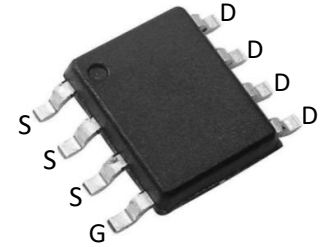


N and P-Channel Enhancement Mode Power MOSFET

Description:

This N+P Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge. It can be used in a wide variety of applications.

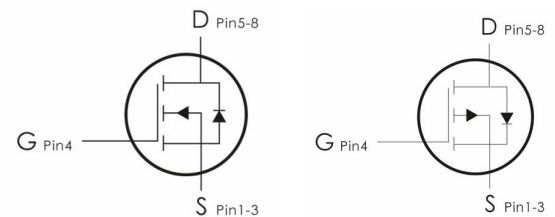


Features:

N-Channel: $V_{DS}=40V, I_D=-10A, R_{DS(ON)}<22m\Omega @V_{GS}=-10V$

P-Channel: $V_{DS}=-40V, I_D=-8A, R_{DS(ON)}<53m\Omega @V_{GS}=-10V$

- 1)
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low $R_{DS(ON)}$.
- 5) Excellent package for good heat dissipation.



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

Symbol	Parameter	N-Channel	P-Channel	Units
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
I_D	Continuous Drain Current- $T_A=25^\circ C$	10	-8	A
	Continuous Drain Current- $T_A=100^\circ C$	6.5	-5.0	
I_{DM}	Pulsed Drain Current ^{note1}	35	-28	A
E_{AS}	Single Pulsed Avalanche Energy ^{note2}	13	17.6	mJ
P_D	Power Dissipation - $T_A=25^\circ C$	2.0	3.2	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		$^\circ C$

Thermal Characteristics:

Symbol	Parameter	N-CH	P-CH	Units
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	39	$^\circ C/W$

N-Channel Electrical Characteristics: ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	40	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=40V$	---	---	1	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0A$	---	---	± 100	nA
On Characteristics³						
V_{GS(th)}	GATE-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	1	1.5	2.5	V
R_{DS(on)}	Drain-Source On Resistance ^{note3}	$V_{GS}=10V, I_D=10A$	---	17	22	m Ω
		$V_{GS}=4.5V, I_D=6.5A$	---	25	35	
Dynamic Characteristics⁴						
C_{iss}	Input Capacitance	$V_{DS}=20V, V_{GS}=0V, f=1\text{MHz}$	---	620	---	pF
C_{oss}	Output Capacitance		---	65	---	
C_{rss}	Reverse Transfer Capacitance		---	55	---	
Q_g	Gate Charge	$V_{GS}=8V, V_{DS}=20V$ $I_D=10A$	---	12	---	nC
Q_{gs}	Gate-Source Charge		---	3.2	---	
Q_{gd}	Gate-Drain Charge		---	3.1	---	
Switching Characteristics⁴						
t_{d(on)}	Turn-On Delay Time	$V_{DS}=20V, R_L=2.5\ \Omega,$ $R_{REN}=3\ \Omega, V_{GS}=10V$	---	4	---	ns
t_r	Rise Time		---	3	---	ns
t_{d(off)}	Turn-Off Delay Time		---	15	---	ns
t_f	Fall Time		---	2	---	ns
Drain-Source Diode Characteristics						
I_S	Continuous Drain to Source Diode	---	---	---	10	A
I_{SM}	Pulsed Drain to Source Diode	---	---	---	35	A

V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS}=0V, I_S=8A$	---	---	1.2	V
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Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition : $T_J=25^{\circ}C, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25\Omega, I_{AS}=7.2A$
 $T_J=25^{\circ}C, V_{DD}=-20V, V_G= -10V, L=0.5mH, R_g=25\Omega, I_{AS}=-8.4A$
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

