N and P-Channel Enhancement Mode Power MOSFET

TF08NP02U

20V Complementary MOSFET

Product Summary

N-Channel	P-Channel
V_{DS}= 20V	-20V
I_D= 9.0A	-8.2A
$R_{DSON(TYP)}$	$R_{DSON(TYP)}$
< 23mΩ (V_{GS}=4.5V)	< 30mΩ (V_{GS}=-4.5V)
< 28mΩ (V_{GS}=2.5V)	< 37mΩ (V_{GS} =-2.5V)

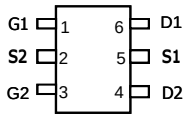
FEATURE

High power and current handing capability

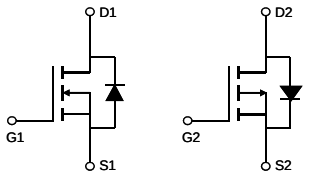
Lead free product is acquired

Surface mount package

SOT-23-6L

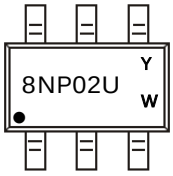


Equivalent Circuit



n-channel **p-channel**

MARKING



Y :year code W :week code

Absolute Maximum Ratings T =25℃ unless otherwise noted					
Parameter		**Symbol**	**Max n-channel**	**Max p-channel**	**Units**
Drain-Source Voltage		V_{DS}	20	-20	V
Gate-Source Voltage		V_{GS}	±8	±8	V
Continuous Drain Current	T_A=25℃	I_D	9.0	-8.2	A
Pulsed Drain Current [C]		I_{DM}	16	-14	
Power Dissipation [B]	T_A=25℃	P_D	1.3	1.2	W
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		℃

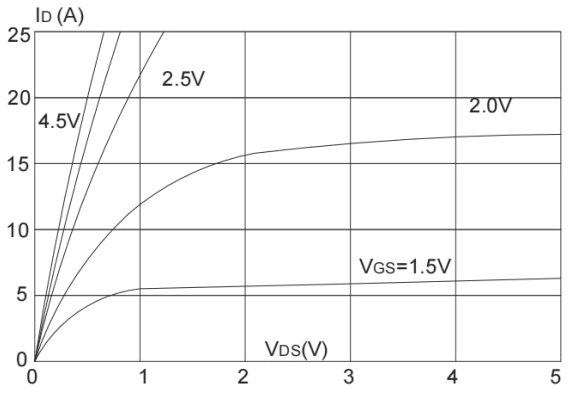
Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	78	110	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		106	150	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	64	80	℃/W

N-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

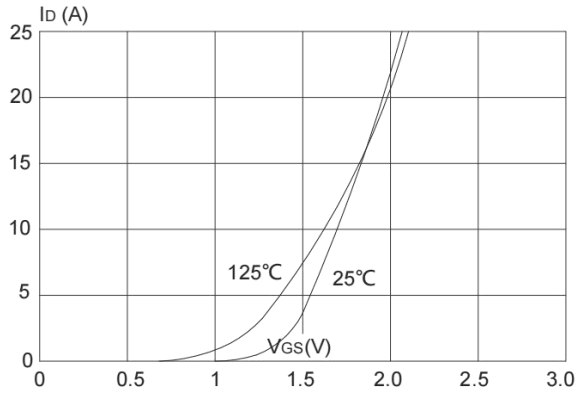
Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250μA, V_{GS}=0V	20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V, V_{GS}=0V			1	μA
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±12V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250μA	0.4	0.7	1	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	13			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=4.5V, I_D=5A		23	28	mΩ
		V_{GS}=2.5V, I_D=3A		28	35	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3A		16		S
V_{SD}	Diode Forward Voltage	I_S=3A,V_{GS}=0V		0.85	1	V
I_S	Maximum Body-Diode Continuous Current				3.0	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz		358		pF
C_{oss}	Output Capacitance			69.3		pF
C_{rss}	Reverse Transfer Capacitance			58.5		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		2.0		Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=2A		5.6		nC
Q_{gs}	Gate Source Charge			0.8		nC
Q_{gd}	Gate Drain Charge			1.0		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=4.5V, V_{DS}=10V, R_G=3Ω, ID=4A		5		ns
t_r	Turn-On Rise Time			30		ns
$t_{D(off)}$	Turn-Off DelayTime			48		ns
t_f	Turn-Off Fall Time			36		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=3A, dI/dt=100A/μs		14	19	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=3.4A, dI/dt=100A/μs		3.8		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

