

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
60V	35mΩ@10V	5A
	45mΩ@4.5V	
-60V	68mΩ@-10V	-4A
	75mΩ@-4.5V	

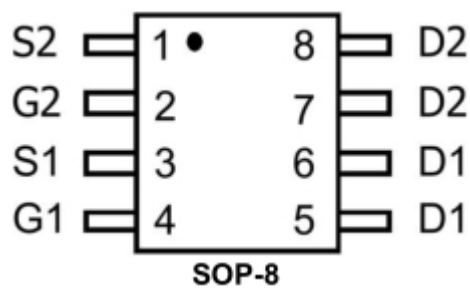
Feature

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

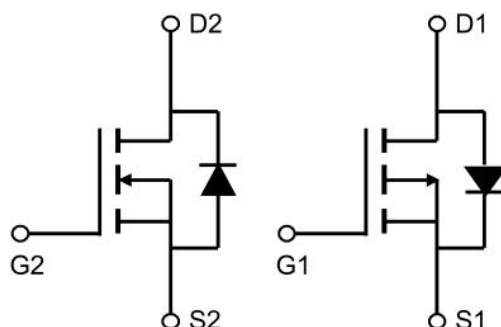
Application

- H-bridge
- Inverters

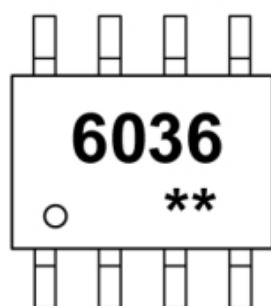
Package



Circuit diagram



Marking



6036 = Device code
** = Week Code

Absolute maximum ratings

($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value		Unit
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	60	-60	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current	I_D	5	-4	A
		3.5	-2.8	
Pulsed Drain Current (Note 1)	I_{DM}	17	-14	A
Maximum Power Dissipation	P_D	2	2	W
Thermal Resistance, Junction-to- Ambient (Note 2)	$R_{\theta JA}$	62.5		$^{\circ}\text{C}/\text{W}$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55~ +150		$^{\circ}\text{C}$

N-Channel Electrical characteristics

($T_A=25^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV (BR)DSS	V _{GS} = 0V, I _D =250μA	60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} = 0V			1	uA
Gate-Body Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V			±100	uA
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-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 (Note 4)						
Input capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f=1MHz		451		pF
Output capacitance	C _{OSS}			61		
Reverse transfer capacitance	C _{rss}			26		
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		
Turn-Off Delay Time	T _{d(off)}			16		
Turn-Off Fall Time	t _f			2		
Total gate charge	Q _g	V _{DS} =30V, I _D =5A, V _{GS} =10V		10		nC
Gate-source charge	Q _{gs}			2.5		
Gate-drain charge	Q _{gd}			3.4		
Source-Drain Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	I _S =1A, V _{GS} =0V			1.2	V
Diode Forward Current (Note 2)	I _S				5	A
Reverse Recovery Time	t _{rr}	T _j = 25°C, I _F =5A		28		nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs(Note3)		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

($T_A=25^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$BV_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	60			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -60V, V_{GS} = 0V$			1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.0	-1.5	-2.5	V
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -3.5A$		68	85	m Ω
		$V_{GS} = -4.5V, I_D = -2.5A$		75	100	
Forward Transconductance	g_{FS}	$V_{DS} = -5V, I_D = -4A$	11			S
Dynamic Characteristics (Note 4)						
Input capacitance	C_{iss}	$V_{DS} = -30V, V_{GS} = 0V,$ $f = 1MHz$		960		pF
Output capacitance	C_{oss}			87		
Reverse transfer capacitance	C_{rss}			38		
Switching Characteristics (Note 4)						
Turn-on Delay Time	$T_{d(on)}$	$V_{DD} = -30V, R_L = 2.5\Omega,$ $V_{GS} = -10V, R_G = 3\Omega$		9		nS
Turn-on Rise Time	T_r			11		
Turn-Off Delay Time	$T_{d(off)}$			25		
Turn-Off Fall Time	t_f			12		
Total gate charge	Q_g	$V_{DS} = -30V, I_D = 10A,$ $V_{GS} = -10V$		15.7		nC
Gate-source charge	Q_{gs}			3		
Gate-drain charge	Q_{gd}			3.5		
Source-Drain Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$I_S = -4A, V_{GS} = 0V$			-1.2	V
Diode Forward Current (Note 2)	I_S				-4	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = -4A$		26.5		nS
Reverse Recovery Charge	Q_{rr}	$di/dt = 100A/\mu s$ (Note 3)		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

