

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	$I_D$ Max $T_A = +25^\circ\text{C}$
20V	25m $\Omega$ @ $V_{GS} = 4.5\text{V}$	6.8A
	29m $\Omega$ @ $V_{GS} = 2.5\text{V}$	5.5A

## Description and Applications

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

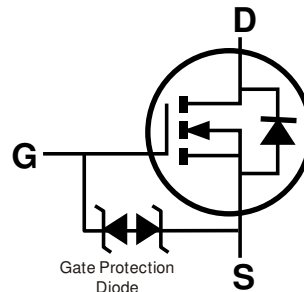
- Backlighting
- Power-Management Functions
- DC-DC Converters
- Motor Control



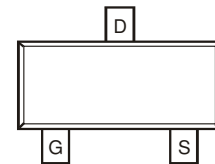
ESD-Protected Gate



Top View



Internal Schematic



Top View

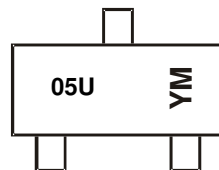
- ## Features and Benefits
- Low On-Resistance
  - Low-Input Capacitance
  - Fast Switching Speed
  - **ESD Protected Gate**
  - **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
  - **Halogen and Antimony Free. "Green" Device (Note 3)**
- ## Mechanical Data
- Case: SOT23
  - Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
  - Moisture Sensitivity: Level 1 per J-STD-020
  - Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
  - Terminals Connections: See Diagram Below
  - Weight: 0.009 grams (Approximate)

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2024U-7	SOT23	3000/Tape & Reel
DMN2024U-13	SOT23	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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



05U = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: F = 2018)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2018	2019	2020	2021	2022	2023	2024	2025
Code	F	G	H	I	J	K	L	M

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

### 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>	±10	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	6.8 5.5	A
Maximum Continuous Body Diode Forward Current (Note 6)			I <sub>S</sub>	2.2	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	45	A

### Thermal Characteristics

Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 5)			P <sub>D</sub>	0.8	W
Thermal Resistance, Junction to Ambient (Note 5)		Steady State	R <sub>θJA</sub>	159	°C/W
Total Power Dissipation (Note 6)			P <sub>D</sub>	1.4	W
Thermal Resistance, Junction to Ambient (Note 6)		Steady State	R <sub>θJA</sub>	92	°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 7)</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>	—	—	1.0	μA	T <sub>J</sub> = +25°C, V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.5	-	0.9	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	16	25	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6.5A
			18.5	29		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 5.5A
			23	36		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 3.5A
Diode Forward Voltage	V <sub>SD</sub>	—	0.8	1.2	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 5A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	647	—	pF	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	78	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	38	—	pF	
Gate Resistance	R <sub>g</sub>	—	628	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	—	7.1	—	nC	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V, I <sub>D</sub> = 6.5A
Gate-Source Charge	Q <sub>gs</sub>	—	0.9	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	0.7	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	98	—	ns	
Turn-On Rise Time	t <sub>r</sub>	—	140	—	ns	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 4.5V, R <sub>L</sub> = 10Ω, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	1024	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	434	—	ns	
Reverse Recovery Time	t <sub>RR</sub>	—	245	—	ns	I <sub>F</sub> = 1.0A, di/dt = 100A/μs
Reverse Recovery Charge	Q <sub>RR</sub>	—	149	—	nC	I <sub>F</sub> = 1.0A, di/dt = 100A/μs

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout.
  - Device mounted on 1" × 1" FR-4 PCB with high-coverage 2oz copper, single sided.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

