

## P-Channel Enhancement Mode Power MOSFET

### Description

The RM50P40LD uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

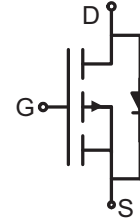
### General Features

- $V_{DS} = -40V, I_D = -52A$   
 $R_{DS(ON)} < 13m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 20m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

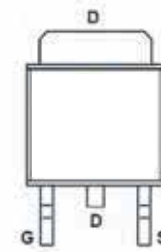
### Application

- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply
- Halogen-free

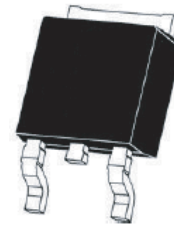
**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**



Schematic diagram



Marking and pin assignment



TO-252-2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Packing Code	Reel Size	Tape width	Quantity
50P40	RM50P40LD	TO-252-2L	-T	13'	-	2500

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-52	A
Drain Current-Continuous ( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	-32	A
Pulsed Drain Current	$I_{DM}$	-105	A
Maximum Power Dissipation	$P_D$	52.1	W
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	146	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	2.4	$^{\circ}\text{C/W}$
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## Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-32V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.6	-2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-18A$	-	10.5	13	m $\Omega$
		$V_{GS}=-4.5V, I_D=-12A$	-	15	20	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-18A$	-	24	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{iss}$	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	3500	-	PF
Output Capacitance	$C_{oss}$		-	323	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	222	-	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-1A, R_L=1\Omega$ $V_{GS}=-10V, R_G=3.3\Omega$	-	40	-	nS
Turn-on Rise Time	$t_r$		-	35.2	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	100	-	nS
Turn-Off Fall Time	$t_f$		-	9.6	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-20V, I_D=-12A,$ $V_{GS}=-4.5V$	-	27.9	-	nC
Gate-Source Charge	$Q_{gs}$		-	7.7	-	nC
Gate-Drain Charge	$Q_{gd}$		-	7.5	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=-1A$	-	-	-1	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	-52	A

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.

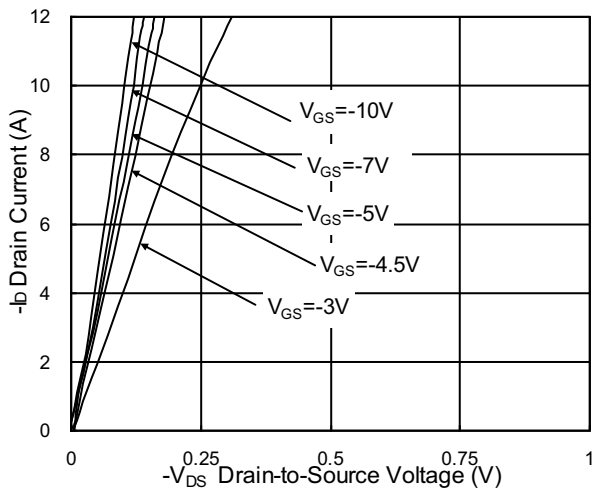
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

4. Guaranteed by design, not subject to production

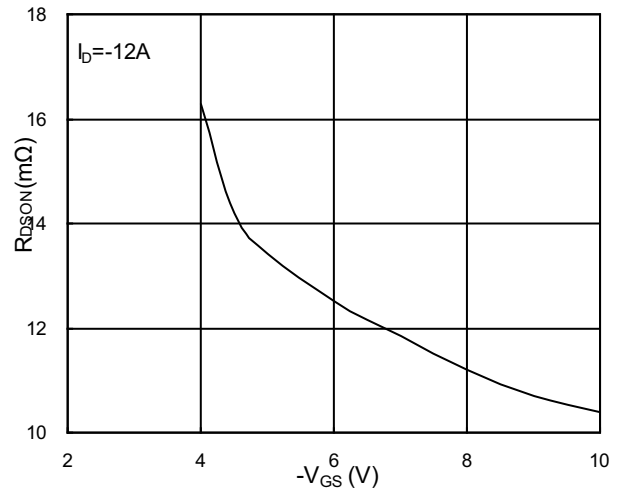
5.  $E_{AS}$  condition :  $T_j=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=1\text{mH}, R_G=25\Omega,$



