MT4237

40V Complementary Power MOSFET

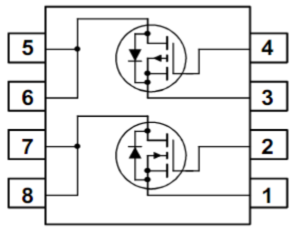
MT Semiconductor®

http://www.mtsemi.com

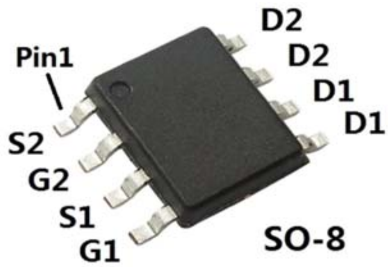
Features

- N-Channel
  40V/5.0A
  R_{DS}(ON) = 25mΩ (typ) @ VGS = 10V
  R_{DS}(ON) = 33mΩ (typ) @ VGS = 4.5V
- P-Channel
  -40V/-4.0A
  R_{DS} (ON) = 44mΩ (typ) @ VGS = -10V
  R_{DS} (ON) = 57mΩ (typ) @ VGS = -4.5V
- RoHS Compliant

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



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

Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	N-CH	P-CH	Units
V_{DSS}	Drain-Source Voltage	40	-40	V
V_{GSS}	Gate-Source Voltage	± 20	± 20	V
I_D	Drain Current - Continuous (Note 1a)	5.0	-4.0	A
	- Pulsed	25	-18	
P_D	Power Dissipation for Dual Operation	2.1		W
	Power Dissipation for Single Operation (Note 1a)	1.6		
	(Note 1b)	1.2		
	(Note 1c)	2.0		
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		°C

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	80	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	55	°C/W

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
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	40 -40	-	-	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	-	21 -13	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 40V, V_{GS} = 0 V V_{DS} = -40V, V_{GS} = 0 V	N-CH P-CH	-	-	1 –1	µA
I_{GSS}	Gate-Body Leakage	$_{GS}$ = ±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	1.7 -1.5	2.5 -2.5	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	-	-3.6 -3.6	-	mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS}= 10V,I_D=2.5A V_{GS}=4.5V,I_D=2.0A	N-CH	- -	25 33	35 45	mΩ
		V_{GS}= -10V,I_D=-2.5A V_{GS}=-4.5V,I_D=-2.0A	P-CH	- -	44 57	60 78	
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V V_{GS} = –10 V, V_{DS} = –5 V	N-CH P-CH	2.5 -2	-	-	A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 4.5 A V_{DS} = –5 V, I_D = -3.5 A	N-CH P-CH	-	15 12	-	S
Dynamic Characteristics							
C_{iss}	Input Capacitance	N-CH V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz P-CH V_{DS} = -10 V, V_{GS} = 0 V, f = 1.0 MHz	N-CH P-CH	-	315 55	-	pF
C_{oss}	Output Capacitance		N-CH P-CH	-	40 19	-	pF
C_{rss}	Reverse Transfer Capacitance		N-CH P-CH	-	68 32	-	pF
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	N-CH V_{DD} = 10 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 1 Ω P-CH V_{DD} = -10 V, I_D = –1 A, V_{GS} = -10 V, R_{GEN} = 1 Ω	N-CH P-CH	-	3 5	-	ns
t_r	Turn-On Rise Time		N-CH P-CH	-	7.5 12	-	ns
$t_{d(off)}$	Turn-Off Delay Time		N-CH P-CH	-	20 25	-	ns
t_f	Turn-Off Fall Time		N-CH P-CH	-	6 10	-	ns
Q_g	Total Gate Charge	N-CH V_{DS} = 10 V, I_D = 4.5 A, V_{GS} = 10 V P-CH V_{DS} = -10 V, I_D = –3.5 A, V_{GS} = –10V	N-CH P-CH	-	10 30	-	nC
Q_{gs}	Gate-Source Charge		N-CH P-CH	-	1 0.8	-	nC
Q_{gd}	Gate-Drain Charge		N-CH P-CH	-	2 1.8	-	nC

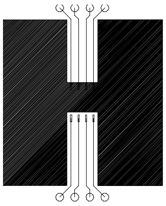
Electrical Characteristics (continued)

