

P-Channel Enhancement Mode Power MOSFET

Description

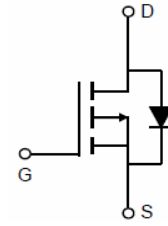
The HM85P02K uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- $V_{DS} = -20V, I_D = -85A$
 $R_{DS(ON)} < 7m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 9m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 12m\Omega @ V_{GS} = -1.8V$
- 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

Application

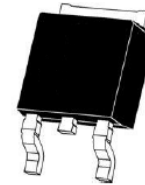
- Load switch
- Battery protection



Schematic diagram



Marking and pin Assignment



TO-252-2L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM85P02K	HM85P02K	TO-252-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	-85	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	-60	A
Pulsed Drain Current	I_{DM}	-255	A
Maximum Power Dissipation	P_D	80	W
Derating factor		0.64	W/ $^\circ C$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	1.6	$^\circ C/W$
--	-----------------	-----	--------------

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-20	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-16V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.4	-0.6	-1.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-20A$	-	5.8	7	m Ω
		$V_{GS}=-2.5V, I_D=-20A$	-	7.2	9	
		$V_{GS}=-1.8V, I_D=-20A$	-	9	12	
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-20A$	80	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=-10V, V_{GS}=0V,$ $F=1.0MHz$	-	3500	-	PF
Output Capacitance	C_{oss}		-	577	-	PF
Reverse Transfer Capacitance	C_{rss}		-	445	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10V, R_{GEN}=3\Omega$ $V_{GS}=-4.5V, R_L=0.5\Omega$	-	18	-	nS
Turn-on Rise Time	t_r		-	42	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	85	-	nS
Turn-Off Fall Time	t_f		-	23	-	nS
Total Gate Charge	Q_g	$V_{DS}=-10V, I_D=-20A,$ $V_{GS}=-4.5V$	-	55	-	nC
Gate-Source Charge	Q_{gs}		-	10	-	nC
Gate-Drain Charge	Q_{gd}		-	15	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-20A$	-	-	-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-85	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}, I_F = -10A$ $di/dt = 100A/\mu s$ (Note 3)	-	47	-	nS
Reverse Recovery Charge	Q_{rr}		-	53	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

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

Typical Electrical and Thermal Characteristics (Curves)

