


TM05P04MI

P-Channel Enhancement Mosfet

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Low <math>R_{DS(ON)}</math></li> <li>• RoHS and Halogen-Free Compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Load switch</li> <li>• PWM</li> </ul>	<p><b>General Features</b></p> <p><math>V_{DS} = -40V</math> <math>I_D = -5.4A</math>  <math>R_{DS(ON)} = 45m\Omega (typ.) @ V_{GS} = 10V</math></p> <p>100% UIS Tested              100% <math>R_g</math> Tested</p> 
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MI:SOT-23-3L

Marking: 5P04

**Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_A = 25^\circ\text{C}$	Continuous Drain Current	-5.4	A
$I_D @ T_A = 70^\circ\text{C}$	Continuous Drain Current	-3.6	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-22	A
$P_D @ T_A = 25^\circ\text{C}$	Total Power Dissipation <sup>3</sup>	2.0	W
$P_D @ T_A = 70^\circ\text{C}$	Total Power Dissipation <sup>3</sup>	1.5	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

**Thermal Data**

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	65	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup> ( $t \leq 10s$ )	---	48	$^\circ\text{C/W}$

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.7	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance Note2	$V_{GS}=-10V, I_D=-5A$	-	45	54	m $\Omega$
		$V_{GS}=-4.5V, I_D=-4A$	-	60	85	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=-20V, V_{GS}=0V,$ $f=1.0MHz$	-	869	-	pF
$C_{oss}$	Output Capacitance		-	94	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	69	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=-20V, I_D=-4A,$ $V_{GS}=-10V$	-	17.3	-	nC
$Q_{gs}$	Gate-Source Charge		-	3.2	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	4.3	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=-20V, I_D=-4A,$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	10.3	-	ns
$t_r$	Turn-on Rise Time		-	4.3	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	39	-	ns
$t_f$	Turn-off Fall Time		-	46.5	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	-5.4	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-22	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=-5.5A$	-	-0.8	-1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS}=0V, I_S=-5.5A,$	-	17	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt=100A/\mu s$	-	11.5	-	nC

