MT5060A

N-Channel Power®MOSFET

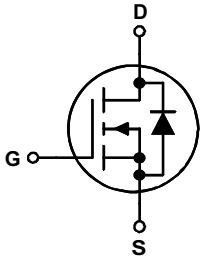
MT Semiconductor®

http://www.mtsemi.com

General Description

This N-Channel MOSFET is produced using MOS-TECH Semiconductor's advanced Power®process that has been especially tailored to minimize the on-state resistance. this device is well suited for Power Management and load switching applications common in Notebook Computers and Protable Battery Packs.

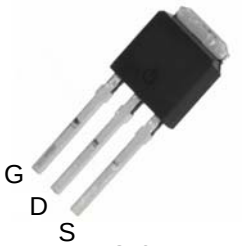
Simplified Schematic



Features

- $R_{DS(on)}$ = 11.2mΩ @ V_{GS} = 10V, I_D = 12A
- $R_{DS(on)}$ = 12.4mΩ @ V_{GS} = 4.5V, I_D = 10A
- High performance technology for extremely low $R_{DS(on)}$
- Termination is Lead-free and RoHS Compliant

MARKING DIAGRAM & PIN ASSIGNMENT



TO-251

Applications

- DC/DC buck converters
- Notebook battery management
- Load switching in notebook

Absolute Maximum Ratings (T_A = 25℃ unless otherwise noted)

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			60	V
V_{GS}	Gate to Source Voltage		(Note 4)	±25	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25°C		20	A
	-Continuous (Silicon limited)	T_C = 25°C		50	
	-Continuous	T_A = 25°C	(Note 1a)	22	
	-Pulsed			90	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	28	mJ
P_D	Power Dissipation	T_C = 25°C		26	W
	Power Dissipation	T_A = 25°C	(Note 1a)	2.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Package Marking and Ordering Information

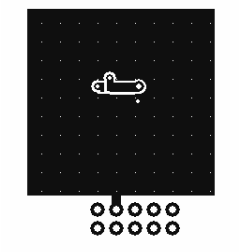
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT5060A	MT5060A	TO-251	-	-	50 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} =	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		14		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.0		2.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 12 A		11.2	12.5	mΩ
		V_{GS} = 4.5 V, I_D = 10 A		12.4	13.5	
		V_{GS} = 10 V, I_D = 12 A, T_J = 125 °C		14.5	15.7	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 12 A		45		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 45 V, V_{GS} = 0 V, f = 1 MHz		1011	1220	pF
C_{oss}	Output Capacitance			330	401	pF
C_{rss}	Reverse Transfer Capacitance			40	48	pF
R_g	Gate Resistance		0.2	1.0	2.0	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 45 V, I_D = 12 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		9	18	ns
t_r	Rise Time			2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			15	31	ns
t_f	Fall Time			2	10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 15 V, I_D = 12 A		16	26	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 5 V, V_{DD} = 15 V, I_D = 12 A		8	11	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15 V, I_D = 12 A		3.5		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 15 V, I_D = 12 A		1.9		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.9 A (Note 2)		0.75	1.2	V
		V_{GS} = 0 V, I_S = 12 A (Note 2)		0.80	1.2	
t_{rr}	Reverse Recovery Time	I_F = 12 A, di/dt = 100 A/μs		26	41	ns
Q_{rr}	Reverse Recovery Charge			9	18	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 53 °C/W when mounted on a 1 in^2 pad of 2 oz copper.

b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. E_{AS} of 21 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = 12 A, V_{DD} = 27 V, V_{GS} = 10 V.

4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse ocurrence only. No continuous rating is implied.