Typical Performance Characteristics-N

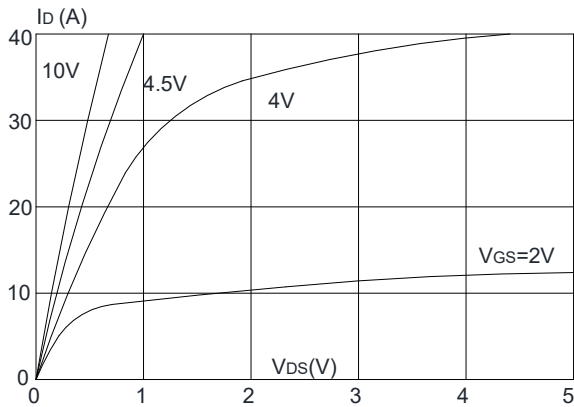


Figure 1: Output Characteristics

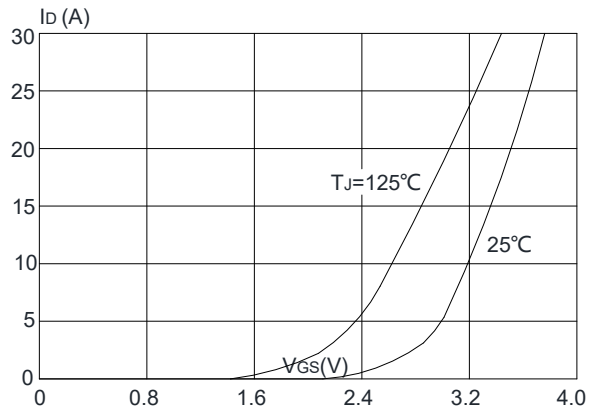


Figure 2: Typical Transfer Characteristics

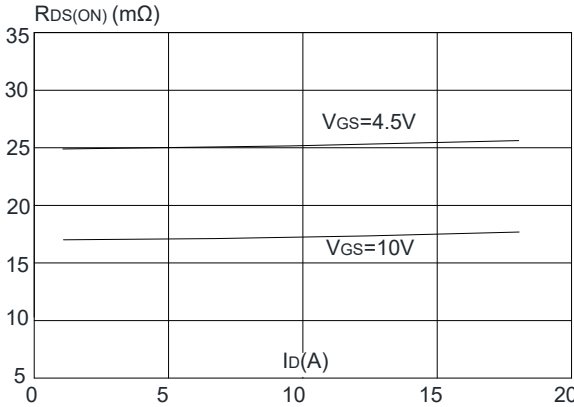


Figure 3: On-resistance vs. Drain Current

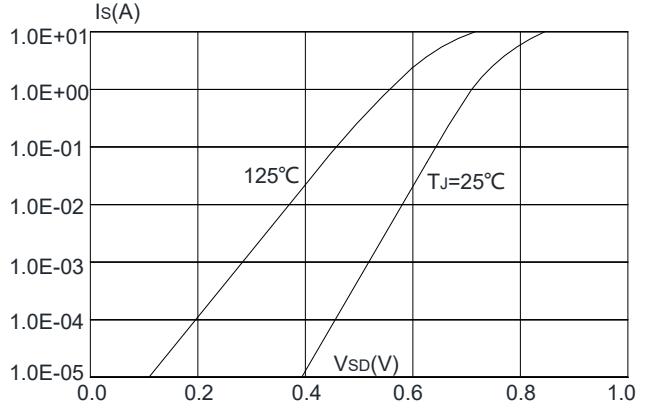


Figure 4: Body Diode Characteristics

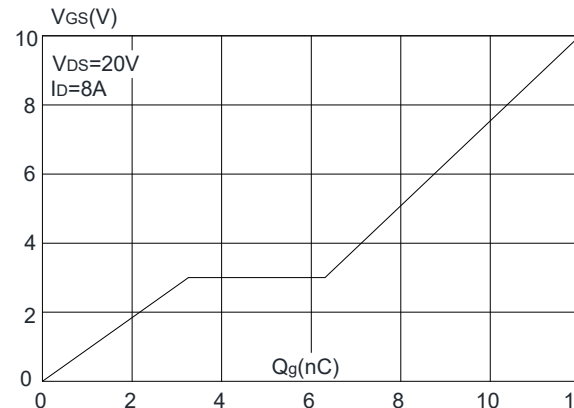


Figure 5: Gate Charge Characteristics

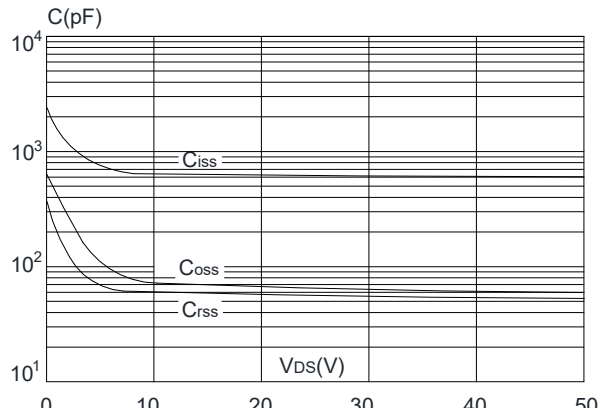


Figure 6: Capacitance Characteristics

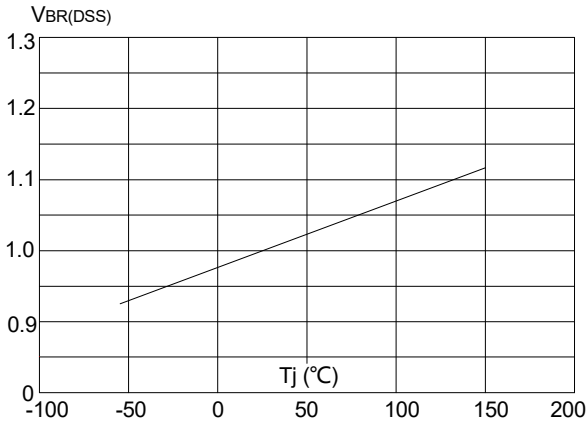


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

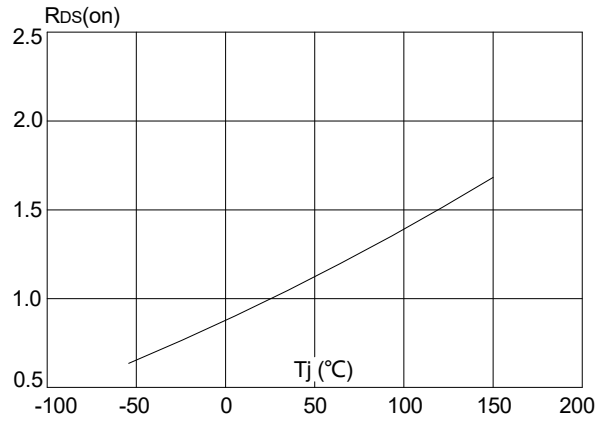


Figure 8: Normalized on Resistance vs. Junction Temperature

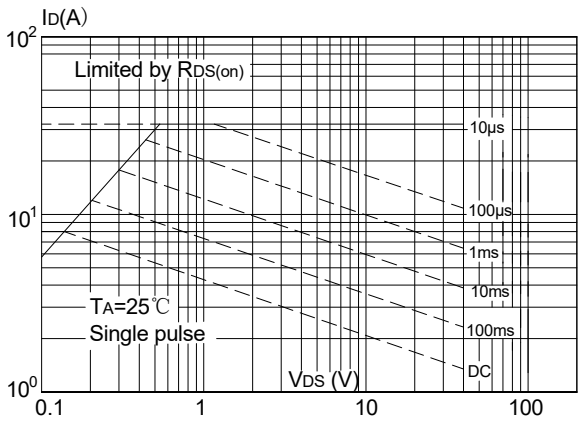


