

# MT60P25S

## P-Channel Enhancement Mode Field Effect Transistor

### Product Summary

- $V_{DS} = -60V$
- $I_D = -40A (V_{GS} = -10V)$
- $R_{DS(ON)} 31 m\Omega @ V_{GS} = -4.5V$
- $R_{DS(ON)} 25 m\Omega @ V_{GS} = -10V$

### Features

- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.

### Applications

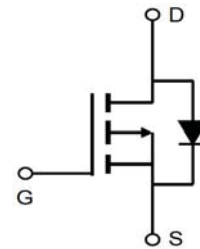
- High side switch for full bridge converter
- DC/DC converter for LCD display



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### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



TO-252-2L

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-40	A
Drain Current-Continuous( $T_C=100^\circ C$ )	$I_D(100^\circ C)$	-25	A
Pulsed Drain Current	$I_{DM}$	-150	A
Maximum Power Dissipation ( $T_C=25^\circ C$ )	$P_D$	83	W
Derating factor		0.72	W/°C
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	193	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	1.4	°C/W
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### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MT60P25S	MT60P25S	TO-252-2L	-	-	2500

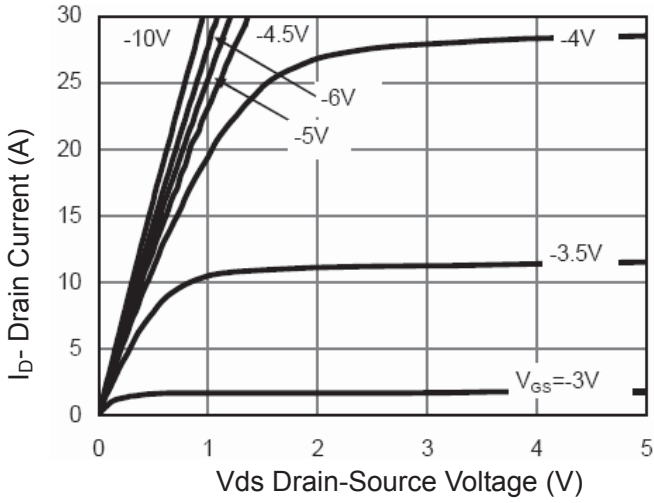
**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.0	-2.0	-2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-15A	-	25	30	mΩ
		V <sub>GS</sub> = - 4.5V, I <sub>D</sub> =-10A	-	31	39	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-10V, I <sub>D</sub> =-10A	-	25	-	S
<b>Dynamic Characteristics</b> (Note4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, F=1.0MHz	-	3430	-	PF
Output Capacitance	C <sub>oss</sub>		-	213	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	132	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-30V, R <sub>L</sub> =1.5Ω, V <sub>GS</sub> =-10V, R <sub>G</sub> =3Ω	-	12	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	15	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	38	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	15	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-30, I <sub>D</sub> =-20A, V <sub>GS</sub> =-10V	-	46	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	9.5	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	10.5	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-10A	-	-	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-40	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = - 10A di/dt = -100A/μs(Note3)	-	47	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	43	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

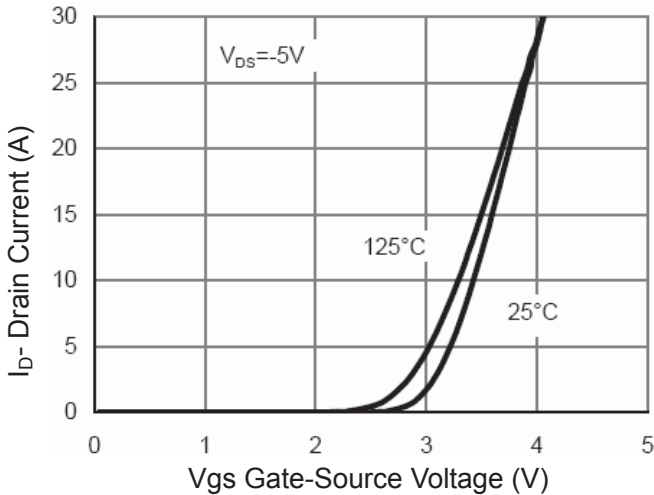
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E<sub>AS</sub> condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=-20V, V<sub>G</sub>=-10V, L=1mH, R<sub>g</sub>=25Ω, I<sub>AS</sub>=33A

