

## WNMD2166

Dual N-Channel, 20V, 4.0A, Power MOSFET

[Http://www.willsemi.com](http://www.willsemi.com)

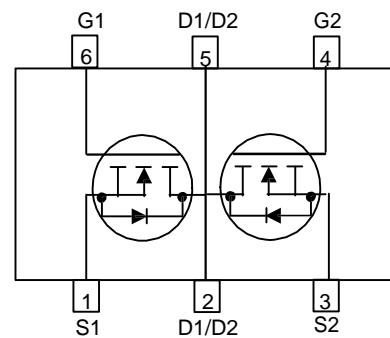
$V_{DS}$ (V)	$R_{ds(on)}$ ( $\Omega$ )
20	0.022 @ $V_{GS}=4.5V$
	0.023 @ $V_{GS}=3.7V$
	0.024 @ $V_{GS}=3.1V$
	0.027 @ $V_{GS}=2.5V$



Package

### Descriptions

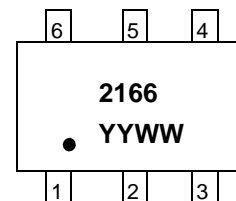
The WNMD2166 is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product WNMD2166 is Pb-free.



Pin configuration (Top view)

### Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance for higher DC current
- Extremely Low Threshold Voltage
- Small package SOT-23-6L



2166 = Device Code

YY = Year

WW = Week

### Marking

### Applications

- Driver for Relay, Solenoid, Motor, LED etc.
- DC-DC converter circuit
- Power Switch
- Load Switch
- Charging

### Order information

Device	Package	Shipping
WNMD2166-6/TR	SOT-23-6L	3000/Reel&Tape

**Absolute Maximum ratings**

Parameter		Symbol	10 S	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	+20		V
Gate-Source Voltage		$V_{GS}$	$\pm 10$		
Continuous Drain Current <sup>a</sup>	$T_A=25^\circ\text{C}$	$I_D$	5.0	4.0	A
	$T_A=70^\circ\text{C}$		3.8	3.5	
Maximum Power Dissipation <sup>a</sup>	$T_A=25^\circ\text{C}$	$P_D$	1.1	0.9	W
	$T_A=70^\circ\text{C}$		0.7	0.6	
Continuous Drain Current <sup>b</sup>	$T_A=25^\circ\text{C}$	$I_D$	4.0	3.5	A
	$T_A=70^\circ\text{C}$		3.5	3.0	
Maximum Power Dissipation <sup>b</sup>	$T_A=25^\circ\text{C}$	$P_D$	0.9	0.7	W
	$T_A=70^\circ\text{C}$		0.55	0.45	
Pulsed Drain Current <sup>c</sup>		$I_{DM}$	25		A
Operating Junction Temperature		$T_J$	-55~+150		$^\circ\text{C}$
Lead Temperature		$T_L$	260		$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	-55~+150		$^\circ\text{C}$

**Thermal resistance ratings**

Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance <sup>a</sup>	t 10 s	$R_{JA}$	90	112	$^\circ\text{C/W}$
	Steady State		115	132	
Junction-to-Ambient Thermal Resistance <sup>b</sup>	t 10 s	$R_{JA}$	105	135	
	Steady State		138	162	
Junction-to-Case Thermal Resistance		$R_{JC}$	63	78	