Typical Characteristics T_J = 25 °C unless otherwise noted

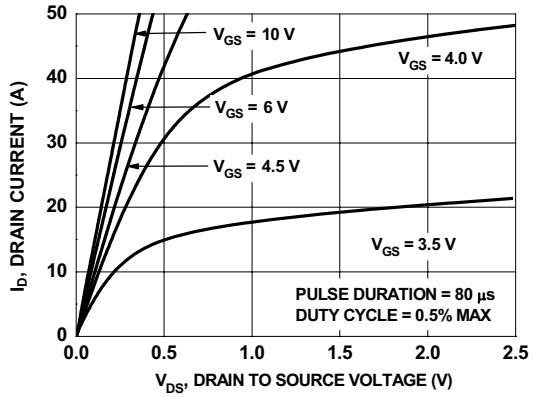


Figure 1. On Region Characteristics

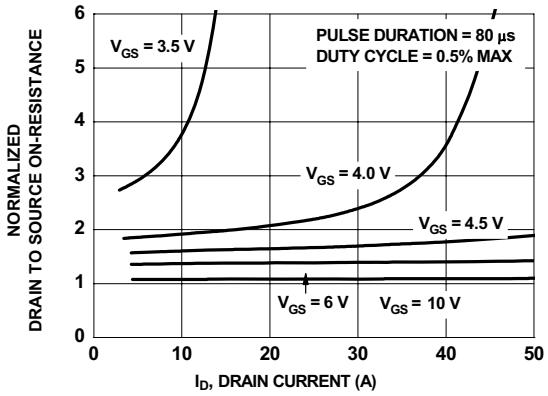


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

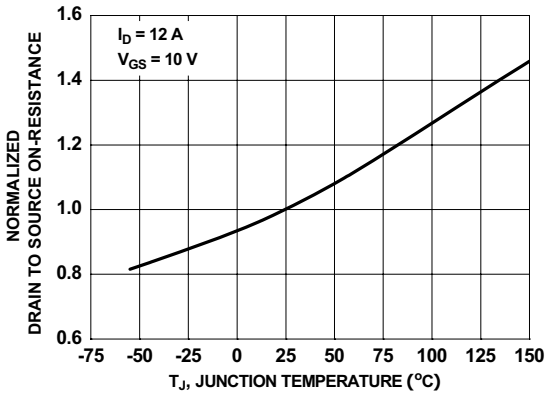


Figure 3. Normalized On Resistance vs Junction Temperature

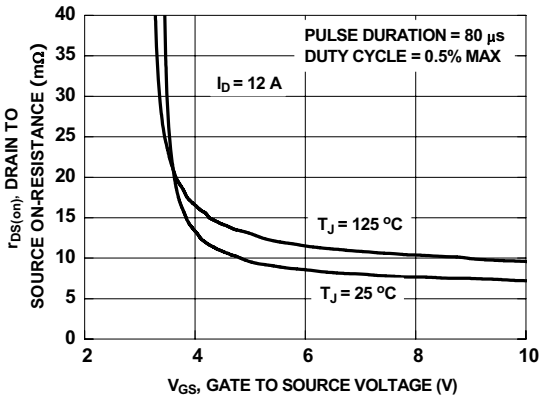


Figure 4. On-Resistance vs Gate to Source Voltage

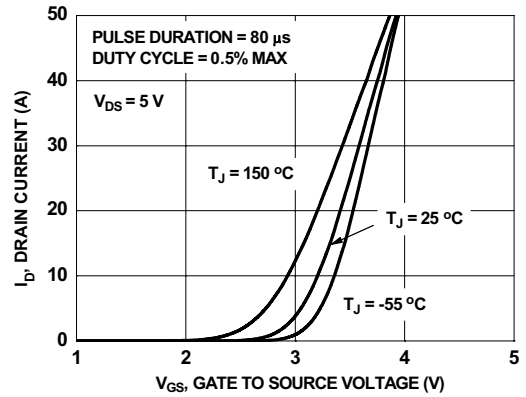


Figure 5. Transfer Characteristics

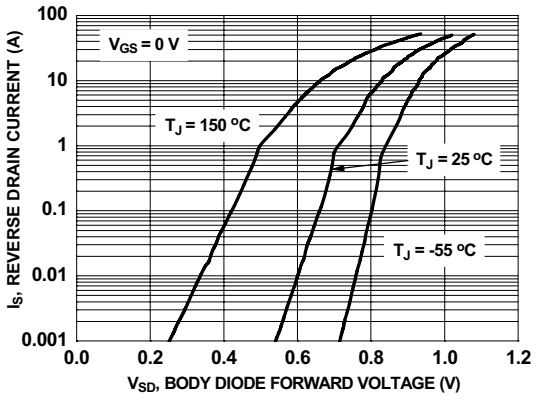


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

