

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
60V	35mΩ@10V	5A
	45mΩ@4.5V	
-60V	80mΩ@-10V	-3.5A
	95mΩ@-4.5V	

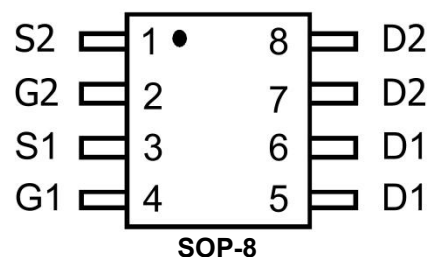
Feature

- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

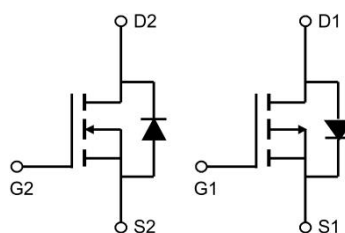
Application

- H-bridge
- Inverters

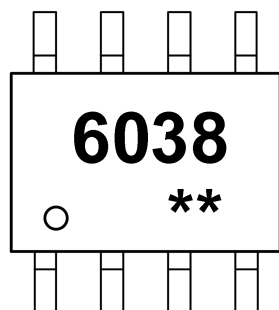
Package



Circuit diagram



Marking



6038 = Device code

** = Week Code

**Absolute maximum ratings (Ta=25°C unless otherwise noted)**

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	60	-60	V
Gate-Source Voltage		V_{GS}	± 20	± 20	V
Continuous Drain Current	TC=25°C	I_D	5	-3.5	A
	TC=100°C		3.5	-2.5	
Pulsed Drain Current (Note 1)		I_{DM}	17	-12	A
Maximum Power Dissipation	TC=25°C	P_D	2	2	W
Thermal Resistance, Junction-to- Ambient (Note 2)		$R_{\theta JA}$	62.5		°C/W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	-55 To 150	°C

N-Channel Electrical characteristics (TA=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V,V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	1.0	1.6	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4.5A	-	35	50	mΩ
		V _{GS} =4.5V, I _D =4A	-	45	65	
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =5A	11	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{ISS}	V _{DS} =30V,V _{GS} =0V, F=1.0MHz	-	451	-	PF
Output Capacitance	C _{OSS}		-	61	-	PF
Reverse Transfer Capacitance	C _{rSS}		-	26	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V ,R _L =2.5Ω V _{GS} =10V,R _G =3Ω	-	4.4	-	nS
Turn-on Rise Time	t _r		-	3.4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	16	-	nS
Turn-Off Fall Time	t _f		-	2	-	nS
Total Gate Charge	Q _g	V _{DS} =30V,I _D =5A, V _{GS} =10V	-	10		nC
Gate-Source Charge	Q _{gs}		-	2.5		nC
Gate-Drain Charge	Q _{gd}		-	3.4		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V,I _S =5A	-		1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	5	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =5A di/dt = 100A/μs ^(Note3)	-	28	-	nS
Reverse Recovery Charge	Q _{rr}		-	32	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

**P-Channel Electrical characteristics (TA=25 °C, unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.5	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-3.5A	-	80	100	mΩ
		V _{GS} =-4.5V, I _D =-2.5A	-	95	125	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-4A	11	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-30V, V _{GS} =0V, F=1.0MHz	-	960	-	PF
Output Capacitance	C _{oss}		-	87	-	PF
Reverse Transfer Capacitance	C _{rss}		-	38	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V ,R _L =2.5Ω V _{GS} =-10V,R _G =3Ω	-	9	-	nS
Turn-on Rise Time	t _r		-	11	-	nS
Turn-Off Delay Time	t _{d(off)}		-	25	-	nS
Turn-Off Fall Time	t _f		-	12	-	nS
Total Gate Charge	Q _g	V _{DS} =-30V, I _D =-4A, V _{GS} =10V	-	15.7		nC
Gate-Source Charge	Q _{gs}		-	3		nC
Gate-Drain Charge	Q _{gd}		-	3.5		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-4A	-		-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-4	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =-4A di/dt = 100A/μs (Note3)	-	26.5	-	nS
Reverse Recovery Charge	Q _{rr}		-	31	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