Figure 9: Maximum Safe Operating Area

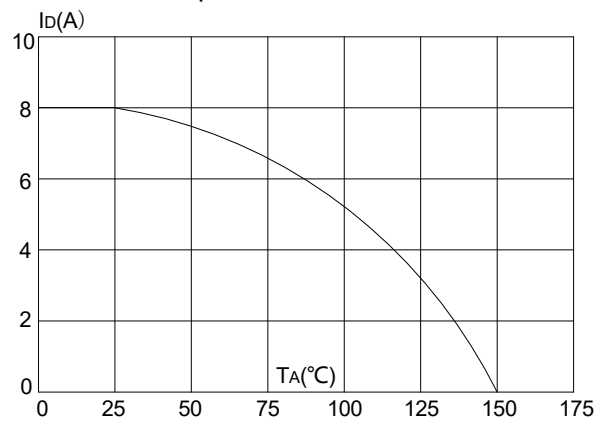


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

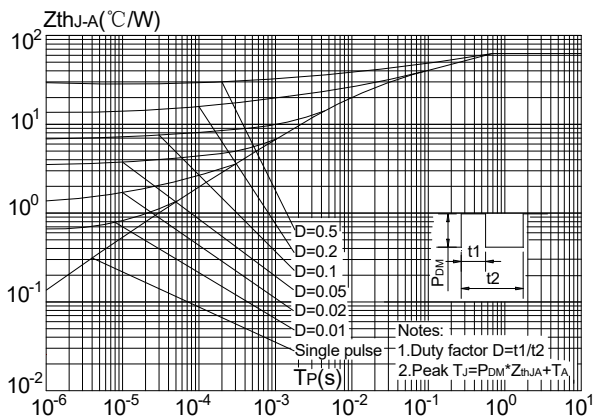


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

P-Channel Electrical Characteristics: ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	-40	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=-40V$	---	---	-1	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0A$	---	---	± 100	nA
On Characteristics³						
$V_{GS(th)}$	GATE-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	-1	-1.6	-2.5	V
$R_{DS(on)}$	Drain-Source On Resistance ^{note3}	$V_{GS}=-10V, I_D=-8A$	---	41	53	m Ω
		$V_{GS}=-4.5V, I_D=-5A$	---	58	81	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=-20V, V_{GS}=0V, f=1\text{MHz}$	---	850	---	pF
C_{oss}	Output Capacitance		---	85	---	
C_{rss}	Reverse Transfer Capacitance		---	68	---	
Switching Characteristics⁴						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=-20V, R_L=2.3\ \Omega$ $V_{GS}=-10V, R_{GEN}=6\ \Omega$	---	7.5	---	ns
t_r	Rise Time		---	5.5	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	19	---	ns
t_f	Fall Time		---	7	---	ns
Q_g	Total Gate Charge	$V_{GS}=-10V, V_{DS}=-20V, I_D=-6A$	---	13	---	nC
Q_{gs}	Gate-Source Charge		---	3.8	---	nC
Q_{gd}	Gate-Drain "Miller" Charge		---	3.1	---	nC
Drain-Source Diode Characteristics						
I_S	Continuous Drain to Source Diode	---	---	---	-8	A
I_{SM}	Pulsed Drain to Source Diode	---	---	---	-24	---
V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS}=0V, I_S=-6A$	---	---	-1.2	V

