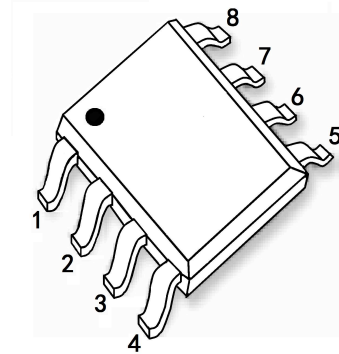


## 40V N+P Channel Mosfet

### FEATURES

- N-Channel: 40V
  - $R_{DS(ON)} \leq 28m\Omega$  ( 18m $\Omega$  Typ) @  $V_{GS}=10V$
  - $R_{DS(ON)} \leq 42m\Omega$  ( 26m $\Omega$  Typ) @  $V_{GS}=4.5V$
- P-Channel: -40V
  - $R_{DS(ON)} \leq 45m\Omega$  ( 35m $\Omega$  Typ) @  $V_{GS}=-10V$
  - $R_{DS(ON)} \leq 60m\Omega$  ( 50m $\Omega$  Typ) @  $V_{GS}=-4.5V$

### SOP-8

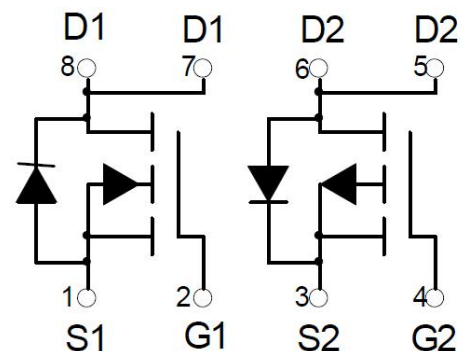


1: S1	3: S2	5: D2	7: D1
2: G1	4: G2	6: D2	8: D1

### APPLICATIONS

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> Synchronous Rectifier
- POL application
- BLDC Motor driver

### N+P CHANNEL MOSFET



**Absolute Maximum Ratings ( $T_a=25^{\circ}\text{C}$  unless otherwise specified)**

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		$V_{DS}$	40	-40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current <sup>note1</sup>	$T_C=25^{\circ}\text{C}$	$I_D$	7.5	-6	A
	$T_C=100^{\circ}\text{C}$		5.2	-4	
Pulsed Drain Current <sup>note2</sup>		$I_{DM}$	22	-18	A
Single Pulse Avalanche Energy <sup>note3</sup>		$E_{AS}$	15.8	21	mJ
Avalanche Current		$I_{AS}$	17.8	-20.5	A
Power Dissipation <sup>note4</sup>		$P_D$	2.4		W
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 to 150		$^{\circ}\text{C}$

**THERMAL RESISTANCE RATINGS**

Thermal Resistance	Symbol	Typ.	Maximum	Unit
Maximum Junction-to-Ambient <sup>note1</sup>	$R_{\theta JA}$	-	52	$^{\circ}\text{C}/\text{W}$
Maximum Junction-to-Case <sup>note1</sup>	$R_{\theta JC}$	-	30	$^{\circ}\text{C}/\text{W}$