a Surface mounted on FR-4 Board using 1 square inch pad size, 1oz copper

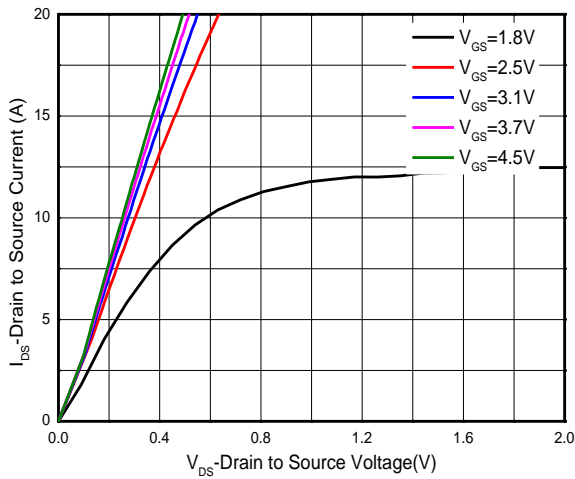
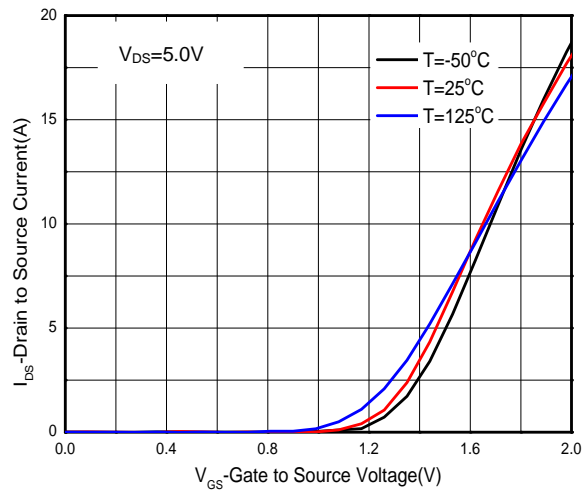
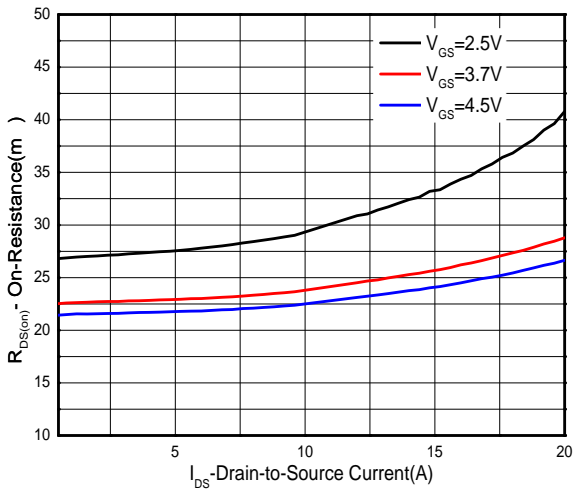
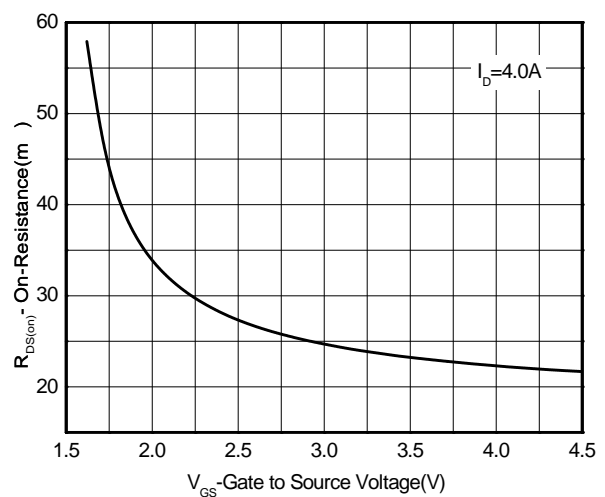
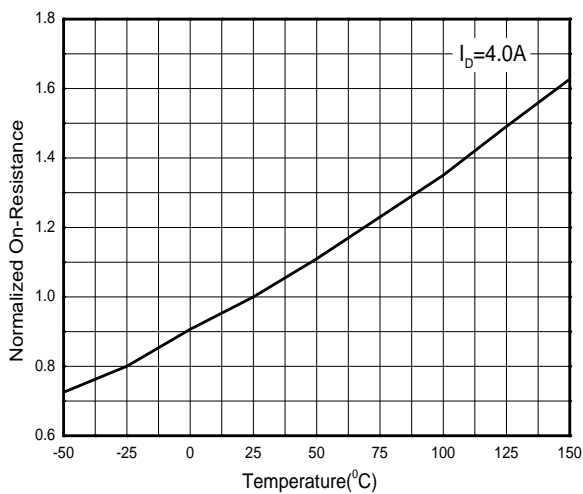
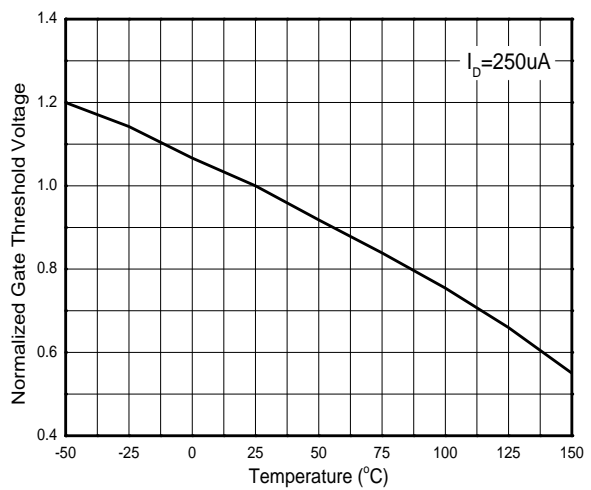
b Surface mounted on FR-4 board using minimum pad size, 1oz copper

