

## Product Summary (Typ. @ $V_{GS} = 3.3V$ , $T_A = +25^\circ C$ )

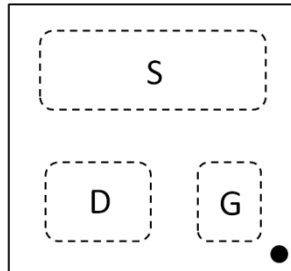
$V_{DSS}$	$R_{DS(ON)}$	$Q_g$	$Q_{gd}$	$I_D$
12V	14.1m $\Omega$	10.5nC	4.1nC	7.5A

## Description

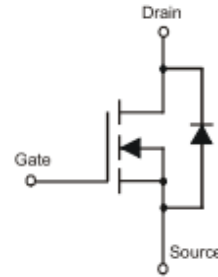
This new generation MOSFET is engineered to minimize on-state losses and switch ultra-fast, making it ideal for high efficiency power transfer. Using Chip-Scale Package (CSP) to increase power density by combining low thermal impedance with minimal  $R_{DS(ON)}$  per footprint area.

## Applications

- DC-DC Converters
- Battery Management
- Load Switch



Top-View  
Pin Configuration



Equivalent Circuit

## Features

- TR-MOS Technology with the Lowest  $R_{DS(ON)}$ :  
 $R_{DS(ON)} = 14.1m\Omega$  to Minimize On-State Losses
- CSP with Footprint 1.0mm  $\times$  1.0mm
- Height = 0.29mm for Low Profile
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

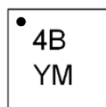
- Case: X3-DSN1010-3
- Terminal Connections: See Diagram Below
- Terminal Finish: Matte Tin Annealed Over Copper Pillar  $\text{\textcircled{E3}}$
- Solder Cap Material: SnAg (Ag: 2.0+/-0.5%)

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN1017UCP3-7	X3-DSN1010-3	3000/Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - 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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



4B = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: E = 2017)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022
Code	D	E	F	G	H	I	J

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

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	12	V
Gate-Source Voltage	$V_{GSS}$	$\pm 8$	V
Continuous Drain Current @ $V_{GS} = 3.3V$ (Note 5)	$I_D$	$T_A = +25^\circ C$	5.4
		$T_A = +70^\circ C$	4.3
Continuous Drain Current @ $V_{GS} = 3.3V$ (Note 6)	$I_D$	$T_A = +25^\circ C$	7.5
		$T_A = +70^\circ C$	6.1
Pulsed Drain Current (Pulse Duration 10 $\mu s$ , Duty Cycle $\leq 1\%$ )	$I_{DM}$	15	A
Continuous Source-Drain Diode Current (Note 6)	$I_S$	1.47	A
Pulse Diode Forward Current (Note 6)	$I_{SM}$	15	A

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	$P_D$	0.74	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	167	$^\circ C/W$
Total Power Dissipation (Note 6)	$P_D$	1.47	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	85	$^\circ C/W$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ C$

