

WCM2002

N- and P-Channel, 20V, Small signal MOSFET

V_{DS} (V)	$R_{DS(on)}$ (Ω)
N-Channel 20	0.230@ $V_{GS}=4.5V$
	0.275@ $V_{GS}=2.5V$
	0.330@ $V_{GS}=1.8V$
P-Channel -20	0.520@ $V_{GS} = -4.5V$
	0.685@ $V_{GS} = -2.5V$
	0.890@ $V_{GS} = -1.8V$

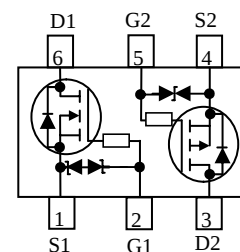
[Http://www.willsemi.com](http://www.willsemi.com)



SOT-363

Descriptions

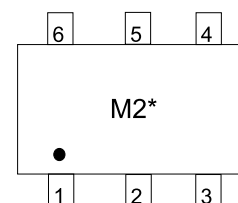
The WCM2002 is the N- and P-Channel enhancement MOS Field Effect Transistor as a single package for DC-DC converter or level shift applications, uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Standard Product WCM2002 is Pb-free.



Pin configuration (Top View)

Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Small package SOT-363



M2 = Device Code

* = Date Code

Marking

Applications

- Driver: Relays, Solenoids, Lamps, Hammers
- Power supply converters circuit
- Load/Power Switching for potable device

Order Information

Device	Package	Shipping
WCM2002-6/TR	SOT-363	3000/Tape&Reel

Absolute Maximum Ratings

(T_A=25°C unless otherwise noted)

Parameter		Symbol	N-Channel		P-Channel		Unit
			10 S	Steady State	10 S	Steady State	
Drain-Source Voltage		V _{DS}	+20		-20		V
Gate-Source Voltage		V _{GS}	±6				V
Continuous Drain Current ^a	T _A =25°C	I _D	0.88	0.80	-0.66	-0.59	A
	T _A =70°C		0.7	0.64	-0.53	-0.47	
Maximum Power Dissipation ^a	T _A =25°C	P _D	0.38	0.31	0.37	0.29	W
	T _A =70°C		0.24	0.2	0.24	0.19	
Continuous Drain Current ^b	T _A =25°C	I _D	0.75	0.69	-0.56	-0.51	A
	T _A =70°C		0.6	0.55	-0.45	-0.41	
Maximum Power Dissipation ^b	T _A =25°C	P _D	0.28	0.23	0.27	0.22	W
	T _A =70°C		0.17	0.15	0.17	0.14	
Pulsed Drain Current ^c		I _{DM}	1.4		-1.0		A
Operating Junction Temperature		T _J	150				°C
Lead Temperature		T _L	260				°C
Storage Temperature Range		T _{stg}	-55 to 150				°C

Thermal resistance ratings

Parameter		Symbol	N-Channel		P-Channel		Unit
			Typical	Maximum	Typical	Maximum	
Junction-to-Ambient Thermal Resistance ^a	t ≤ 10 s	R _{θJA}	276	325	280	330	°C/W
	Steady State		328	395	340	420	
Junction-to-Ambient Thermal Resistance ^b	t ≤ 10 s	R _{θJA}	375	445	380	455	
	Steady State		446	532	460	545	
Junction-to-Case Thermal Resistance	Steady State	R _{θJC}	260	300	280	320	

a Surface mounted on FR4 Board using 1 square inch pad size, 1oz copper

b Surface mounted on FR4 board using minimum pad size, 1oz copper

c Repetitive rating, pulse width limited by junction temperature, t_p=10μs, Duty Cycle=1%

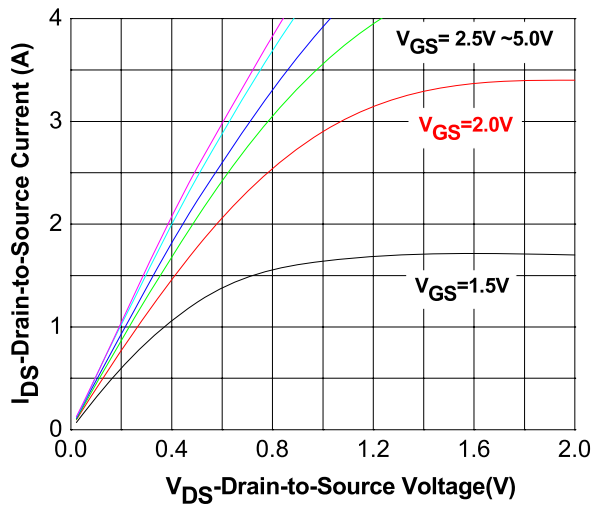
d Repetitive rating, pulse width limited by junction temperature T_J=150°C.