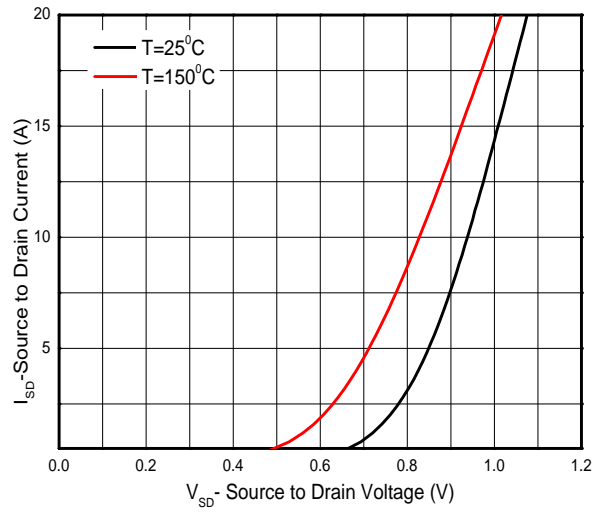
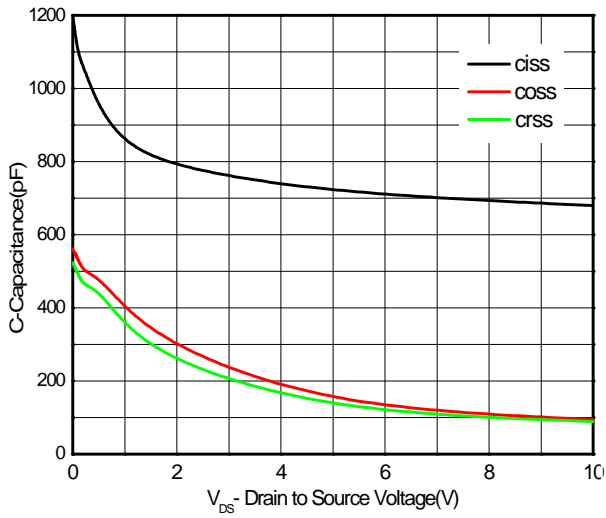
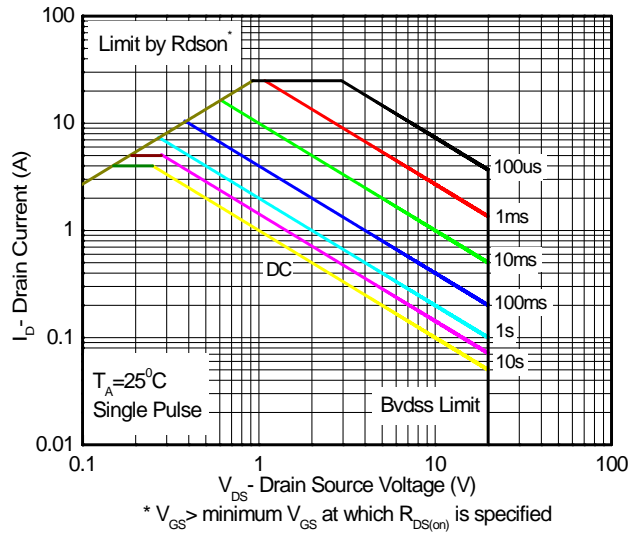
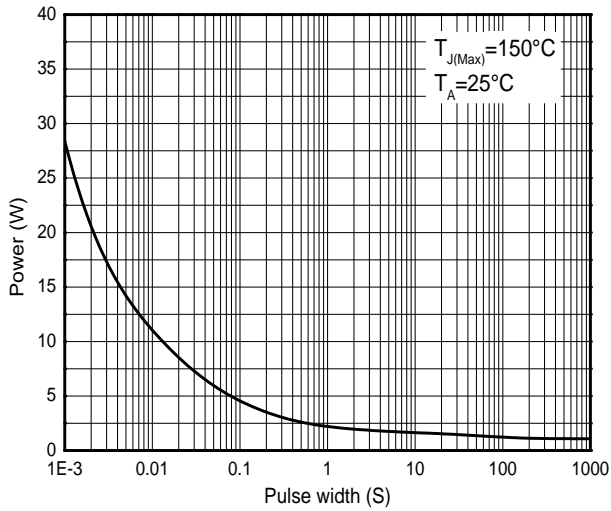
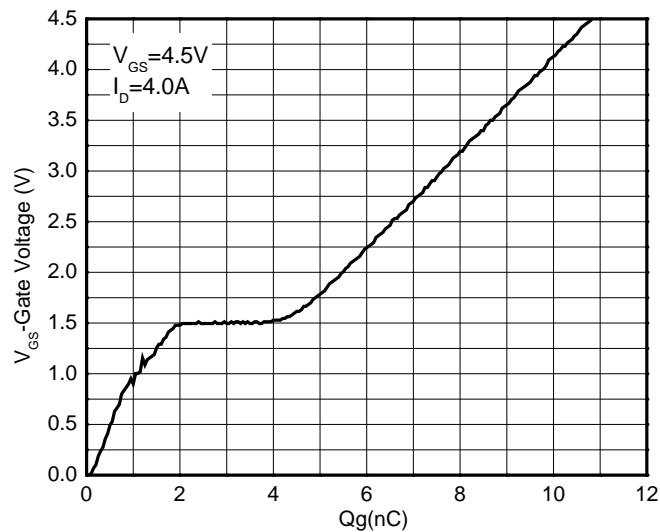
c Pulse width<380 $\mu\text{s}$ , Duty Cycle<2%

