MT3906S5

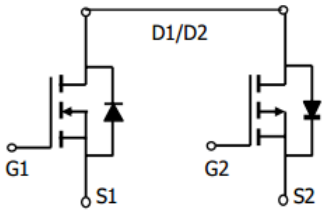
60V Complementary Power MOSFET

MT Semiconductor®

http://www.mtsemi.com

Features

- N-Channel
  60V/8.0A,
  $R_{DS(ON)}$ = 36mΩ @ VGS = 10V
  $R_{DS(ON)}$ = 42mΩ @ VGS = 4.5V
- P-Channel
  -60V/-6.0A,
  $R_{DS(ON)}$ = 80 mΩ @ VGS = -10V
  $R_{DS(ON)}$ = 99 mΩ @ VGS = -4.5V
- RoHS Compliant



N-channel P-channel

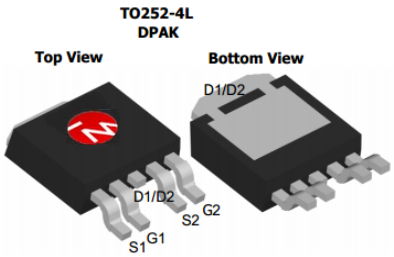
General Description

This complementary MOSFET device is produced using Mos-tech's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

Applications

- DC-DC converter
- Power management
- LCD backlight inverter
- DC-FAN

MARKING DIAGRAM & PIN ASSIGNMENT



Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	N-CH	P-CH	Units
V_{DSS}	Drain-Source Voltage	60	–60	V
V_{GSS}	Gate-Source Voltage	±20	±20	V
I_D	Drain Current - Continuous (Note 1a)	8.0	-6.0	A
	- Pulsed	25	-25	
P_D	Power Dissipation for Dual Operation	15	10	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	62.5	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	41	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
MT3906S5	MT3906S5	-	-	2500 units

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 1)							
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	V_{DD} = 30 V, I_D = 4.5 A	N-CH	-	-	93	mJ
I_{AR}	Maximum Drain-Source Avalanche Current		N-CH	-	-	7.0	A
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA V_{GS} = 0 V, I_D = –250 µA	N-CH P-CH	60 –60	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C I_D = –250 µA, Referenced to 25°C	N-CH P-CH	-	59 –47	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V V_{DS} = –48 V, V_{GS} = 0 V	N-CH P-CH	-	-	1 –1	µA
I_{GSS}	Gate-Body Leakage	V_{GS} = ±20 V, V_{DS} = 0 V V_{GS} = ±20 V, V_{DS} = 0 V	N-CH P-CH	-	-	±100 ±100	nA
On Characteristics (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA V_{DS} = V_{GS}, I_D = –250 µA	N-CH P-CH	1 –1	2.0 –2.0	3 –3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C I_D = –250 µA, Referenced to 25°C	N-CH P-CH	-	–5.6 4	-	mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 7.0A V_{GS} = 10 V, I_D = 6.0A , T_J = 125°C V_{GS} = 4.5 V, I_D = 5.2A	N-CH	-	36 52 42	40 64 45	mΩ
		V_{GS} = –10 V, I_D = -7.0A V_{GS} = –10 V, I_D = -6.0A , T_J = 125°C V_{GS} = –4.5 V, I_D = -5.2A	P-CH	-	80 108 99	108 129 126	
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V V_{GS} = –10 V, V_{DS} = –5 V	N-CH P-CH	20 –20	-	-	A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 5.3A V_{DS} = –5 V, I_D = 5.3A	N-CH P-CH	-	4 6	-	S
Dynamic Characteristics							
C_{iss}	Input Capacitance	N-CH V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz P-CH V_{DS} = –30 V, V_{GS} = 0 V, f = 1.0 MHz	N-CH P-CH	-	680 770	-	pF
C_{oss}	Output Capacitance		N-CH P-CH	-	86 94	-	pF
C_{rss}	Reverse Transfer Capacitance		N-CH P-CH	-	37 39	-	pF
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	N-CH V_{DD} = 30 V, I_D = 1 A, V_{GS} = 10V, R_{GEN} = 6 Ω P-CH V_{DD} = –30 V, I_D = –1 A, V_{GS} = –10 V, R_{GEN} = 6 Ω	N-CH P-CH	-	13 7	23 17	ns
t_r	Turn-On Rise Time		N-CH P-CH	-	8 12	19 23	ns
$t_{d(off)}$	Turn-Off Delay Time		N-CH P-CH	-	19 19	39 37	ns
t_f	Turn-Off Fall Time		N-CH P-CH	-	6 12	17 25	ns
Q_g	Total Gate Charge	N-CH V_{DS} = 30 V, I_D = 5.3A , V_{GS} = 10 V P-CH V_{DS} = –30 V, I_D = -5.3A , V_{GS} = –10V	N-CH P-CH	-	15.5 18	19 24	nC
Q_{gs}	Gate-Source Charge		N-CH P-CH	-	2.6 2.7	-	nC
Q_{gd}	Gate-Drain Charge		N-CH P-CH	-	2.7 3.3	-	nC