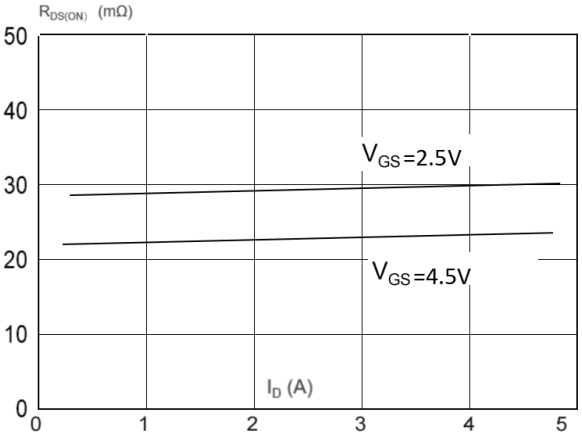
N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



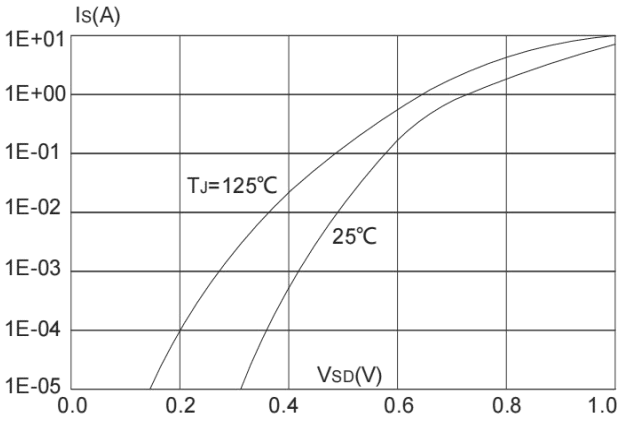
Output Characteristics



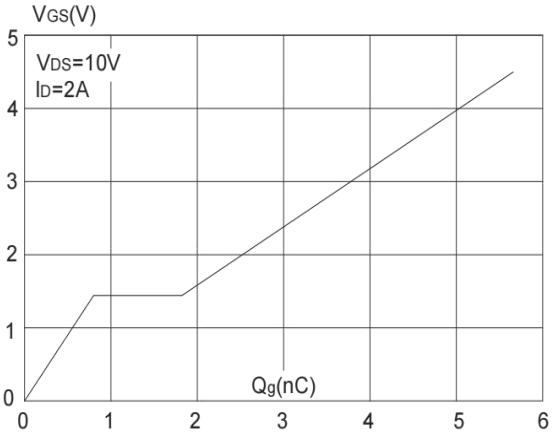
Typical Transfer Characteristics



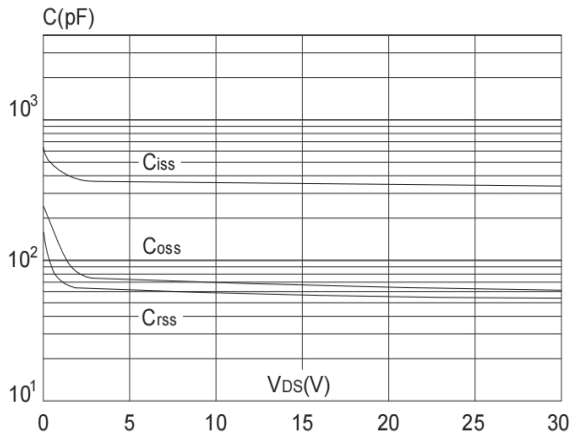
On-resistance vs. Drain Current



Body Diode Characteristics

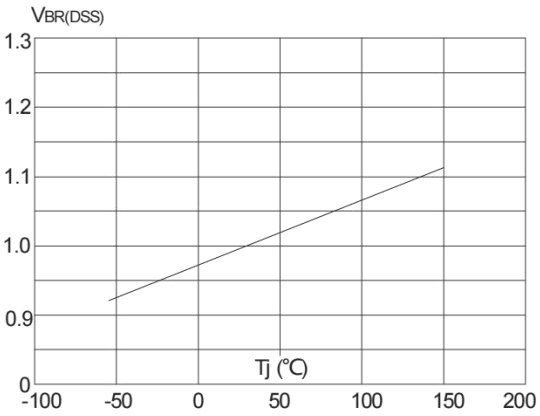


Gate Charge Characteristics



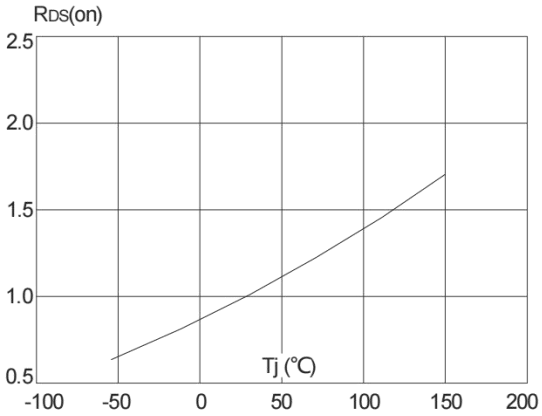
Capacitance Characteristics

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



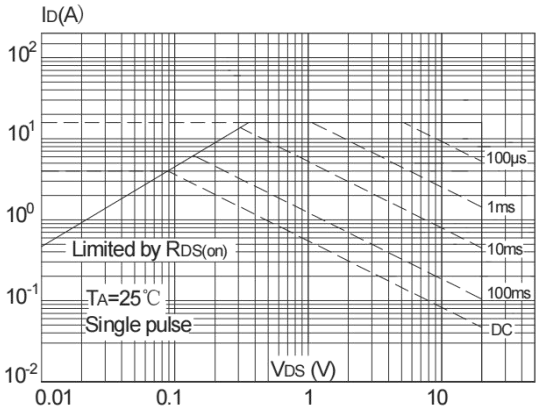
Normalized Breakdown Voltage vs.

Junction Temperature

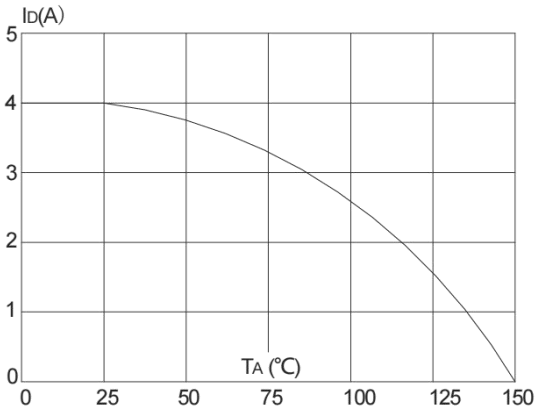


Normalized on Resistance vs.

Junction Temperature

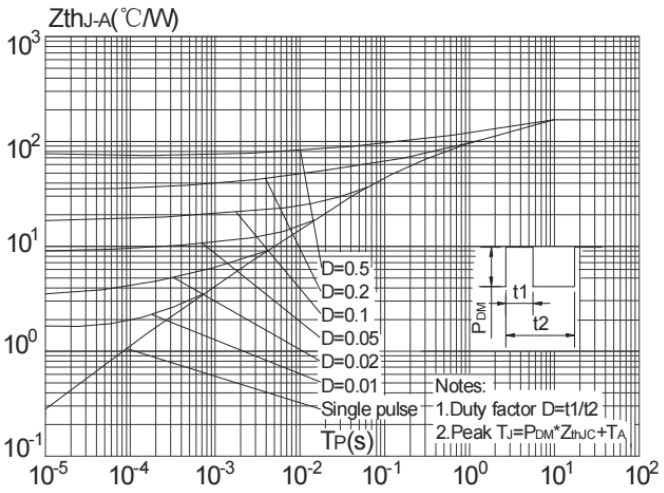


Maximum Safe Operating Area



Maximum Continuous Drain Current vs.

Case Temperature



Maximum Effective Transient

Thermal Impedance, Junction-to-Case

P-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250μA, V_{GS}=0V	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-20V, V_{GS}=0V			-1	μA
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250μA	-0.4	-0.65	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-13			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-4.1A		30	35	mΩ
		V_{GS}=-2.5V, I_D=-3A		37	42	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-4.1A		13		S
V_{SD}	Diode Forward Voltage	I_S=-3A,V_{GS}=0V		-0.85	-1	V
I_S	Maximum Body-Diode Continuous Current				-3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		1010		pF
C_{oss}	Output Capacitance			130		pF
C_{rss}	Reverse Transfer Capacitance			109		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		12		Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-4A		11		nC
Q_{gs}	Gate Source Charge			2.2		nC
Q_{gd}	Gate Drain Charge			2.5		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_G=3Ω, V_{GEN}=-4.5		8.5		ns
t_r	Turn-On Rise Time			36		ns
$t_{D(off)}$	Turn-Off DelayTime			77		ns
t_f	Turn-Off Fall Time			56		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-2.5A, dI/dt=100A/μs		37	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-2.5A, dI/dt=100A/μs		27		nC