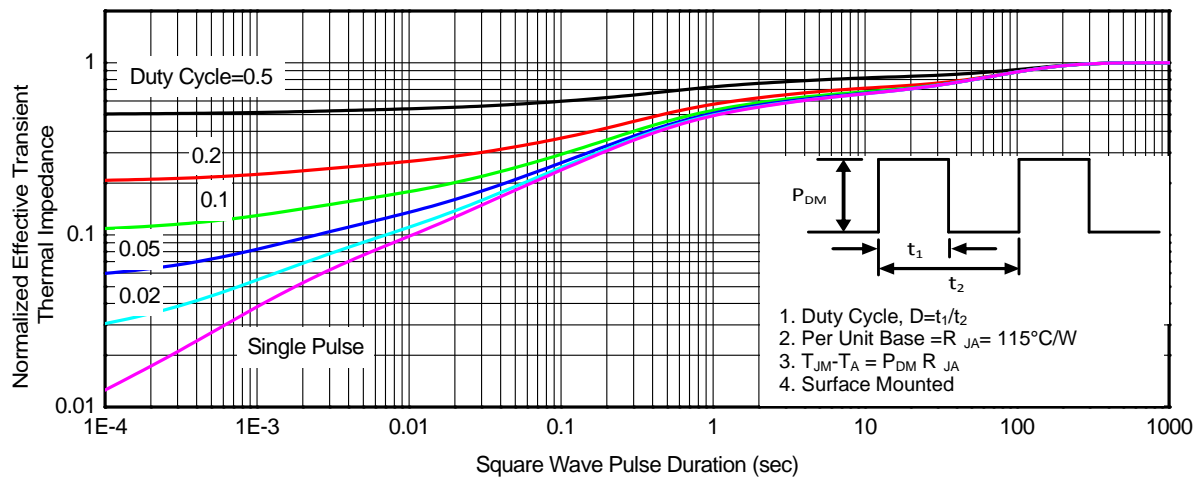
d Maximum junction temperature  $T_J=150^\circ\text{C}$ .

