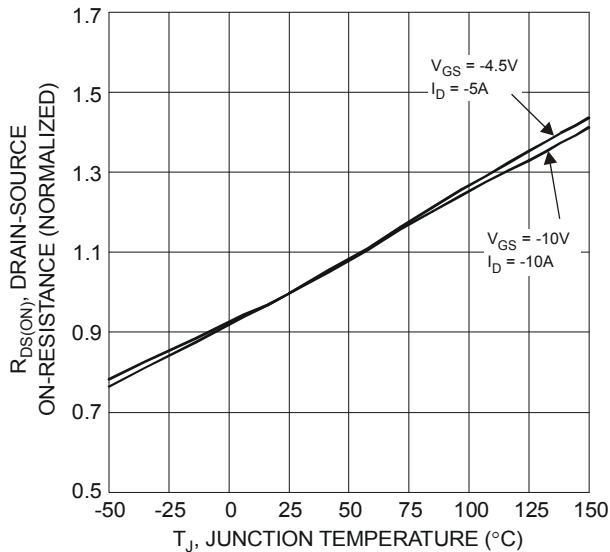


Figure 5 On-Resistance Variation with Temperature

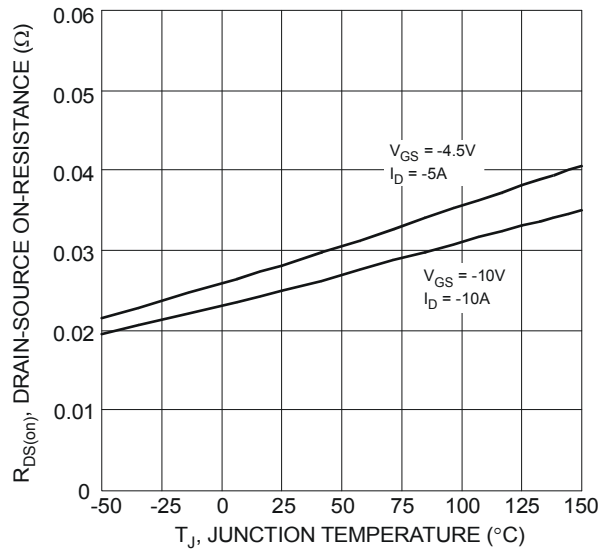


Figure 6 On-Resistance Variation with Temperature

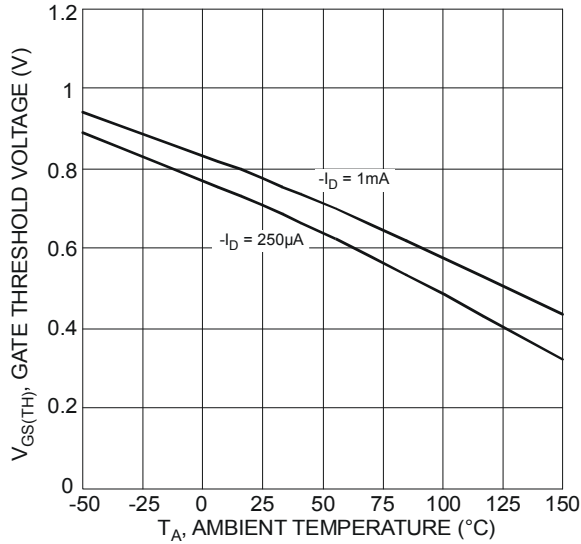


Figure 7 Gate Threshold Variation vs. Ambient Temperature

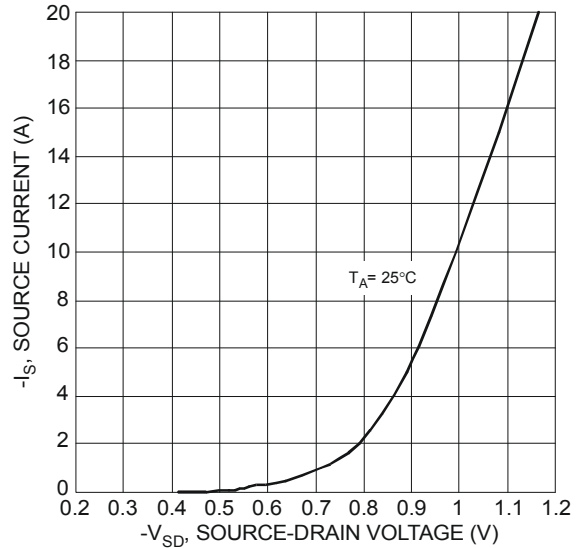


Figure 8 Diode Forward Voltage vs. Current

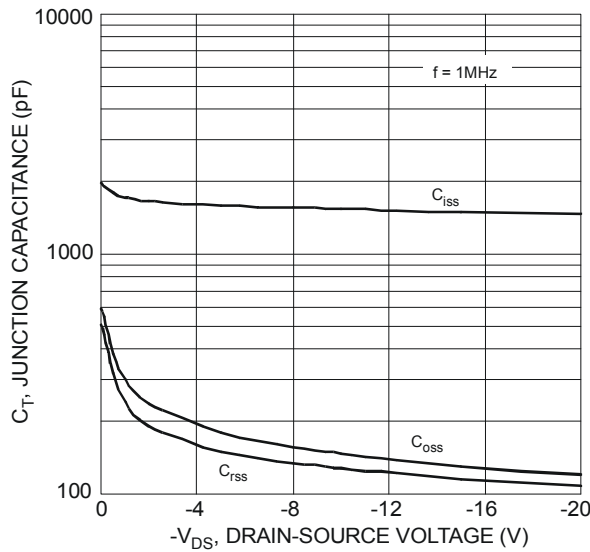


Figure 9 Typical Junction Capacitance

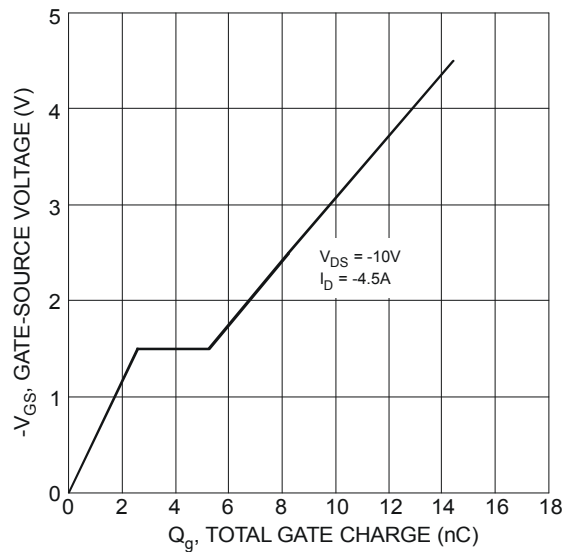