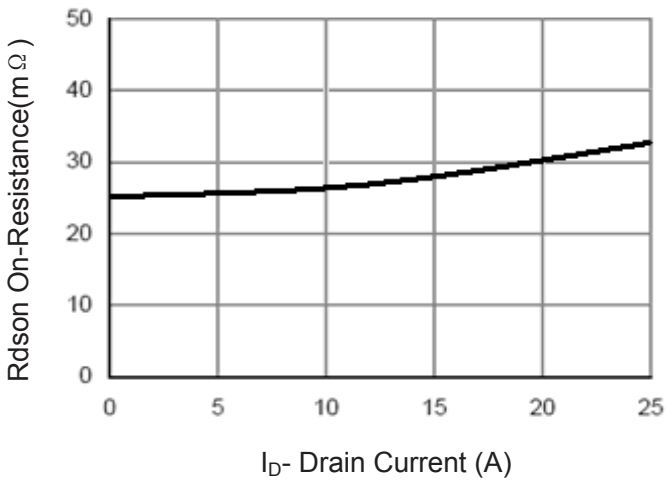
### Characteristics Curve



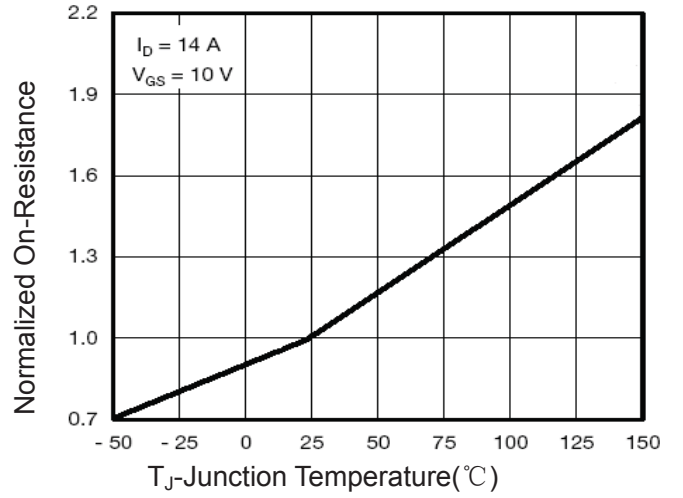
**Figure 1 Output Characteristics**



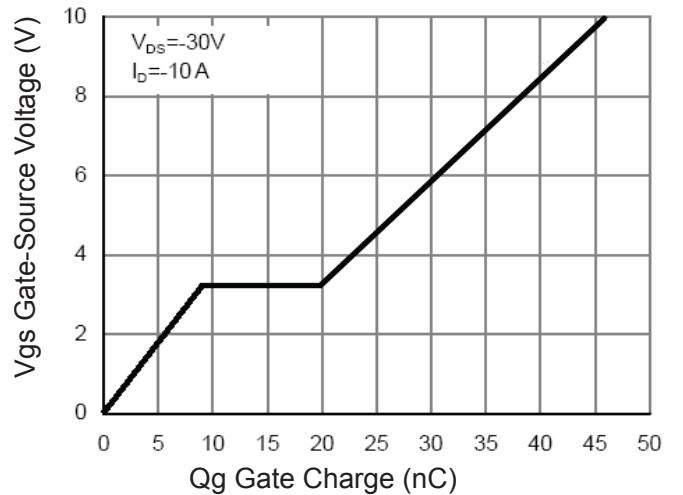
**Figure 2 Transfer Characteristics**



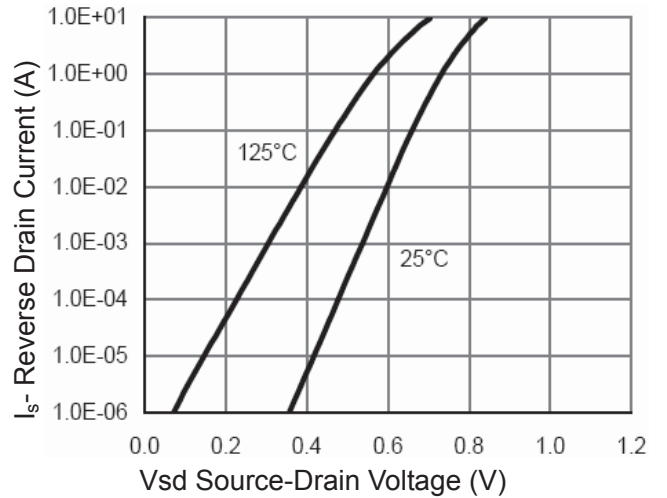
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**