Electrical Characteristics (continued) T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-CH P-CH			1.4 –1.4	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.0A (Note 2) V_{GS} = 0 V, I_S = 2.0A (Note 2)	N-CH P-CH		0.8 –0.8	1.2 -1.2	V

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

Scale 1 : 1 on letter size paper

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

Typical Characteristics: P-CH

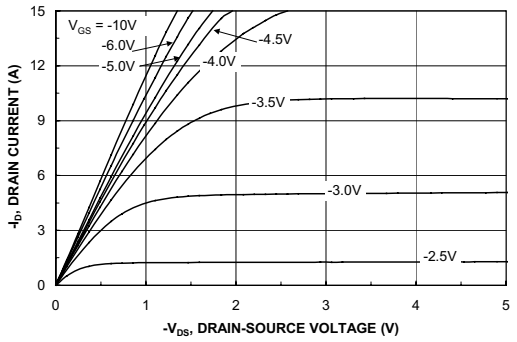


Figure 1. On-Region Characteristics.

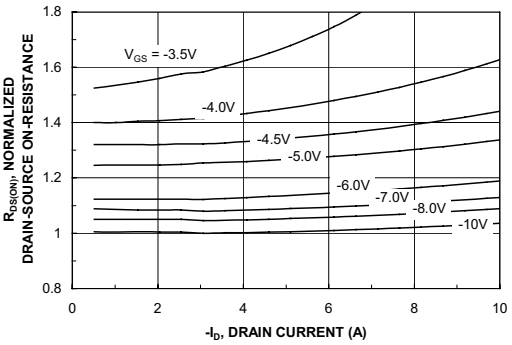


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

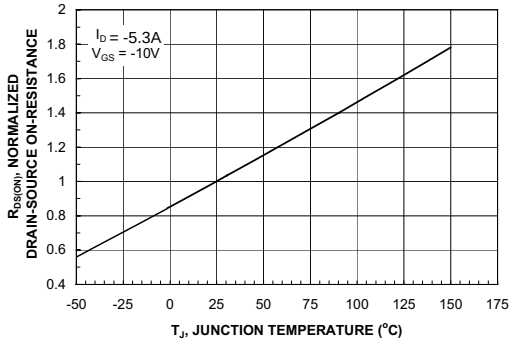


Figure 3. On-Resistance Variation with Temperature.