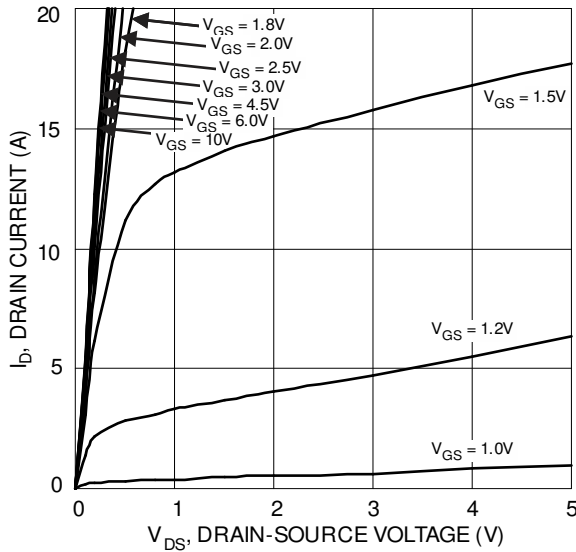


Figure 1 Typical Output Characteristic

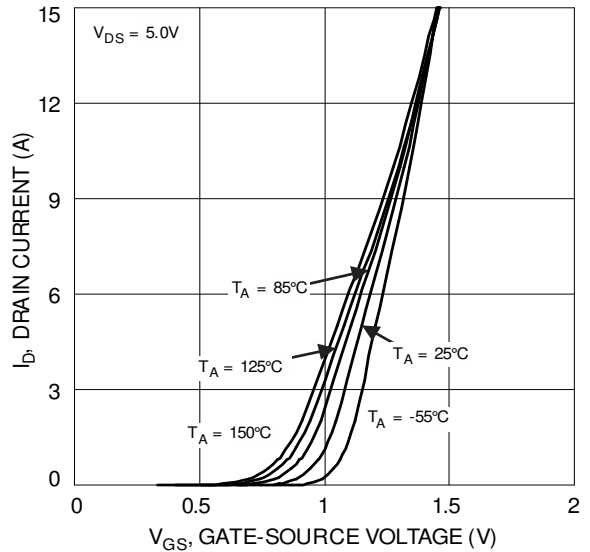


Figure 2 Typical Transfer Characteristics

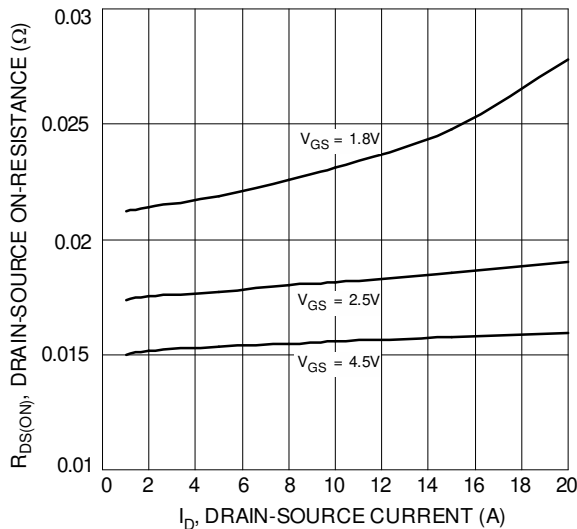


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

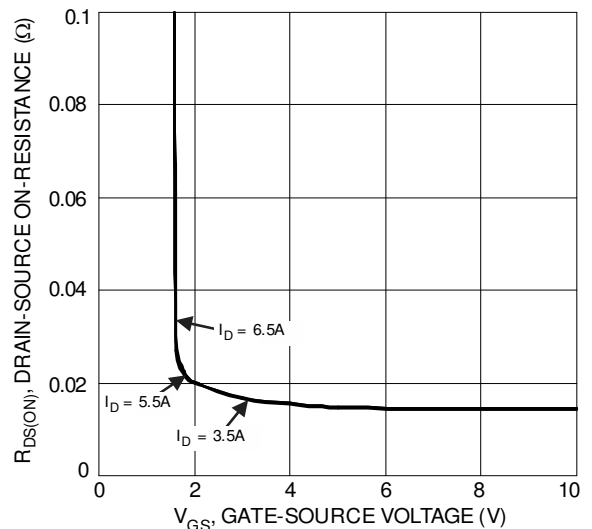


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

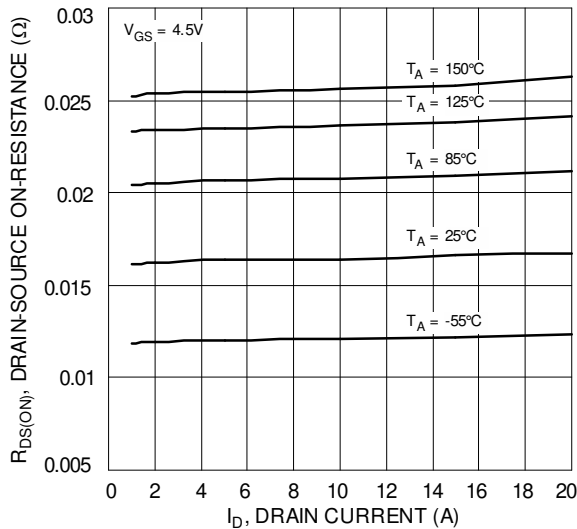


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