Typical Performance Characteristics-P

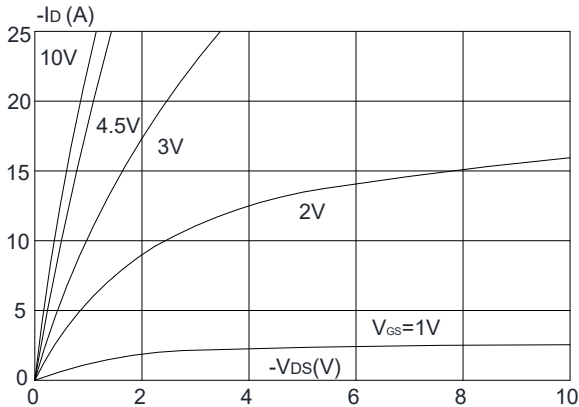


Figure 1: Output Characteristics

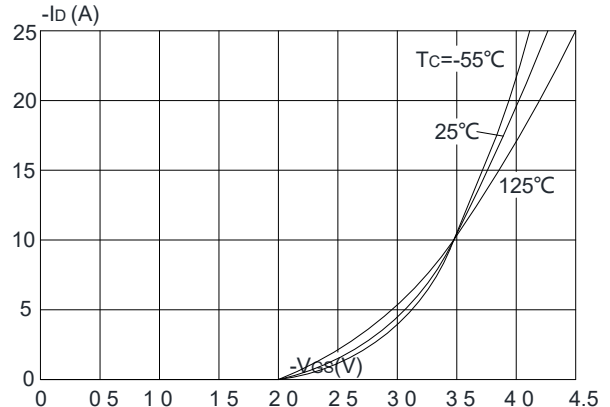


Figure 2: Typical Transfer Characteristics

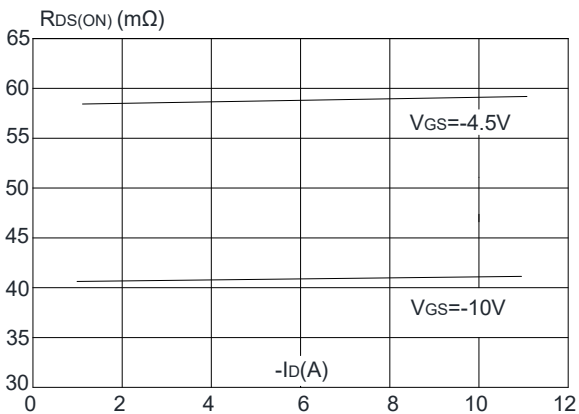


Figure 3: On-resistance vs. Drain Current

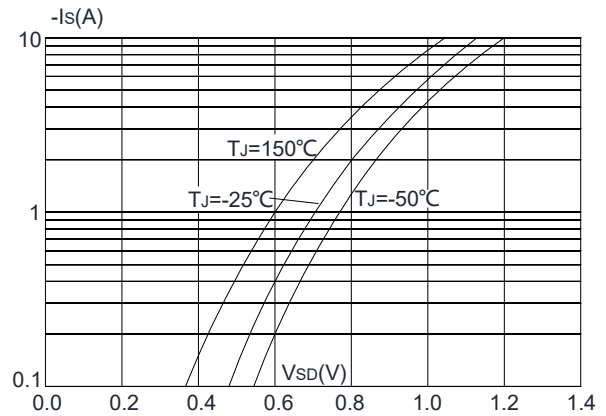


Figure 4: Body Diode Characteristics

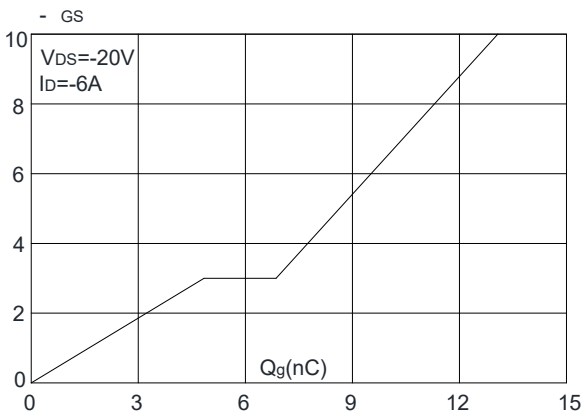