Notes:1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

2. Pulse Test: Pulse Width $\leq 300\mu\text{s}$ , Duty Cycle $\leq 2\%$

3. EAS condition:  $V_{DS}=25\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $L=0.1\text{mH}$

4. The power dissipation is limited by  $150^{\circ}\text{C}$  junction temperature

**N-Channel Electrical Characteristics ( $T_a=25^{\circ}\text{C}$  unless otherwise specified)**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=32V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	-	-	1.0	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.7	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <sup>note1</sup>	$V_{GS}=10V, I_D=5A$	-	18	28	m $\Omega$
		$V_{GS}=4.5V, I_D=4A$	-	26	42	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5V, I_D=5A$	-	8	-	S
$R_G$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	-	2.6	-	$\Omega$
<b>Dynamic Characteristics</b> <sup>note2</sup>						
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1.0\text{MHz}$	-	590	-	pF
$C_{oss}$	Output Capacitance		-	75	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	55	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=20V, I_D=6A, V_{GS}=4.5V$	-	5.4	-	nC
$Q_{gs}$	Gate-Source Charge		-	1.2	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	2.5	-	nC
<b>Switching Characteristics</b> <sup>note2</sup>						
$t_{d(on)}$	Turn-on Delay Time	$V_{GS}=10V, V_{DS}=20V, I_D=1A, R_G=3.3\Omega$	-	8.5	-	ns
$t_r$	Turn-on Rise Time		-	2.1	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	40	-	ns
$t_f$	Turn-off Fall Time		-	2.5	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	7.5	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current <sup>note2</sup>		-	-	22	A
$V_{SD}$	Drain to Source Diode Forward Voltage <sup>note1</sup>	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	-	-	1.2	V

Notes:1. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

2. Guaranteed by design, not subject to production

**P-Channel Electrical Characteristics ( $T_a=25^{\circ}\text{C}$  unless otherwise specified)**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D = -250\mu A$	-40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -32V, V_{GS} = 0V,$	-	-	-1	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.0	-1.6	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note1</small>	$V_{GS} = -10V, I_D = -4A$	-	35	45	m $\Omega$
		$V_{GS} = -4.5V, I_D = -3A$	-	50	60	
$g_{FS}$	Forward Transconductance	$V_{DS} = -10V, I_D = -4A$	-	6	-	S
<b>Dynamic Characteristics <small>note2</small></b>						
$C_{iss}$	Input Capacitance	$V_{DS} = -15V, V_{GS} = 0V$ $f = 1.0MHz$	-	620	-	pF
$C_{oss}$	Output Capacitance		-	65	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	50	-	pF
$Q_g$	Total Gate Charge	$V_{DS} = -20V, I_D = -4A,$ $V_{GS} = -4.5V$	-	5.6	-	nC
$Q_{gs}$	Gate-Source Charge		-	1.0	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	2.0	-	nC
<b>Switching Characteristics <small>note2</small></b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS} = -12V, I_D = -1A,$ $R_G = 3.3\Omega, V_{GS} = -10V,$	-	13.0	-	ns
$t_r$	Turn-on Rise Time		-	8	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	38	-	ns
$t_f$	Turn-off Fall Time		-	3.4	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	-6	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current <small>note2</small>		-	-	-18	A
$V_{SD}$	Drain to Source Diode Forward Voltage <small>note1</small>	$V_{GS} = 0V, I_S = -1A$ $T_J = 25^{\circ}\text{C}$	-	-	-1.2	V