N-Channel Typical Characteristics

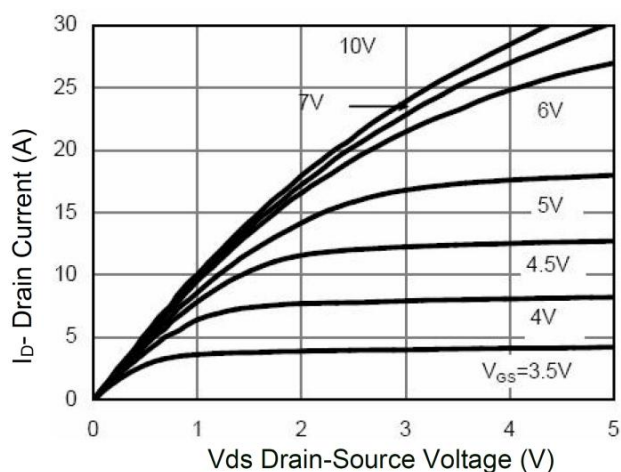


Figure 1 Output Characteristics

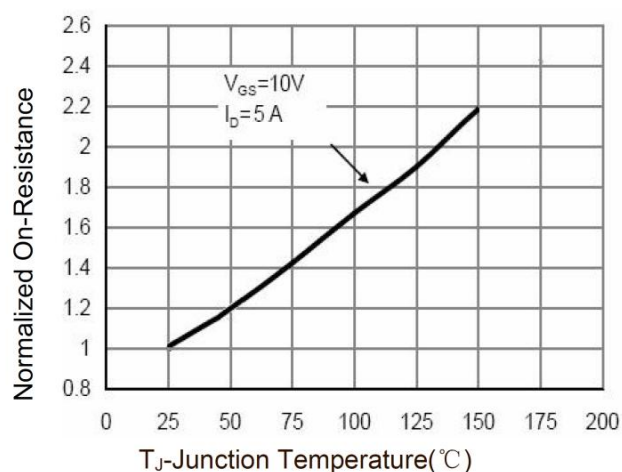


Figure 4 $R_{DS(on)}$ -Junction Temperature

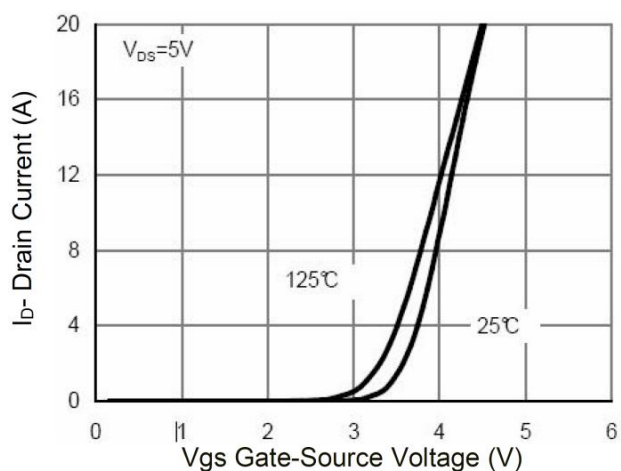


Figure 2 Transfer Characteristics