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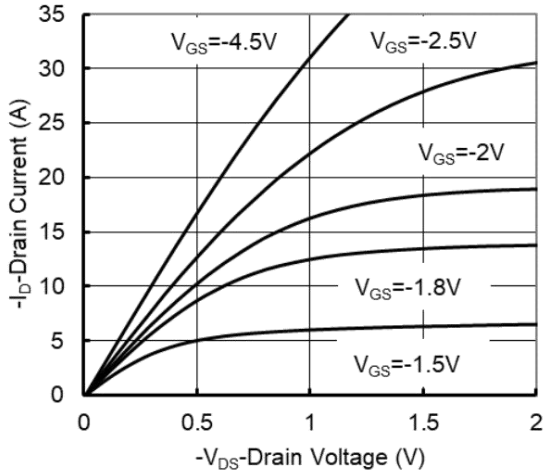
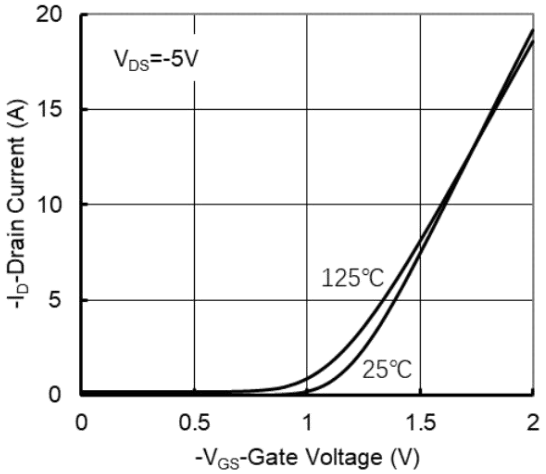
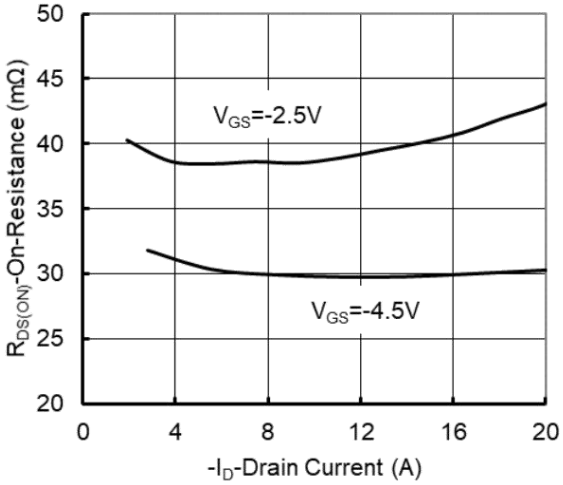
P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