Notes:1. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

2. Guaranteed by design, not subject to production

N-Channel Typical Performance Characteristics

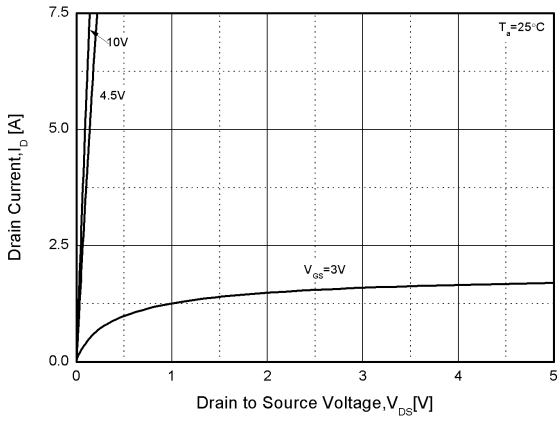


Figure1. Output Characteristics

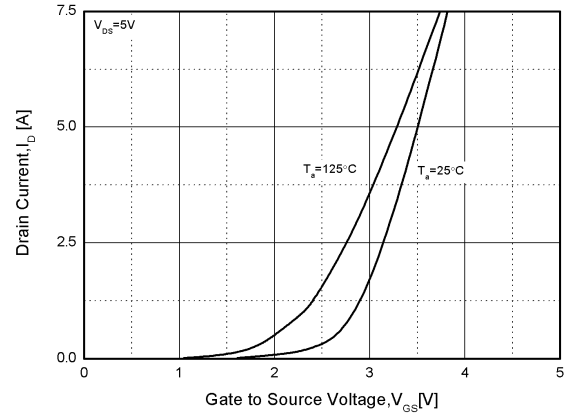


Figure2. Transfer Characteristics

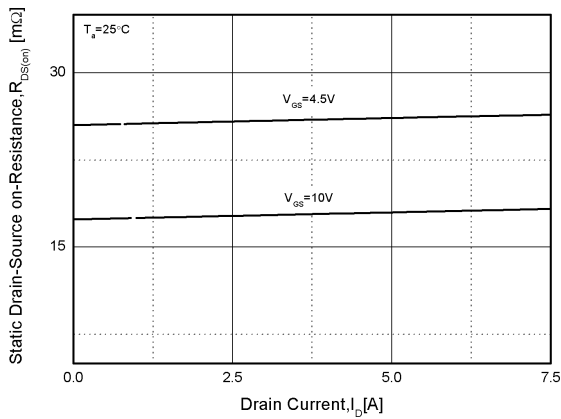


Figure3. Rdson-Drain Current

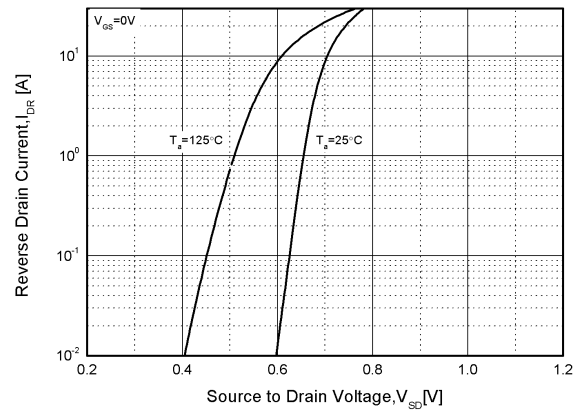


Figure4. Typical Source-Drain Diode Forward Voltage

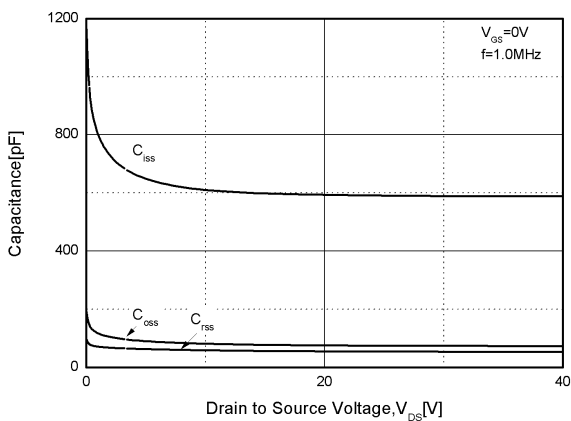


Figure5. Capacitance Characteristics

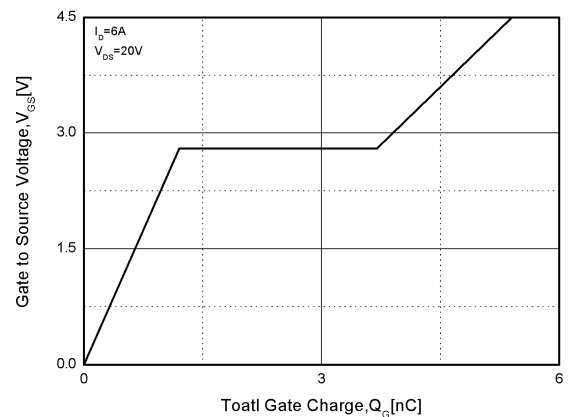


Figure6. Gate Charge

N-Channel Typical Performance Characteristics (cont.)

