



## MSP7016 P-channel Enhancement Mode Power MOSFET

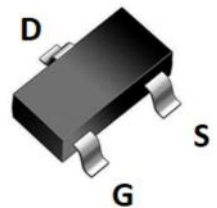
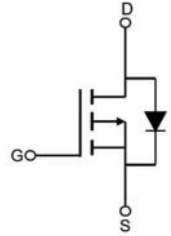
### Features

- -16V, -7A  
 $R_{DS(ON)} < 24.5m\Omega @ V_{GS} = -4.5V$   
 $R_{DS(ON)} < 32m\Omega @ V_{GS} = -2.5V$
- Advanced Trench Technology
- Provide Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired

### Application

- Load Switch
- PWM Application
- Power management

Marking : P72



SOT 23-3L

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise specified)

Symbol	Parameter	Max.	Units	
$V_{DSS}$	Drain-Source Voltage	-16	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 12$	V	
$I_D$	Continuous Drain Current	$T_A = 25^\circ C$	-7	A
		$T_A = 100^\circ C$	-4.6	A
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>	-28	A	
$P_D$	Power Dissipation	2	W	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ C/W$	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ C$	



### Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA	-16	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V,	-	-	-1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA	-0.4	-0.7	-1.0	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note2</small>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -7A	-	18.7	24.5	mΩ
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -5A	-	22.7	32	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -10V, V <sub>GS</sub> =0V, f=1.0MHz	-	2000	-	pF
C <sub>oss</sub>	Output Capacitance		-	242	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	231	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -10V, I <sub>D</sub> = -3A, V <sub>GS</sub> = -4.5V	-	15.3	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	2.2	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	4.4	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = -10V, I <sub>D</sub> = -7A, V <sub>GS</sub> = -4.5V, R <sub>GEN</sub> =2.5Ω	-	10	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	31	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	28	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	8	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	-7	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-28	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> = -7A	-	-0.8	-1.2	V

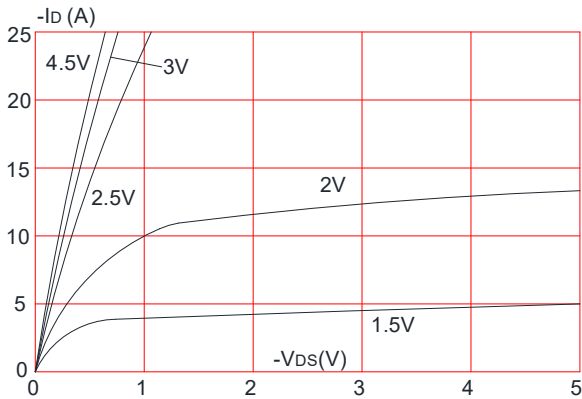
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