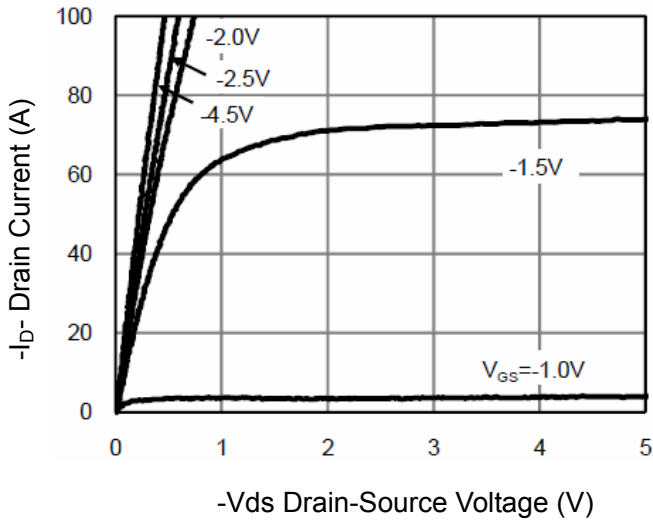


Figure 1 Output Characteristics

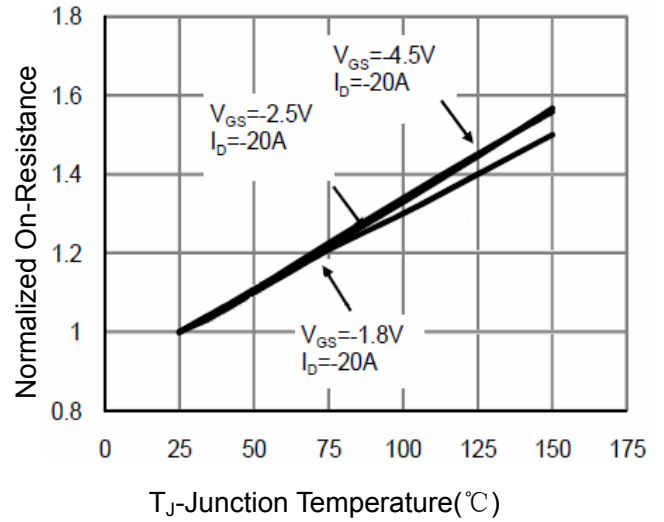


Figure 4 Rdson-Junction Temperature

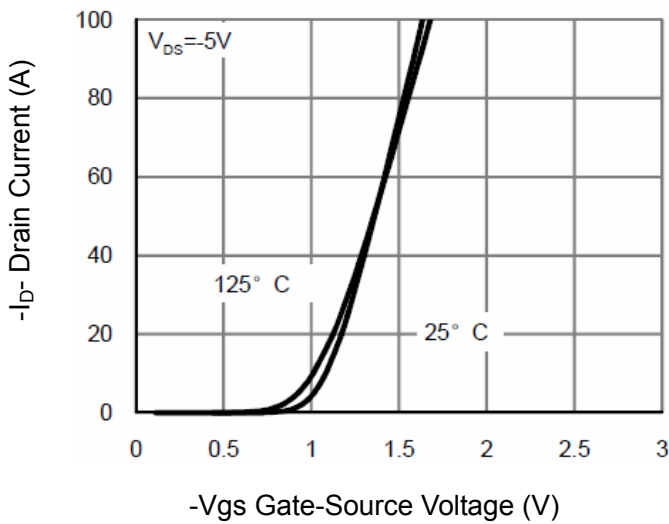


Figure 2 Transfer Characteristics