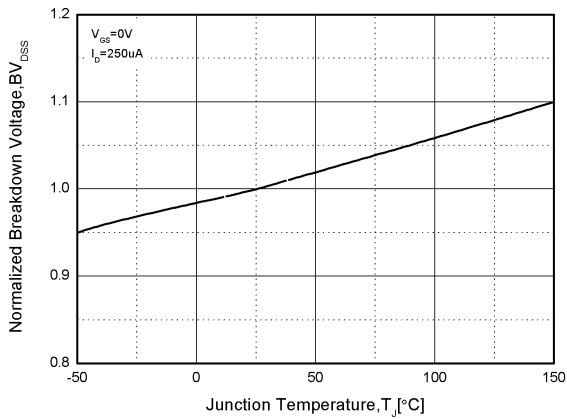


Figure7. Normalized Breakdown Voltage vs. Junction Temperature

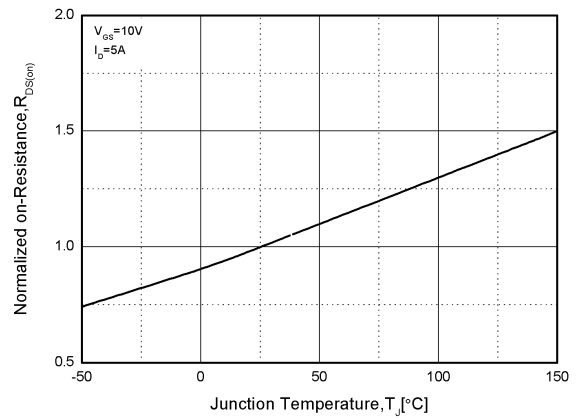


Figure8. Normalized on-Resistance vs. Junction Temperature

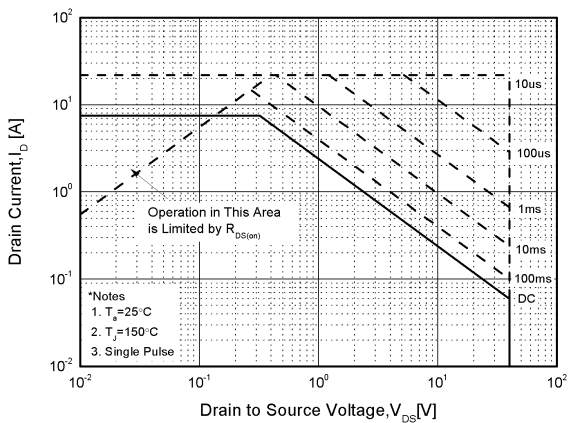


Figure9. Safe Operation Area

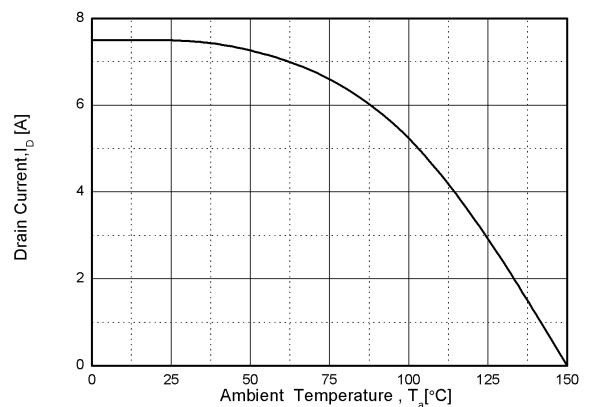


Figure10. Drain Current vs. Ambient Temperature

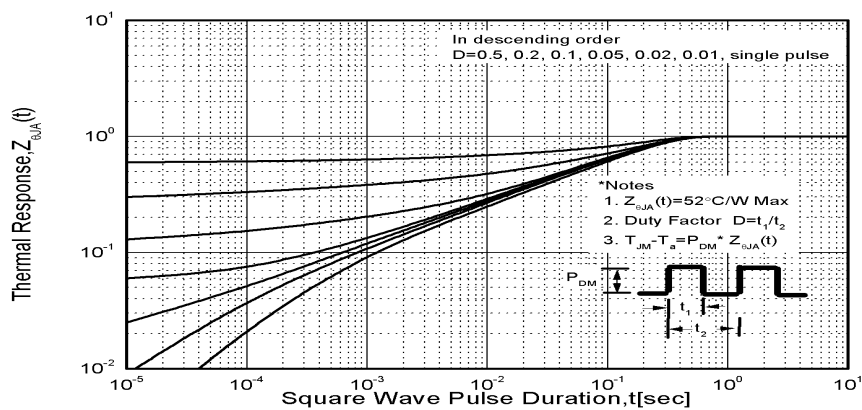


Figure11. Transient Thermal Response Curve

P-Channel Typical Performance Characteristics