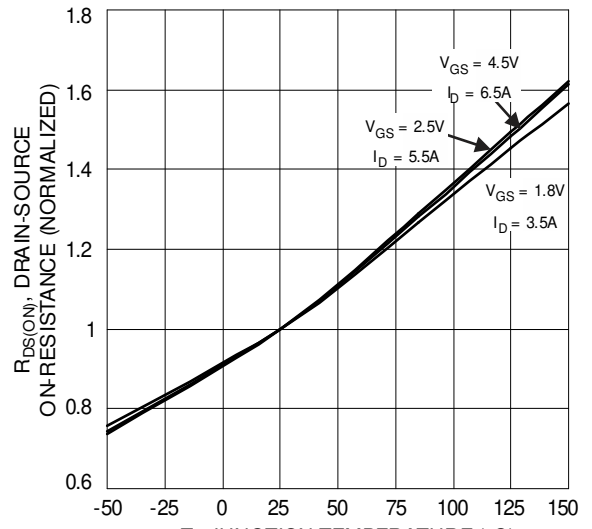


Figure 6 On-Resistance Variation with Temperature

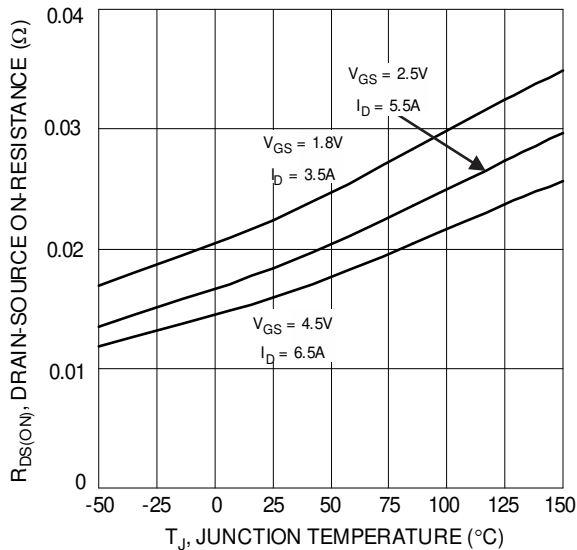


Figure 7 On-Resistance Variation with Temperature

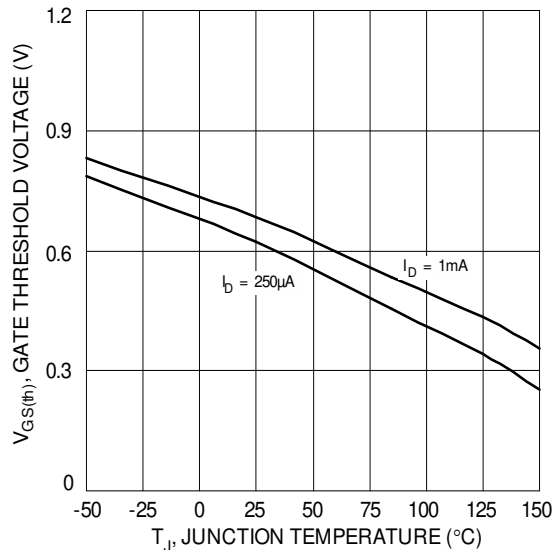


Figure 8 Gate Threshold Variation vs. Ambient Temperature

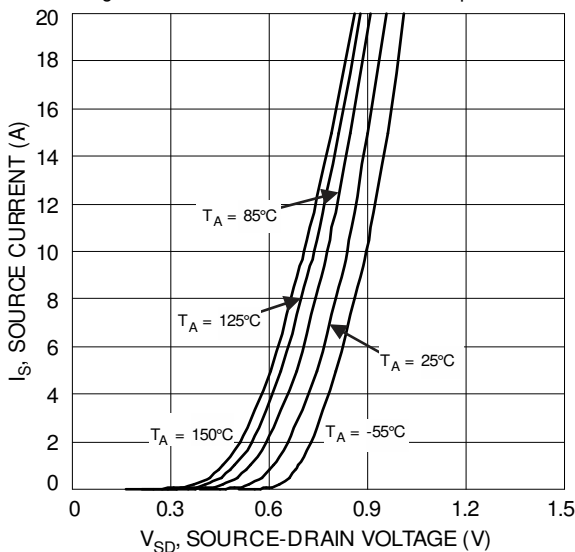


Figure 9 Diode Forward Voltage vs. Current

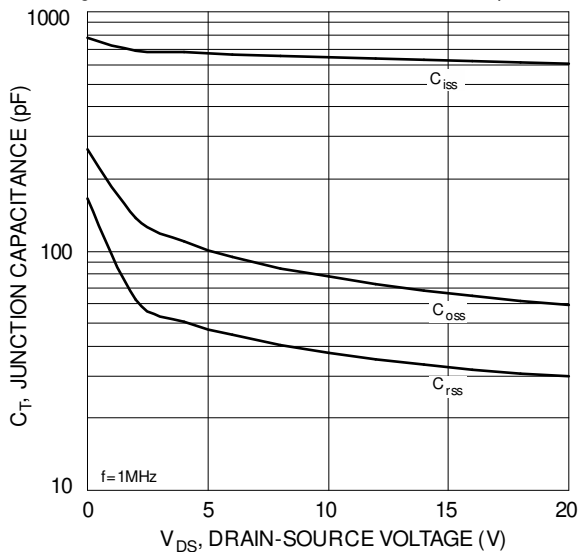


Figure 10 Typical Junction Capacitance

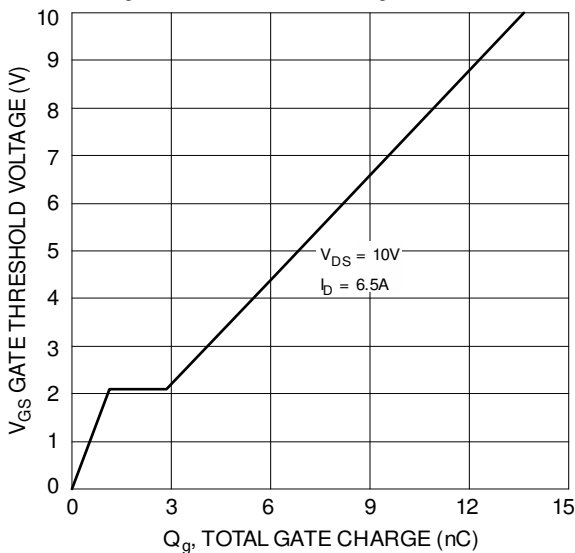