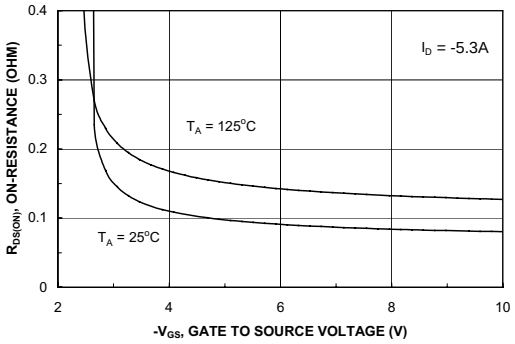


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

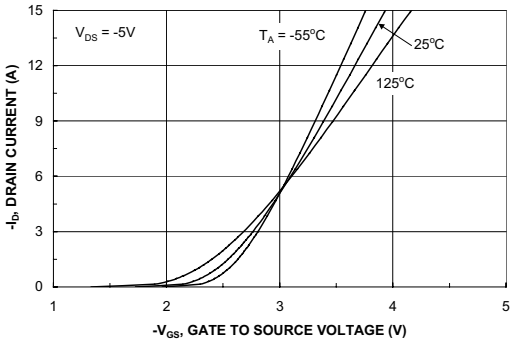


Figure 5. Transfer Characteristics.

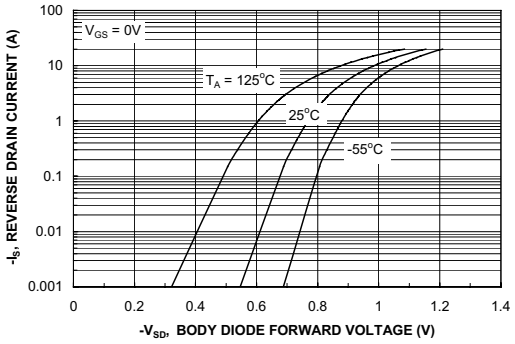


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: P-CH

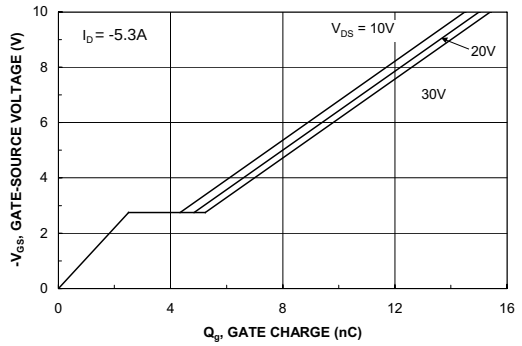


Figure 7. Gate Charge Characteristics.

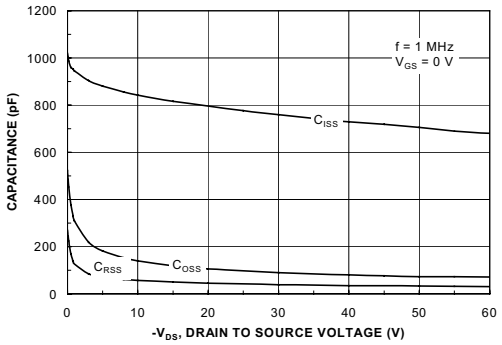


Figure 8. Capacitance Characteristics.

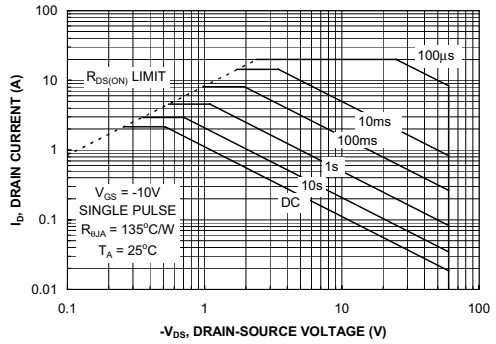


Figure 9. Maximum Safe Operating Area.

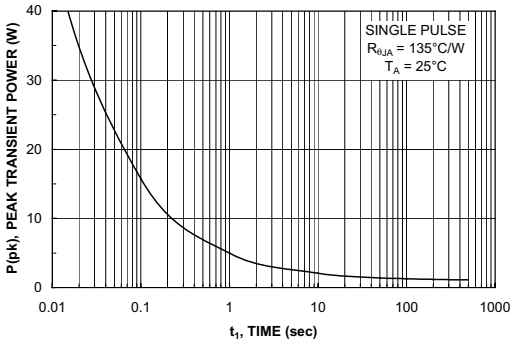


Figure 10. Single Pulse Maximum Power Dissipation.