T_A = 25°C unless otherwise noted

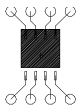
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-CH P-CH	-	-	1.4 –1.4	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 1 A (Note 2) V_{GS} = 0 V, I_S = -3.5 A (Note 2)	N-CH P-CH	-	0.8 -0.9	-	V

Notes:

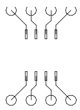
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper



b) 125°C/W when mounted on a .02 in^2 pad of 2 oz copper



c) 135°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

TYPICAL CHARACTERISTICS P-CH

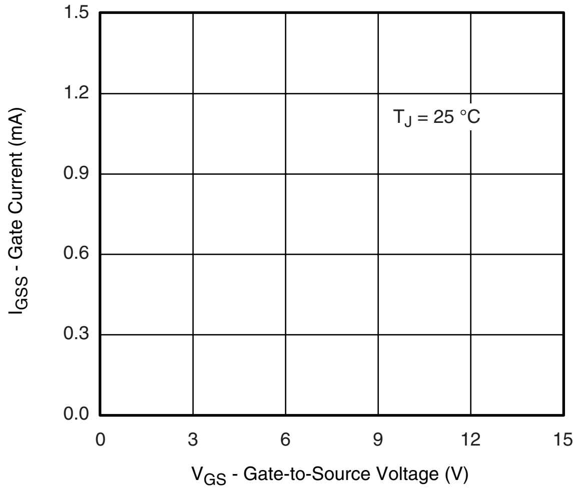


Figure 1 Gate Current vs. Gate-Source Voltage

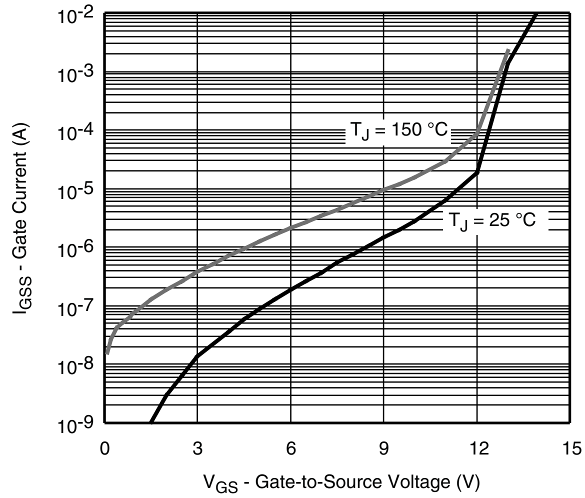


Figure 2 Gate Current vs. Gate-Source Voltage

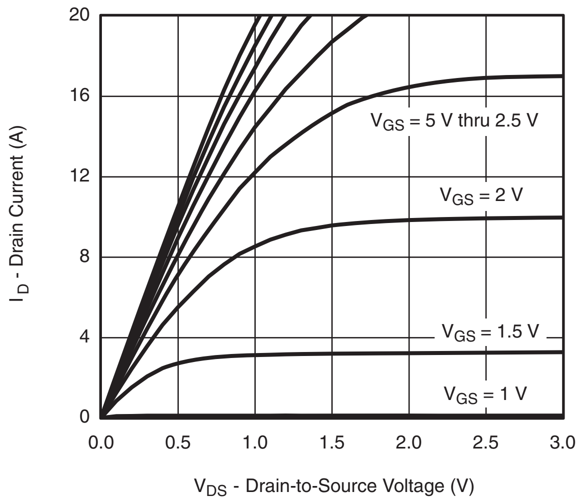


Figure 3 Output Characteristics