Electronics Characteristics (T_A=25°C unless otherwise noted)

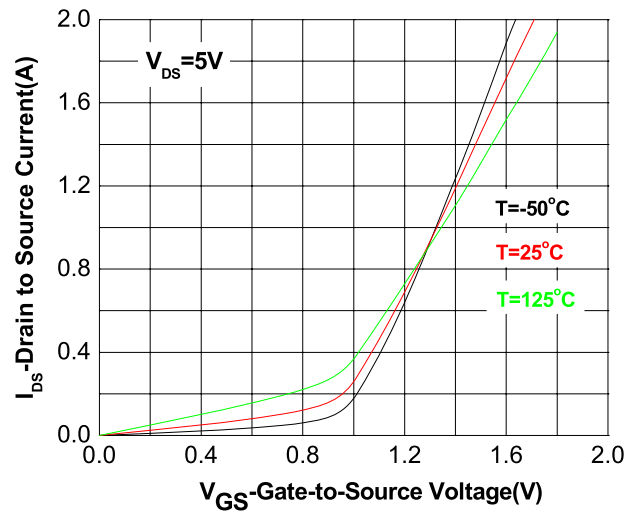
Symbol	Parameter	Test Condition	Min	Typ.	Max	Unit	
Off Characteristics							
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	N-Ch	20		V	
		V _{GS} =0V, I _D =-250uA	P-Ch	-20			
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =16 V, V _{GS} =0V	N-Ch		1	uA	
		V _{DS} =-16 V, V _{GS} =0V	P-Ch		-1		
I _{GSS}	Gate –Source leakage current	V _{DS} =0V, V _{GS} =±5V	N-Ch		±5	uA	
			P-Ch		±5		
ON Characteristics							
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =250uA	N-Ch	0.4	0.55	0.9	V
		V _{DS} = V _{GS} , I _D =-250uA	P-Ch	-0.4	0.62	-0.9	
R _{DS(on)}	Drain-Source On-Resistance	V _{GS} =4.5V, I _D =0.55A	N-Ch		230	310	mΩ
		V _{GS} =-4.5V, I _D =-0.45A	P-Ch		520	810	
		V _{GS} =2.5V, I _D =0.45A	N-Ch		275	360	
		V _{GS} =-2.5V, I _D =-0.35A	P-Ch		685	1050	
		V _{GS} =1.8V, I _D =0.35A	N-Ch		330	460	
		V _{GS} =-1.8V, I _D =-0.25A	P-Ch		890	1300	
g _{FS}	Forward Transconductance	V _{DS} = 5 V, I _D = 0.55A	N-Ch		2.0		S
		V _{DS} = -5 V, I _D = -0.45A	P-Ch		1.25		
Dynamic Characteristics							
C _{iss}	Input Capacitance	NMOS: V _{DS} =10V, V _{GS} =0V, F=100KHz PMOS:V _{DS} =-10V, V _{GS} =0V, F=100KHz	N-Ch		50		pF
			P-Ch		74.5		
C _{oss}	Output Capacitance		N-Ch		13		
			P-Ch		10.8		
Cr _{ss}	Reverse Transfer Capacitance		N-Ch		8		
			P-Ch		10.2		
Q _{G(TOT)}	Total Gate Charge	NMOS: V _{DS} =10V, V _{GS} =4.5V , I _D = 0.55A PMOS: V _{DS} =-10V, V _{GS} =-4.5V, I _D =-0.45A	N-Ch		1.15		nC
			P-Ch		1.8		
Q _{G(TH)}	Threshold gate charge		N-Ch		0.06		
			P-Ch		0.12		
Q _{GS}	Gate-Source Charge		N-Ch		0.15		
			P-Ch		0.18		
Q _{GD}	Gate-Drain Charge		N-Ch		0.23		
			P-Ch		0.74		