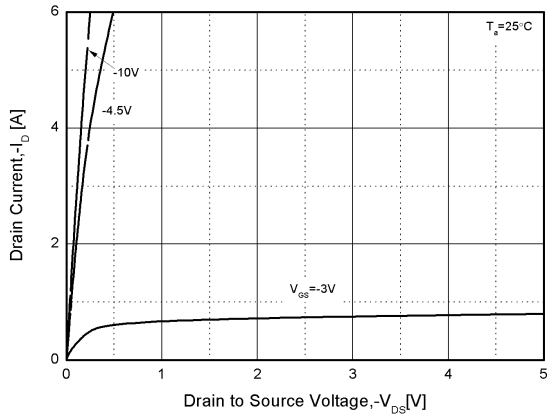


Figure1. Output Characteristics

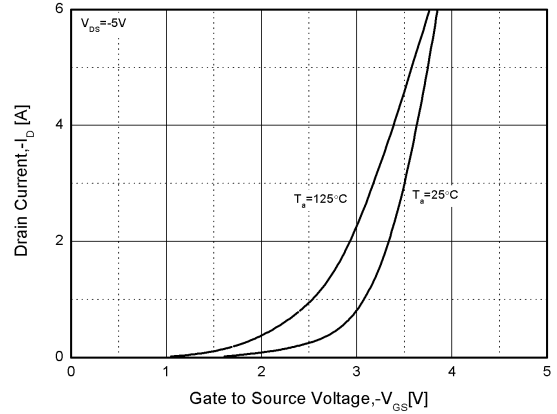


Figure2. Transfer Characteristics

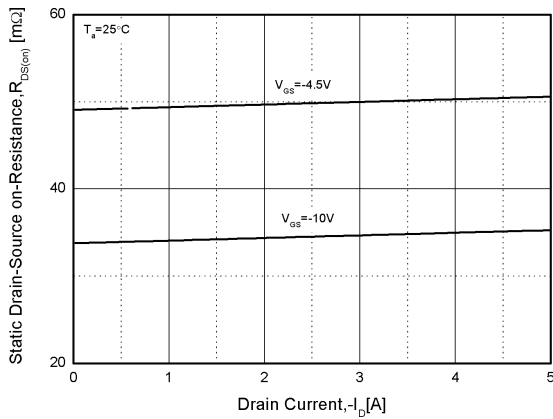


Figure3. Rdson-Drain Current

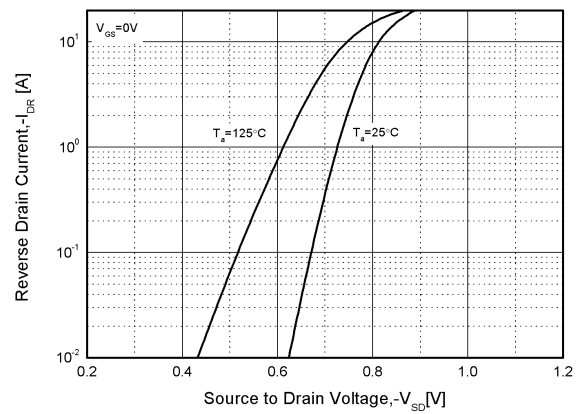


Figure4. Typical Source-Drain Diode Forward Voltage

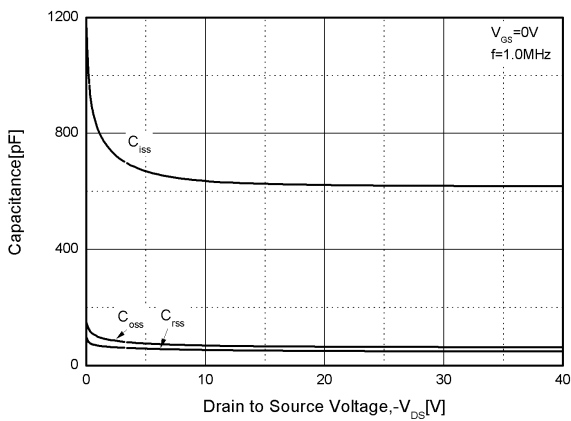


Figure5. Capacitance Characteristics

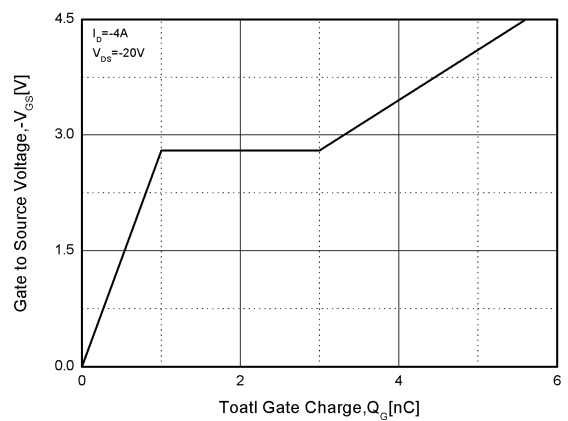


Figure6. Gate Charge

P-Channel Typical Performance Characteristics (cont.)