## Electrical Characteristics (@ $T_A = +25^\circ C$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	12	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1.0	$\mu A$	$V_{DS} = 9.6V, V_{GS} = 0V$
Gate-Body Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 8V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	0.7	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	14.1	17.0	m $\Omega$	$V_{GS} = 3.3V, I_D = 5.0A$
		—	14.4	19.0		$V_{GS} = 3.0V, I_D = 5.0A$
		—	15.5	21.0		$V_{GS} = 2.5V, I_D = 5.0A$
		—	16.0	23.0		$V_{GS} = 2.3V, I_D = 5.0A$
		—	16.8	24.0		$V_{GS} = 2.1V, I_D = 5.0A$
		—	21.3	34.0		$V_{GS} = 2.1V, I_D = 5.0A, +125^\circ C$ (Note 8)
		—	20.0	30.0		$V_{GS} = 1.8V, I_D = 3.0A$
Forward Transfer Admittance	$ Y_{fs} $	—	6.6	—	S	$V_{DS} = 6V, I_S = 1.0A$
Body Diode Forward Voltage	$V_{SD}$	—	0.7	1	V	$V_{GS} = 0V, I_S = 1.0A$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	1002	1503	pF	$V_{DS} = 6V, V_{GS} = 0V, f = 1.0MHz$
Output Capacitance	$C_{oss}$	—	312	468	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	259	389	pF	
Gate Resistance	$R_g$	—	2.2	4.4	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
Total Gate Charge	$Q_g$	—	10.5	16	nC	$V_{GS} = 3.3V, V_{DS} = 6V, I_D = 5.0A$
Gate-Source Charge	$Q_{gs}$	—	1.0	1.5	nC	
Gate-Drain Charge	$Q_{gd}$	—	4.1	6.2	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	3.7	10	ns	$V_{DD} = 6V, I_D = 5.0A, V_{GEN} = 4.5V, R_G = 1\Omega, R_L = 1.2\Omega$
Turn-On Rise Time	$t_R$	—	6.3	15	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	17.9	35	ns	
Turn-Off Fall Time	$t_F$	—	7.5	15	ns	
Reverse Recovery Charge	$Q_{RR}$	—	2.7	5	nC	
Body Diode Reverse Recovery Time	$t_{RR}$	—	14.2	28	ns	$I_F = 5A, di/dt = 100A/\mu s$