Symbol	Parameter	Test Condition	Min	Typ.	Max	Unit	
Switching Characteristics							
td(on)	Turn-On Delay Time	NMOS:V _{DD} =10V, V _{GEN} =4.5V, R _G =6Ω I _D =0.55A	N-Ch		22	ns	
			P-Ch		45		
tr	Turn-On Rise Time		N-Ch		80		
			P-Ch		140		
td(off)	Turn-Off Delay Time	PMOS:V _{DD} =-10V, V _{GEN} =-4.5V, R _G =6Ω I _D =-0.45A	N-Ch		700		
			P-Ch		1500		
tf	Turn-Off Fall Time		N-Ch		380		
			P-Ch		2100		
Drain-to-Source Diode Characteristics							
V _{SD}	Forward Diode Voltage	V _{GS} =0V, I _S =0.15A	N-Ch	0.5	0.70	1.5	V
		V _{GS} =0V, I _S =-0.15A	P-Ch	-0.5	-0.65	-1.5	

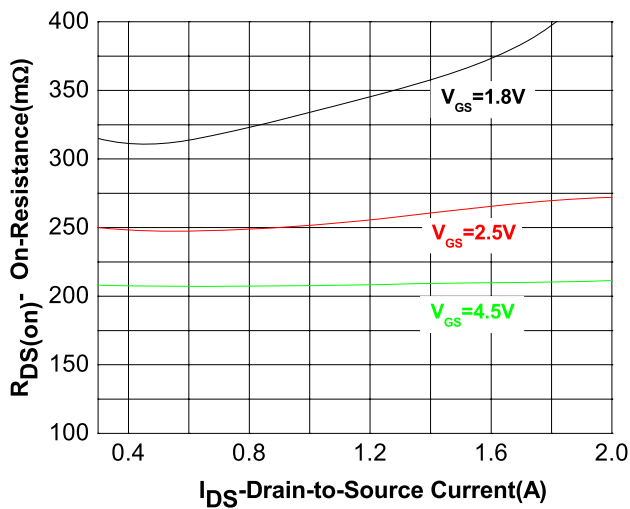
NMOS Typical Characteristics (Ta=25°C, unless otherwise noted)