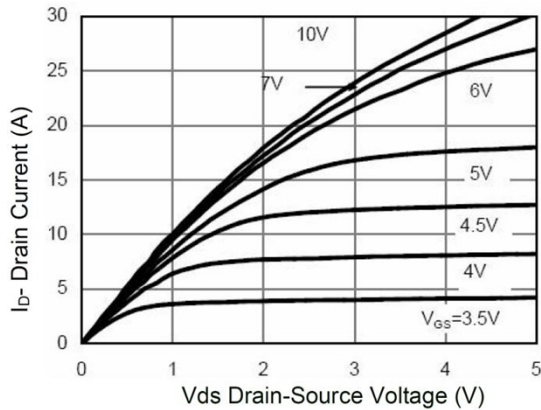


Figure 1 Output Characteristics

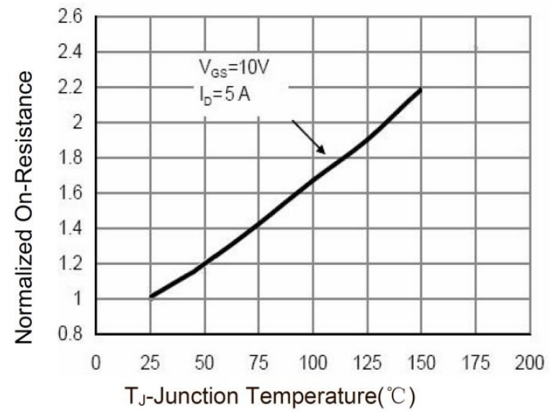


Figure 4 Rdson-Junction Temperature

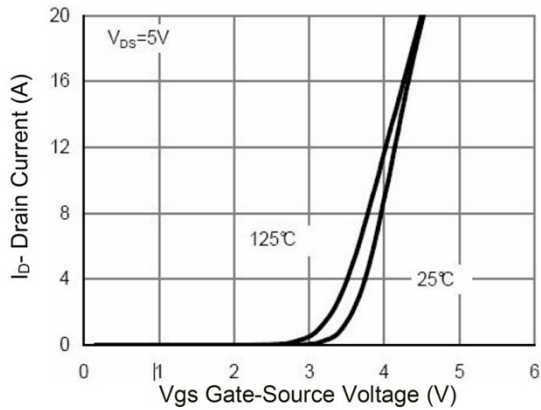


Figure 2 Transfer Characteristics

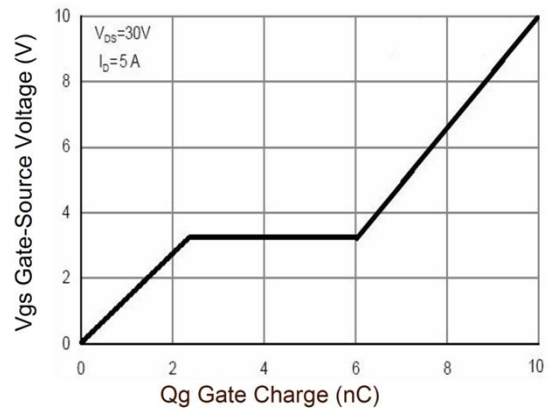


Figure 5 Gate Charge