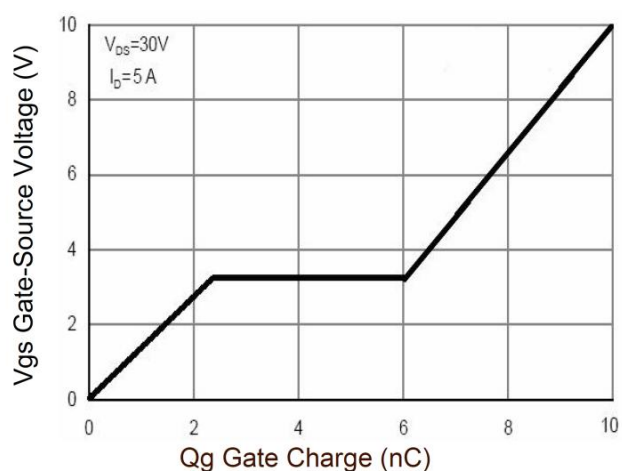


Figure 5 Gate Charge

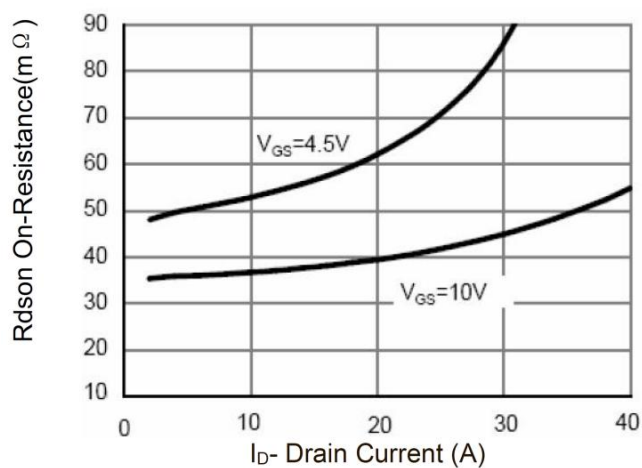


Figure 3 $R_{DS(on)}$ - Drain Current

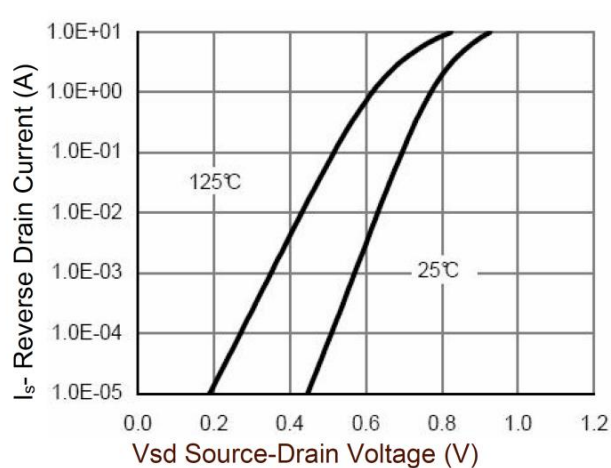


Figure 6 Source- Drain Diode Forward

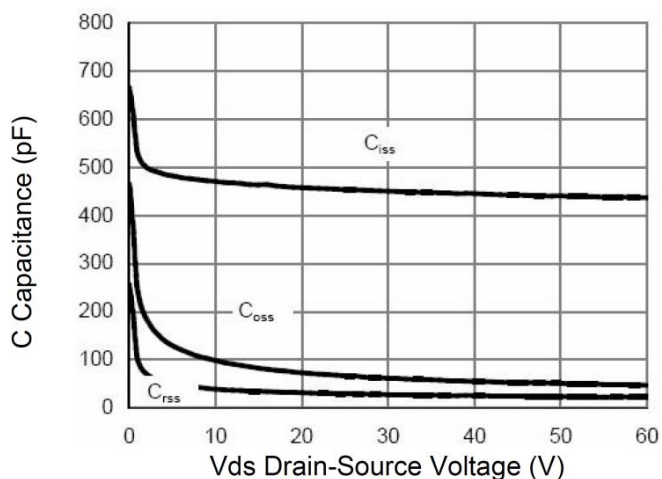


Figure 7 Capacitance vs Vds