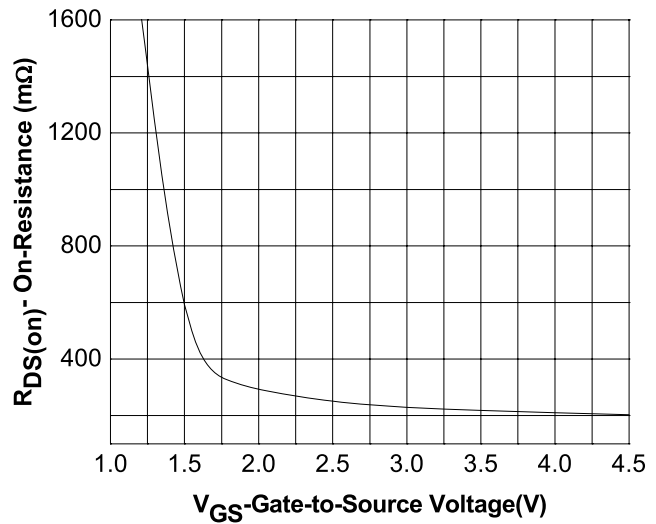
Output characteristics



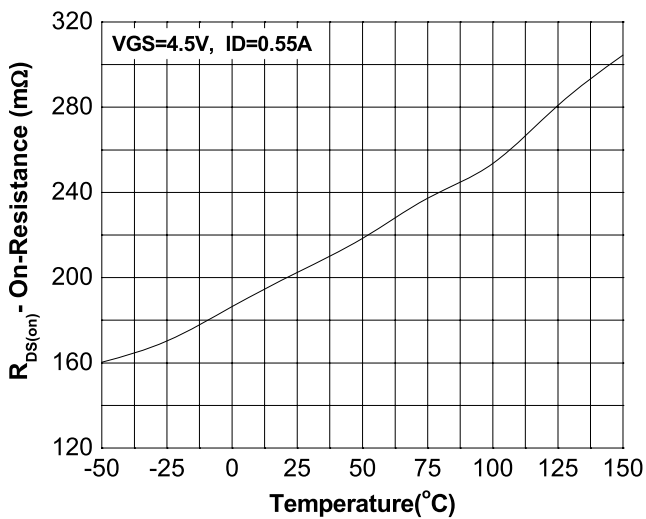
Transfer characteristics



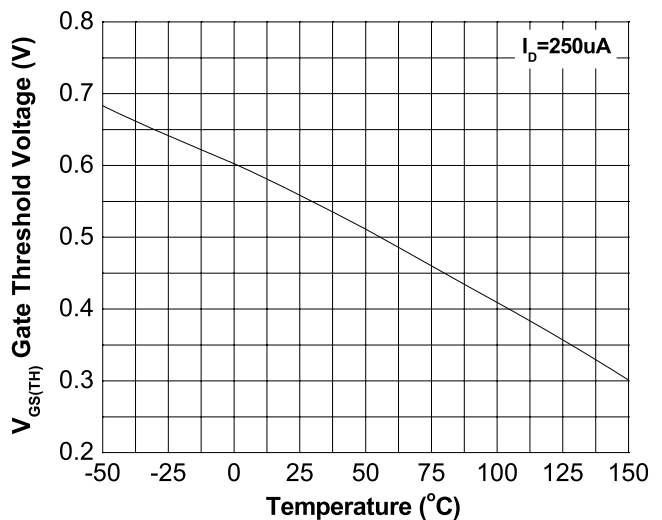
On-Resistance vs. Drain current