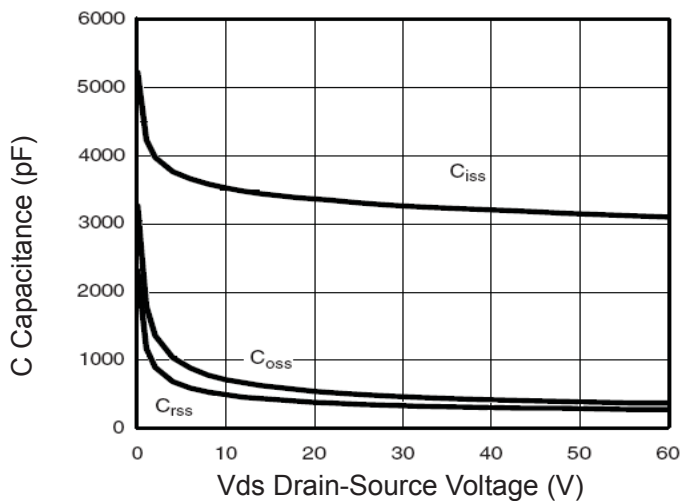


**Figure 5 Gate Charge**

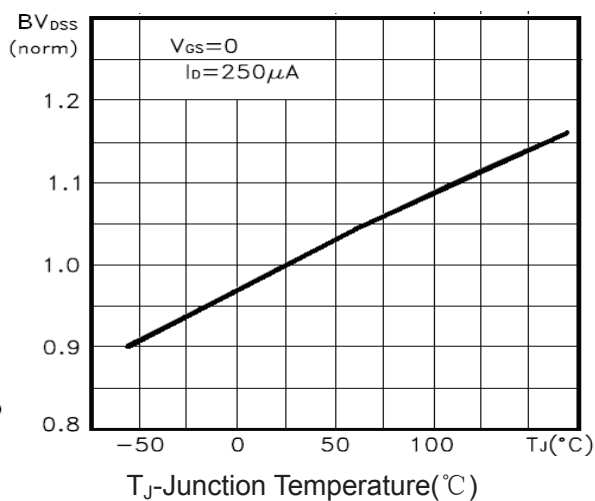


**Figure 6 Source- Drain Diode Forward**

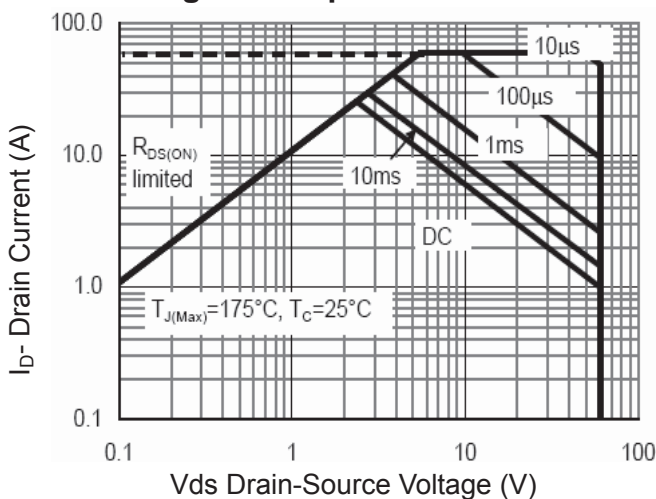
### Characteristics Curve



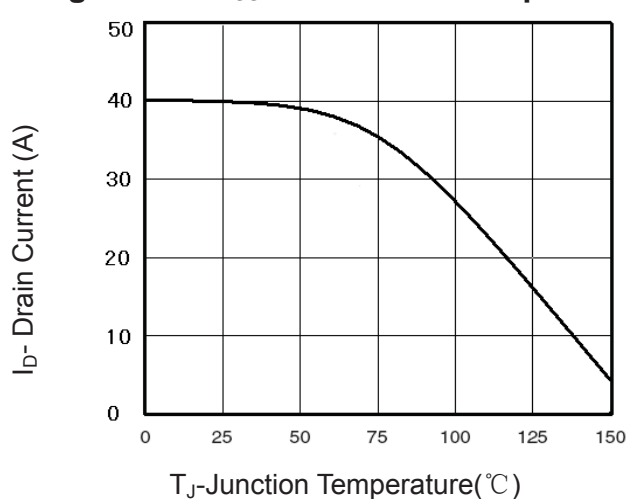
**Figure 7 Capacitance vs Vds**



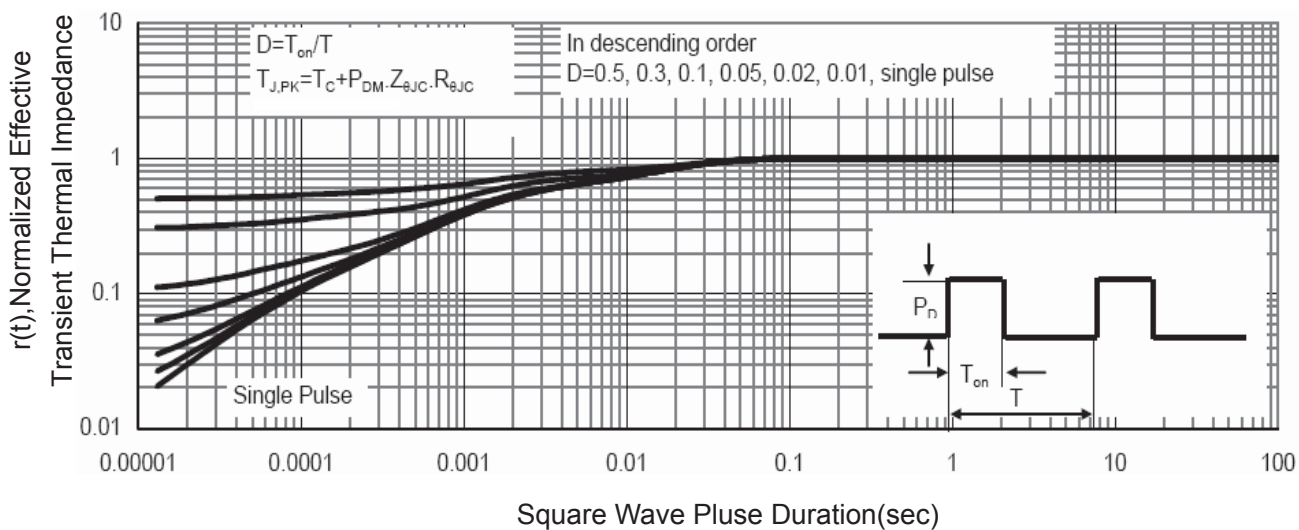
**Figure 9  $BV_{DSS}$  vs Junction Temperature**



**Figure 8 Safe Operation Area**



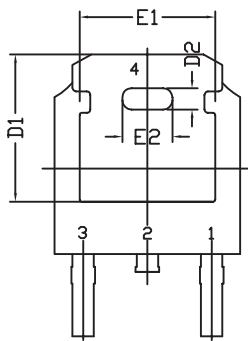
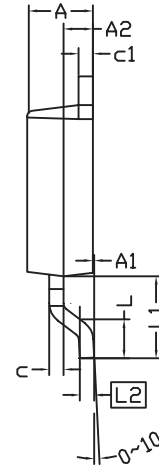
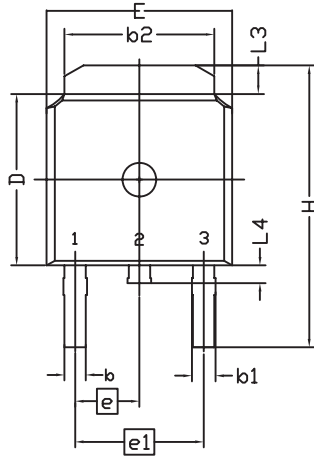
**Figure 10  $I_D$  Current De-rating**



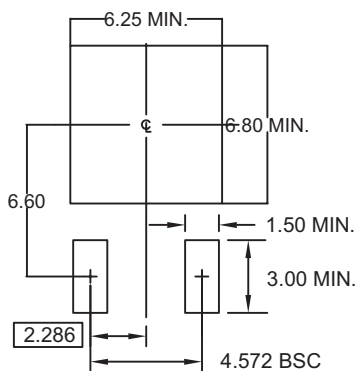
**Figure 11 Normalized Maximum Transient Thermal Impedance**

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Version	S

T0252(DPAK) PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MILS.
2. DIMENSION L IS MEASURED IN GAUGE PLANE
3. TOLERANCE 0.10 mm UNLESS OTHERWISE SPECIFIED
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. REFER TO JEDEC TO-252 (AA)

