

## General Description

The WSP6039 is the highest performance trench P-ch MOSFETs with extreme high cell density, which provide excellent R<sub>DS(on)</sub> and gate charge for most of the synchronous buck converter applications.

The WSP6039 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

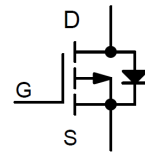
## Product Summary

BVDSS	R <sub>DS(on)</sub>	I <sub>D</sub>
-60V	88mΩ	-3.5A

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- CCFL Back-light Inverter

## SOP-8 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	-60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current	-3.5	A
I <sub>D</sub> @T <sub>C</sub> =70°C	Continuous Drain Current	-2.5	A
I <sub>DP</sub>	Pulsed Drain Current	-17.5	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation	2.0	W
T <sub>J</sub> /T <sub>STG</sub>	Operating/Storage Temperature Range	-55 to 150	°C

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient	---	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case	---	4	°C/W

**P-Channel Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-60	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-4A$	---	88	114	m $\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	---	118	153	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.65	-3.0	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-60V, V_{GS}=0V$	---	---	-1	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS} = -30V, I_D = -3.7A,$ $V_{GS} = -10V$	---	17	---	nC
$Q_{gs}$	Gate-Source Charge		---	2	---	
$Q_{gd}$	Gate-Drain Charge		---	4	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD} = -30V, I_D = -1A,$ $V_{GS} = -10V, R_{GEN} = 6\Omega$	---	11	---	ns
$T_r$	Rise Time		---	4.5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	50	---	
$T_f$	Fall Time		---	15	---	
$C_{iss}$	Input Capacitance	$V_{DS} = -30V, V_{GS} = 0V, f = 1.0\text{ MHz}$	---	615	---	pF
$C_{oss}$	Output Capacitance		---	140	---	
$C_{rss}$	Reverse Transfer Capacitance		---	45	---	

**Diode Characteristics**

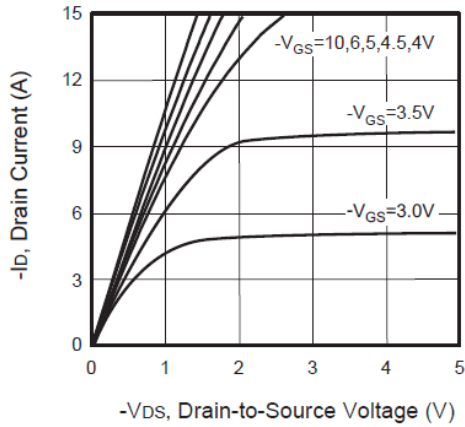
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V$ , Force Current	---	---	-3.5	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1.2	V

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design.

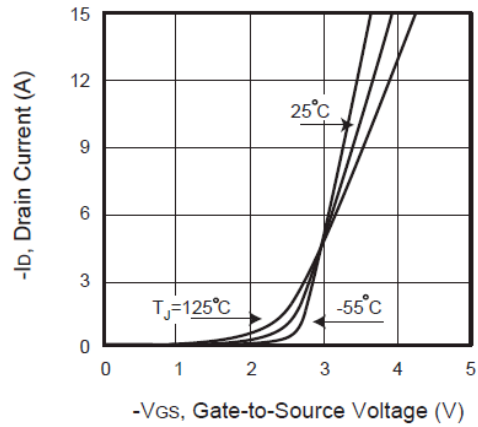
B: Repetitive rating, pulse width limited by junction temperature.