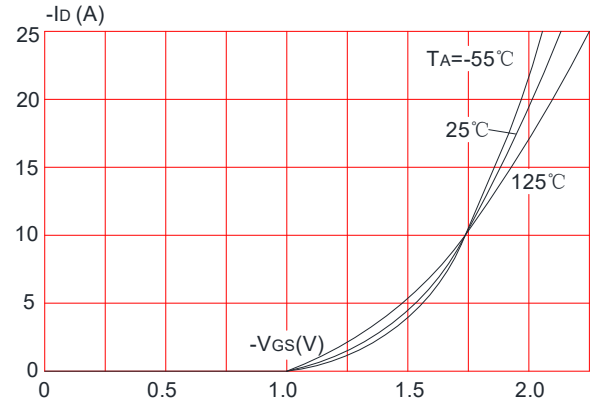


## Typical Performance Characteristics

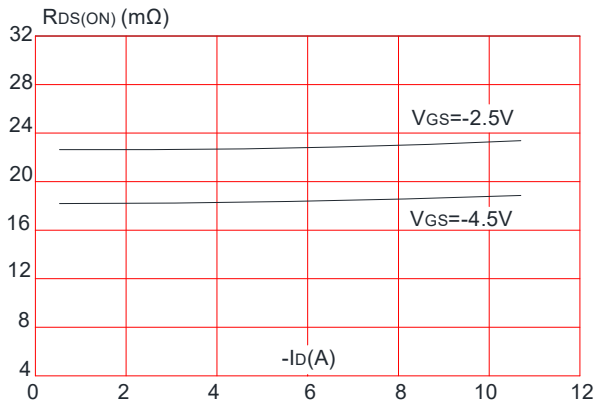
**Figure 1: Output Characteristics**



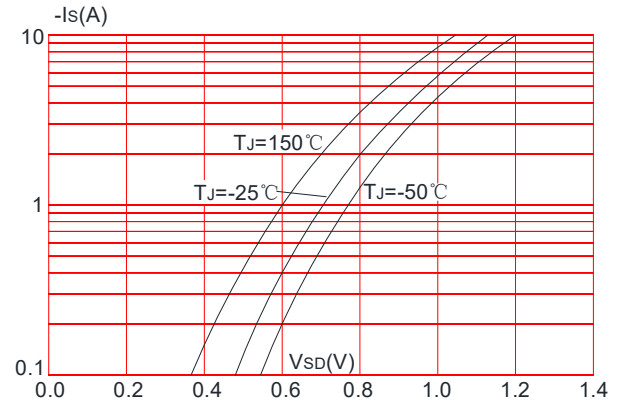
**Figure 2: Typical Transfer Characteristics**



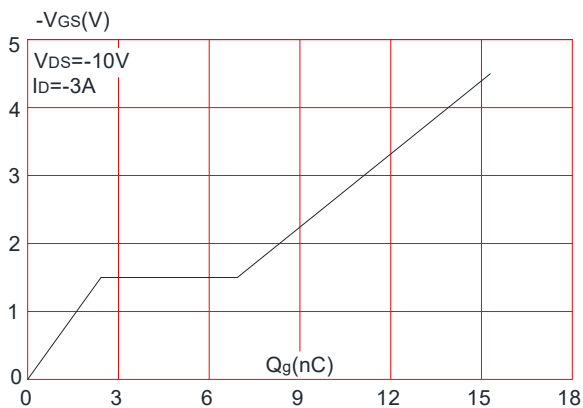
**Figure 3: On-resistance vs. Drain Current**



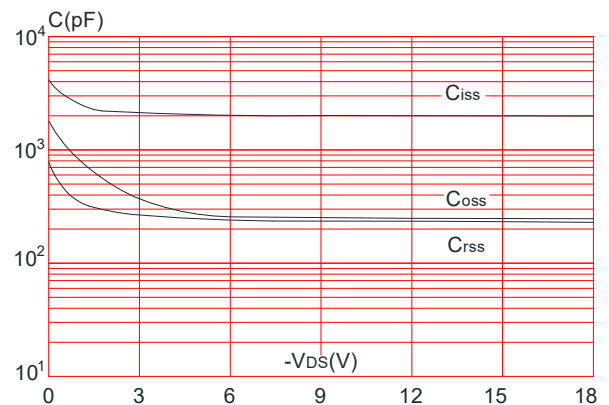
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

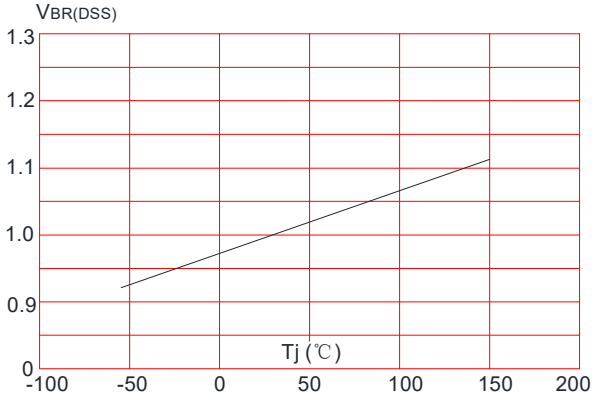


**Figure 6: Capacitance Characteristics**

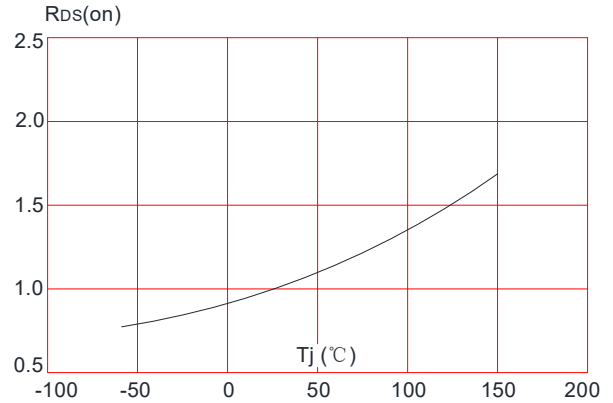




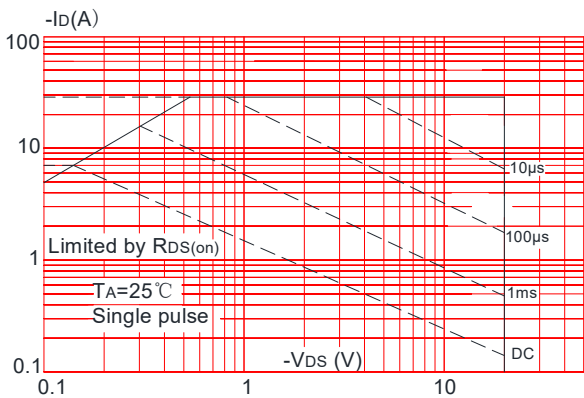
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