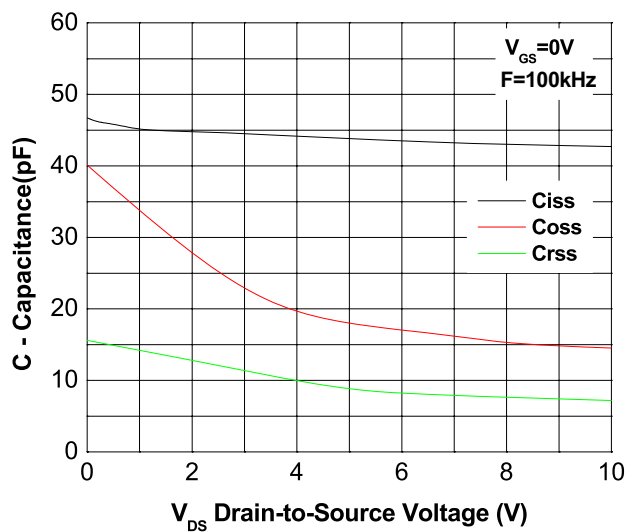
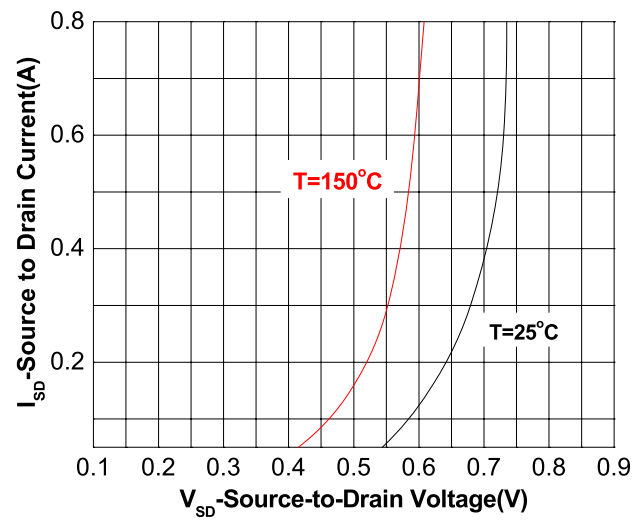
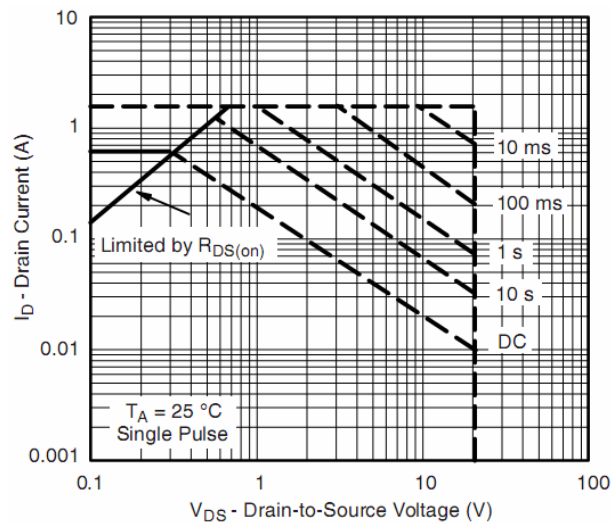
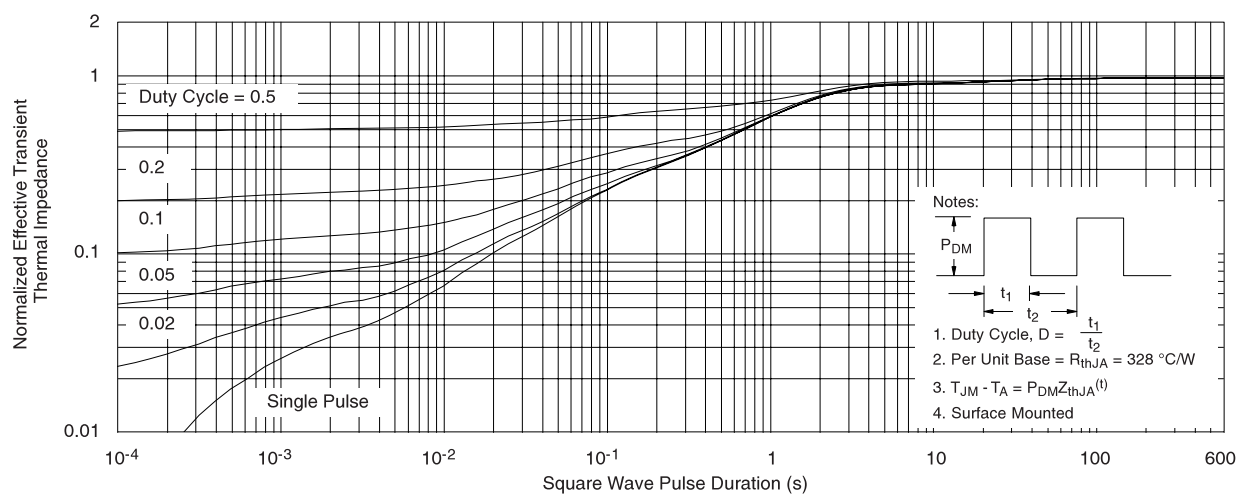
On-Resistance vs. Gate-to-Source voltage