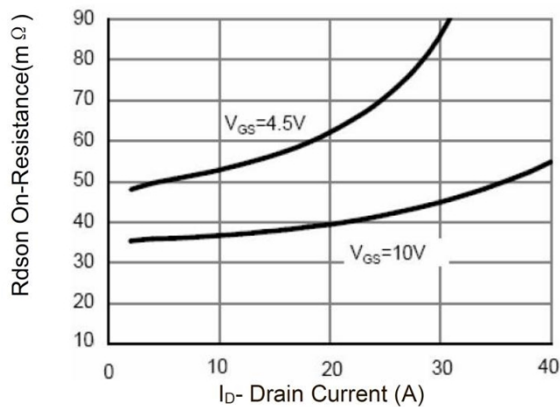


Figure 3 Rdson- Drain Current

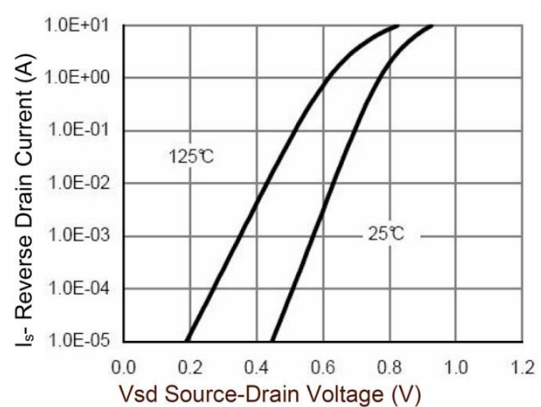


Figure 6 Source- Drain Diode Forward

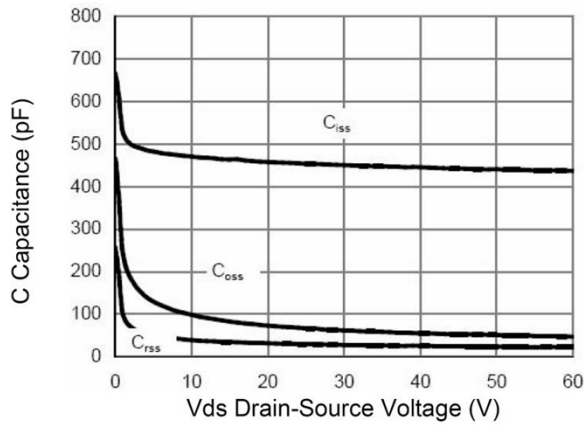


Figure 7 Capacitance vs Vds

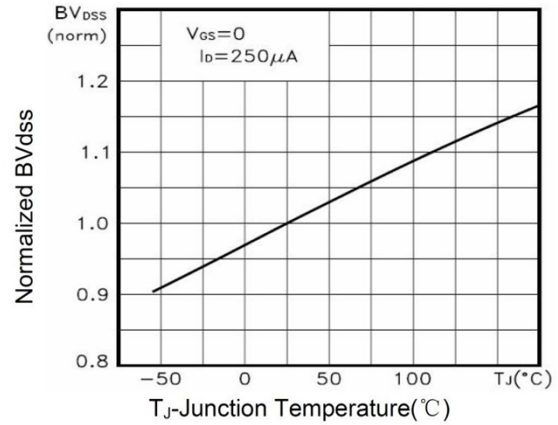
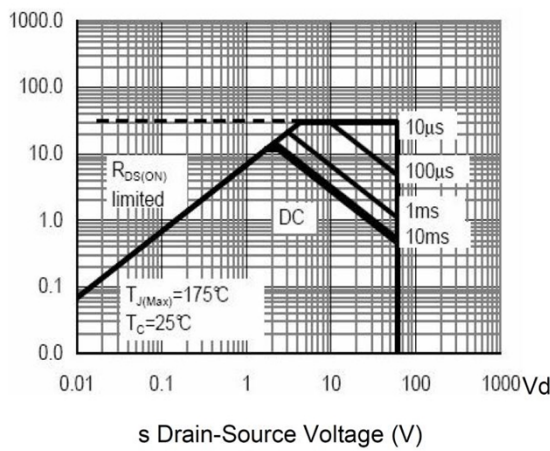