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

 2. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

## Typical Performance Characteristics

Figure 1: Output Characteristics

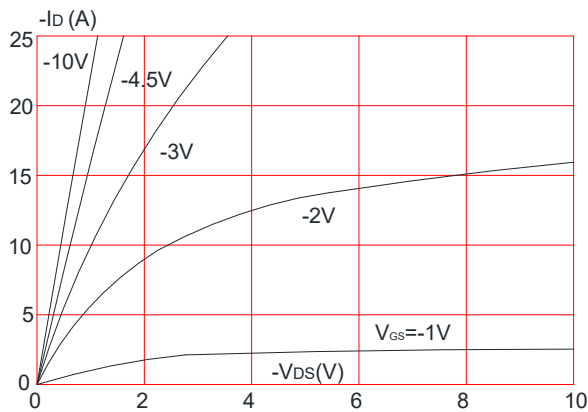


Figure 2: Typical Transfer Characteristics

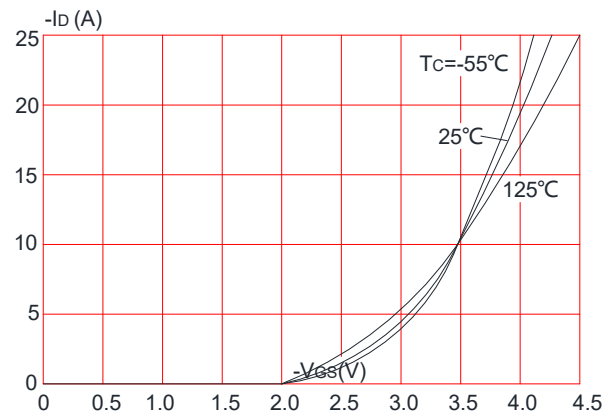


Figure 3: On-resistance vs. Drain Current

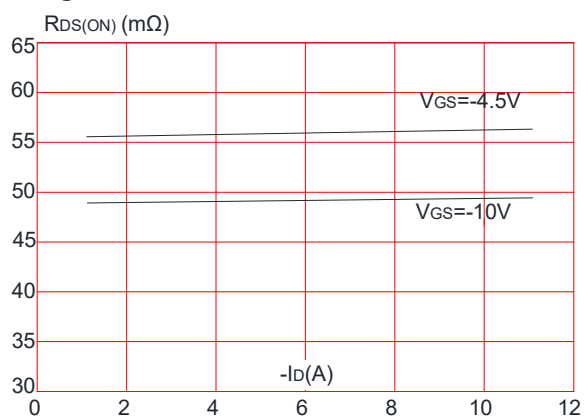


Figure 4: Body Diode Characteristics

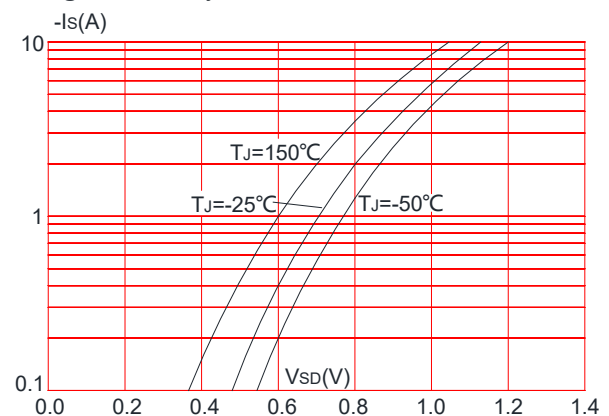


Figure 5: Gate Charge Characteristics

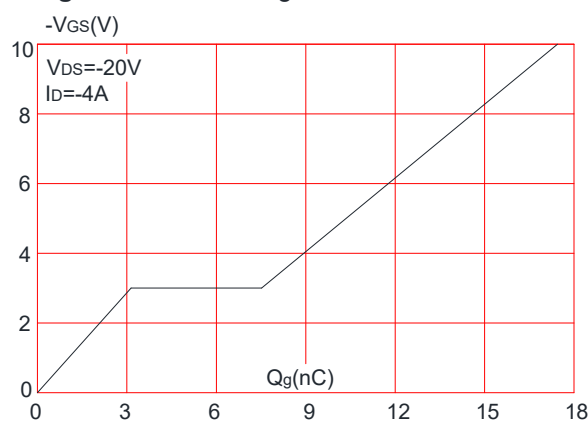
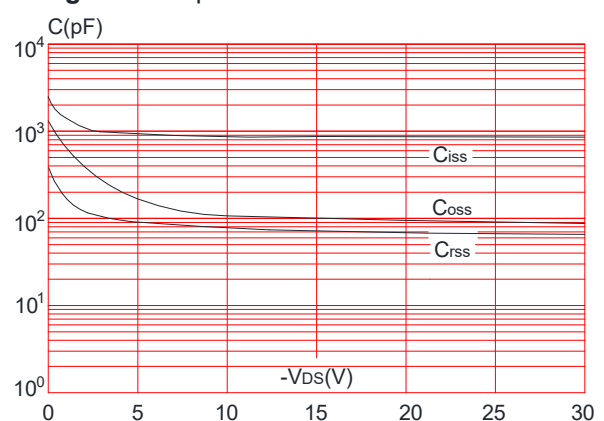