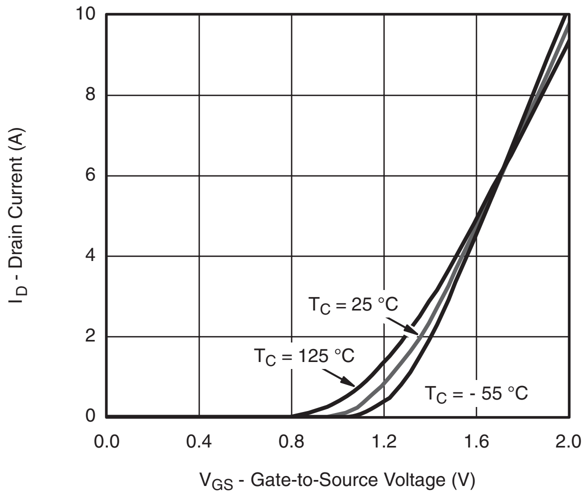


Figure 4 Transfer Characteristics

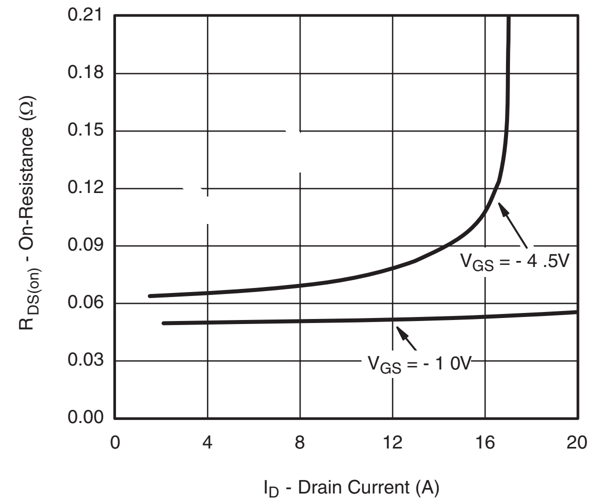


Figure 5 On-Resistance vs. Drain Current

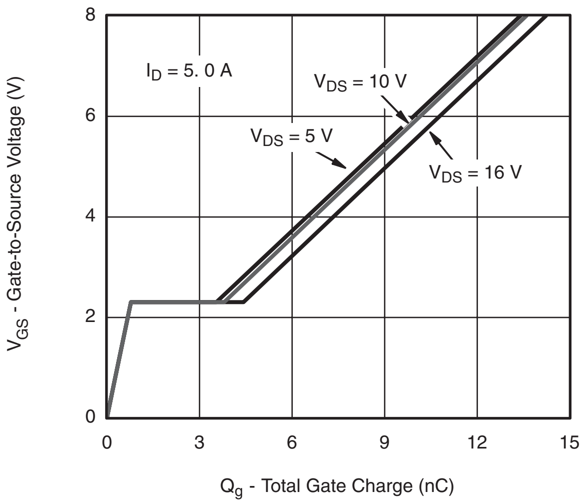


Figure 6 Gate Charge

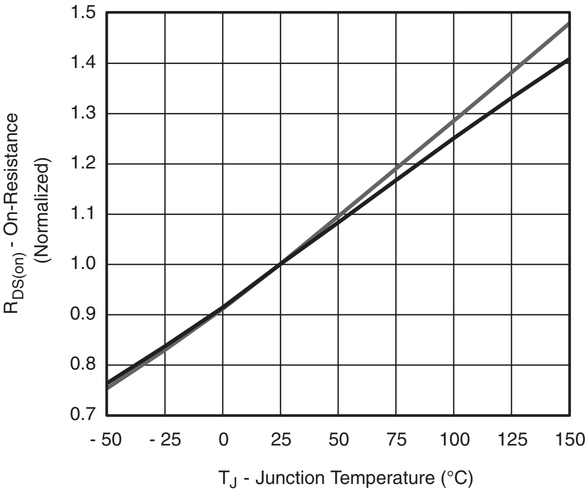


Figure 7 On-Resistance vs. Junction Temperature

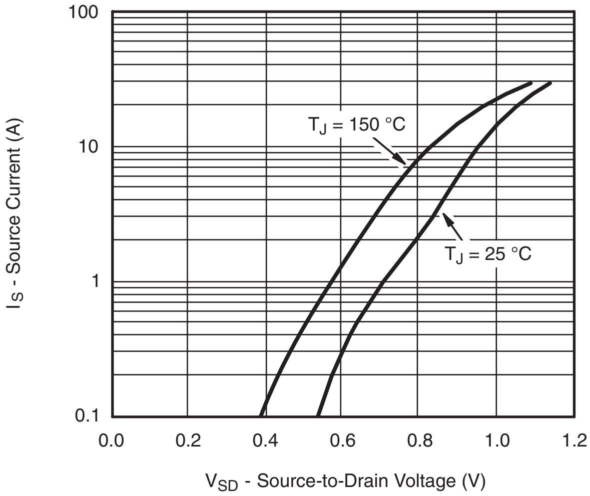


Figure 8 oure-Drain Diode Forward Voltage