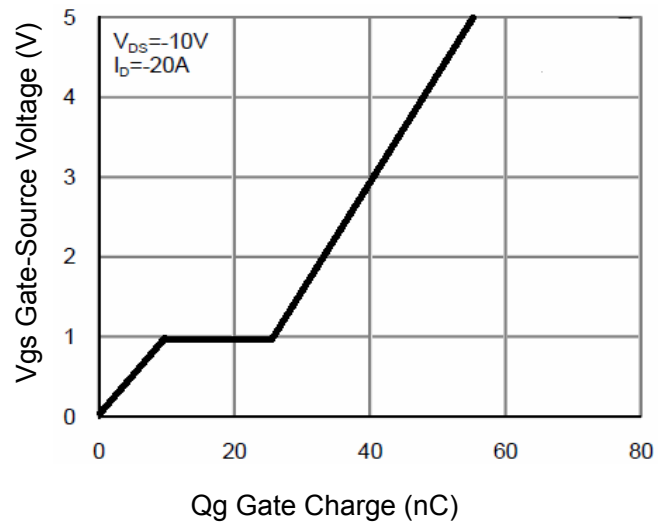


Figure 5 Gate Charge

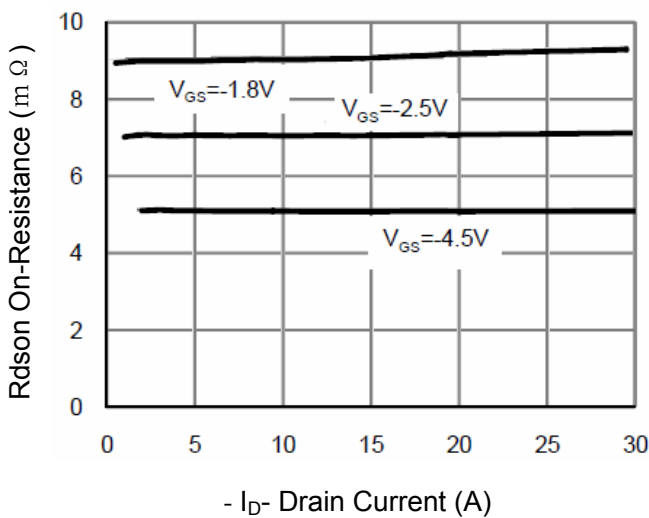


Figure 3 Rdson- Drain Current

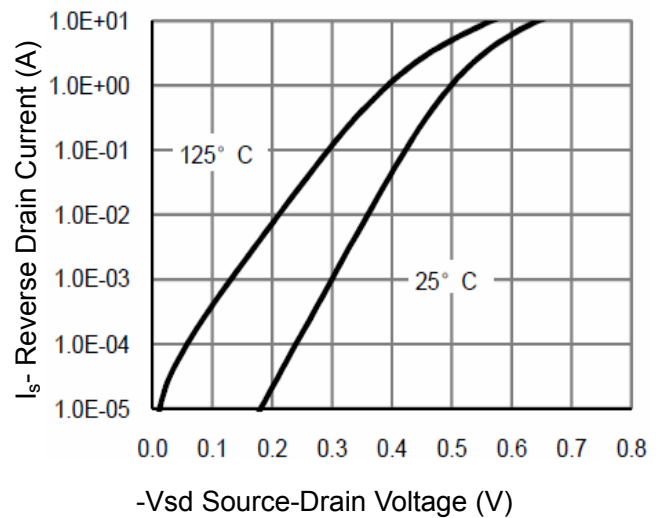
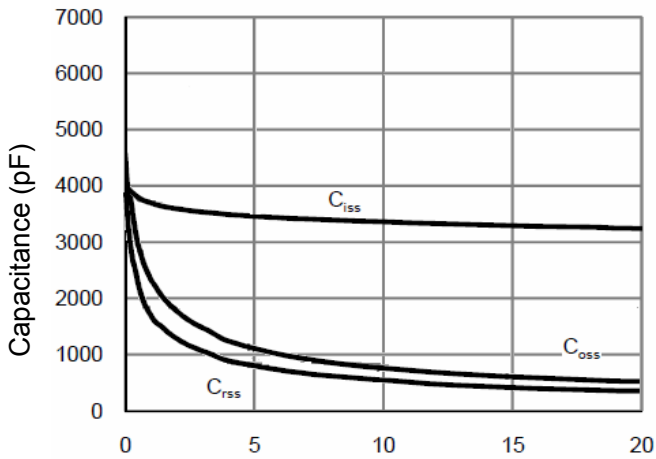
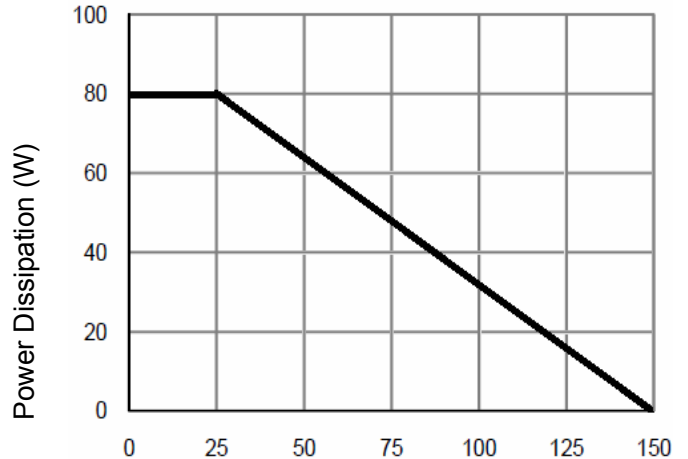


