


**SOP-8**
**Pin Definition:**

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

**PRODUCT SUMMARY**

<b><math>V_{DS}</math> (V)</b>	<b><math>R_{DS(on)}</math>(mΩ)</b>	<b><math>I_D</math> (A)</b>
-30	21 @ $V_{GS} = -10V$	-9.1
	35 @ $V_{GS} = -4.5V$	-6.9

**Features**

- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

**Application**

- DC-DC Conversion
- Battery Switch

**Ordering Information**

<b>Part No.</b>	<b>Package</b>	<b>Packing</b>
TSM4435CS RL	SOP-8	2.5Kpcs / 13" Reel

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

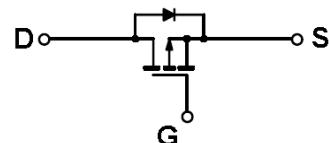
<b>Parameter</b>	<b>Symbol</b>	<b>Limit</b>	<b>Unit</b>
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	-9.1	A
Pulsed Drain Current	$I_{DM}$	-50	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	$I_S$	-2.1	A
Maximum Power Dissipation	$T_a = 25^{\circ}C$	2.5	W
		1.6	
Operating Junction Temperature	$T_J$	+150	°C
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

**Thermal Performance**

<b>Parameter</b>	<b>Symbol</b>	<b>Limit</b>	<b>Unit</b>
Junction to Foot (Drain) Thermal Resistance	$R\Theta_{JF}$	22	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)	$R\Theta_{JA}$	50	°C/W

Notes:

- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board,  $t \leq 10$  sec.

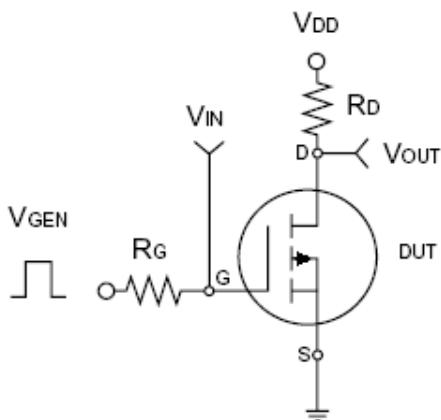
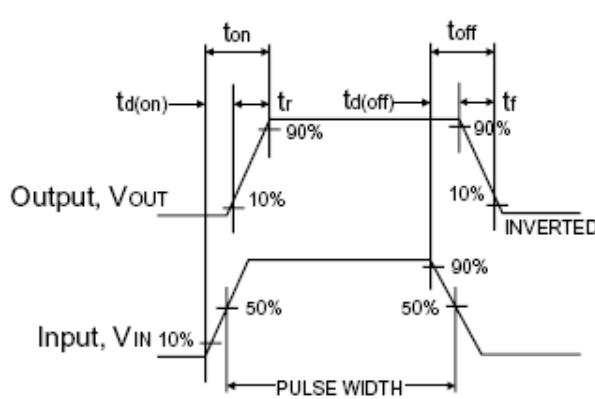
**Block Diagram**

**P-Channel MOSFET**

**Electrical Specifications**

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	$BV_{DSS}$	-30	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-1	--	-3	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -30V, V_{GS} = 0V$	$I_{DSS}$	--	--	-1.0	$\mu A$
On-State Drain Current <sup>a</sup>	$V_{DS} = -5V, V_{GS} = -10V$	$I_{D(ON)}$	-40	--	--	A
Drain-Source On-State Resistance <sup>a</sup>	$V_{GS} = -10V, I_D = -9.1A$	$R_{DS(ON)}$	--	17	21	$m\Omega$
	$V_{GS} = -4.5V, I_D = -6.9A$		--	25	35	
Forward Transconductance <sup>a</sup>	$V_{DS} = -10V, I_D = -9.1A$	$g_{fs}$	--	24	--	S
Diode Forward Voltage	$I_S = -2.1A, V_{GS} = 0V$	$V_{SD}$	--	-0.8	-1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = -15V, I_D = -9.1A, V_{GS} = -10V$	$Q_g$	--	33	70	nC
Gate-Source Charge		$Q_{gs}$	--	5.8	--	
Gate-Drain Charge		$Q_{gd}$	--	8.6	--	
Input Capacitance	$V_{DS} = -15V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	1573	1900	pF
Output Capacitance		$C_{oss}$	--	319	--	
Reverse Transfer Capacitance		$C_{rss}$	--	211	295	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = -15V, R_L = 15\Omega, I_D = -1A, V_{GEN} = -10V, R_G = 6\Omega$	$t_{d(on)}$	--	10	15	nS
Turn-On Rise Time		$t_r$	--	15	25	
Turn-Off Delay Time		$t_{d(off)}$	--	110	170	
Turn-Off Fall Time		$t_f$	--	70	110	