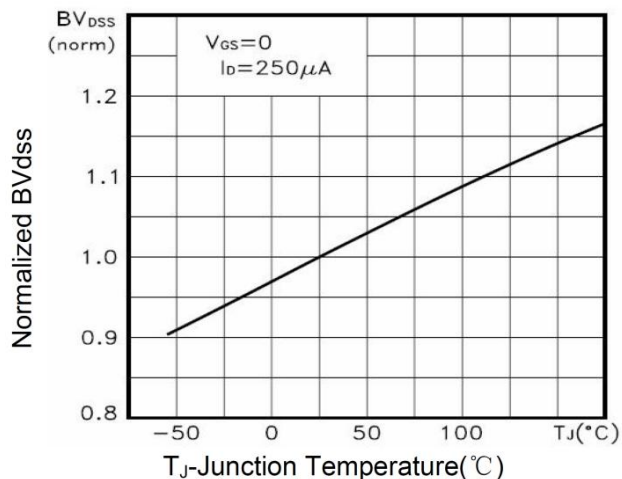


Figure 9 BV_{dss} vs Junction Temperature

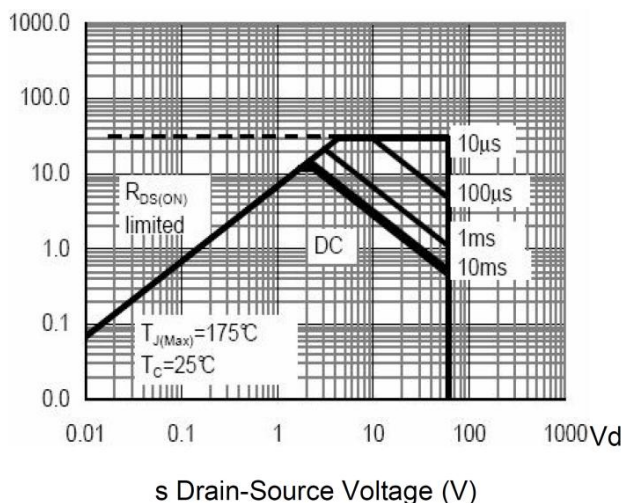


Figure 8 Safe Operation Area

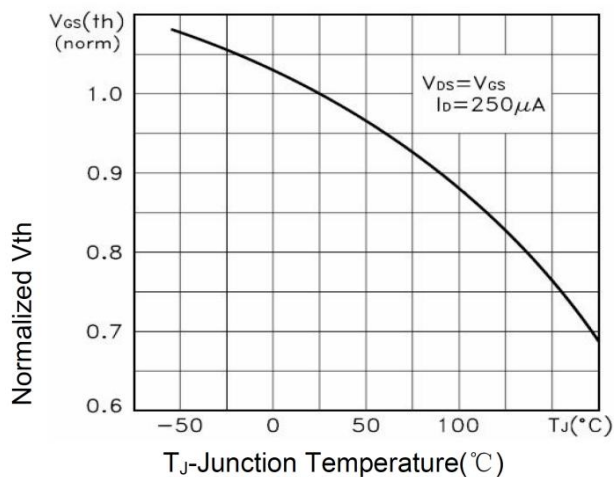


Figure 10 $V_{GS(th)}$ vs Junction Temperature

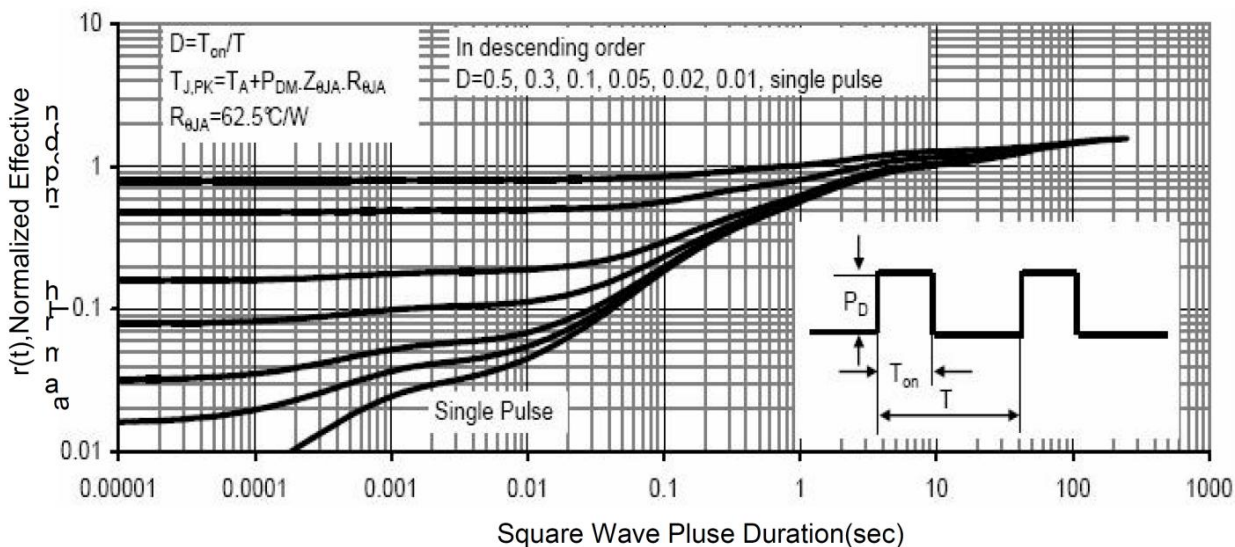