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

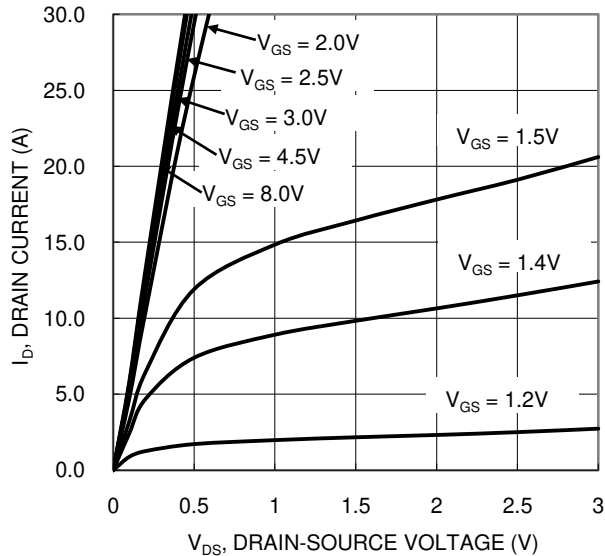


Figure 1. Typical Output Characteristic

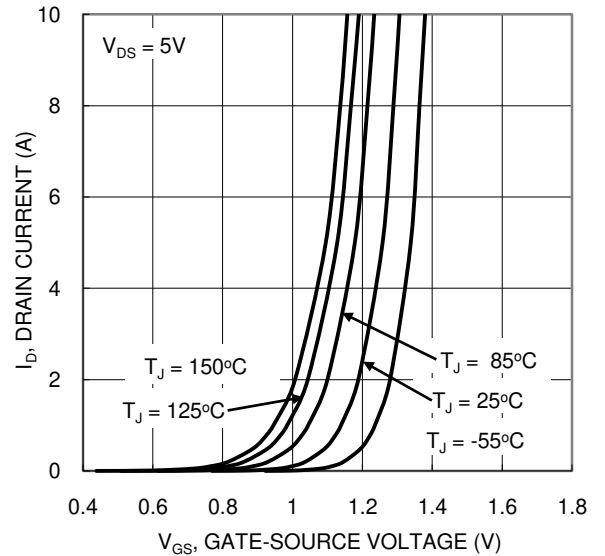


Figure 2. Typical Transfer Characteristic

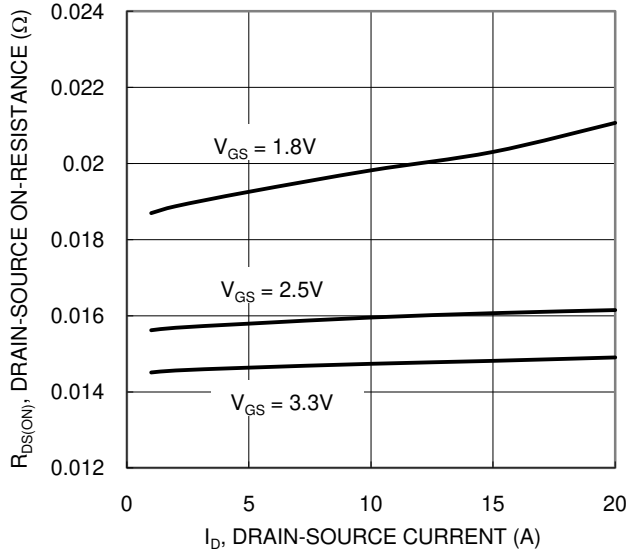


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

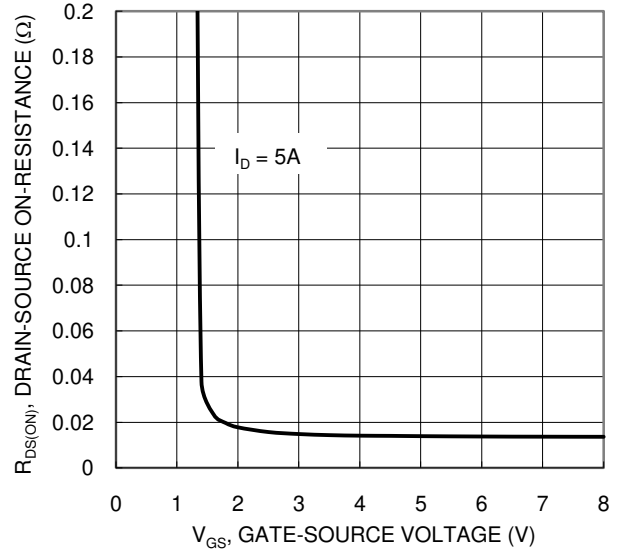


Figure 4. Typical Transfer Characteristic

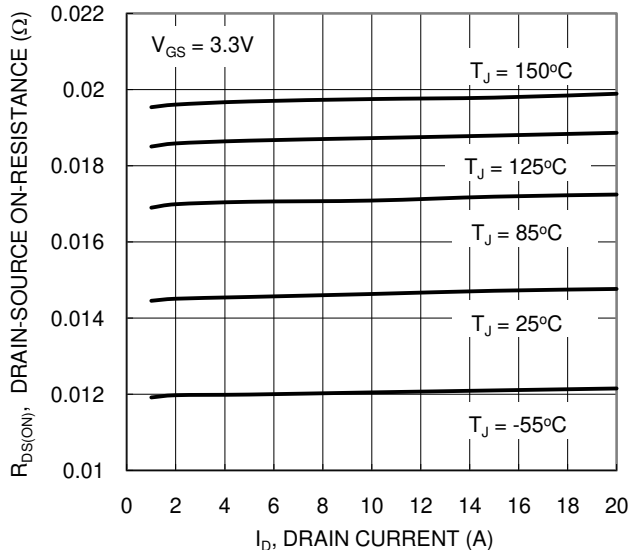