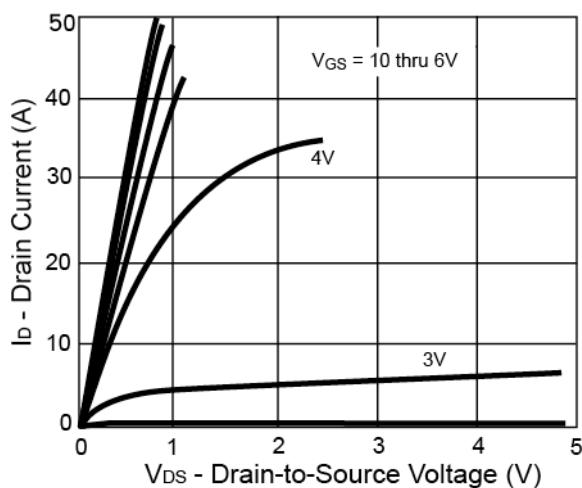
Notes:

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

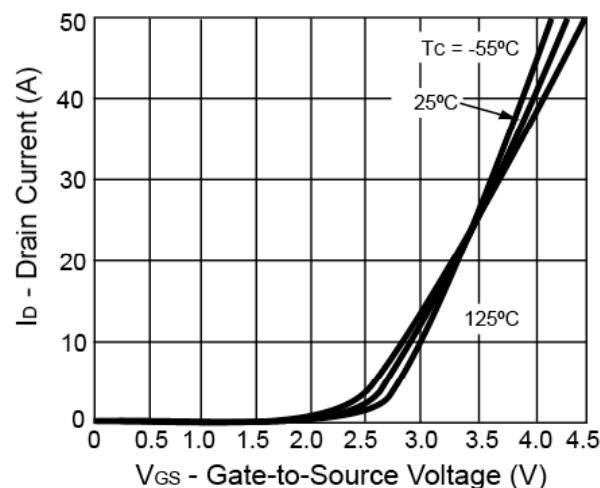

**Switching Test Circuit**

**Switching Waveforms**

**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

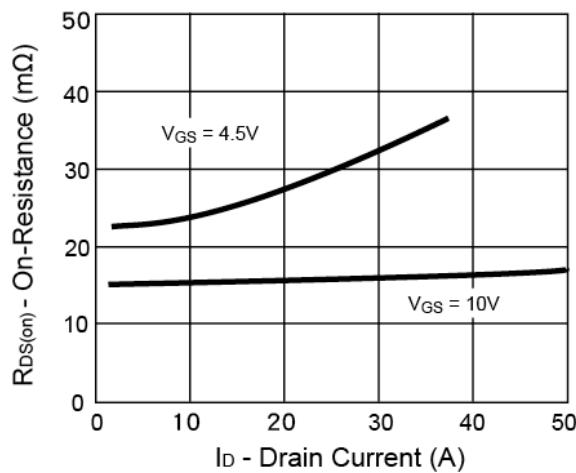
**Output Characteristics**



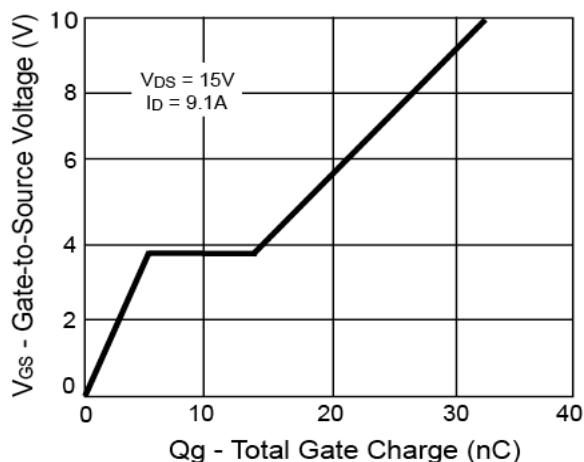