Figure 11 Gate Charge

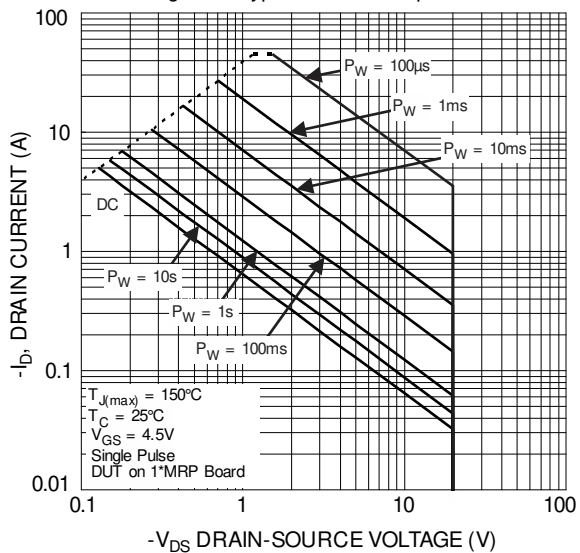
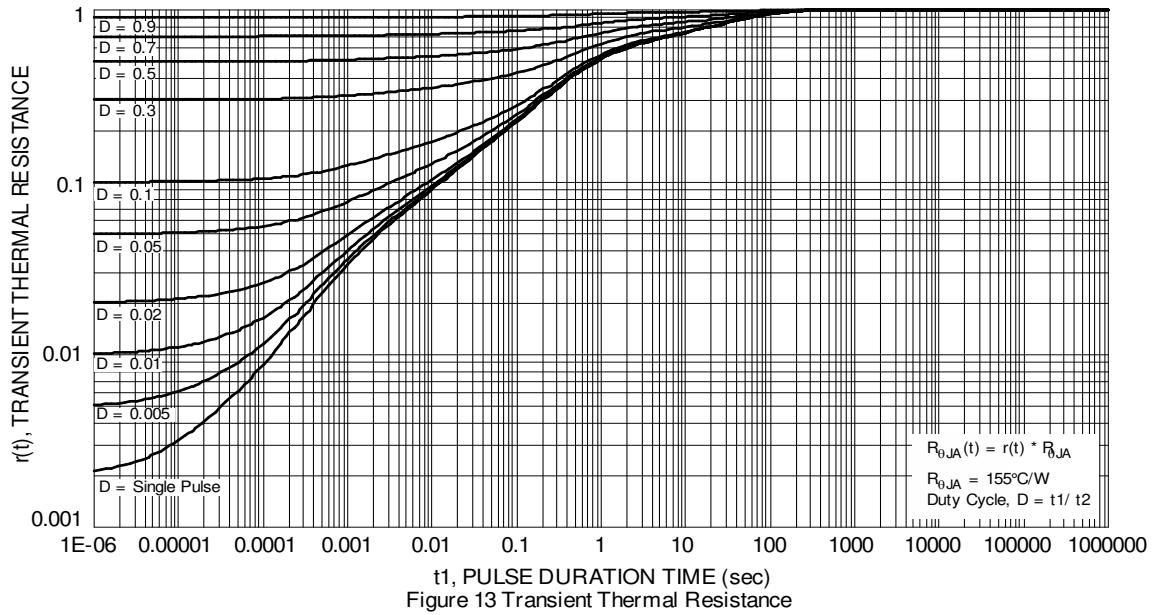
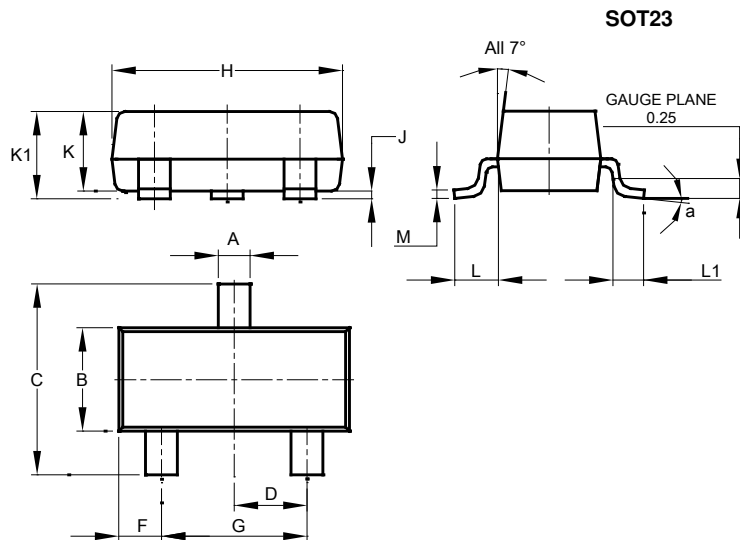


Figure 12 SOA, Safe Operation Area



**Package Outline Dimensions**

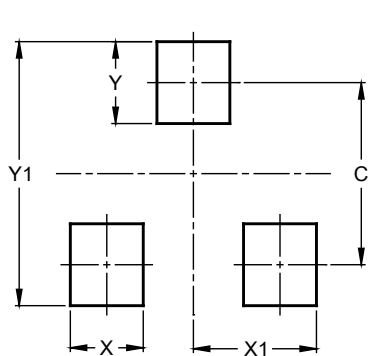
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



SOT23			
Dim	Min	Max	Typ
<b>A</b>	0.37	0.51	0.40
<b>B</b>	1.20	1.40	1.30
<b>C</b>	2.30	2.50	2.40
<b>D</b>	0.89	1.03	0.915
<b>F</b>	0.45	0.60	0.535
<b>G</b>	1.78	2.05	1.83
<b>H</b>	2.80	3.00	2.90
<b>J</b>	0.013	0.10	0.05
<b>K</b>	0.890	1.00	0.975
<b>K1</b>	0.903	1.10	1.025
<b>L</b>	0.45	0.61	0.55
<b>L1</b>	0.25	0.55	0.40
<b>M</b>	0.085	0.150	0.110
<b>a</b>	0°	8°	--
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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



Dimensions	Value (in mm)
<b>C</b>	2.0
<b>X</b>	0.8
<b>X1</b>	1.35
<b>Y</b>	0.9
<b>Y1</b>	2.9

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