**Electronics Characteristics (Ta=25°C, unless otherwise noted)**

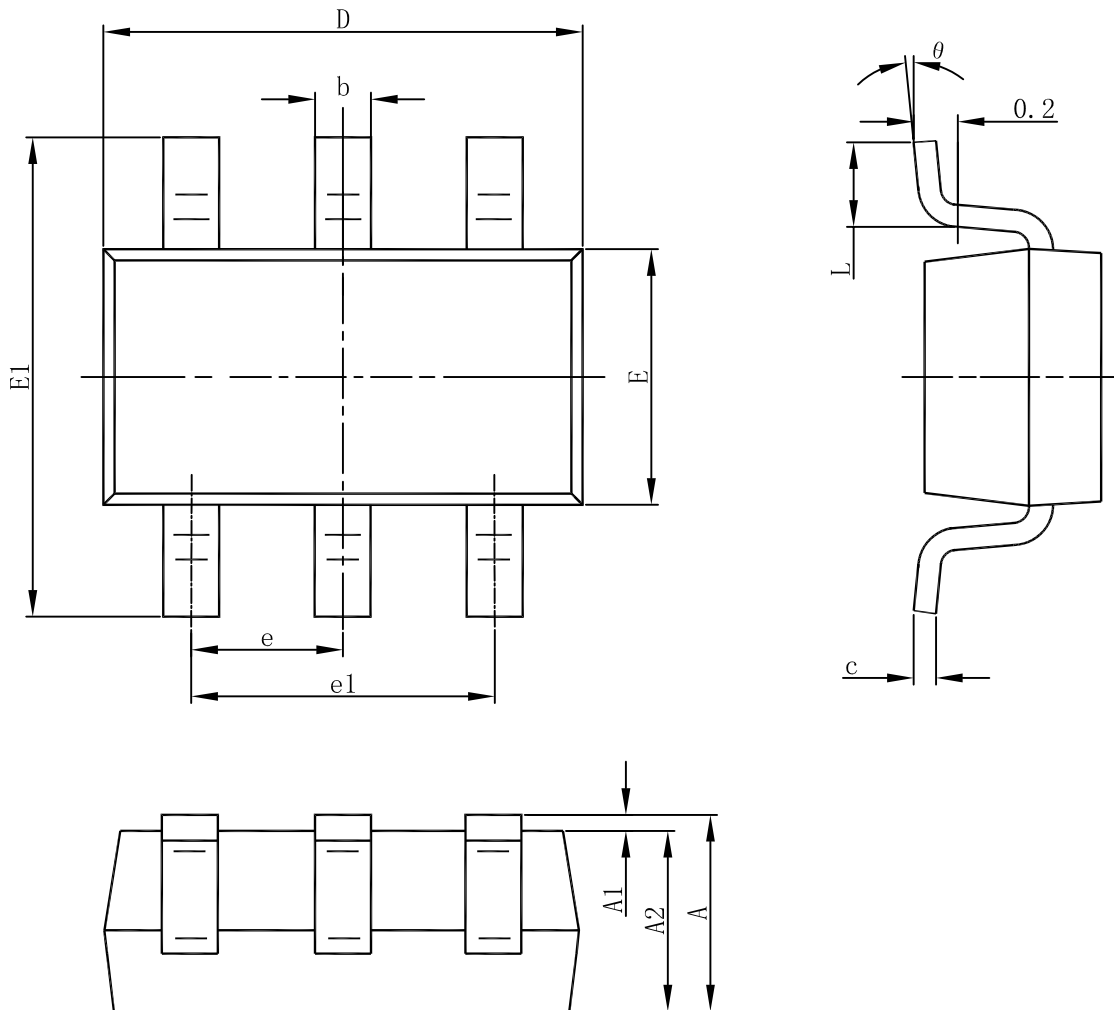
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$			1	$\mu\text{A}$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	0.45	0.75	1.0	V
Drain-to-source On-resistance <sup>b, c</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{V}, I_D = 4.0\text{A}$	15	22	27	m
		$V_{GS} = 3.7\text{V}, I_D = 4.0\text{A}$	17	23	30	
		$V_{GS} = 3.1\text{V}, I_D = 2.5\text{A}$	18	24	35	
		$V_{GS} = 2.5\text{V}, I_D = 2.0\text{A}$	20	27	37	
Forward Trans conductance	$g_{fs}$	$V_{DS} = 5.0\text{V}, I_D = 4.0\text{ A}$		11		S
<b>CAPACITANCES, CHARGES</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz},$ $V_{DS} = 10\text{ V}$		680		pF
Output Capacitance	$C_{OSS}$			95		
Reverse Transfer Capacitance	$C_{RSS}$			89		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V},$ $V_{DS} = 10\text{ V},$ $I_D = 4.0\text{A}$		10.8		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.8		
Gate-to-Source Charge	$Q_{GS}$			2.3		
Gate-to-Drain Charge	$Q_{GD}$			2.5		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V},$ $V_{DS} = 10\text{ V},$ $I_D = 4.0\text{ A},$ $R_G=6$		22		ns
Rise Time	$t_r$			32		
Turn-Off Delay Time	$t_{d(OFF)}$			60		
Fall Time	$t_f$			23		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 1.0\text{A}$		0.78	1.50	V