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

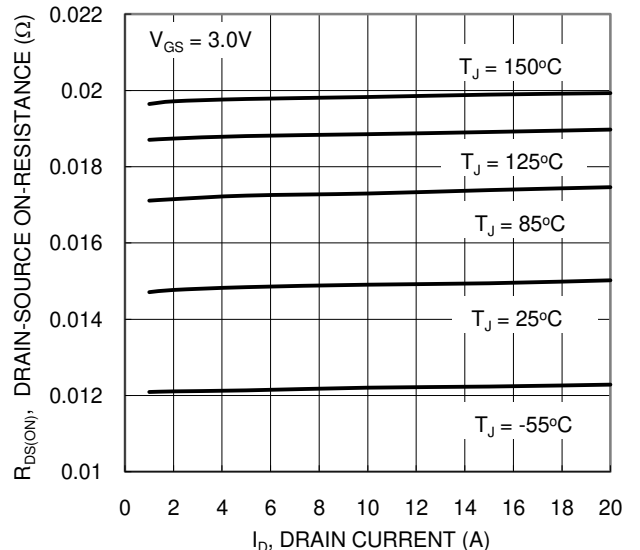


Figure 6. Typical On-Resistance vs. Drain Current and Junction Temperature

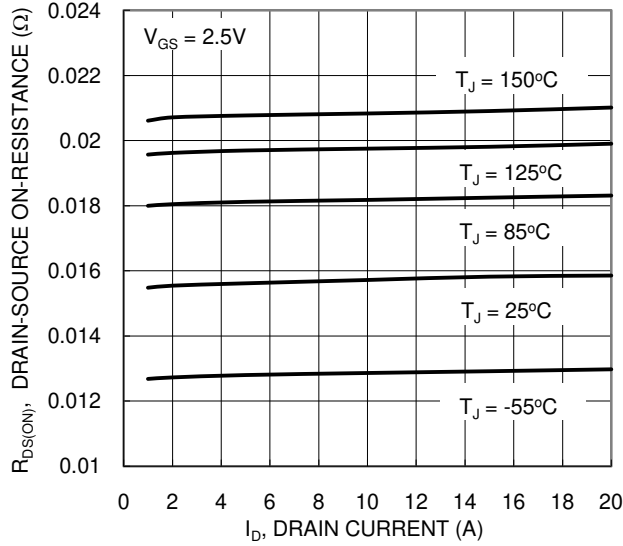


Figure 7. Typical On-Resistance vs. Drain Current and Junction Temperature

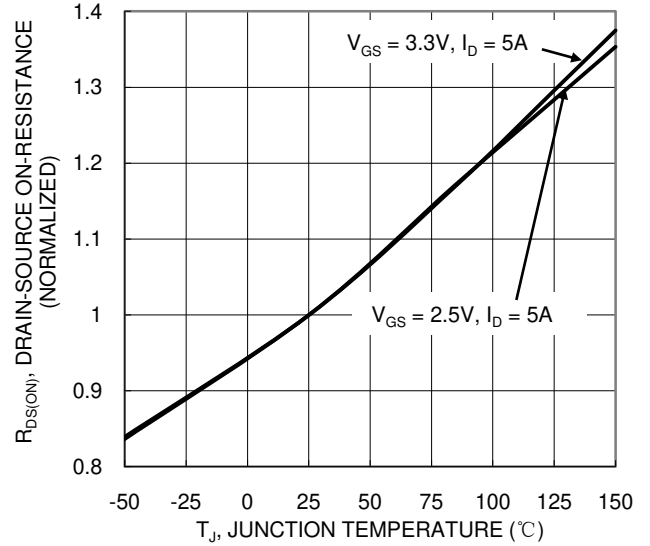


Figure 8. On-Resistance Variation with Junction Temperature

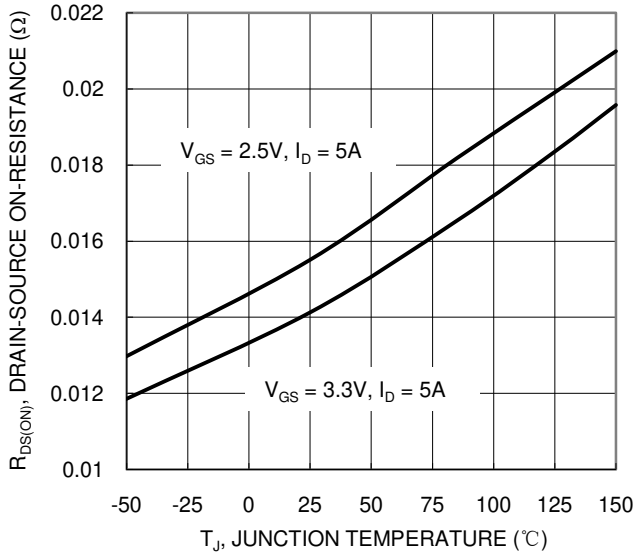