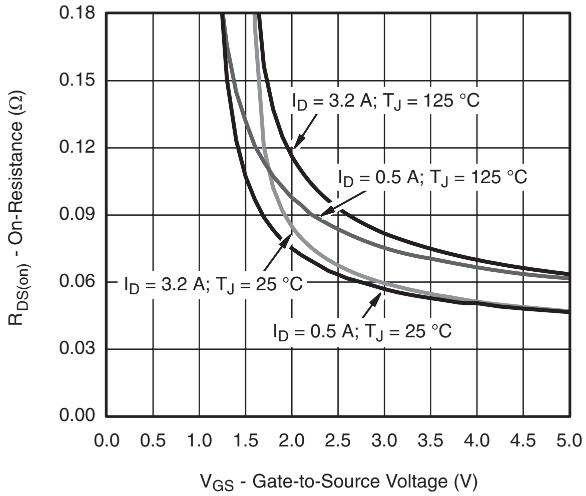


Figure 9 On Resistance VS. Gate-to-Source Voltage

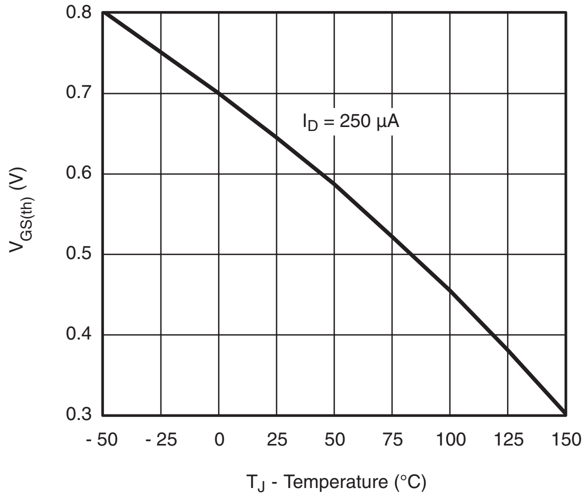


Figure 10 Threshold Voltage

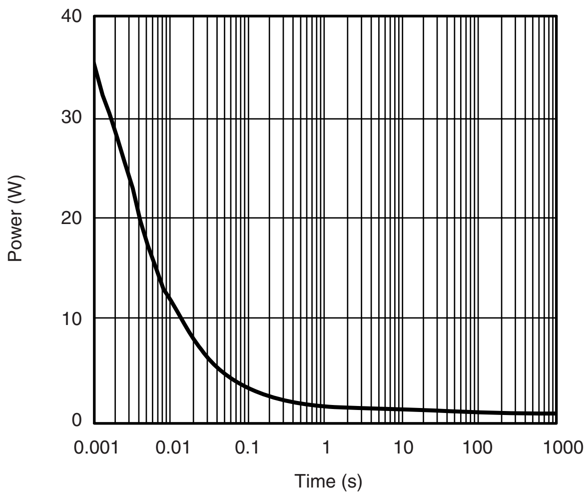


Figure 11 Single Pulse Power, Junction-to-Ambient

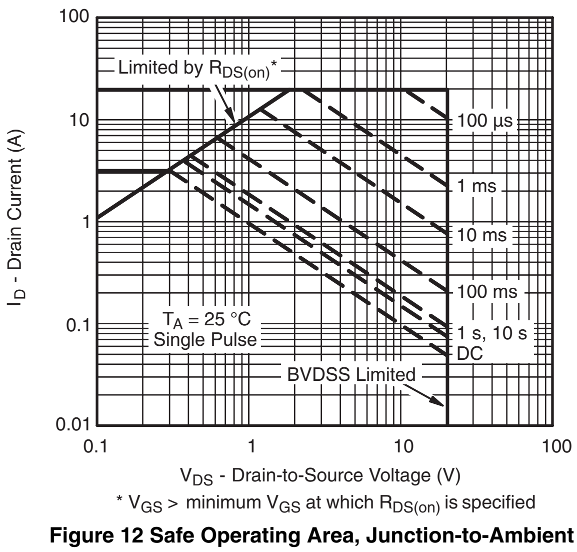


Figure 12 Safe Operating Area, Junction-to-Ambient

Typical Characteristics: N-CH