Figure 5: Gate Charge Characteristics

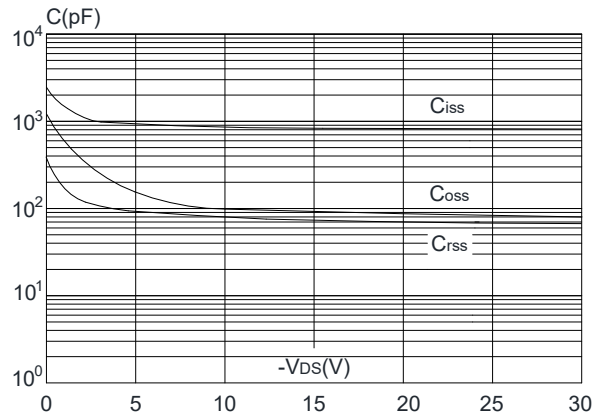


Figure 6: Capacitance Characteristics

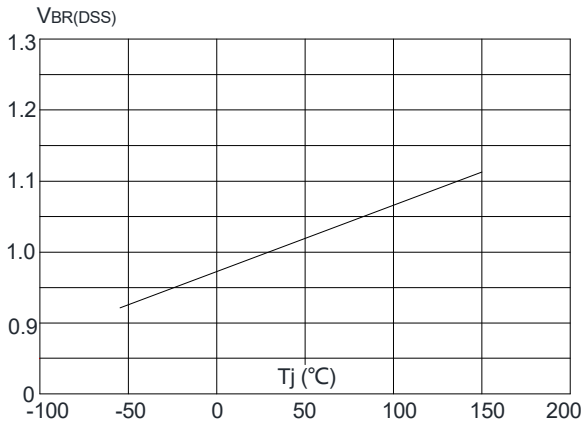


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

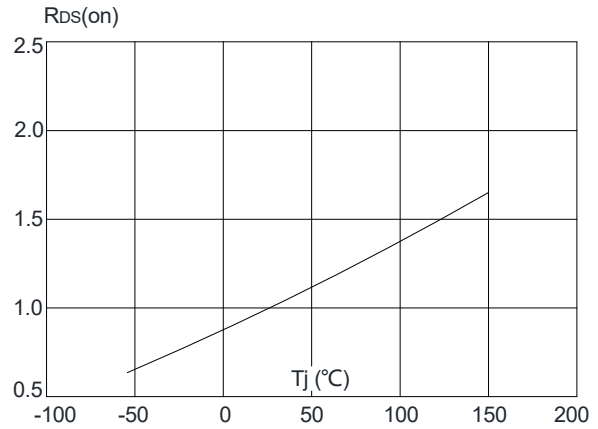


Figure 8: Normalized on Resistance vs. Junction Temperature

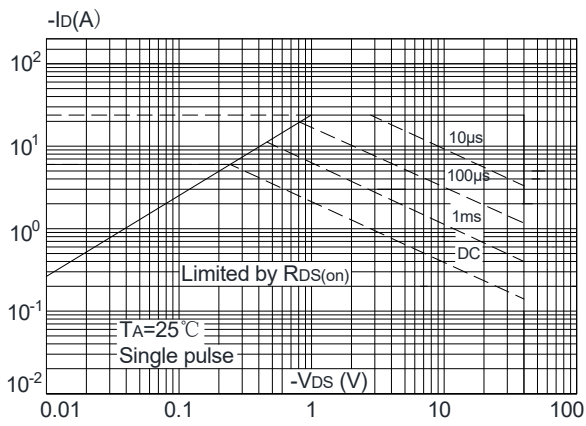


Figure 9: Maximum Safe Operating Area