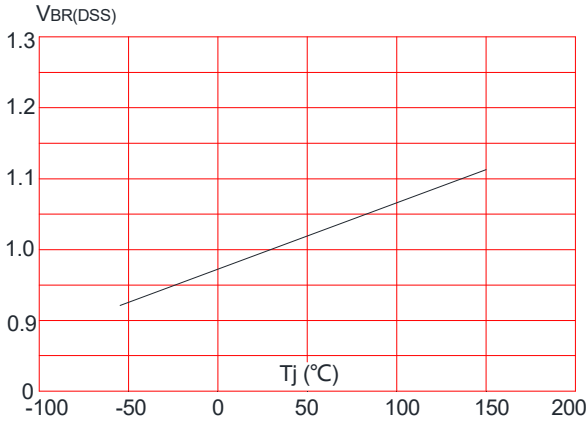
Figure 6: Capacitance Characteristics



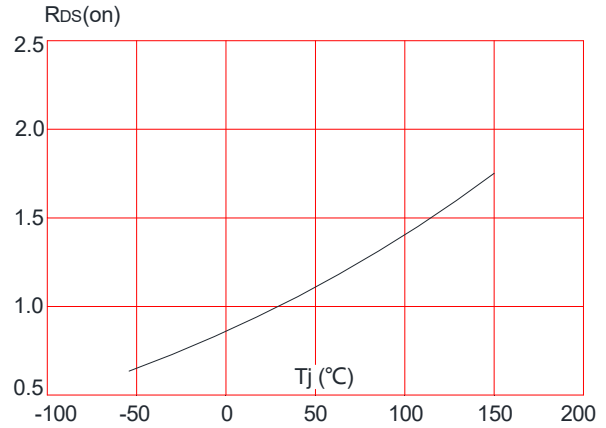
**TM05P04MI**

**P-Channel Enhancement Mosfet**

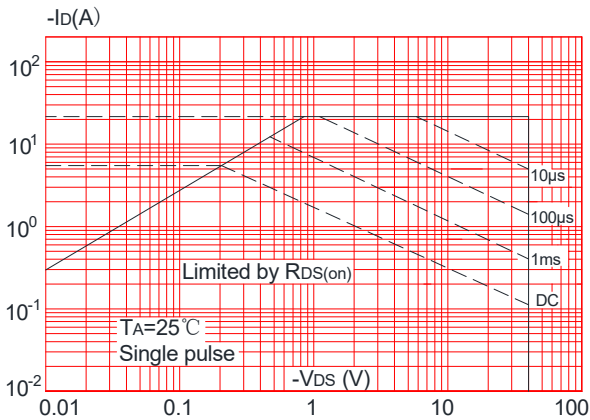
**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**



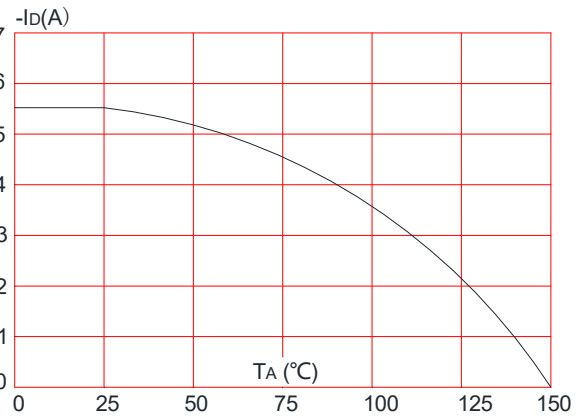
**Figure 8: Normalized on Resistance vs. Junction Temperature**



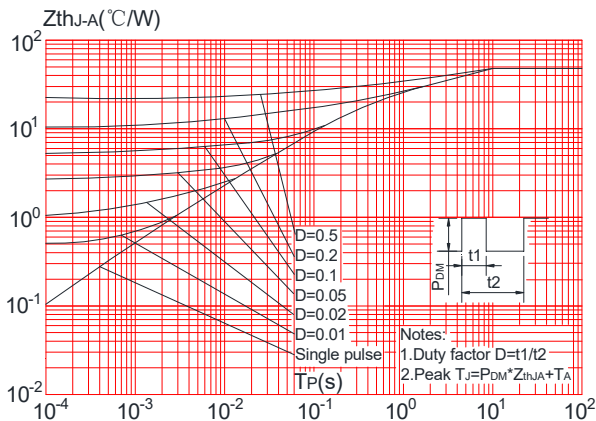
**Figure 9: Maximum Safe Operating Area**



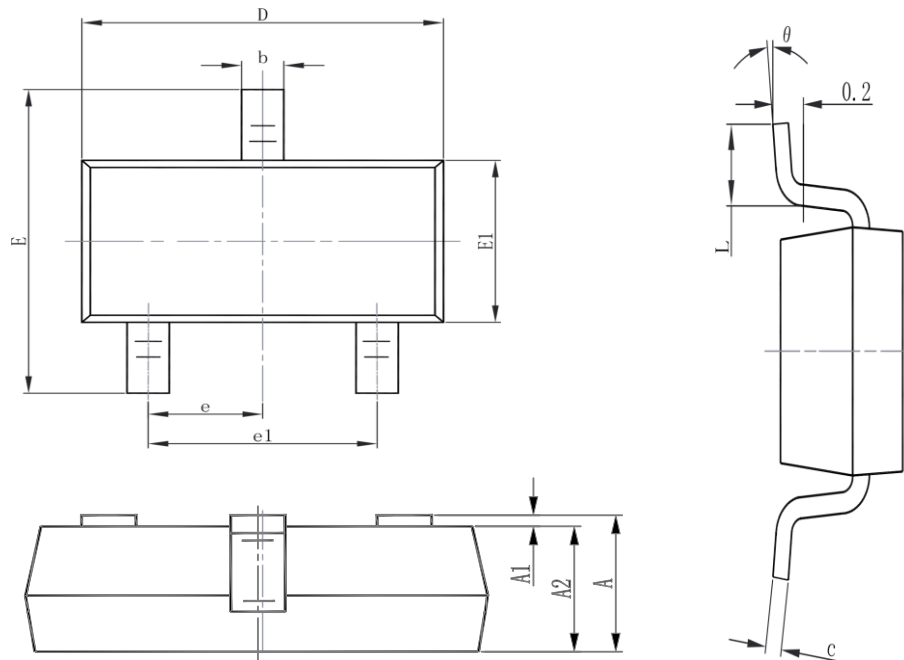
**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**



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



# Package Mechanical Data:SOT-23-3L



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
θ	0°	8°	0°	8°

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