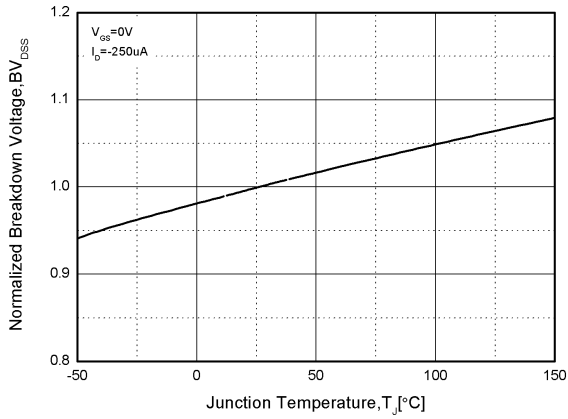


Figure7. Normalized Breakdown Voltage vs. Junction Temperature

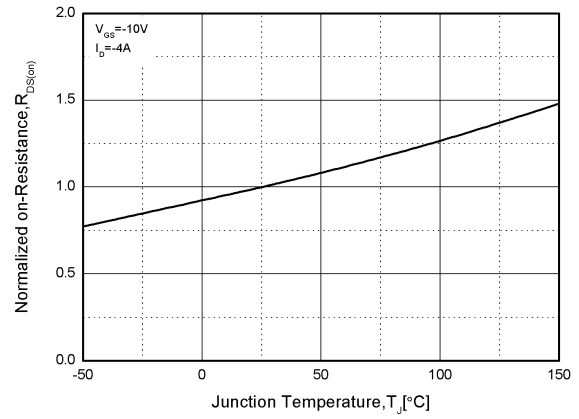


Figure8. Normalized on Resistance vs. Junction Temperature

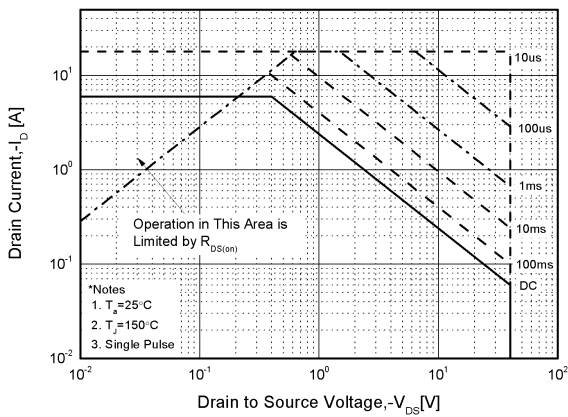


Figure9. Safe Operation Area

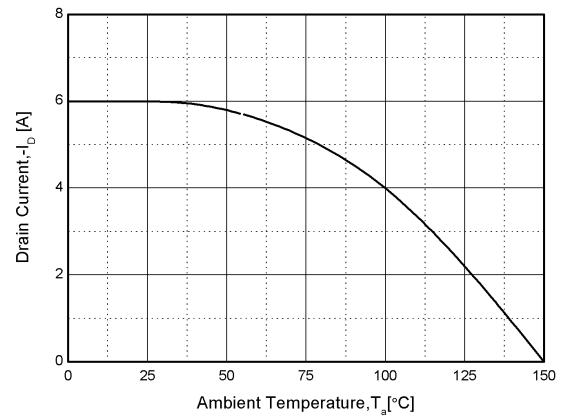


Figure10. Maximum Drain Current vs. Ambient Temperature