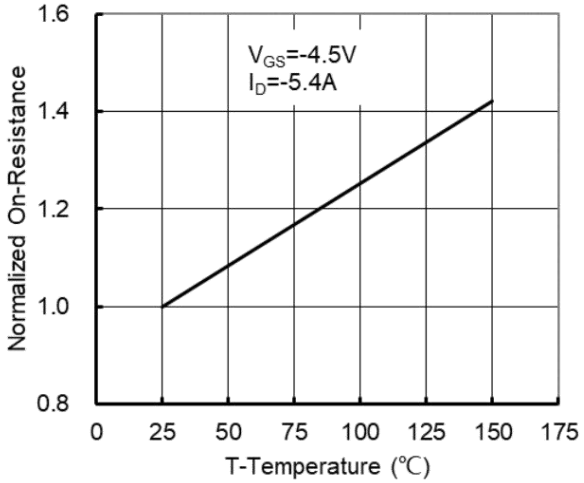
Output Characteristics



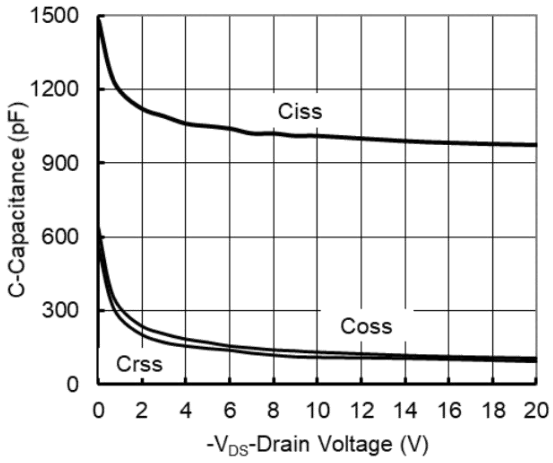
Transfer Characteristics



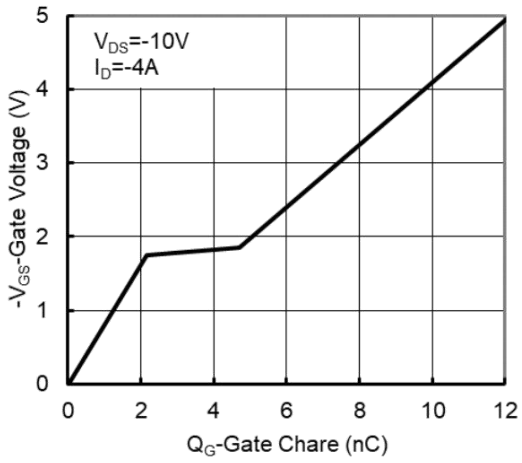
On-resistance vs. Drain Current



On-Resistance vs. Junction Temperature

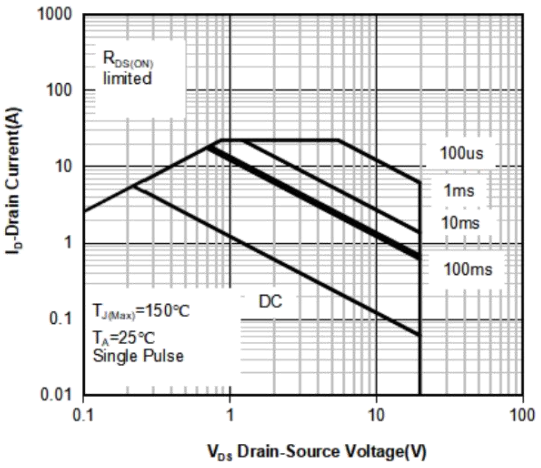


Capacitance Characteristics

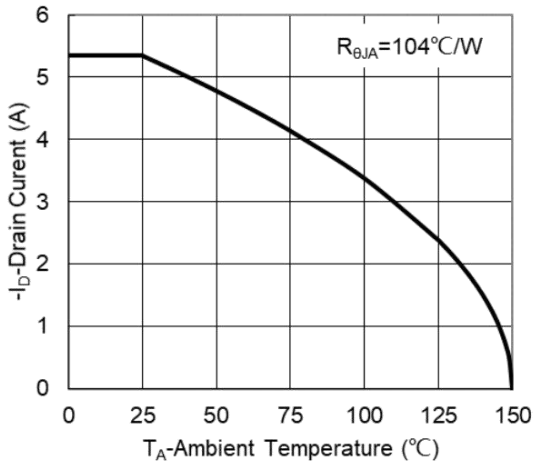


Gate Charge

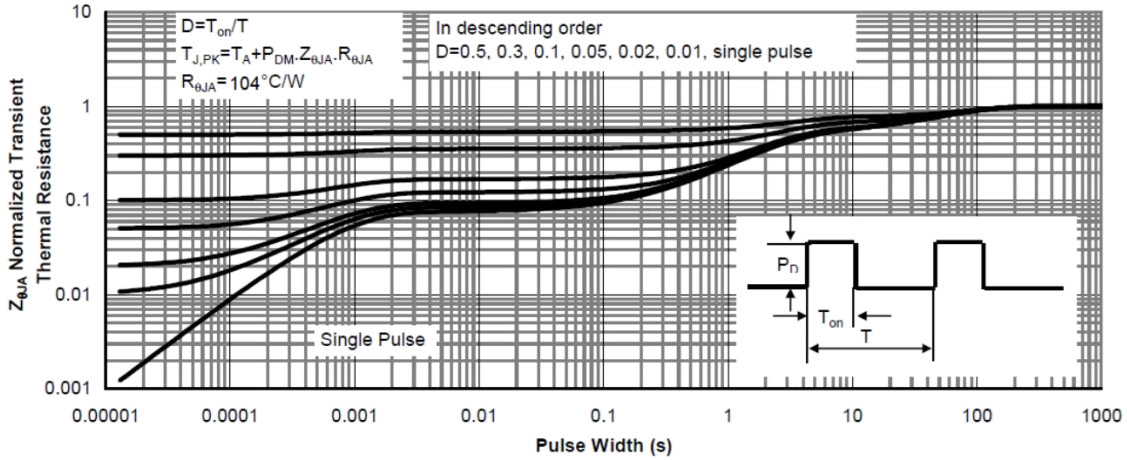
P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