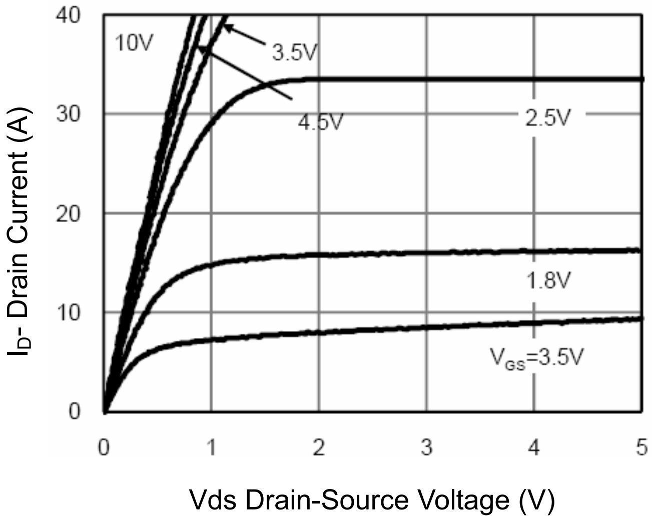


Figure 1 Output Characteristics

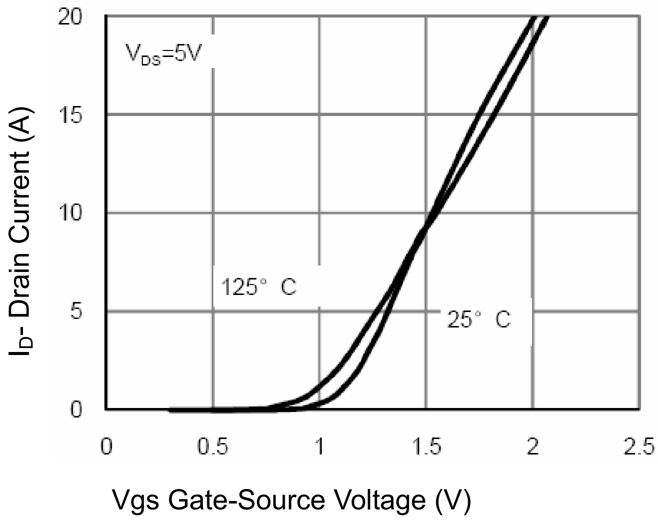


Figure 2 Transfer Characteristics

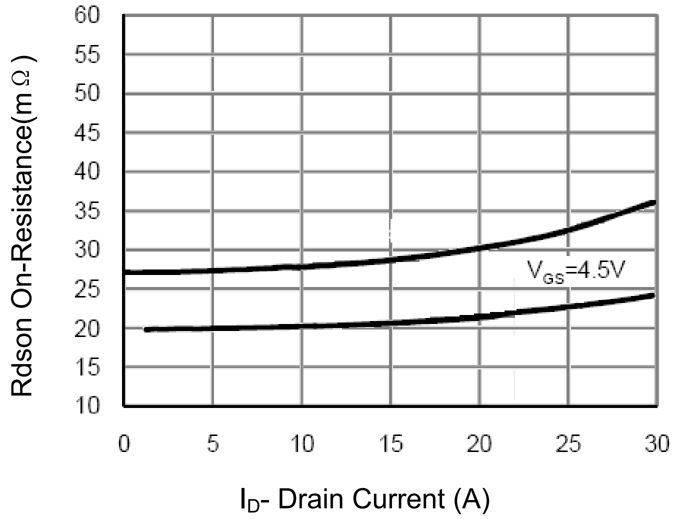


Figure 3 Drain-Source On-Resistance

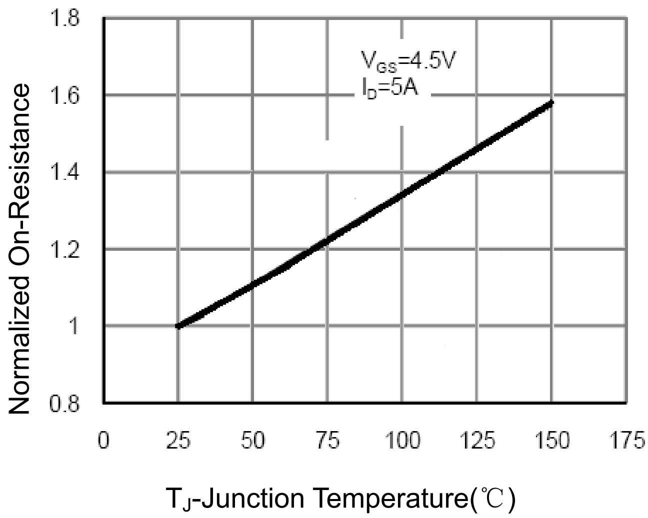


Figure 4 Drain-Source On-Resistance

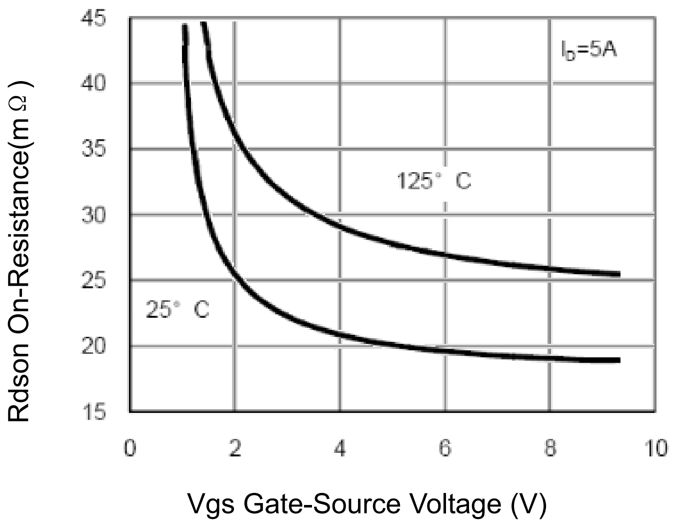
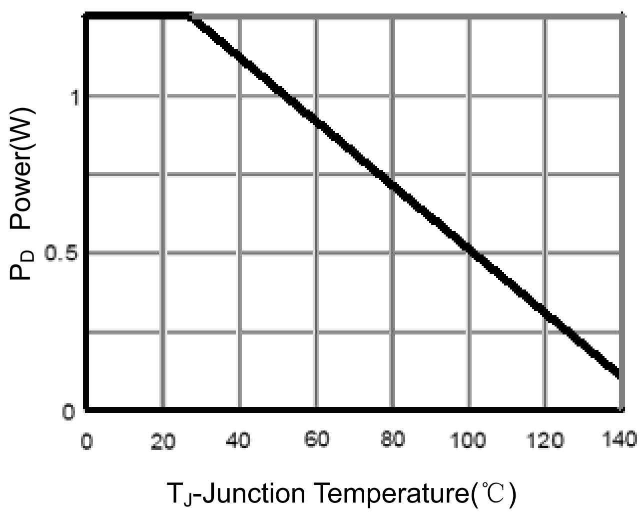