SYMBOL	DIMENSION IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.184	2.286	2.388	0.086	0.090	0.094
A1	0.000	-----	0.127	0.000	-----	0.005
A2	0.889	1.041	1.143	0.035	0.041	0.045
b	0.635	0.762	0.889	0.025	0.030	0.035
b1	0.762	0.840	1.143	0.030	0.033	0.045
b2	4.953	5.340	5.461	0.195	0.210	0.215
c	0.450	0.508	0.610	0.018	0.020	0.024
c1	0.450	0.508	0.610	0.018	0.020	0.024
D	5.969	6.096	6.223	0.235	0.240	0.245
D1	5.210	5.249	5.380	0.205	0.207	0.212
D2	0.662	0.762	0.862	0.026	0.030	0.034
E	6.350	6.604	6.731	0.250	0.260	0.265
E1	4.318	4.826	4.901	0.170	0.190	0.193
E2	1.678	1.778	1.878	0.066	0.070	0.074
e	2.286 BSC			0.090 BSC		
e1	4.572 BSC			0.180 BSC		
H	9.398	10.033	10.414	0.370	0.395	0.410
L	1.270	1.520	2.032	0.050	0.060	0.080
L1	2.921 REF.			0.115REF.		
L2	0.408	0.508	0.608	0.016	0.020	0.024
L3	0.889	1.016	1.270	0.035	0.040	0.050
L4	0.635	-----	1.016	0.025	-----	0.040

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