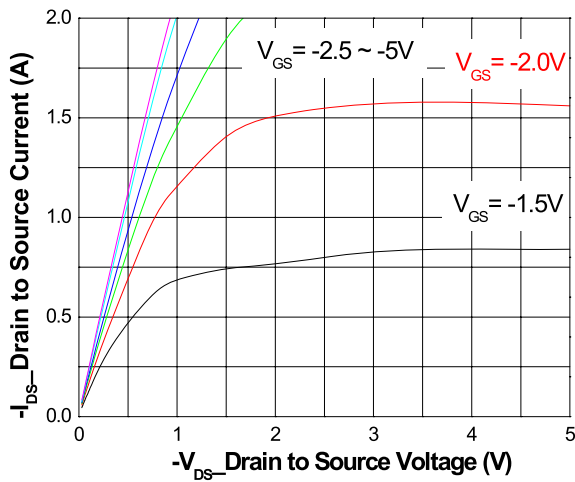
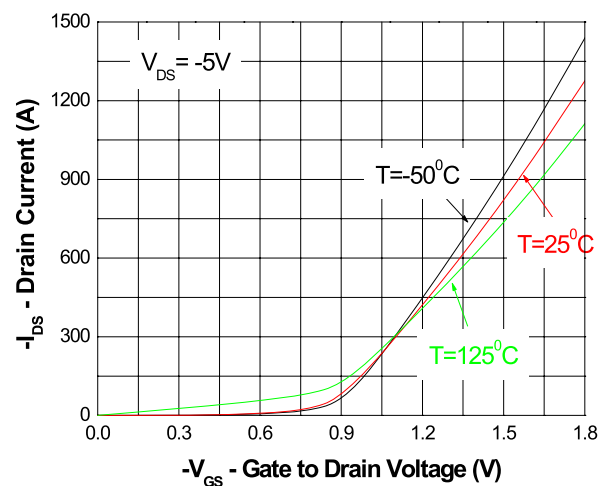
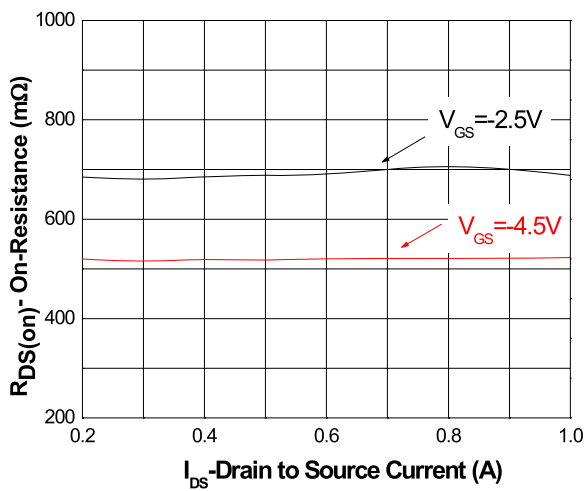
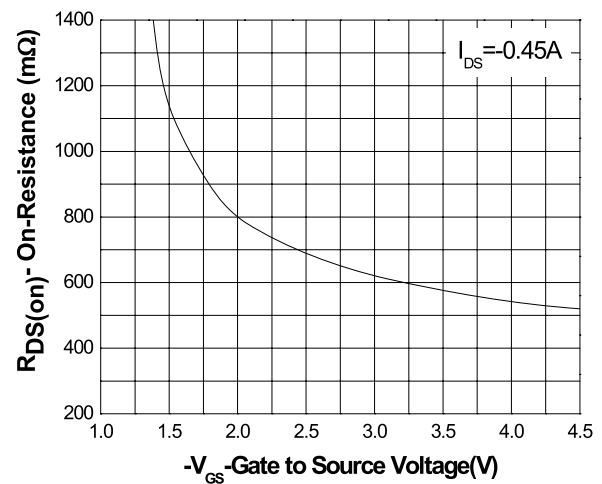
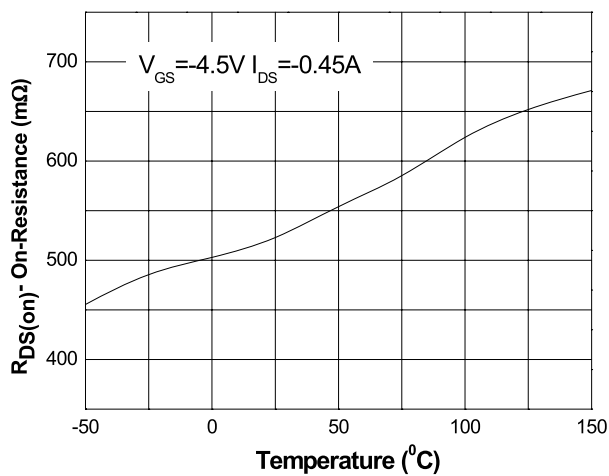
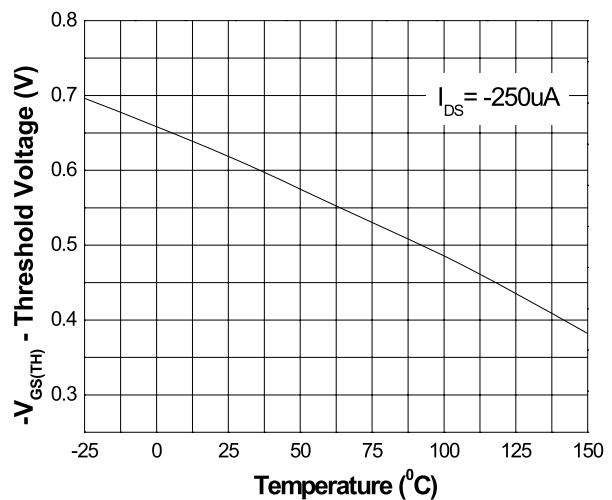