Figure 9. On-Resistance Variation with Junction Temperature

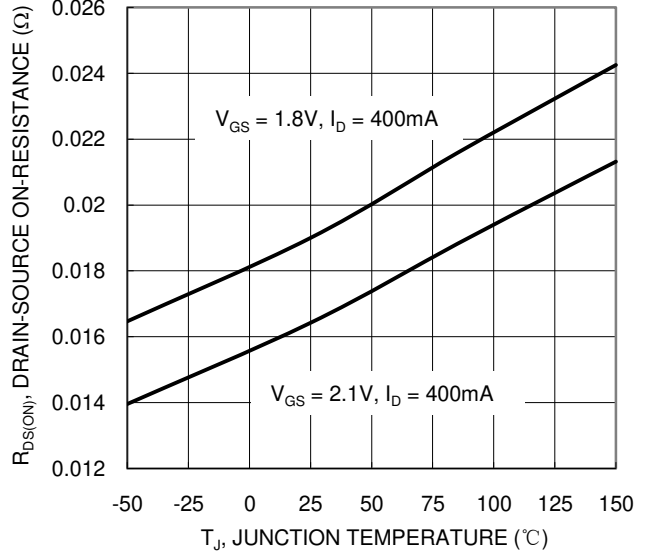


Figure 10. On-Resistance Variation with Junction Temperature

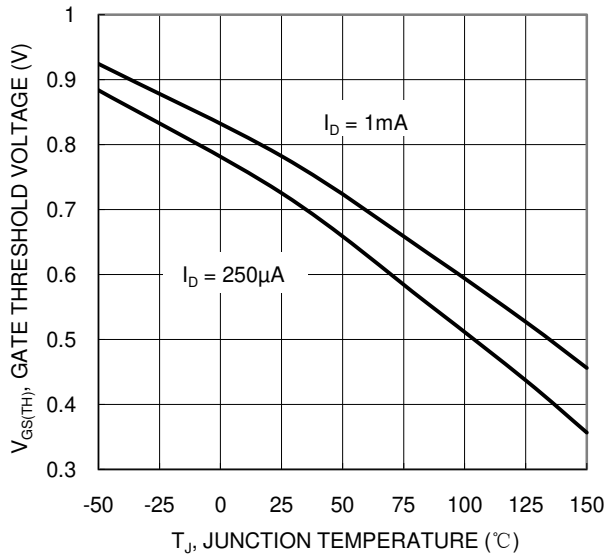


Figure 11. Gate Threshold Variation vs. Junction Temperature

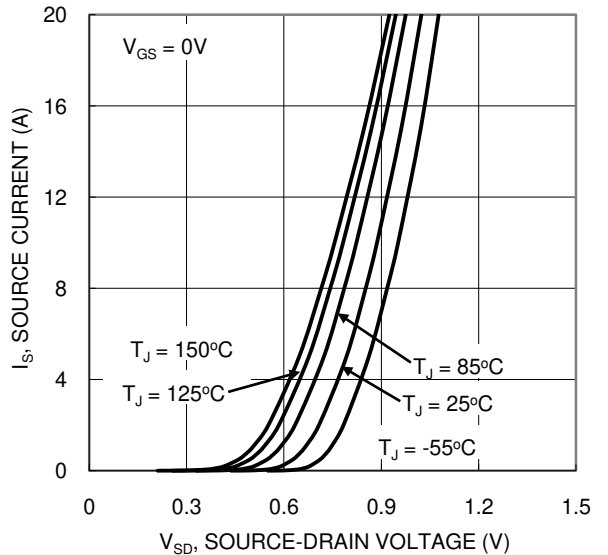


Figure 12. Diode Forward Voltage vs. Current

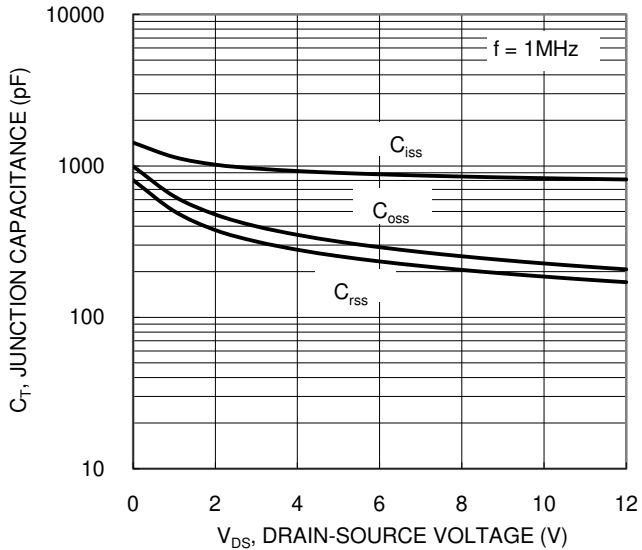


Figure 13. Typical Junction Capacitance

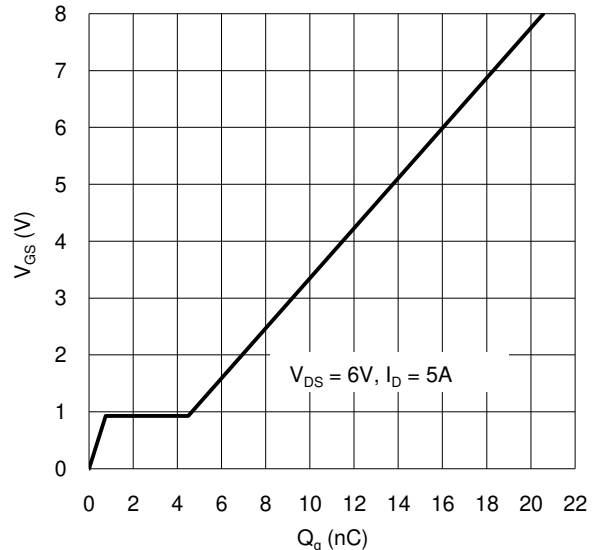