Figure 9 BV_{DSS} vs Junction Temperature


Figure 8 Safe Operation Area

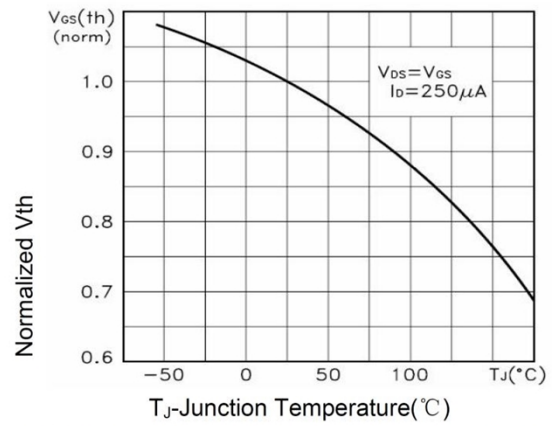
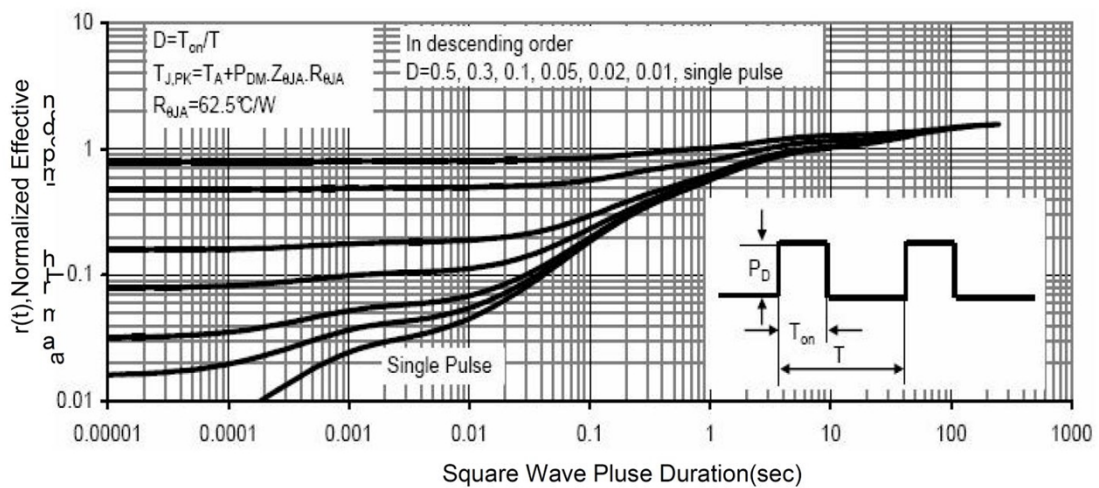
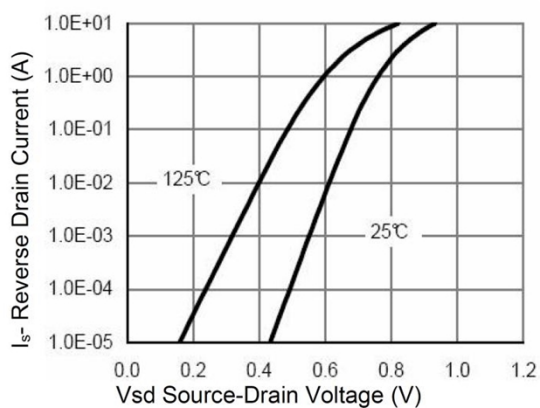