Figure 11 Normalized Maximum Transient Thermal Impedance

P-Channel Typical Characteristics

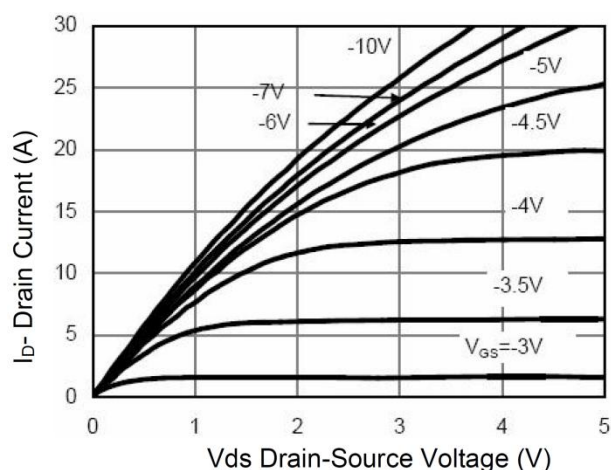


Figure 1 Output Characteristics

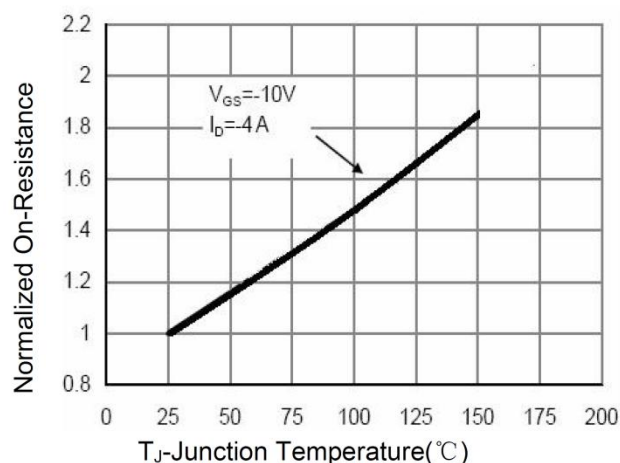


Figure 4 $R_{DS(on)}$ -Junction Temperature

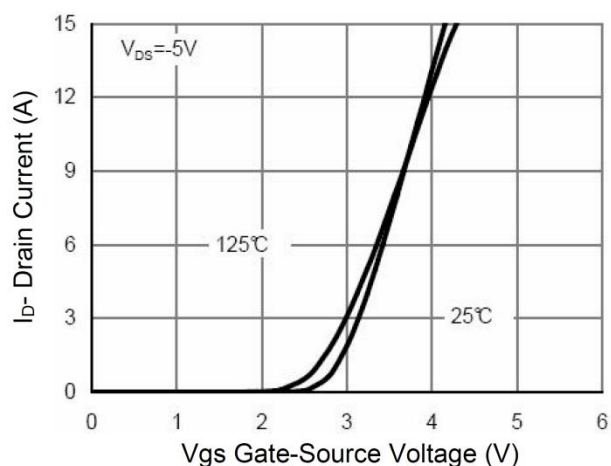