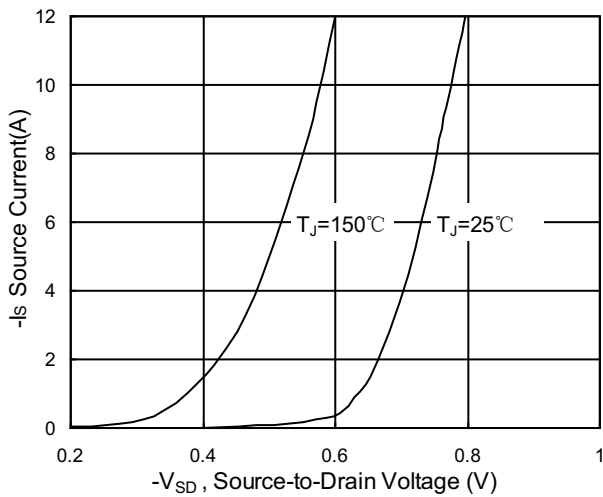
## RATING AND CHARACTERISTICS CURVES (RM50P40LD)



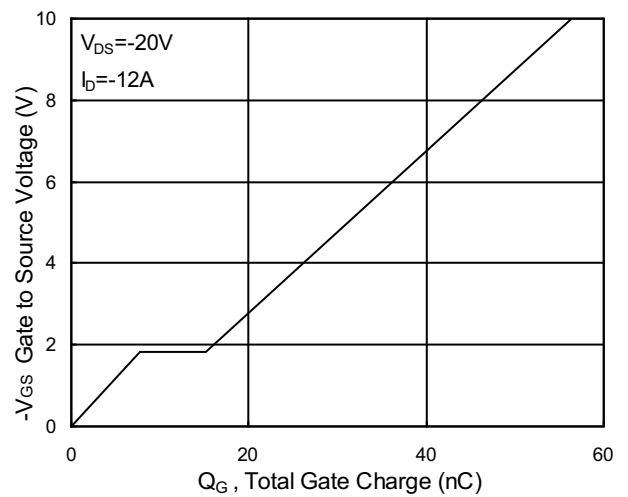
**Fig.1 Typical Output Characteristics**



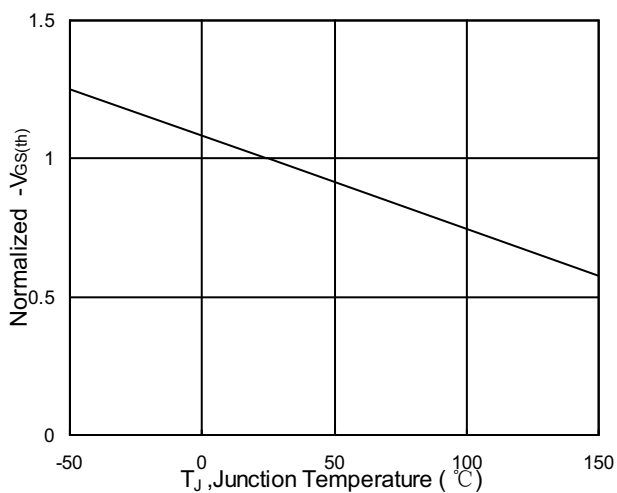
**Fig.2 On-Resistance v.s Gate-Source**



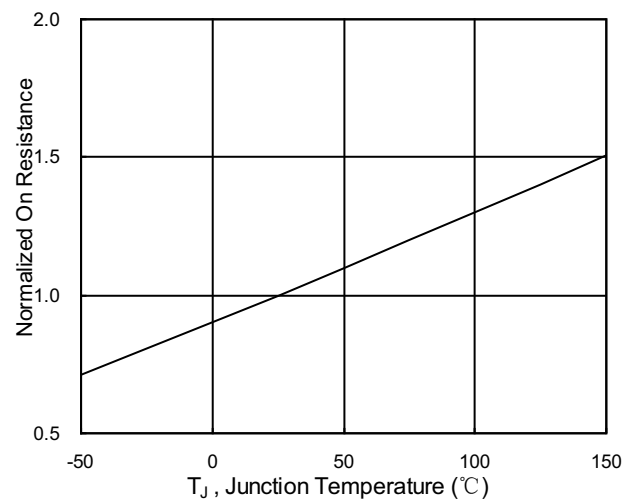
**Fig.3 Forward Characteristics Of Reverse**