Figure5 Rdson vs Vgs



Typical Characteristics: N-CH

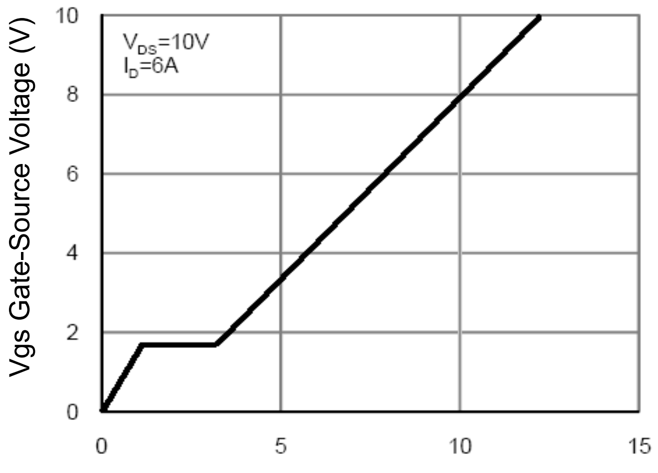


Figure 7 Gate Charge

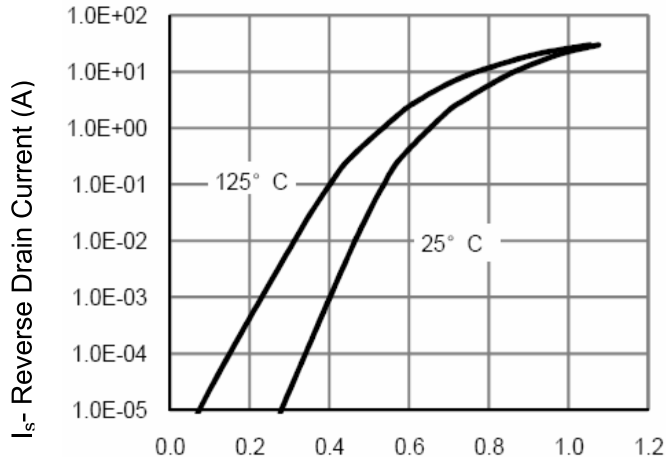


Figure 8 Source- Drain Diode Forward

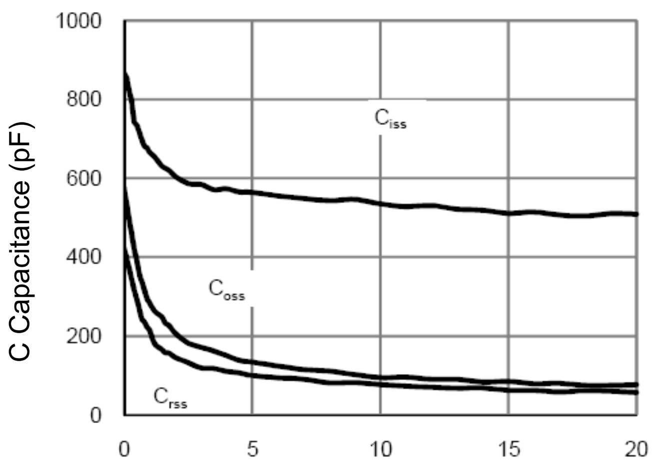


Figure 9 Capacitance vs Vds

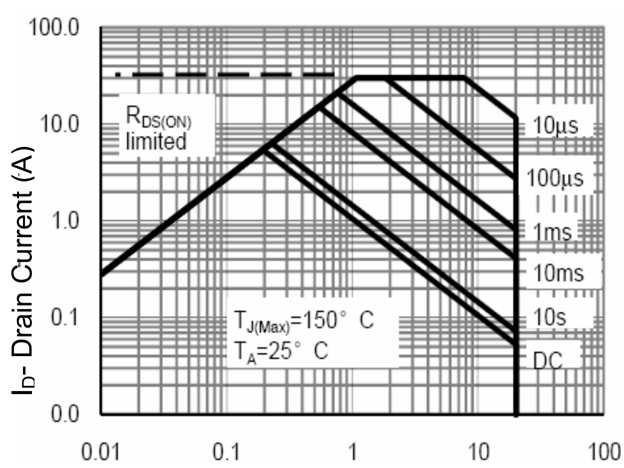


Figure 10 Safe Operation Area

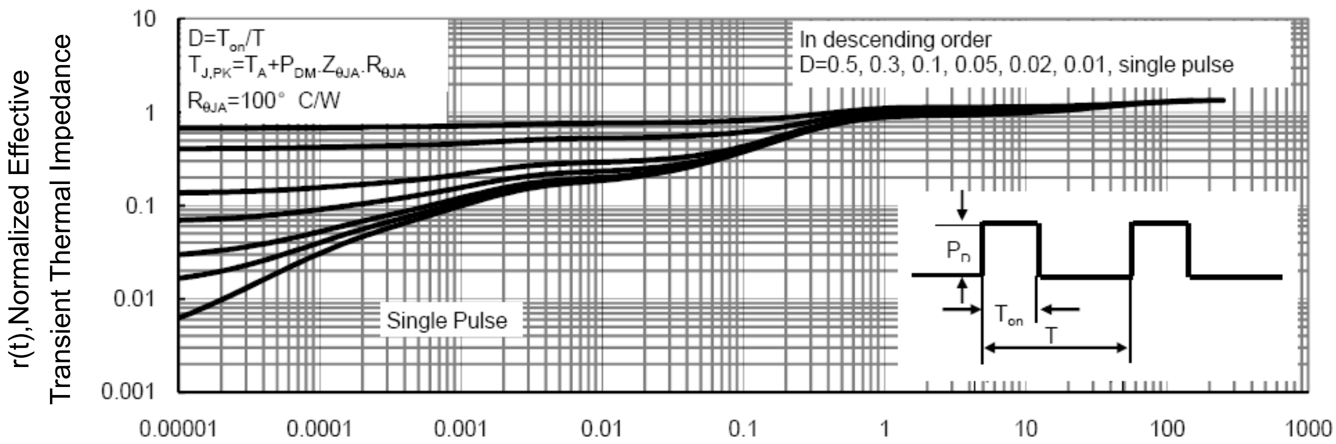


Figure 11 Normalized Maximum Transient Thermal Impedance

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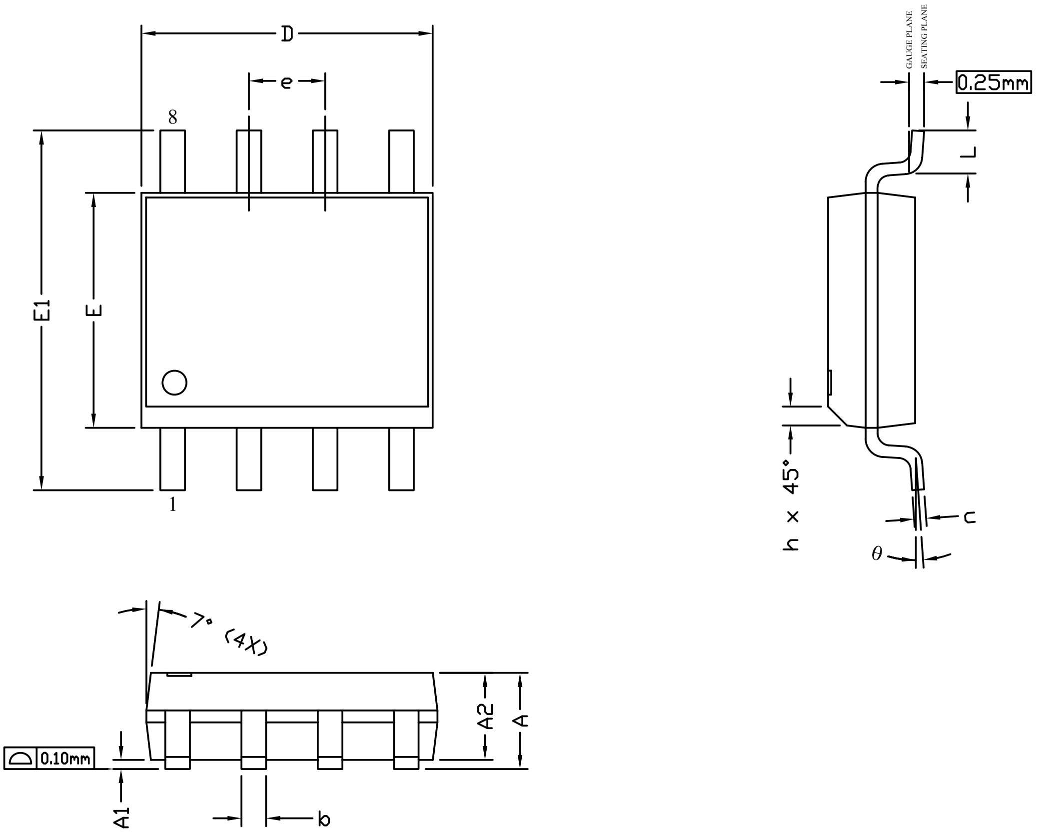
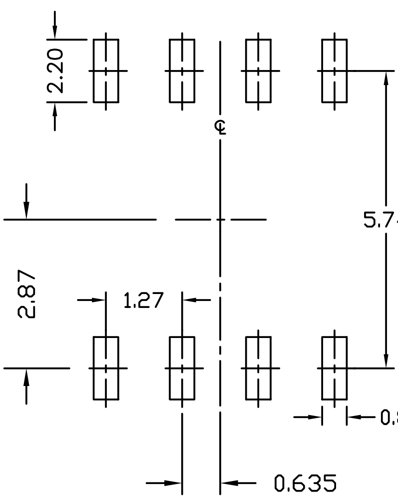
SO8 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	1.65	1.75	0.053	0.065	0.069
A1	0.10	---	0.25	0.004	---	0.010
A2	1.25	1.50	1.65	0.049	0.059	0.065
b	0.31	---	0.51	0.012	---	0.020
c	0.17	---	0.25	0.007	---	0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27 BSC			0.050 BSC		
E1	5.80	6.00	6.20	0.228	0.236	0.244
h	0.25	---	0.50	0.010	---	0.020
L	0.40	---	1.27	0.016	---	0.050
θ	0°	---	8°	0°	---	8°

NOTE
1. ALL DIMENSIONS ARE IN MILLMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
4. DIMENSION L IS MEASURED IN GAUGE PLANE.
5. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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