Figure 2 Transfer Characteristics

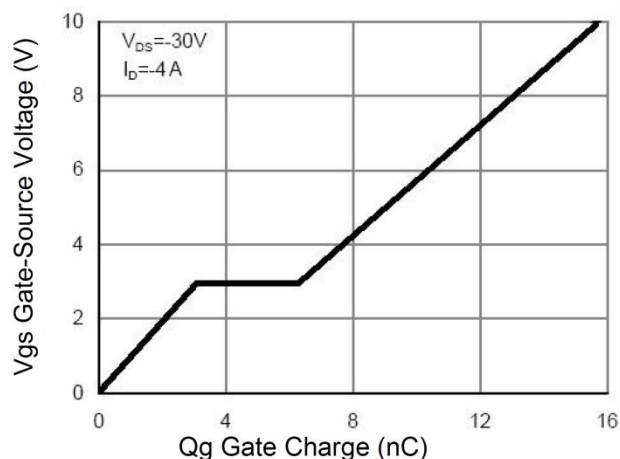


Figure 5 Gate Charge

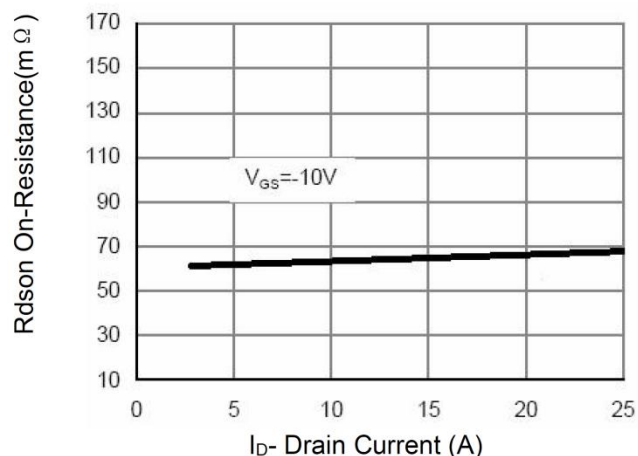


Figure 3 $R_{DS(on)}$ - Drain Current

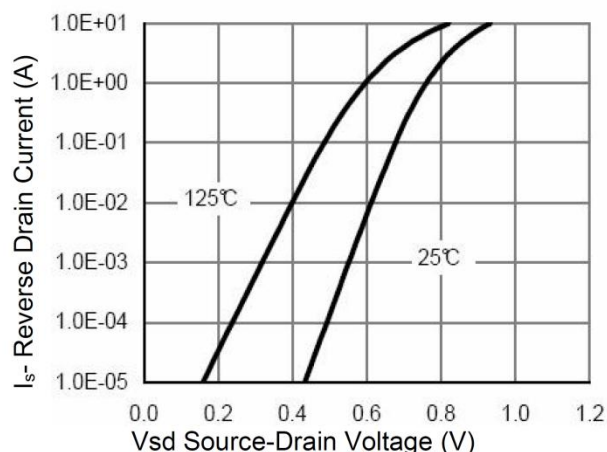


Figure 6 Source- Drain Diode Forward

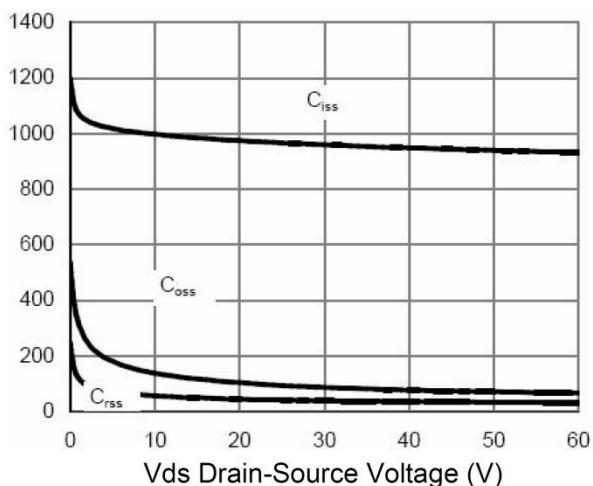