**Typical Characteristics (Ta=25°C, unless otherwise noted)**

**Output characteristics**

**Transfer characteristics**

**On-Resistance vs. Drain current**

**On-Resistance vs. Gate-to-Source voltage**

**On-Resistance vs. Junction temperature**

**Threshold voltage vs. Temperature**

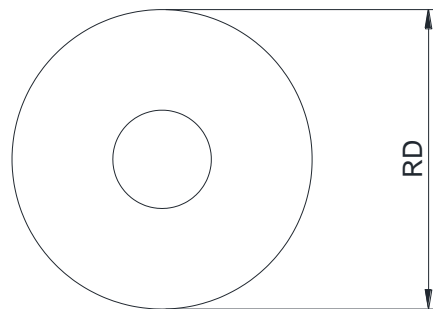
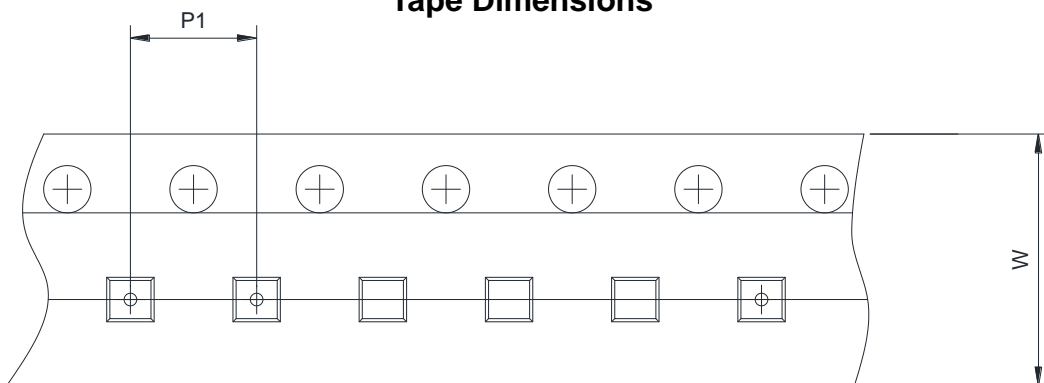
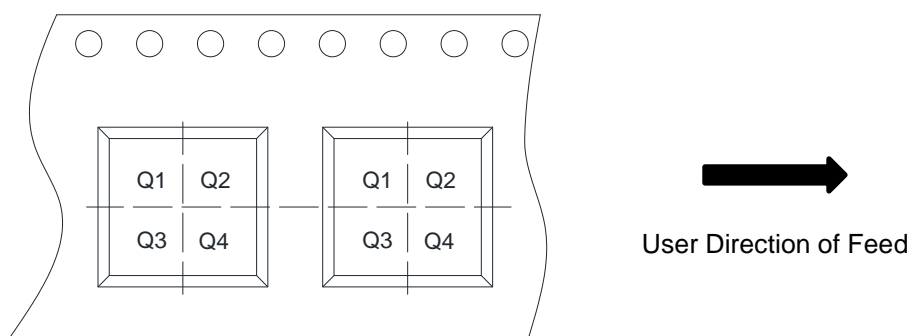

**Capacitance**
**Body diode forward voltage**

**Single pulse power**
**Safe operating power**

**Gate charge Characteristics**



**Transient thermal response (Junction-to-Ambient)**

**Package outline dimensions**
**SOT-23-6L**


Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	1.05	-	1.45
A1	0	-	0.15
A2	1.00	1.15	1.30
b	0.30	0.40	0.50
c	0.10	-	0.21
D	2.72	2.92	3.12
E1	2.60	2.80	3.00
E	1.40	1.60	1.80
e	0.85	0.95	1.05
e1	1.80	1.90	2.00
L	0.30	-	0.60
L1	0.25 BSC		
$\theta$	0 °	-	8 °

**TAPE AND REEL INFORMATION**
**Reel Dimensions**

**Tape Dimensions**

**Quadrant Assignments For PIN1 Orientation In Tape**


RD	Reel Dimension	<input checked="" type="checkbox"/> 7inch	<input type="checkbox"/> 13inch
W	Overall width of the carrier tape	<input checked="" type="checkbox"/> 8mm	<input type="checkbox"/> 12mm <input type="checkbox"/> 16mm
P1	Pitch between successive cavity centers	<input type="checkbox"/> 2mm	<input checked="" type="checkbox"/> 4mm <input type="checkbox"/> 8mm
Pin1	Pin1 Quadrant	<input type="checkbox"/> Q1	<input type="checkbox"/> Q2 <input checked="" type="checkbox"/> Q3 <input type="checkbox"/> Q4