



## 20V Dual N-Channel MOSFET w/ESD Protected

#### **TDFN 3x3**

#### Pin Definition:



- 1. Source 1
- 2. Gate 1
- 3. Source 2
- 4. Gate 2
- 5, 6, 7, 8. Drain

#### **PRODUCT SUMMARY**

V <sub>DS</sub> (V)	$R_{DS(on)}(m\Omega)$	I <sub>D</sub> (A)	
00	32 @ V <sub>GS</sub> = 4.5V	6.5	
20	40 @ V <sub>GS</sub> = 2.5V	5.0	

## **Features**

- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance
- ESD Protect 2KV

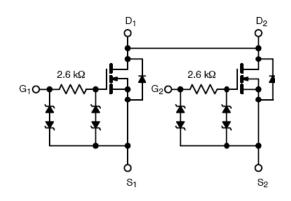
## **Application**

- Specially Designed for Li-on Battery Packs
- **Battery Switch Application**

## **Ordering Information**

Part No.	Package	Packing	
TSM7900DCQ RL	TDFN 3x3	T&R	

### **Block Diagram**



**Dual N-Channel MOSFET** 

## Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

Parameter		Symbol	Limit	Unit	
Drain-Source Voltage		$V_{DS}$	20	V	
Gate-Source Voltage		$V_{GS}$	±12	V	
Continuous Drain Current, V <sub>GS</sub> @4.5V.		I <sub>D</sub>	6	А	
Pulsed Drain Current, V <sub>GS</sub> @4.5V		I <sub>DM</sub>	30	А	
Continuous Source Current (Diode Conduction) <sup>a,b</sup>		I <sub>S</sub>	1.4	Α	
Maximum Power Dissipation	Ta = 25 °C	D	1.25	W	
	Ta = 75 °C	P <sub>D</sub>	0.8		
Operating Junction Temperature		TJ	+150	°C	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C	

#### Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Foot (Drain) Thermal Resistance	$R\Theta_{JF}$	30	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)	R⊖ <sub>JA</sub>	50	°C/W

#### Notes:

- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board, t ≤ 5 sec.



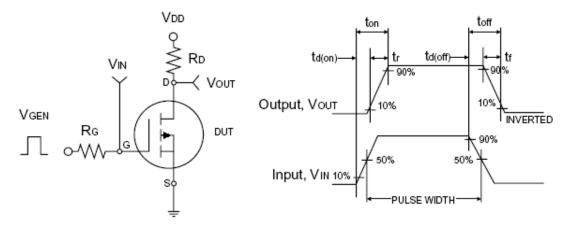
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## **Electrical Specifications**

Parameter	Conditions	Symbol	Min	Тур	Max	Unit
Static	Static					
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250uA$	BV <sub>DSS</sub>	20			V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250uA$	$V_{GS(TH)}$	0.6	8.0	1.0	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	I <sub>GSS</sub>			±100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 16V, V_{GS} = 0V$	I <sub>DSS</sub>			1.0	uA
On-State Drain Current	$V_{DS} \square 5V$ , $V_{GS} = 4.5V$	I <sub>D(ON)</sub>	30			Α
Dunin Course On Otata Basistanaa	$V_{GS} = 4.5V, I_D = 6.0A$	_		30	35	mΩ
Drain-Source On-State Resistance	$V_{GS} = 2.5V, I_D = 5.0A$	R <sub>DS(ON)</sub>		35	40	
Forward Transconductance	$V_{DS} = 10V, I_D = 6.0A$	g <sub>fs</sub>		30		S
Diode Forward Voltage	I <sub>S</sub> = 1.5A, V <sub>GS</sub> = 0V	$V_{SD}$		0.6	1.2	V
Dynamic <sup>b</sup>	_					
Total Gate Charge	\/ - 10\/   - 6A	$Q_g$		15	20	
Gate-Source Charge	$V_{DS} = 10V, I_D = 6A,$ $V_{GS} = 4.5V$	$Q_gs$		3.4		nC
Gate-Drain Charge	V <sub>GS</sub> = 4.5 V	$Q_{gd}$		1.2		
Input Capacitance	\/ - 40\/ \/ - 0\/	$C_{iss}$		950		
Output Capacitance	$V_{DS} = 10V, V_{GS} = 0V,$ f = 1.0MHz	C <sub>oss</sub>		450		pF
Reverse Transfer Capacitance	1 - 1.0IVINZ	$C_{rss}$		125		
Switching <sup>c</sup>						
Turn-On Delay Time	V 40V D 400	t <sub>d(on)</sub>		140	200	
Turn-On Rise Time	$V_{DD} = 10V, R_L = 10\Omega,$	t <sub>r</sub>		210	250	nC
Turn-Off Delay Time	$I_D = 1A$ , $V_{GEN} = 4.5V$ ,	t <sub>d(off)</sub>		3700	4800	nS
Turn-Off Fall Time	$R_G = 6\Omega$	t <sub>f</sub>		2000	2600	

#### Notes:

- a. pulse test: PW  $\square 300 \mu S,$  duty cycle  $\square 2\%$  b. For DESIGN AID ONLY, not subject to production testing.
- b. Switching time is essentially independent of operating temperature.