**Transfer Characteristics**



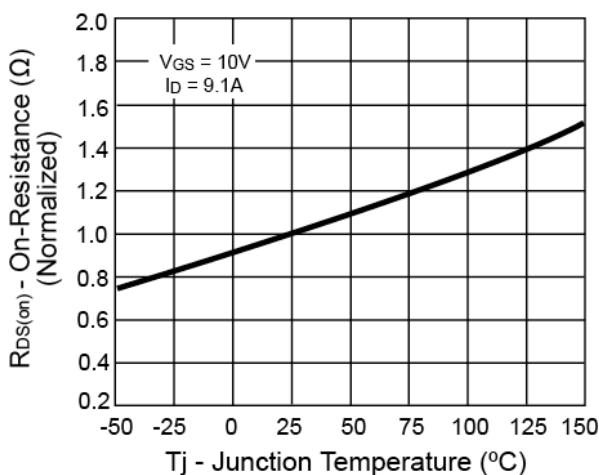
**On-Resistance vs. Drain Current**



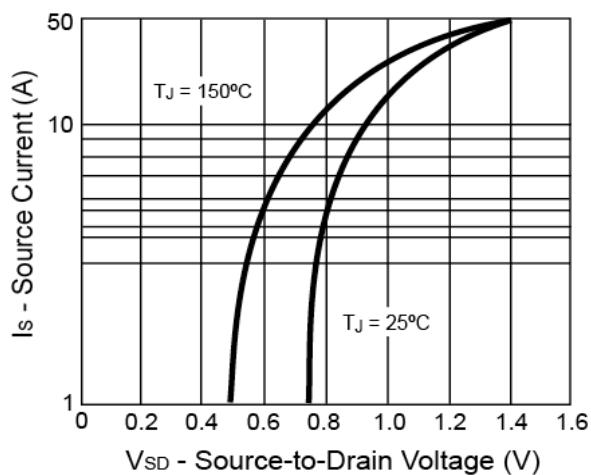
**Gate Charge**



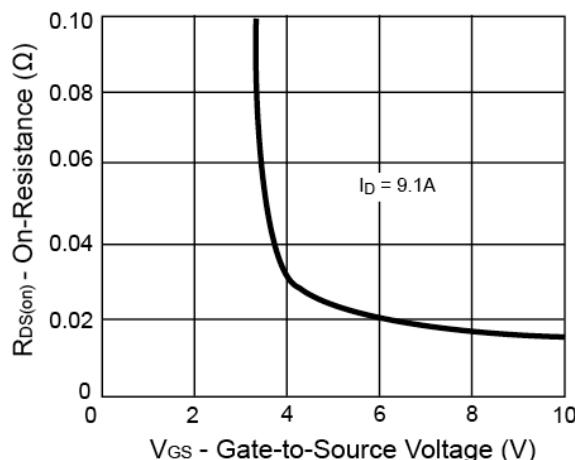
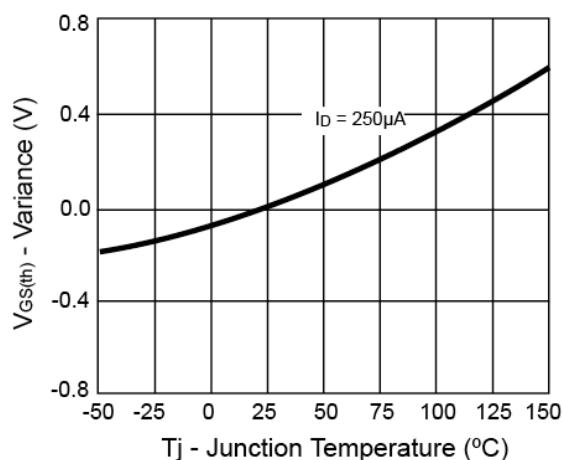
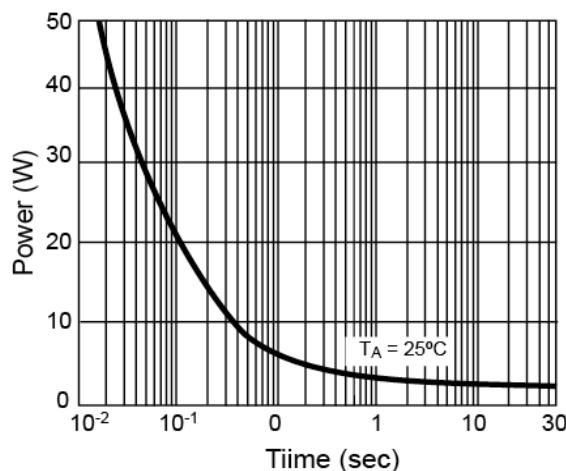
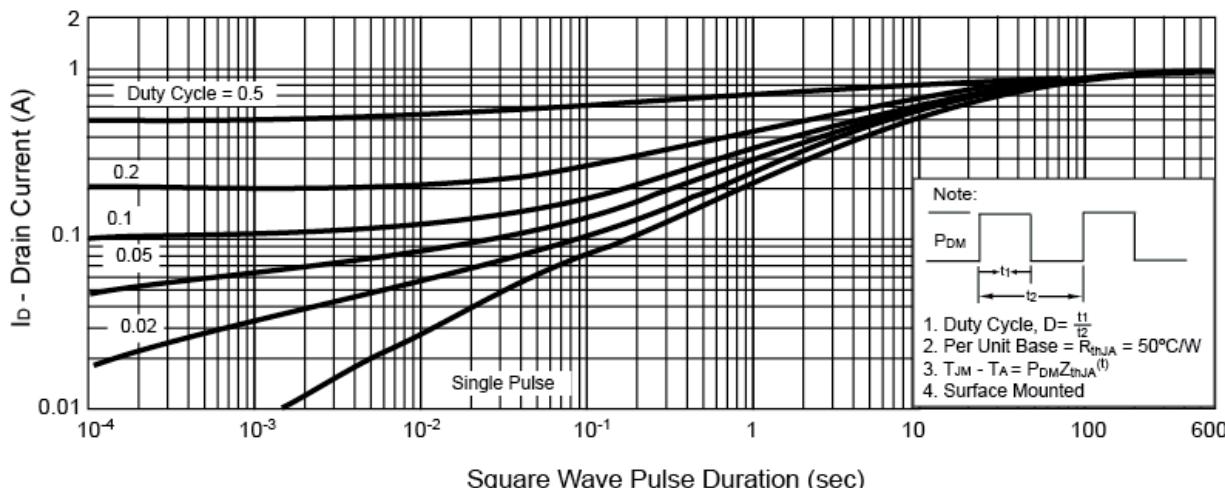
**On-Resistance vs. Junction Temperature**