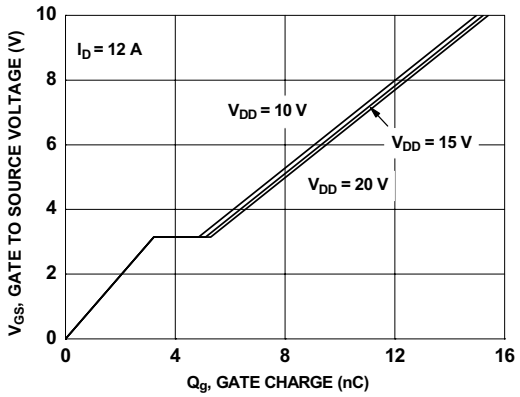


Figure 7. Gate Charge Characteristics

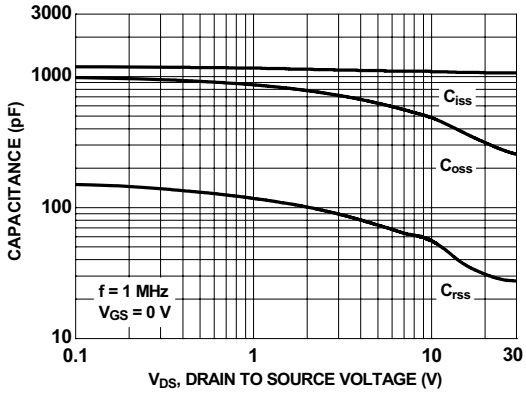


Figure 8. Capacitance vs Drain to Source Voltage

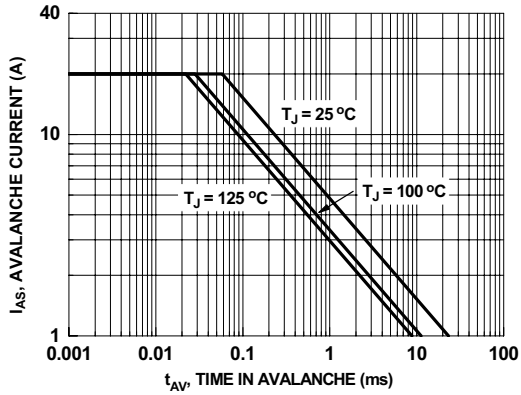


Figure 9. Unclamped Inductive Switching Capability

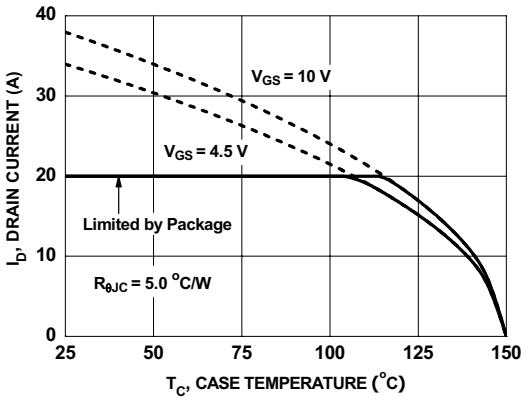


Figure 10. Maximum Continuous Drain Current vs Case Temperature

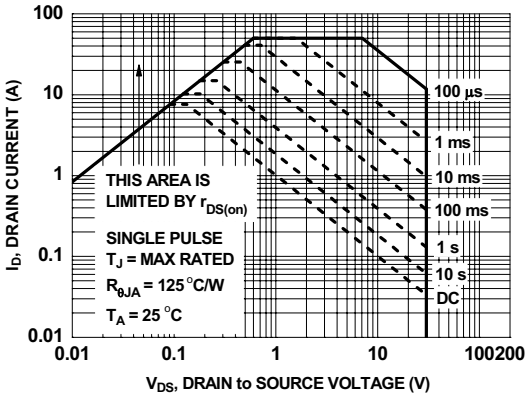


Figure 11. Forward Bias Safe Operating Area

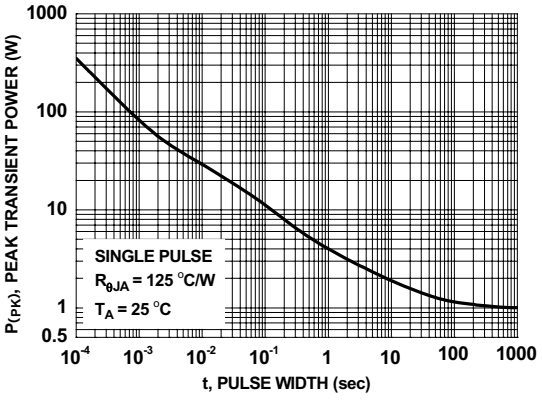


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

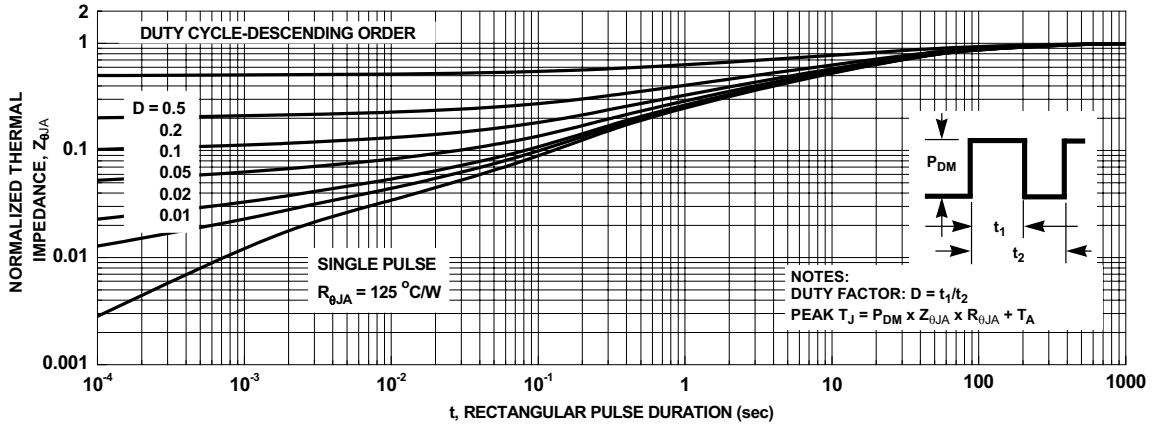