C: The current rating is based on the  $t_s \leq 10s$  junction to ambient thermal resistance rating

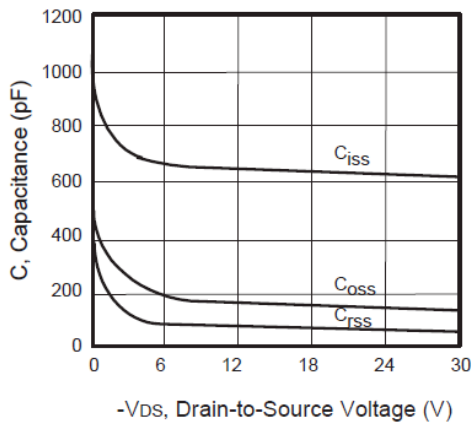
**P-Channel Typical Characteristics**



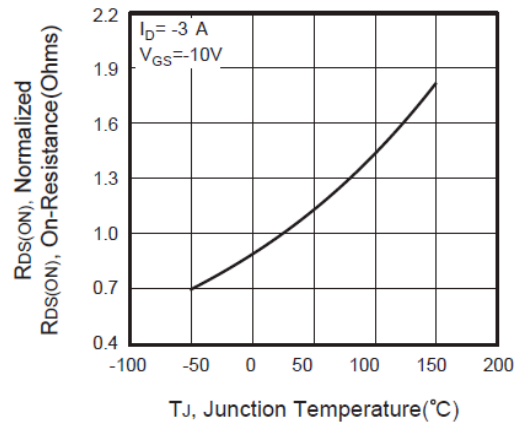
**Figure 1. Output Characteristics**



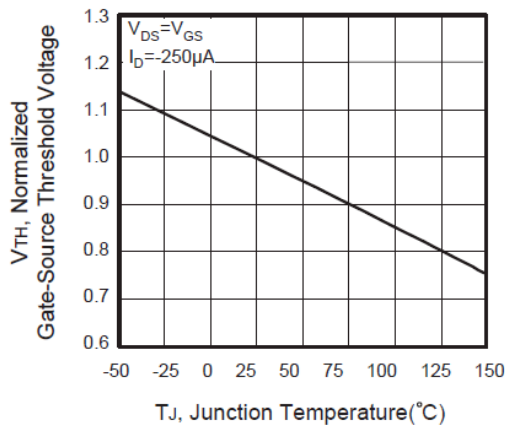
**Figure 2. Transfer Characteristics**



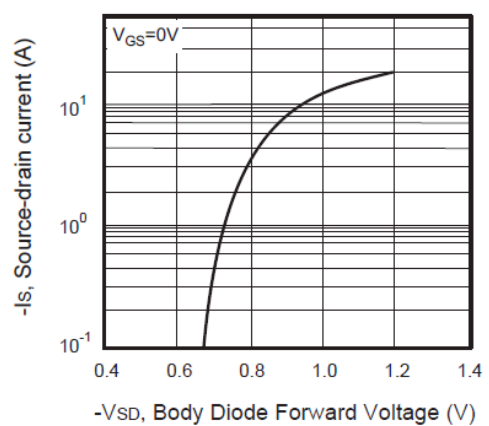
**Figure 3. Capacitance**



**Figure 4. On-Resistance Variation with Temperature**



**Figure 5. Gate Threshold Variation with Temperature**