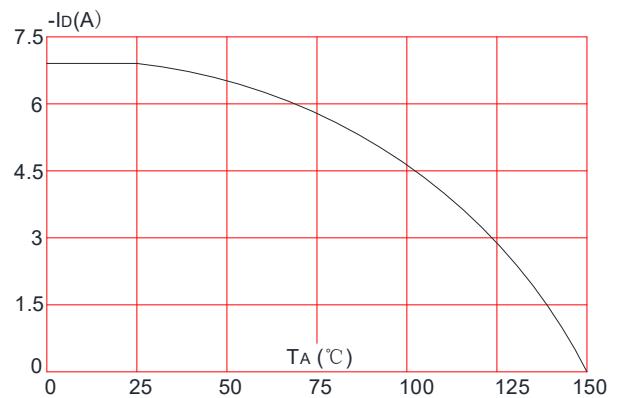
**Figure 8:** Normalized on Resistance vs. Junction Temperature



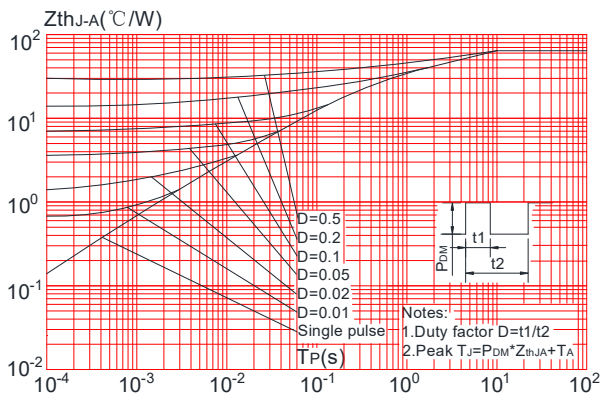
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



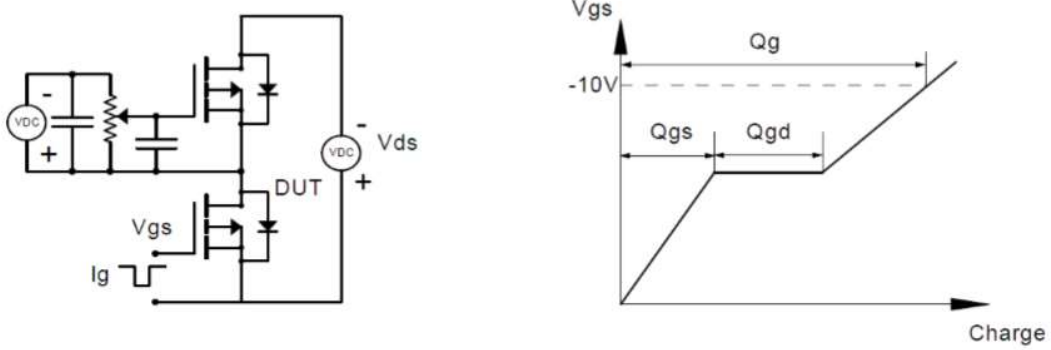
**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