Figure 14. Gate Charge

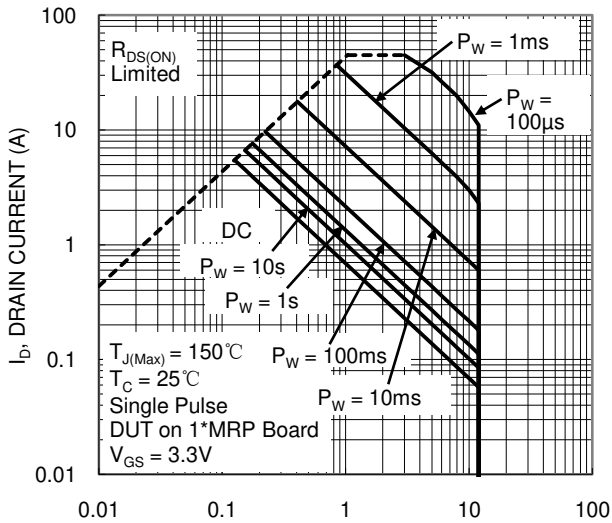


Figure 15. SOA, Safe Operation Area

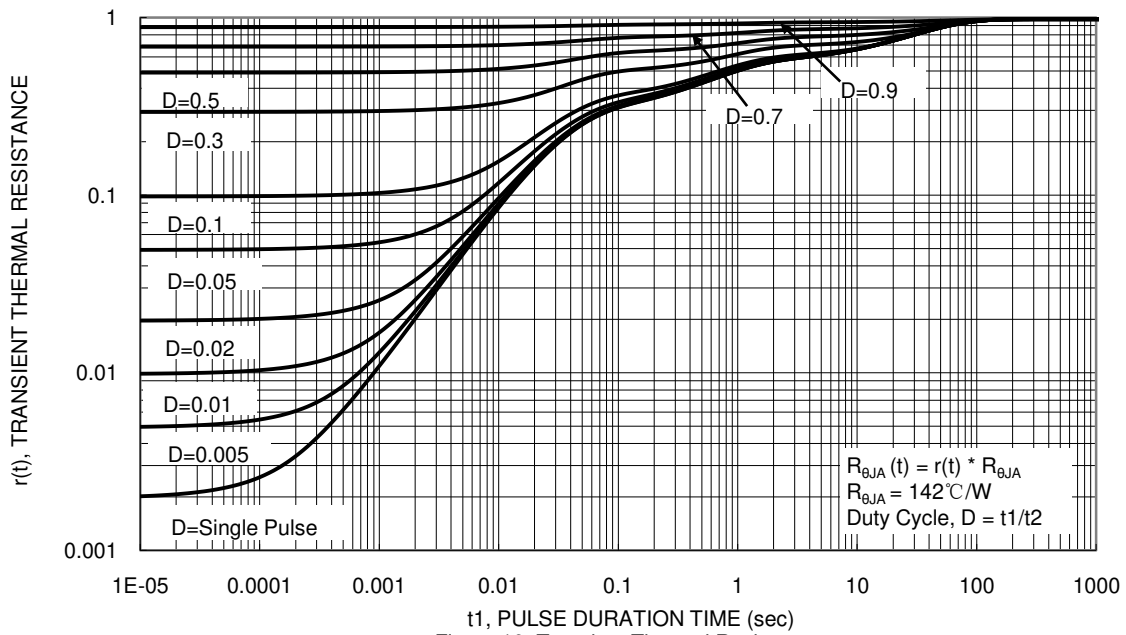
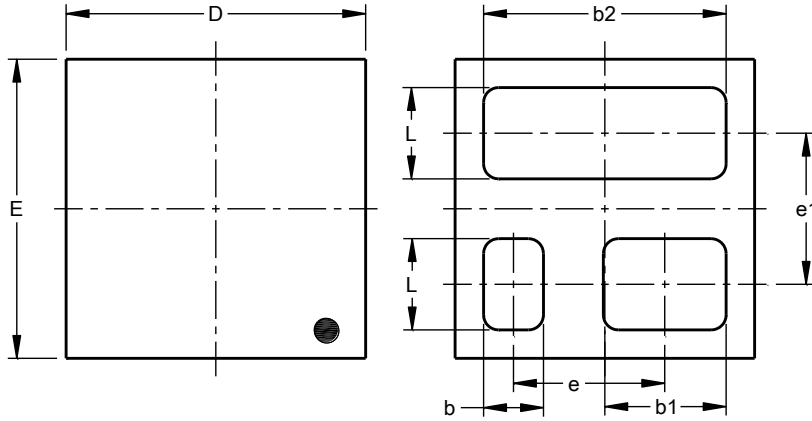


Figure 16. Transient Thermal Resistance

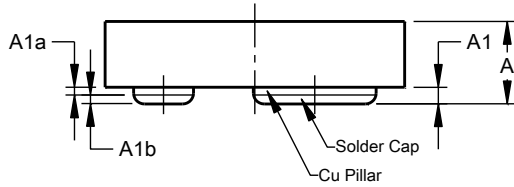
## Package Outline Dimensions

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

**X3-DSN1010-3**



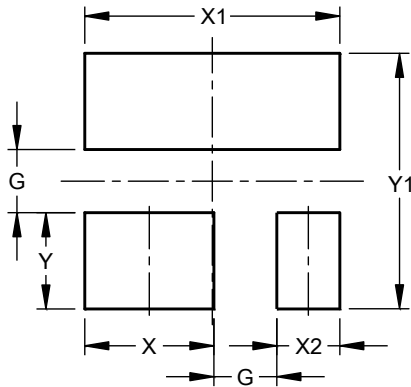
X3-DSN1010-3			
Dim	Min	Max	Typ
A	-	0.29	0.27
A1	0.034	0.046	0.04
A1a	0.015	0.025	0.02
A1b	0.017	0.023	0.02
b	0.18	0.22	0.20
b1	0.39	0.43	0.41
b2	0.79	0.83	0.81
D	0.92	1.00	0.96
E	0.92	1.00	0.96
e	-	-	0.505
e1	-	-	0.505
L	0.285	0.325	0.305
All Dimensions in mm			



## Suggested Pad Layout

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

**X3-DSN1010-3**



Dimensions	Value (in mm)
G	0.200
X	0.410
X1	0.810
X2	0.200
Y	0.305
Y1	0.810

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