**Switching Test Circuit** 

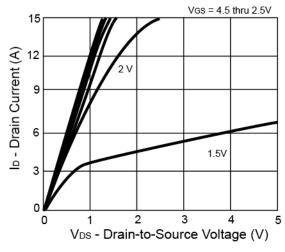
Switchin Waveforms



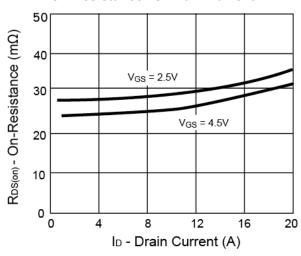


### Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

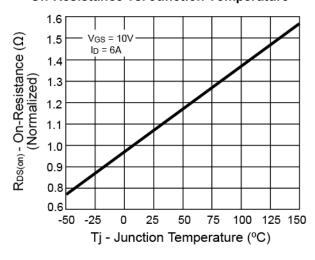
#### **Output Characteristics**



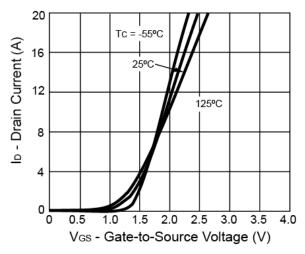
#### On-Resistance vs. Drain Current



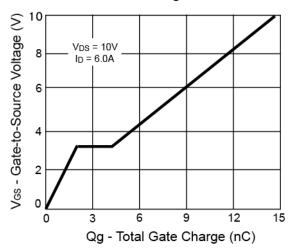
#### On-Resistance vs. Junction Temperature



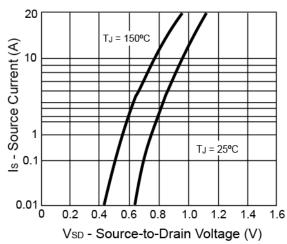
#### **Transfer Characteristics**



#### Gate Charge



#### Source-Drain Diode Forward Voltage



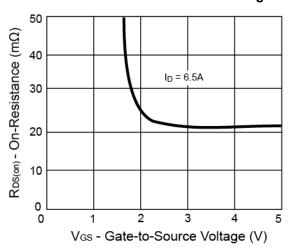


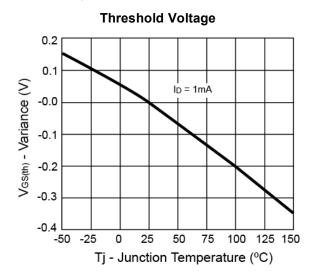


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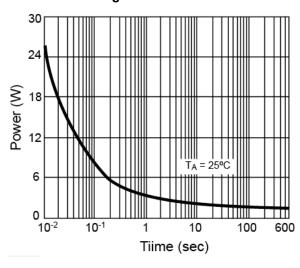
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#### On-Resistance vs. Gate-Source Voltage

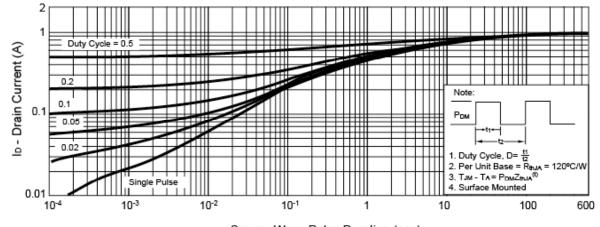




#### **Single Pulse Power**



#### Normalized Thermal Transient Impedance, Junction-to-Ambient



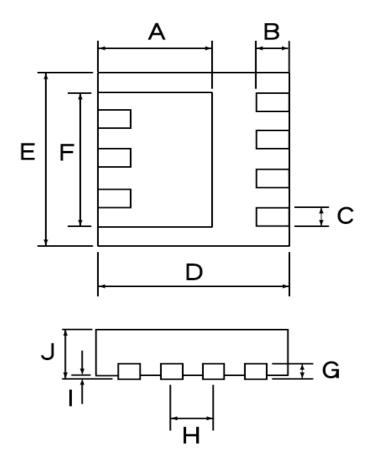
Square Wave Pulse Duration (sec)







## **TDFN Mechanical Drawing**



	TDFN 3x3 DIMENSION			
DIM	MILLIMETERS			
Dilvi	MIN.	TYP.	MAX.	
Α	1.750	1.800	1.850	
В	0.470	0.520	0.570	
С	0.270	0.320	0.370	
D	2.950	3.000	3.050	
Е	2.950	3.000	3.050	
F	2.250	2.300	2.350	
G	0.177	0.203	0.280	
Н	0.610	0.660	0.710	
ı	0.005	0.020	0.050	
J	0.650	0.750	0.850	



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