Figure 10 Gate-Charge Characteristics

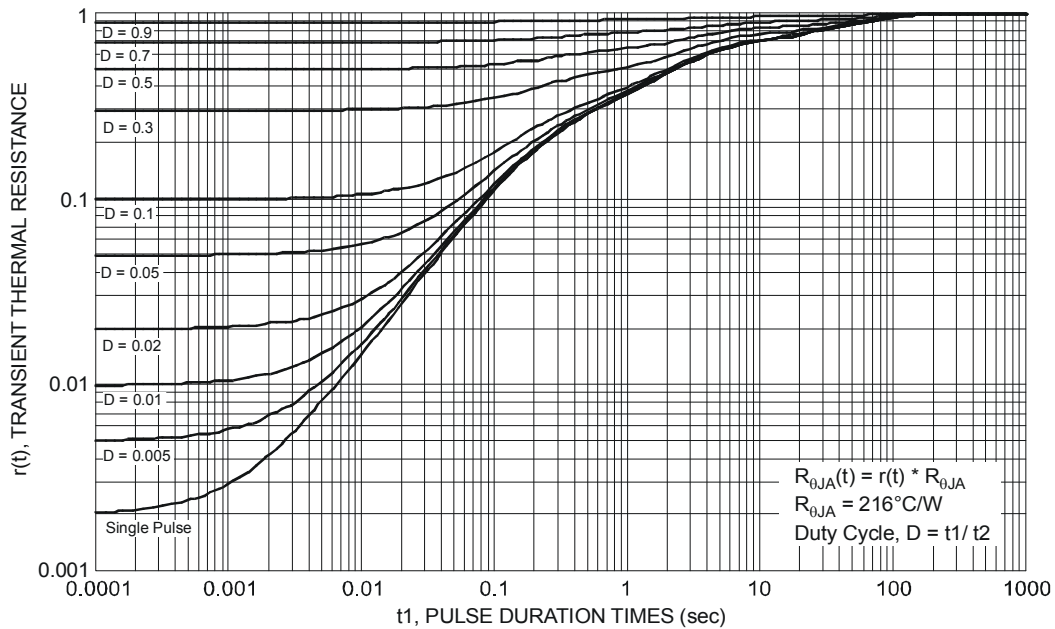
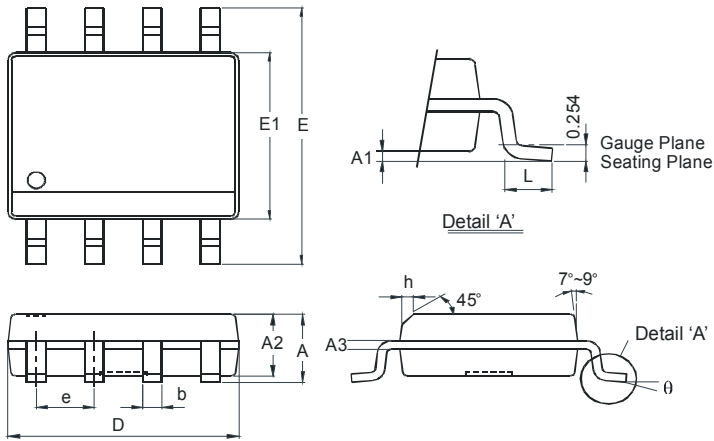


Figure 11 Transient Thermal Resistance

$R_{0JA}(t) = r(t) * R_{0JA}$   
 $R_{0JA} = 216^{\circ}\text{C/W}$   
 Duty Cycle,  $D = t1 / t2$

**Package Outline Dimensions**

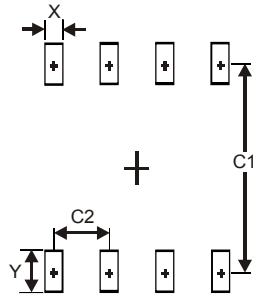
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

**Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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