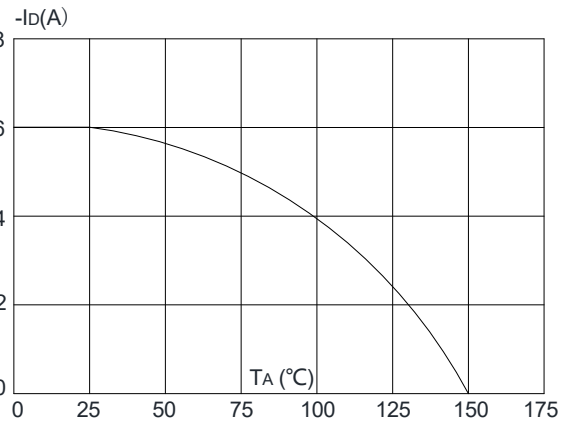


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

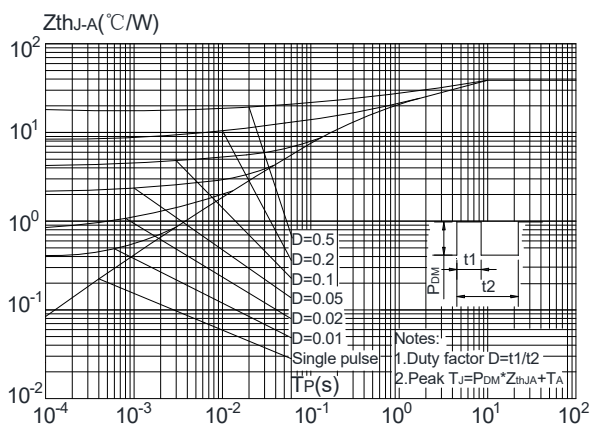
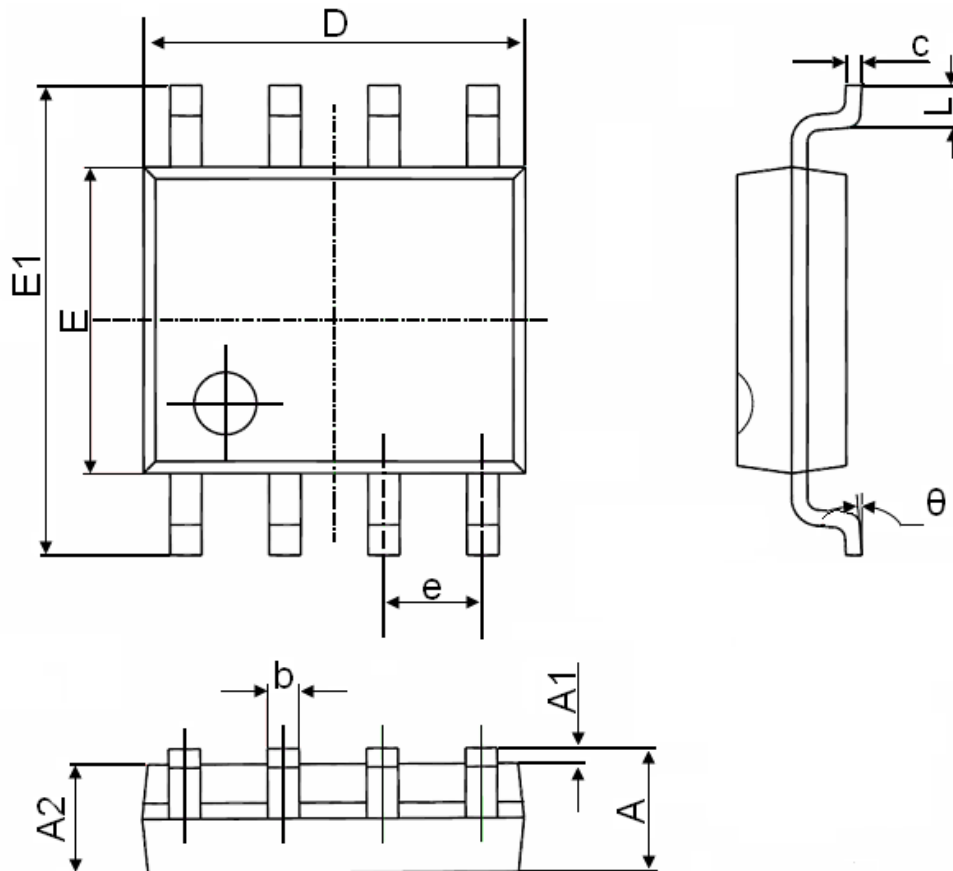


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

SOP-8 Package Information



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	0.053	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
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°