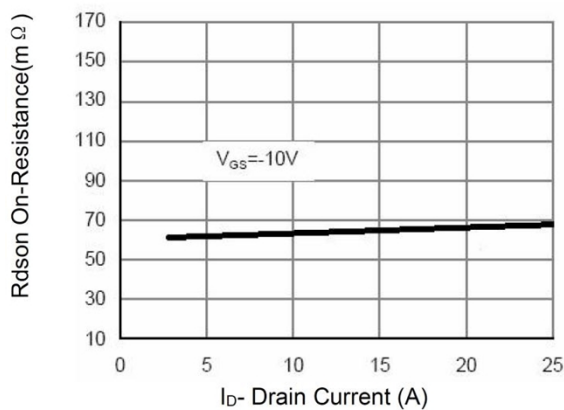
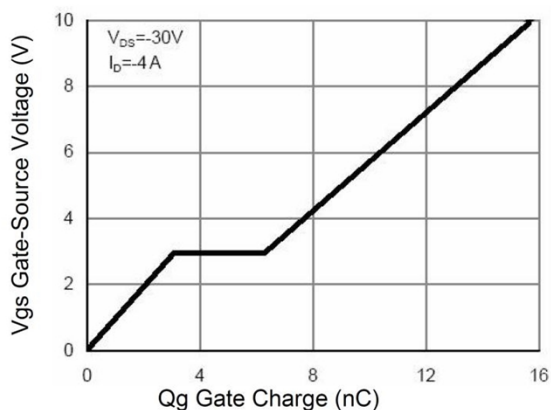
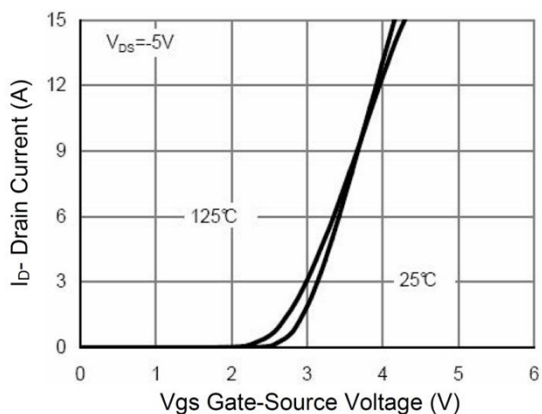
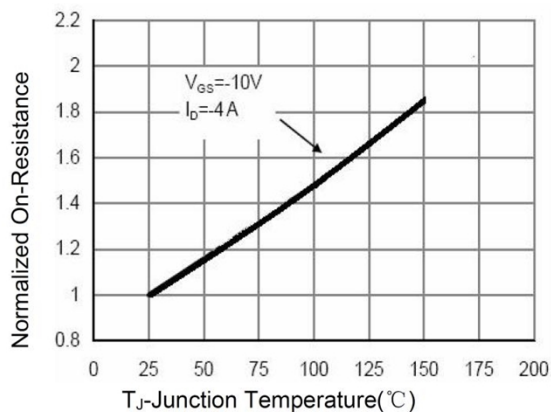
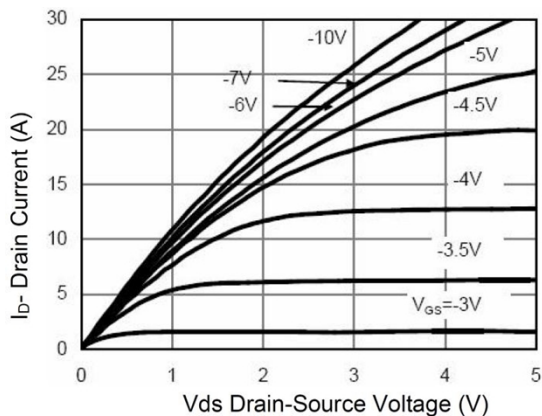