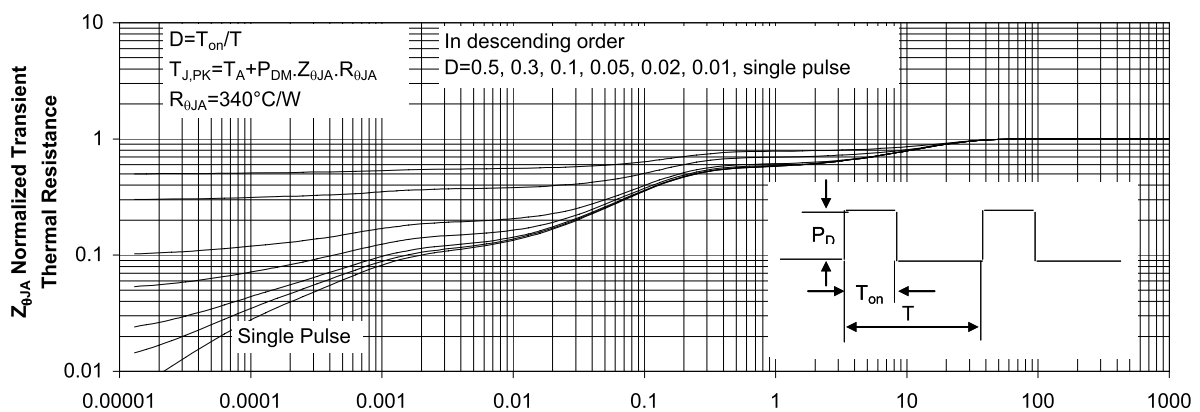
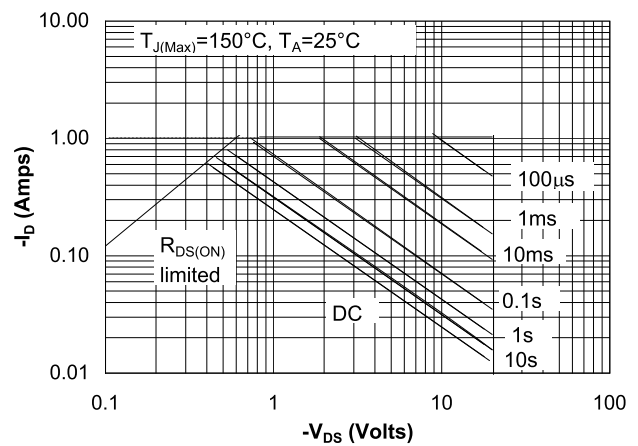
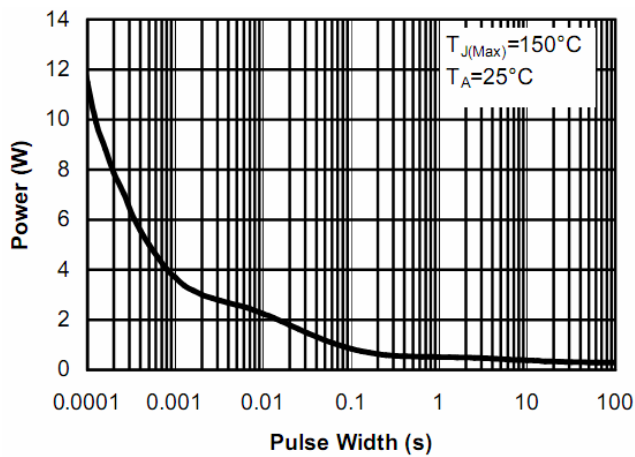
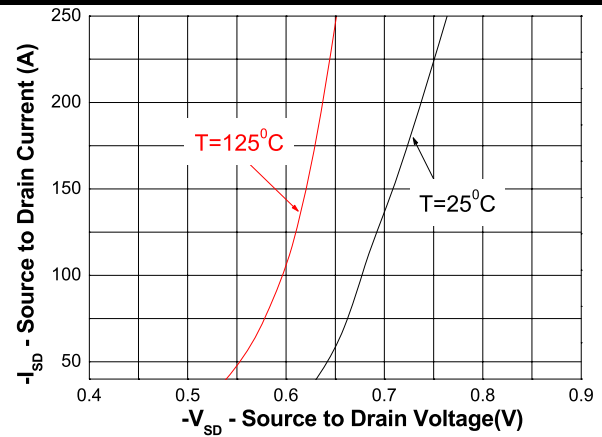
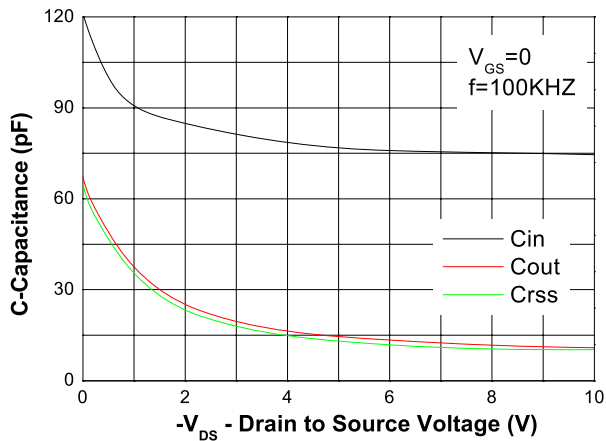
On-Resistance vs. Junction temperature