Typical Characteristics: N-CH

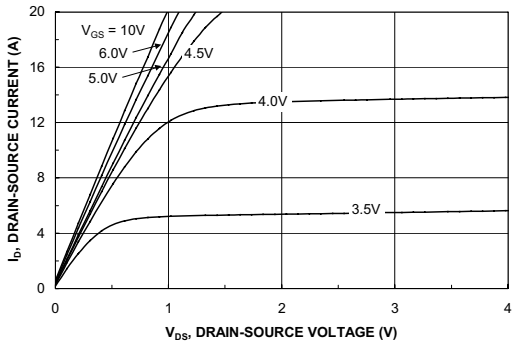


Figure 11. On-Region Characteristics.

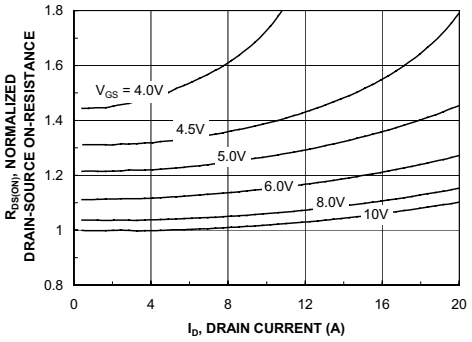


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

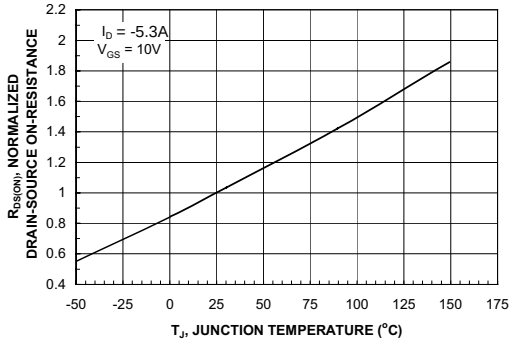


Figure 13. On-Resistance Variation with Temperature.

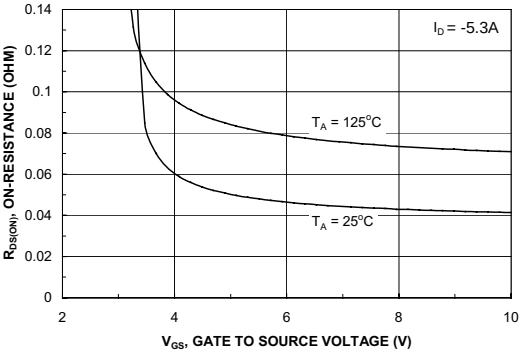


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

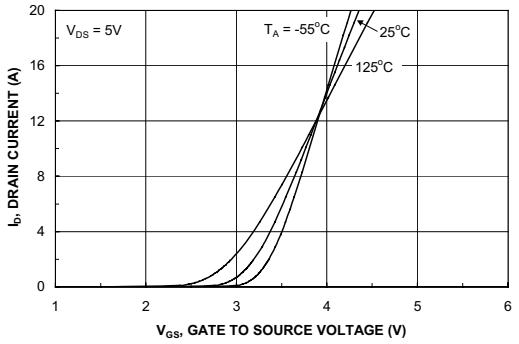


Figure 15. Transfer Characteristics.

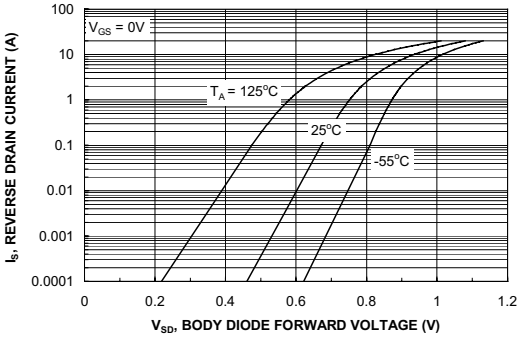


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: N-CH

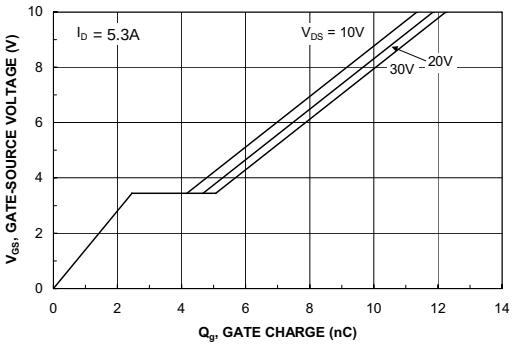


Figure 17. Gate Charge Characteristics.