Figure 10 V_{GS(th)} vs Junction Temperature


Figure 11 Normalized Maximum Transient Thermal Impedance

P-Channel Typical Characteristics



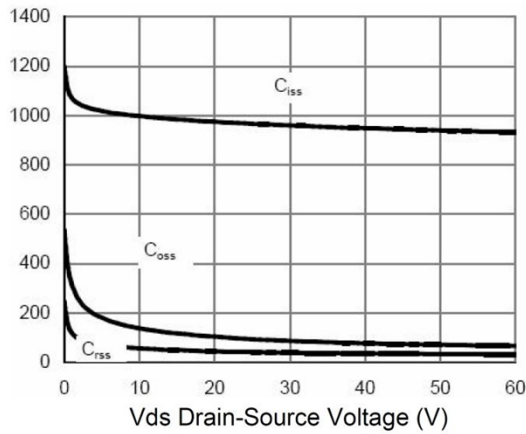


Figure 7 Capacitance vs Vds

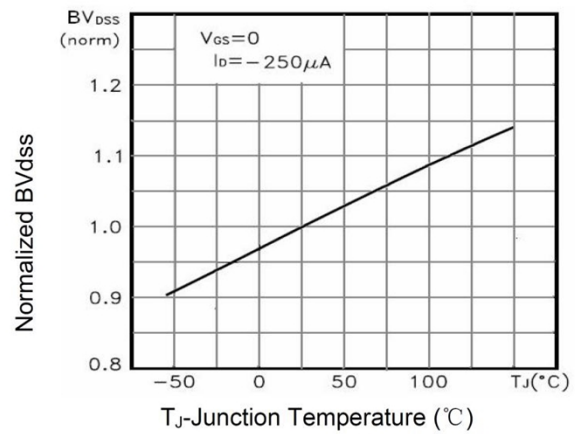


Figure 9 BV_{DSS} vs Junction Temperature

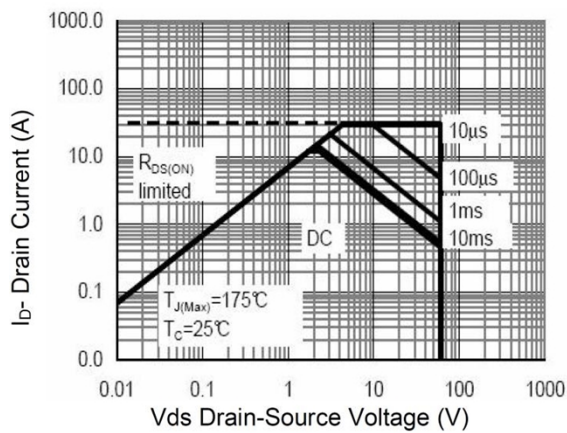