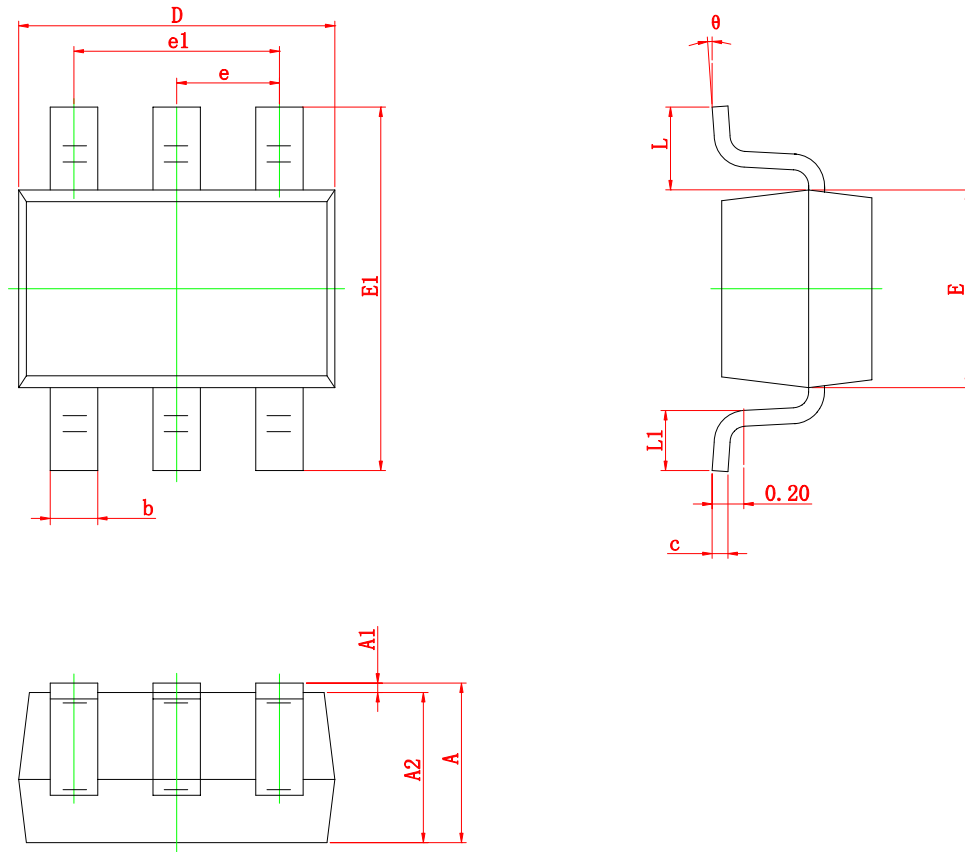


Threshold voltage vs. Temperature


Capacitance

Body diode forward voltage

Safe operating power

Transient thermal response (Junction-to-Ambient)

PMOS Typical Characteristics (Ta=25°C, unless otherwise noted)

Output characteristics

Transfer characteristics

On-Resistance vs. Drain current

On-Resistance vs. Gate-to-Source voltage

On-Resistance vs. Junction temperature

Threshold voltage vs. Temperature



Package Outline Dimension
SOT-363


Symbol	Dimension in Millimeters	
	Min.	Max.
A	0.900	1.100
A1	0.000	0.100
A2	0.900	1.000
b	0.150	0.350
c	0.080	0.150
D	2.000	2.200
E	1.150	1.350
E1	2.150	2.450
e	0.650 TYP	
e1	1.200	1.400
L	0.525 REF	
L1	0.260	0.460
θ	0°	8°