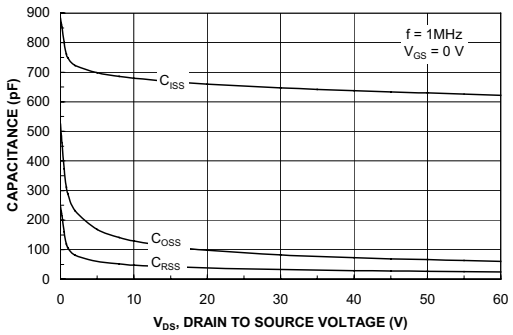


Figure 18. Capacitance Characteristics.

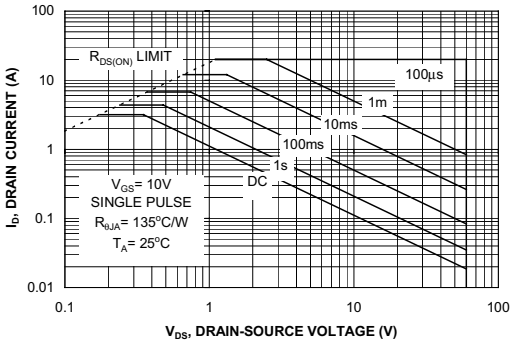


Figure 19. Maximum Safe Operating Area.

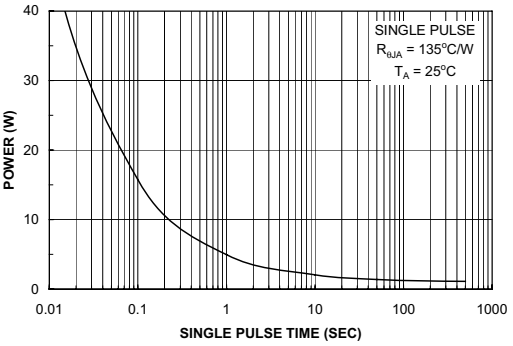


Figure 20. Single Pulse Maximum Power Dissipation.