Safe Operating Area

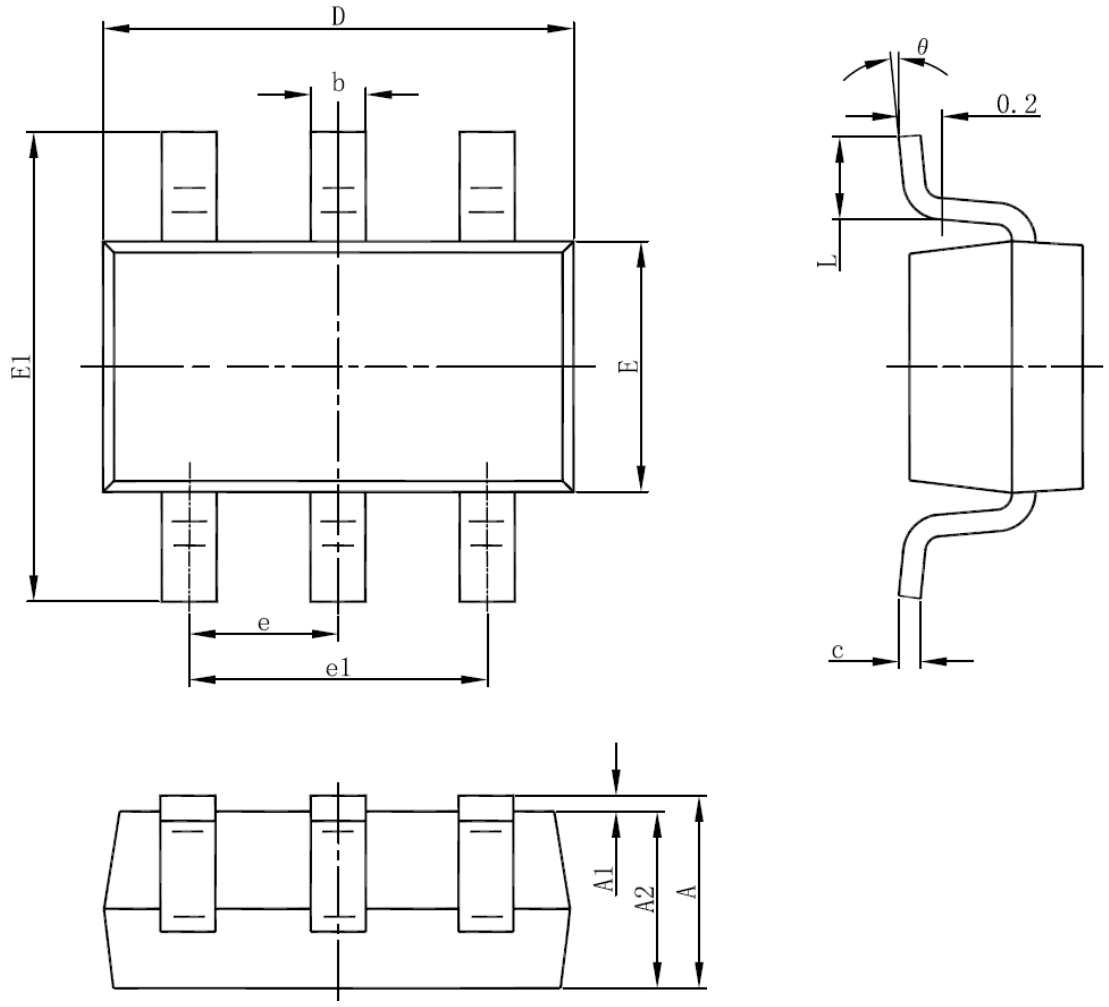


Maximum Continuous Drain Current vs. Ambient Temperature



Normalized Maximum Transient Thermal Impedance

SOT23-6 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°