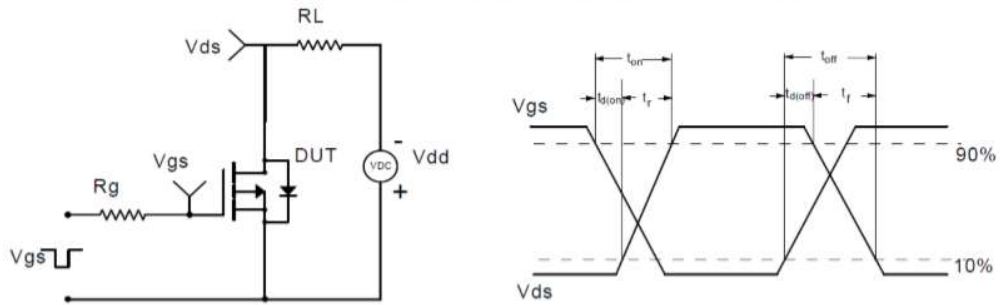


## Test Circuit

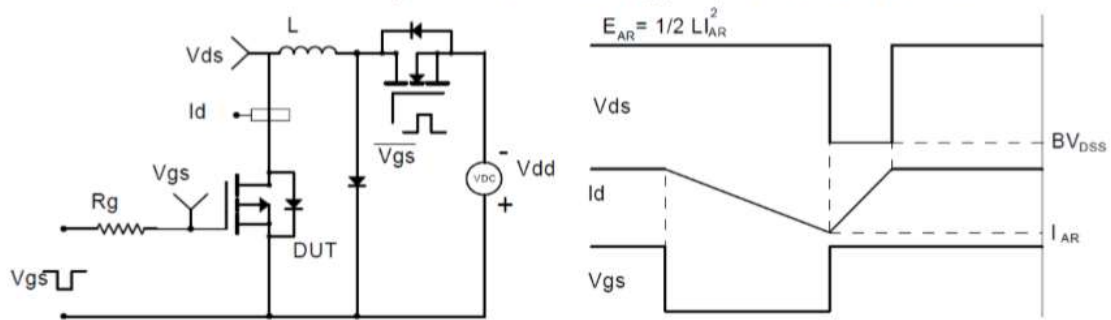
### Gate Charge Test Circuit & Waveform



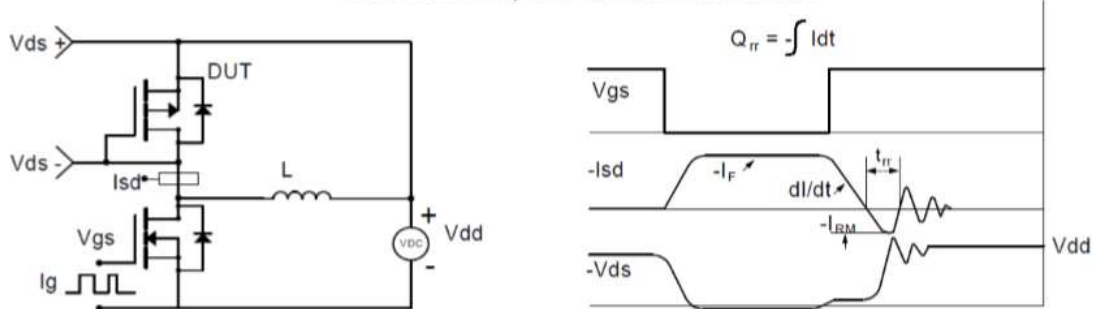
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

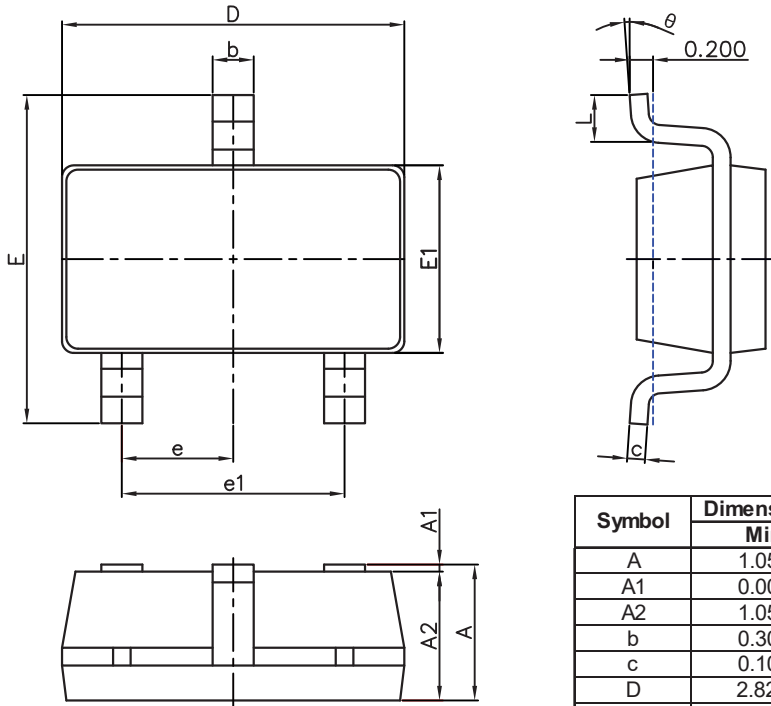


### Diode Recovery Test Circuit & Waveforms



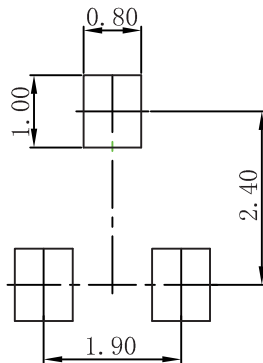


### SOT23-3L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
K	0°	8°	0°	8°

### SOT23-3L Suggested Pad Lay out



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.