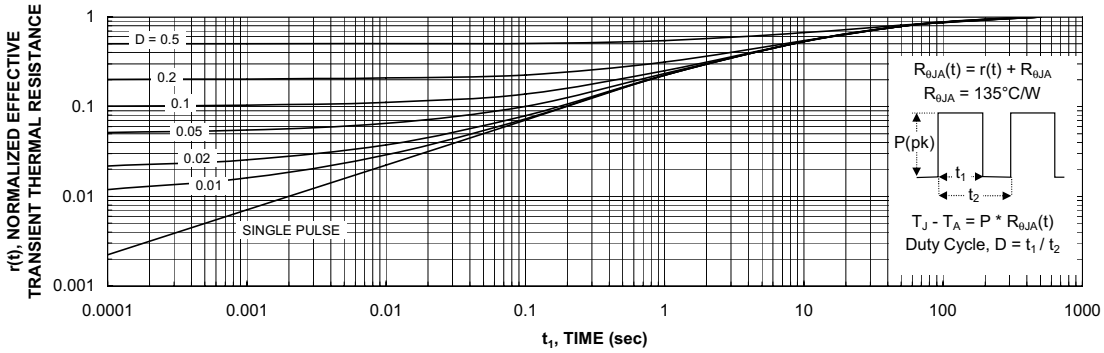
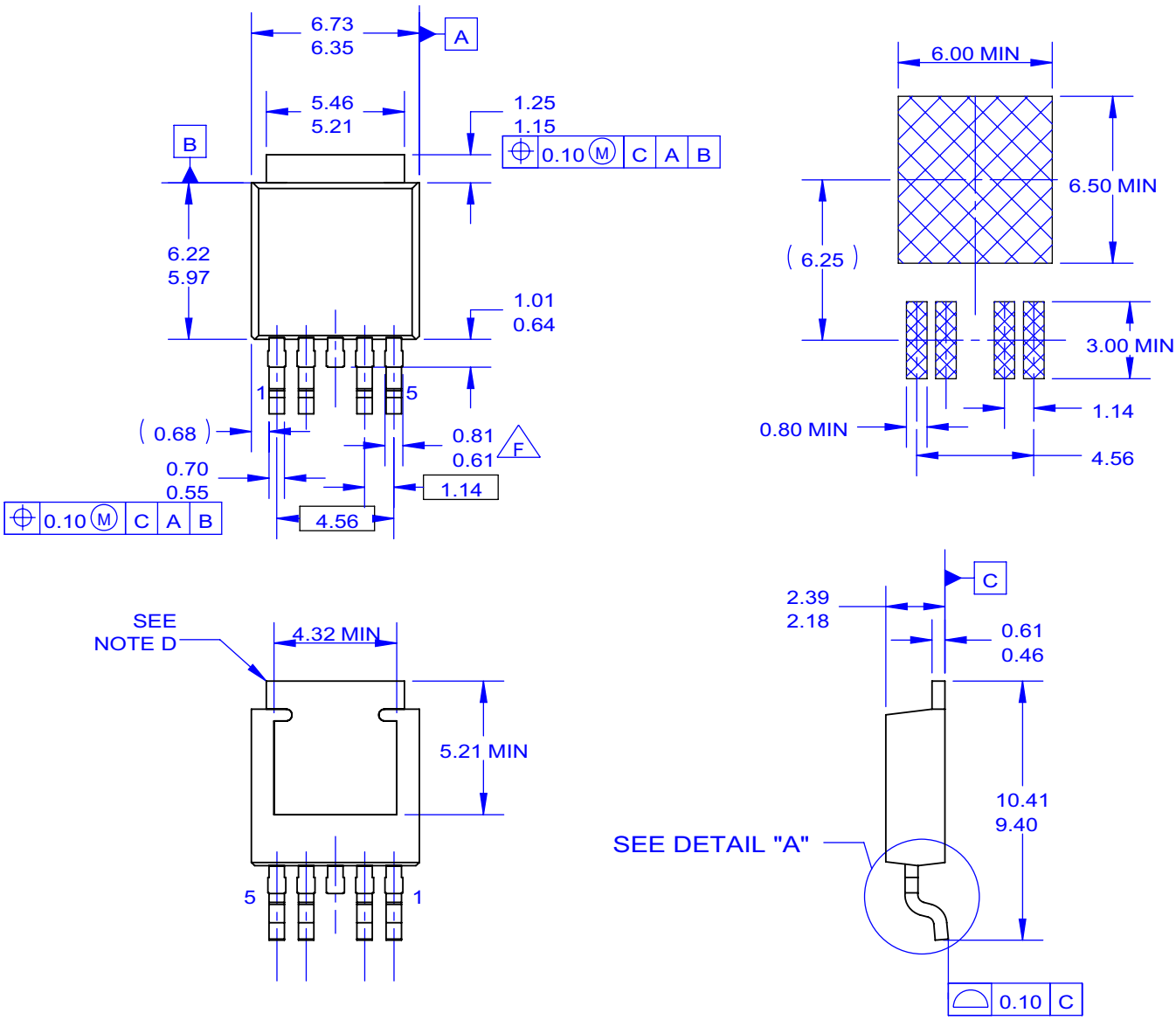


Figure 21. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1c.
Transient thermal response will change depending on the circuit board design.



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   3）用于治疗（切除患部、给药等）的装置。
   4）其他直接影响到人的生命的装置。
9. 在使用本资料所记载的产品时，对于最大额定值、工作电源电压的范围、放热特性、安装条件及其他条件请在本公司规定的保证范围内使用。如果超出了本公司规定的保证范围使用时，对于由此而造成的故障和出现的事故，本公司将不承担任何责任。
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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.