Figure 8 Safe Operation Area

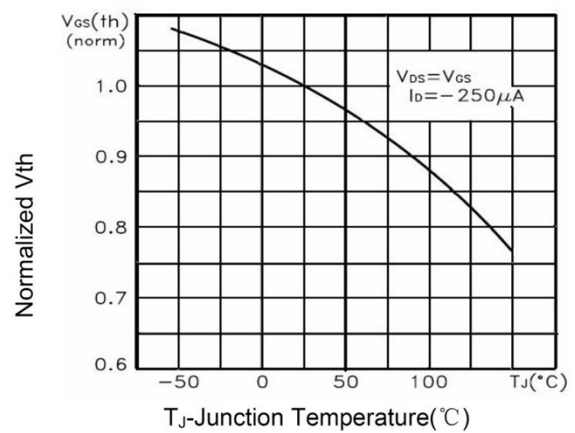


Figure 10 V_{GS(th)} vs Junction Temperature

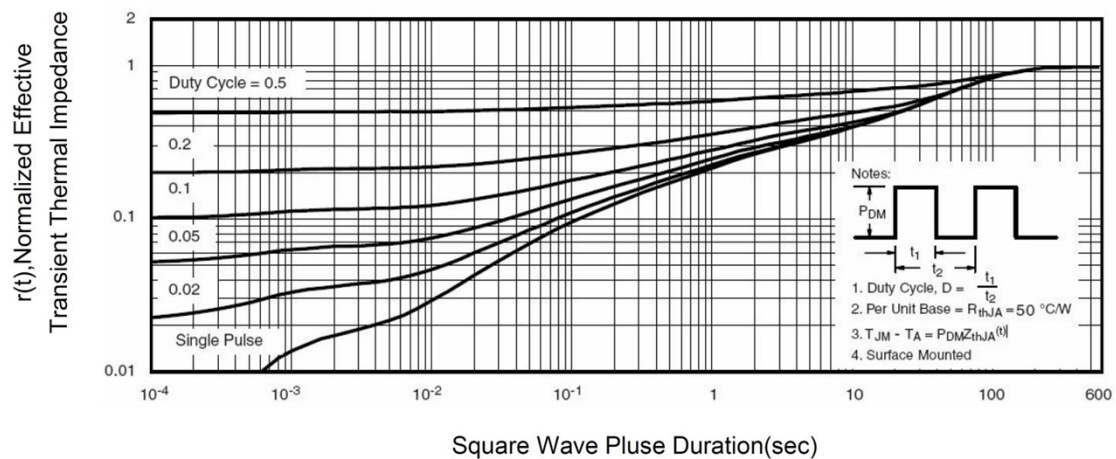
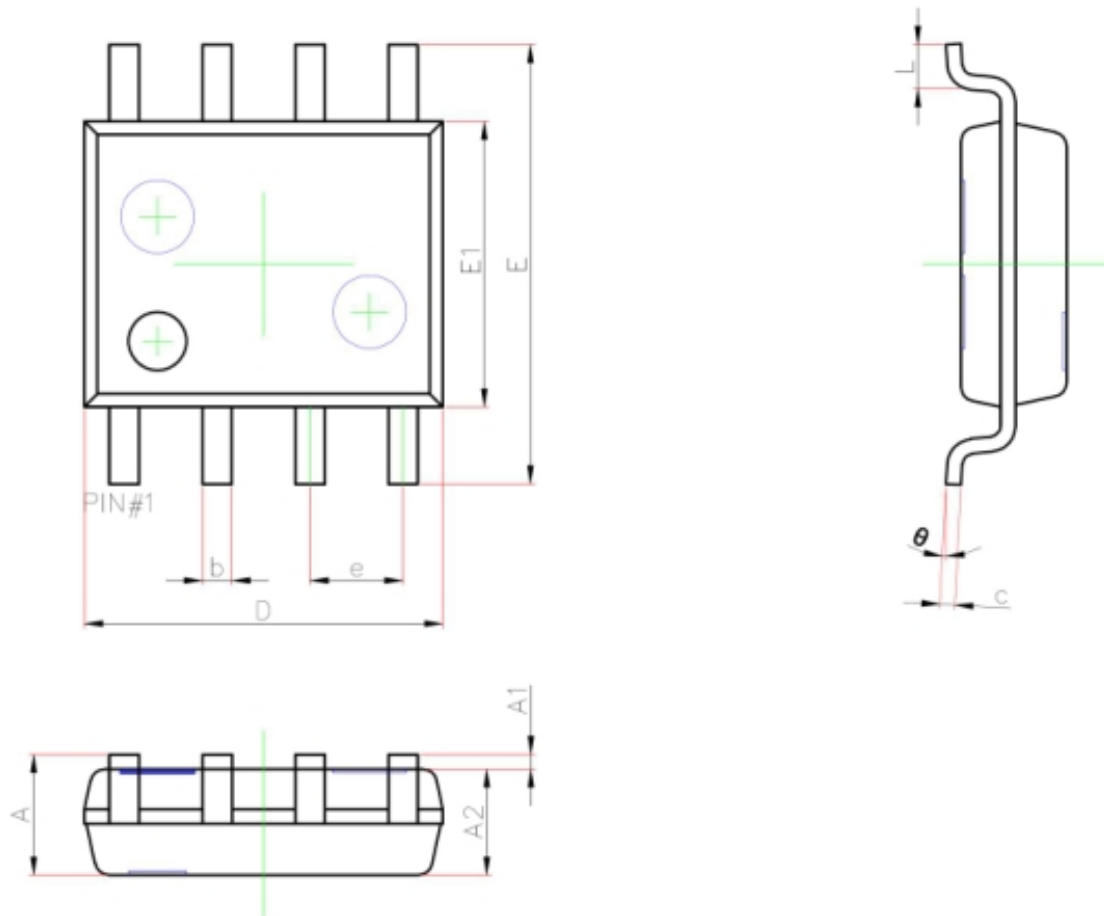


Figure 11 Normalized Maximum Transient Thermal Impedance

SOP-8 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°