**Fig.4 Gate-Charge Characteristics**



**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**

## RATING AND CHARACTERISTICS CURVES (RM50P40LD)

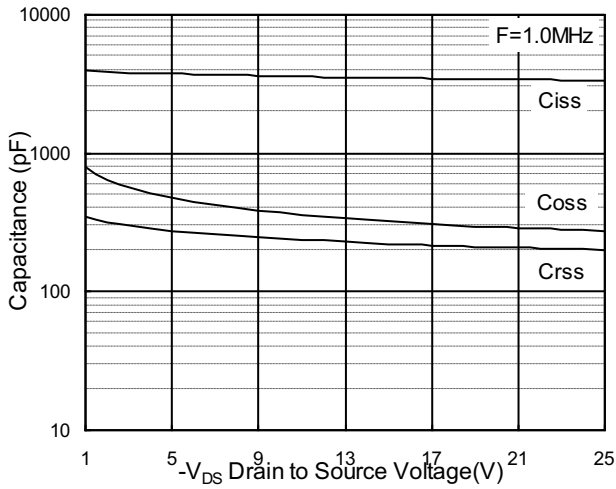


Fig.7 Capacitance

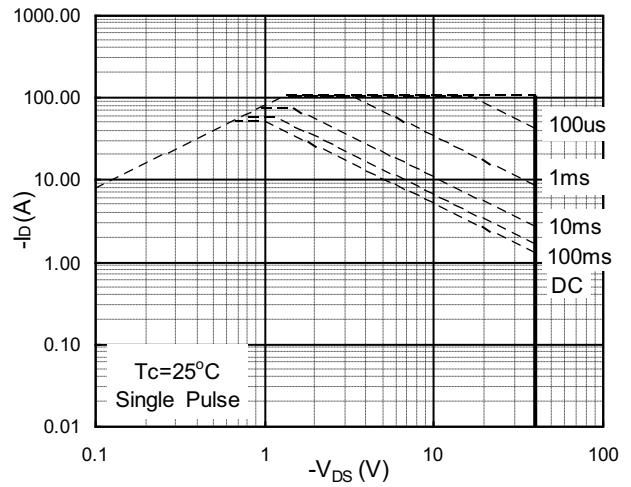


Fig.8 Safe Operating Area

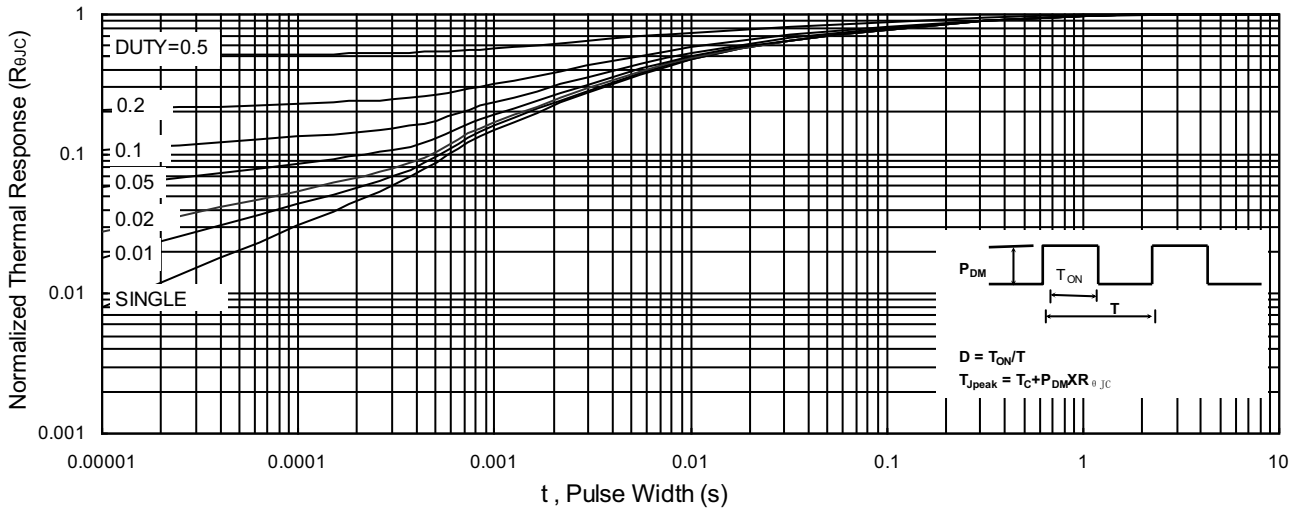