Figure 7 Capacitance vs Vds

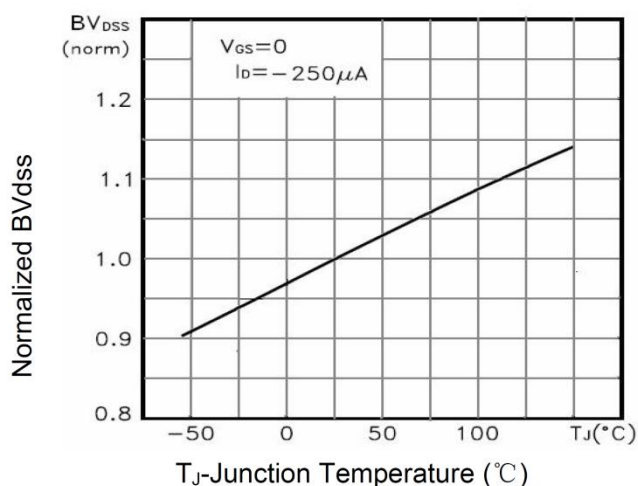


Figure 9 BVdss vs Junction Temperature

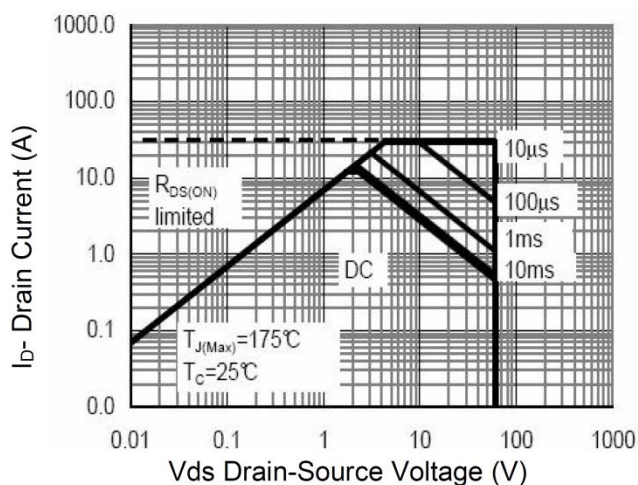


Figure 8 Safe Operation Area

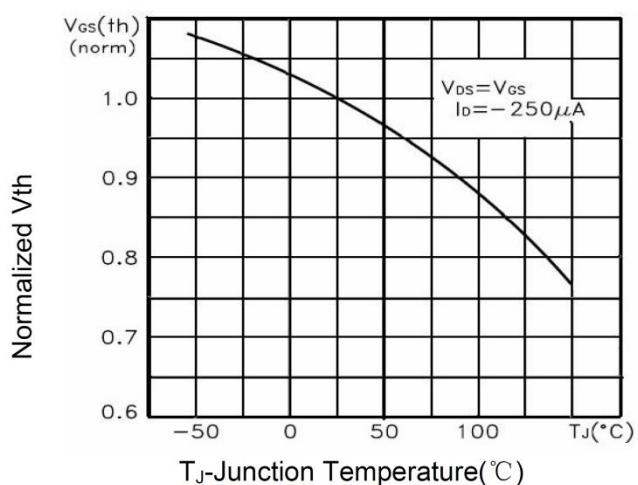


Figure 10 VGS(th) vs Junction Temperature

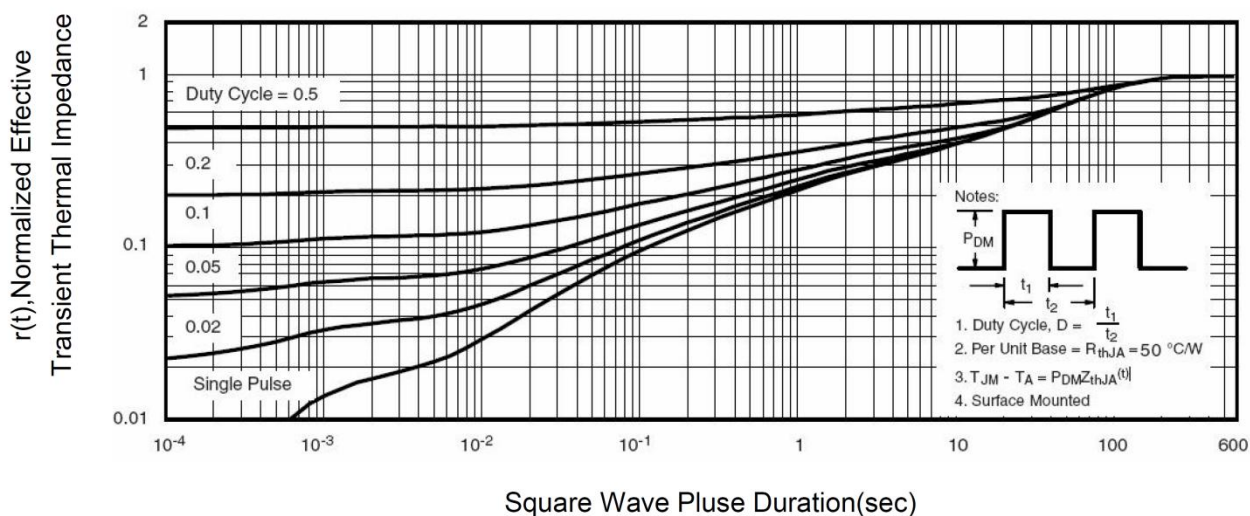