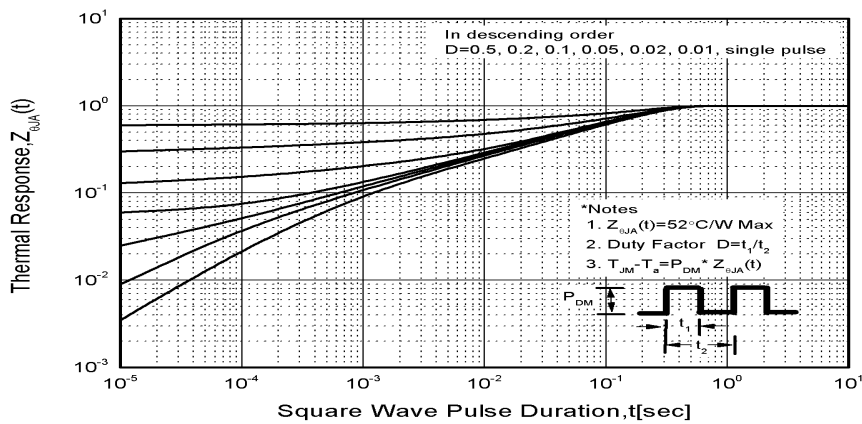
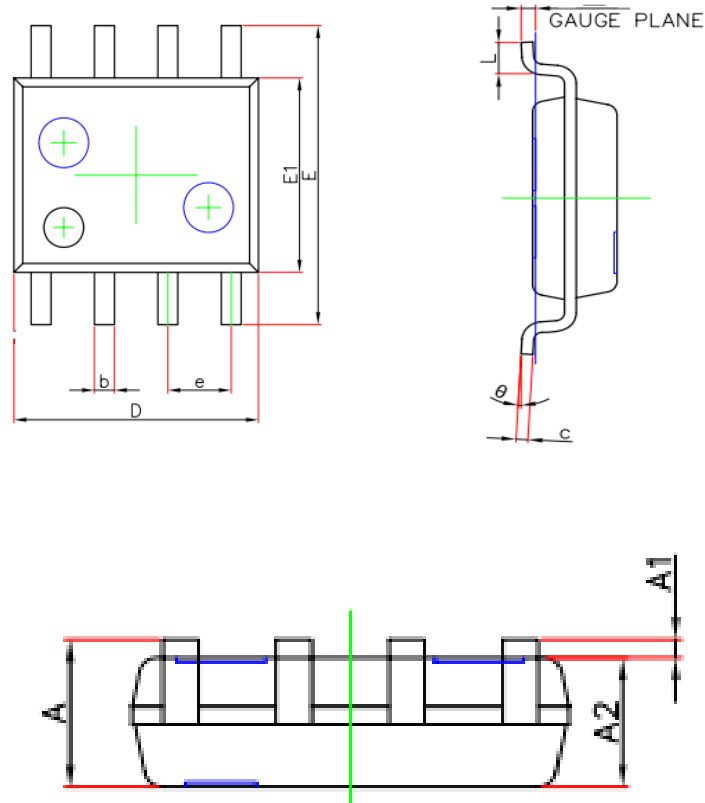


Figure11. Transient Thermal Response Curve



SOP-8 PACKAGE OUTLINE DRAWING



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.063	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E1	3.800	4.000	0.150	0.157
E	5.800	6.200	0.228	0.244
e	1.27(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°