**Figure 6. Body Diode Forward Voltage Variation with Source Current**

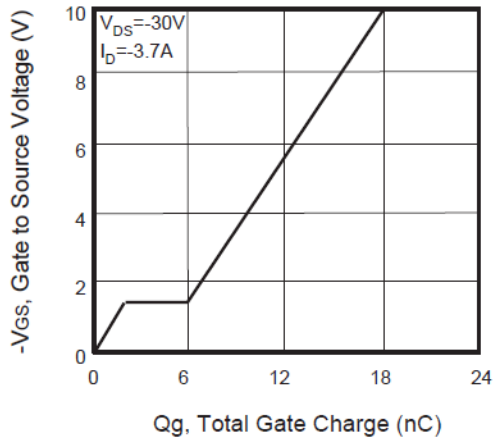


Figure 7. Gate Charge

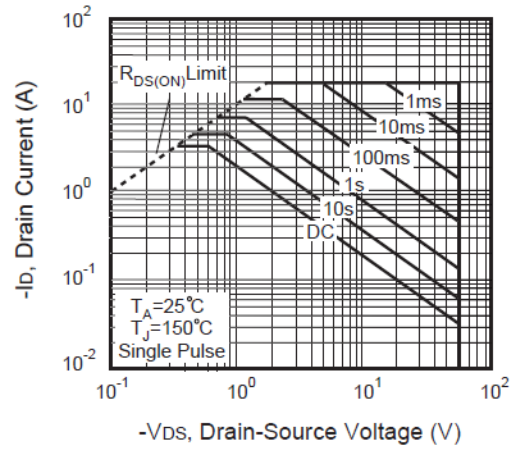


Figure 8. Maximum Safe Operating Area

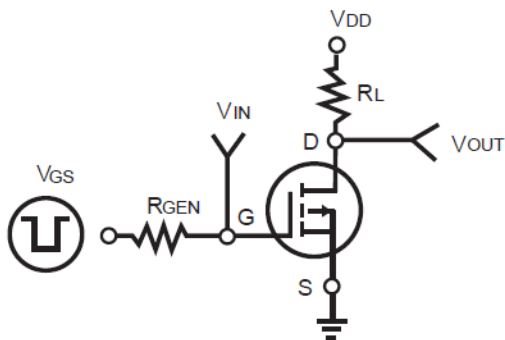


Figure 9. Switching Test Circuit

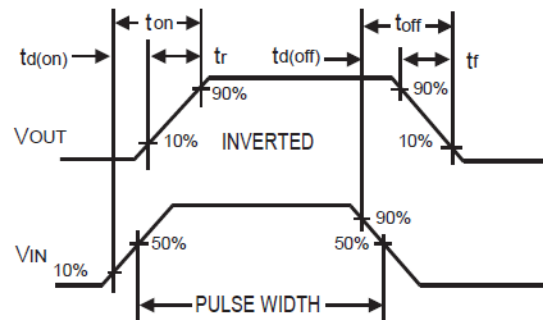


Figure 10. Switching Waveforms

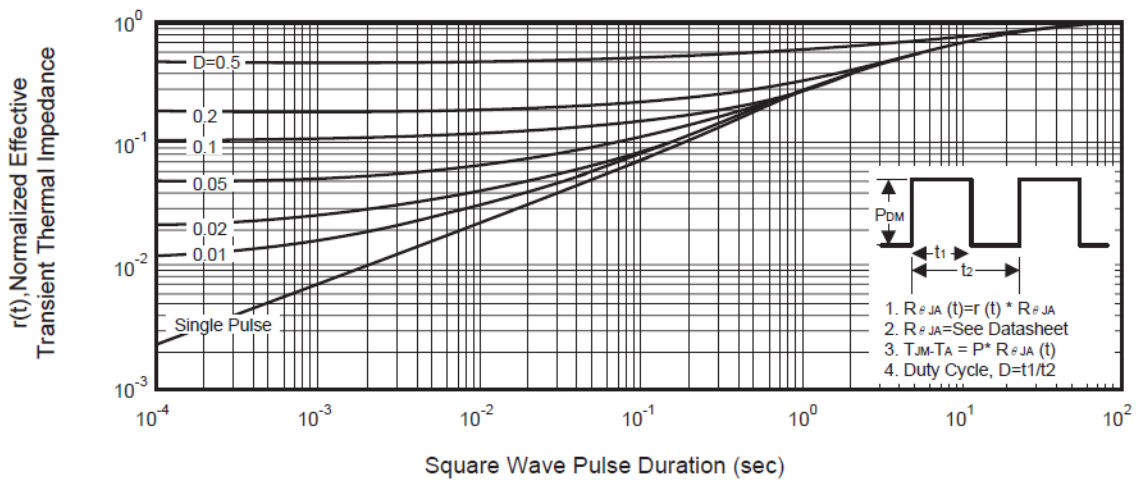


Figure 11. Normalized Thermal Transient Impedance Curve



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