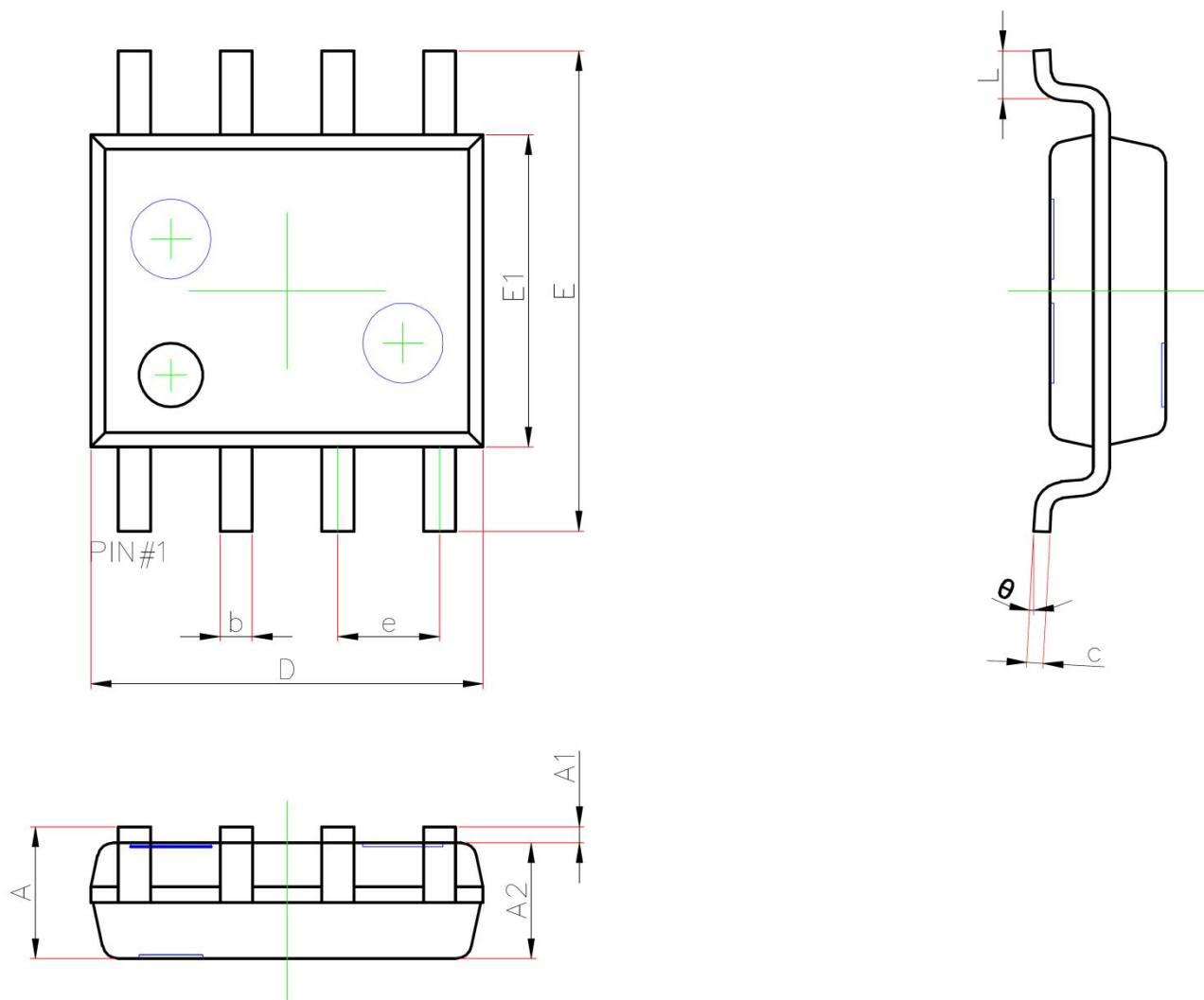


Figure 11 Normalized Maximum Transient Thermal Impedance

SOP-8L Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	1.35	1.75
A1	0.10	0.25
A2	1.35	1.55
b	0.33	0.51
c	0.17	0.25
D	4.80	5.00
e	1.27 REF.	
E	5.80	6.20
E1	3.80	4.00
L	0.40	1.27
θ	0°	8°