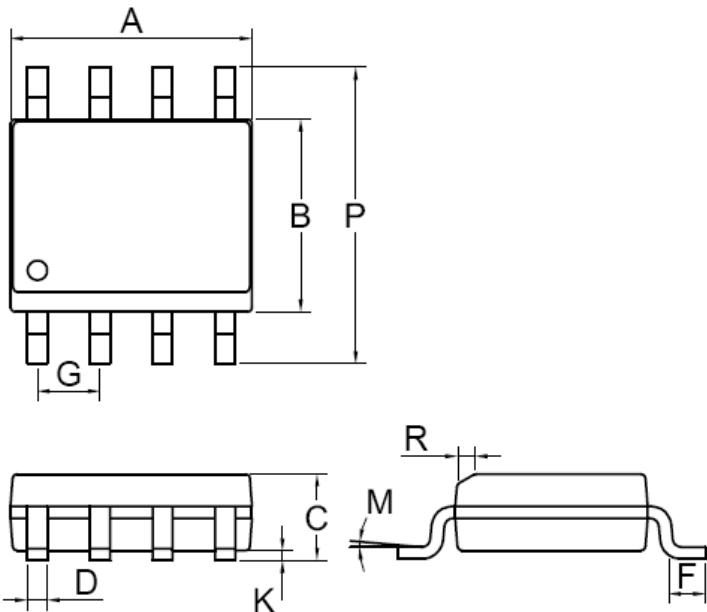
**Source-Drain Diode Forward Voltage**



**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

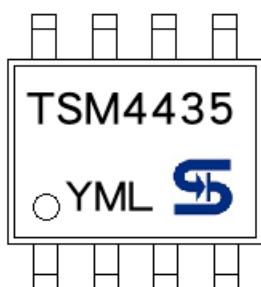
**On-Resistance vs. Gate-Source Voltage**

**Threshold Voltage**

**Single Pulse Power**

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


## SOP-8 Mechanical Drawing



SOP-8 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

## Marking Diagram



**Y** = Year Code

**M** = Month Code

(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug,  
**I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

**L** = Lot Code

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