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

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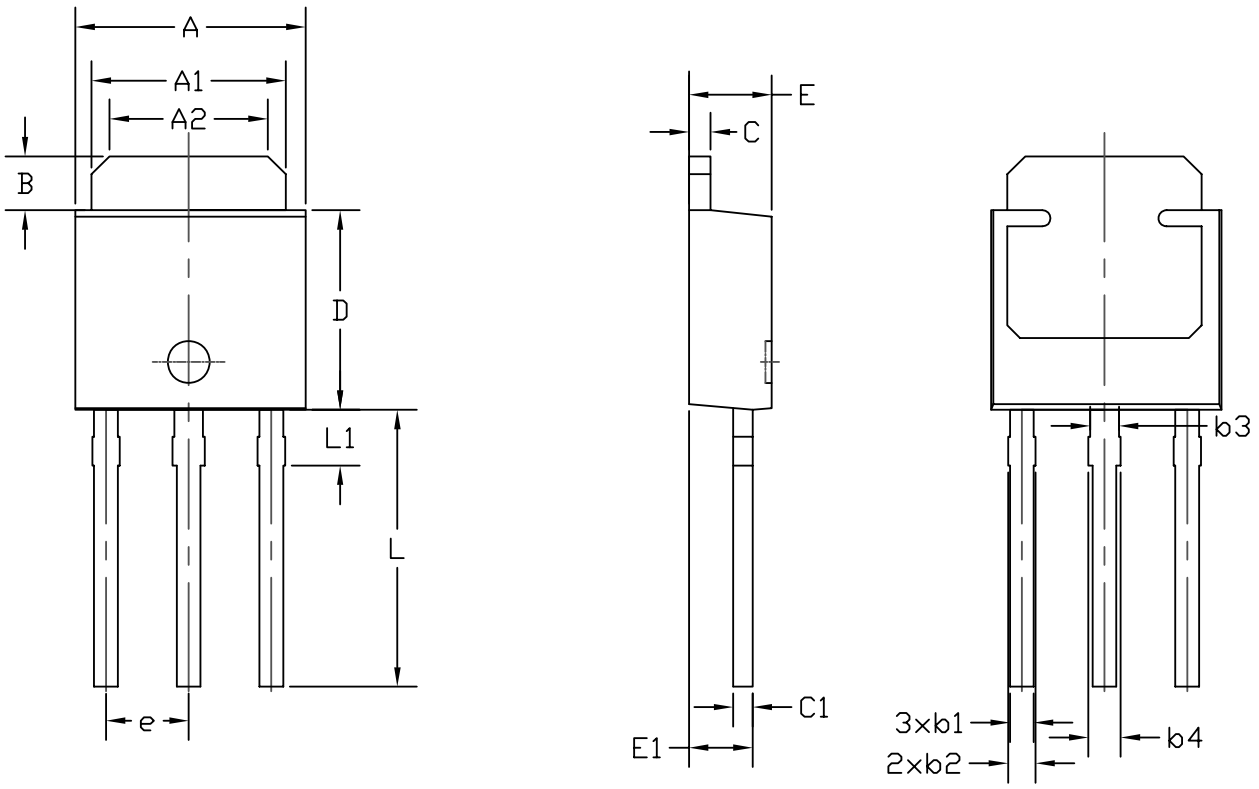
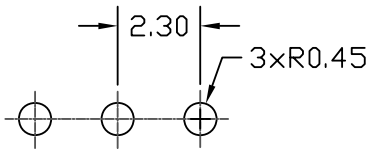
TO251 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT:mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	6.4	6.5	6.6	0.252	0.256	0.260
A1	5.3	5.4	5.5	0.209	0.213	0.217
A2	4.3	4.4	4.5	0.169	0.173	0.177
B	1.35	1.5	1.65	0.053	0.059	0.065
L1		1.55 REF			0.061REF	
L	7.4	7.7	8	0.291	0.303	0.315
D	5.4	5.55	5.7	0.213	0.219	0.224
C	0.55	0.6	0.65	0.022	0.024	0.026
C1	0.49	0.54	0.59	0.019	0.021	0.023
E1	1.72	1.77	1.82	0.068	0.070	0.072
E	2.2	2.3	2.4	0.087	0.091	0.094
b1	0.6	---	0.75	0.024	---	0.030
b2	0.7	---	0.85	0.028	---	0.033
b3		0.8			0.031	
b4		0.9			0.035	
e		2.3			0.091	

NOTE
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   MOLD FLASH SHOULD BE LESS THAN 6 MIL.
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   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
4. REFER TO JEDEC TO-251D AA.

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Keep safety first in your circuit designs!

1. MOS-TECH Semiconductor Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
   Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.