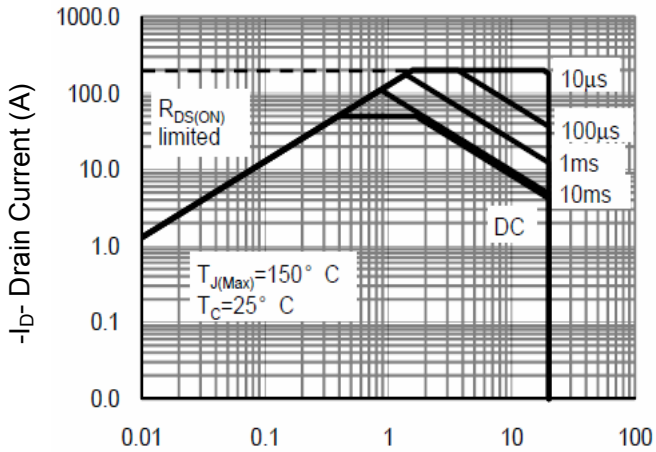
Figure 6 Source- Drain Diode Forward



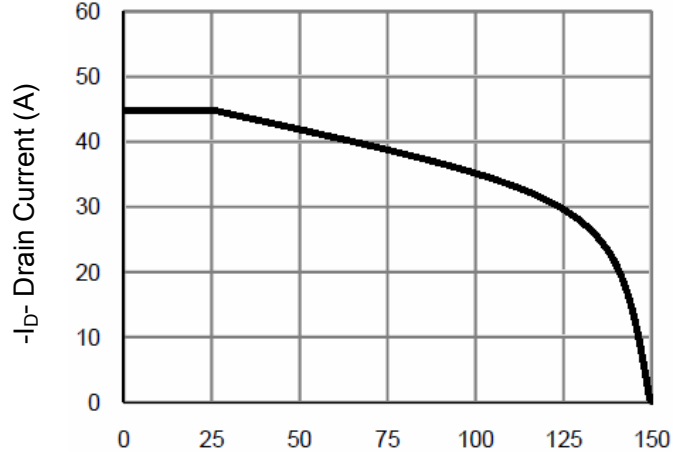
-Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



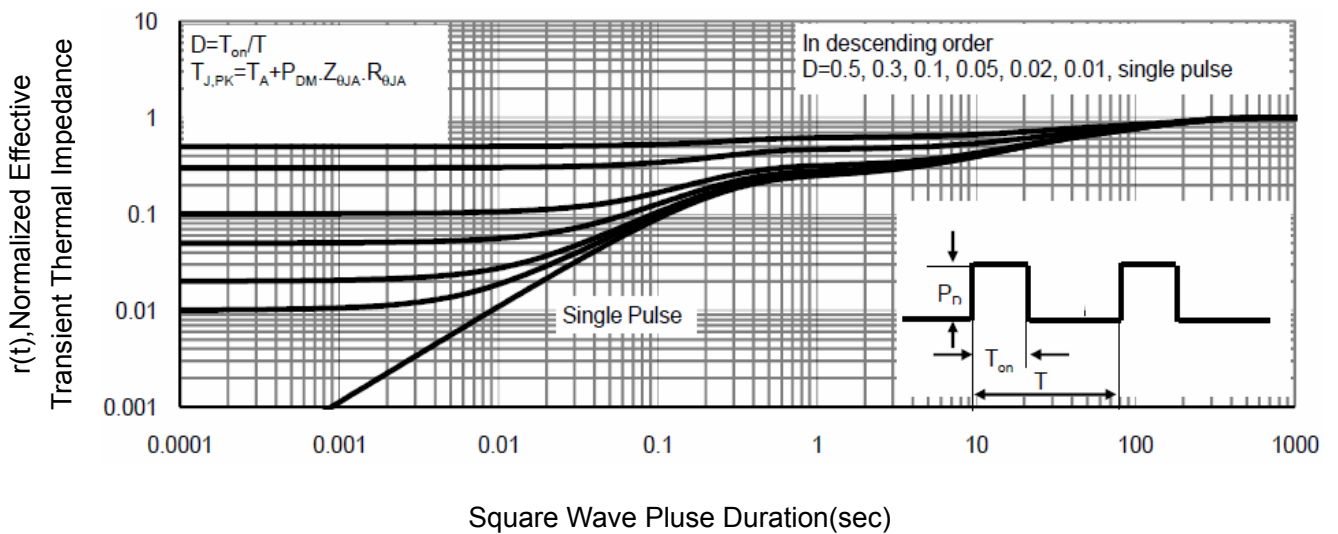
T_J -Junction Temperature(°C)
Figure 9 Power De-rating



-Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area

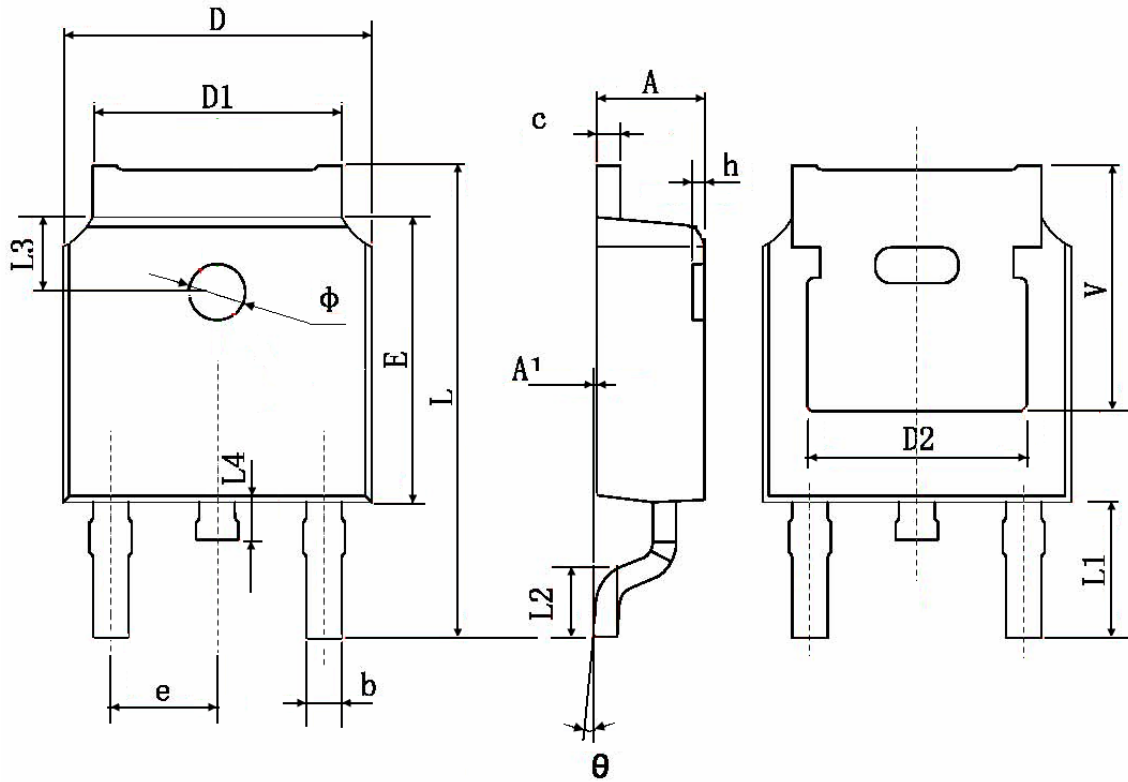


T_J -Junction Temperature(°C)
Figure 10 -Current De-rating



Square Wave Pulse Duration(sec)
Figure 11 Normalized Maximum Transient Thermal Impedance

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	0.483 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
phi	1.100	1.300	0.043	0.051
theta	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	