Fig.9 Normalized Maximum Transient Thermal Impedance

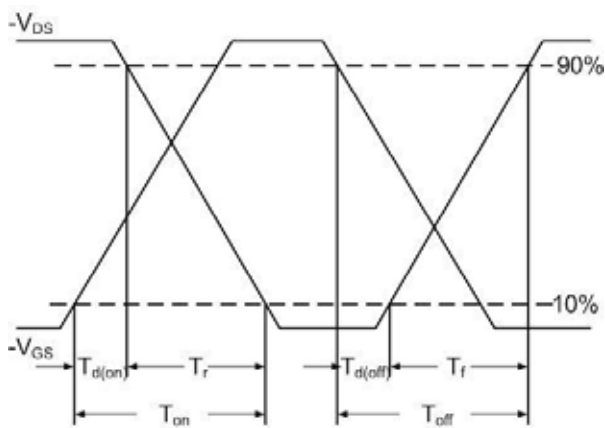


Fig.10 Switching Time Waveform

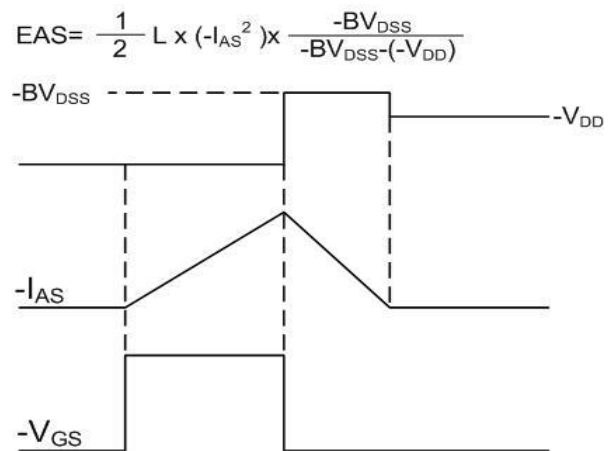
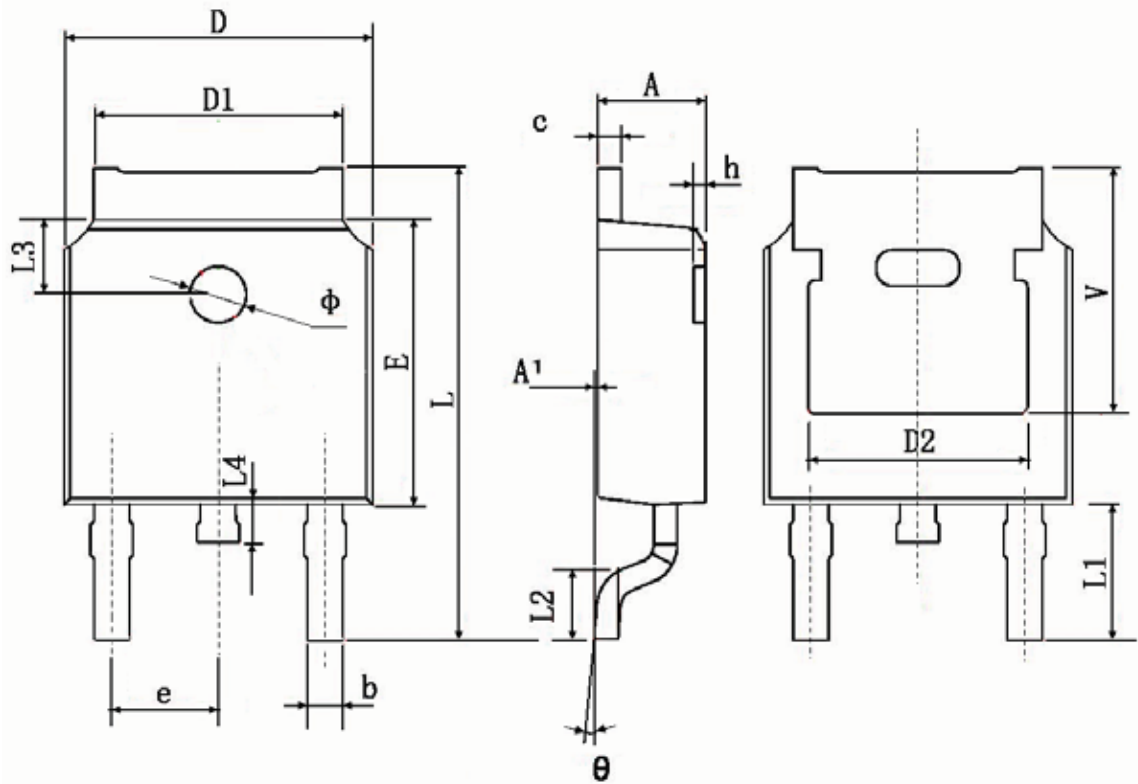


Fig.11 Unclamped Inductive Waveform

## TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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