

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@ $V_{GS} = -1.8V$

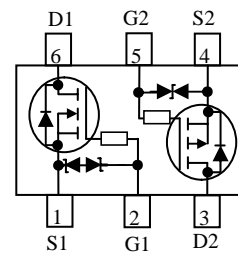
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SOT-363

Descriptions

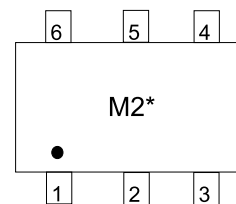
The WCM2002 is the N- and P-Channel enhancement MOS Field Effect Transistor as a single package for DC-DC converter or level shift applications, uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Standard Product WCM2002 is Pb-free.



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	I _D	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	P _D	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	I _D	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	P _D	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	R _{θJA}	328	395	340	420	
Junction-to-Ambient Thermal Resistance ^b	t ≤ 10 s	R _{θJA}	375	445	380	455	
	Steady State	R _{θJA}	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

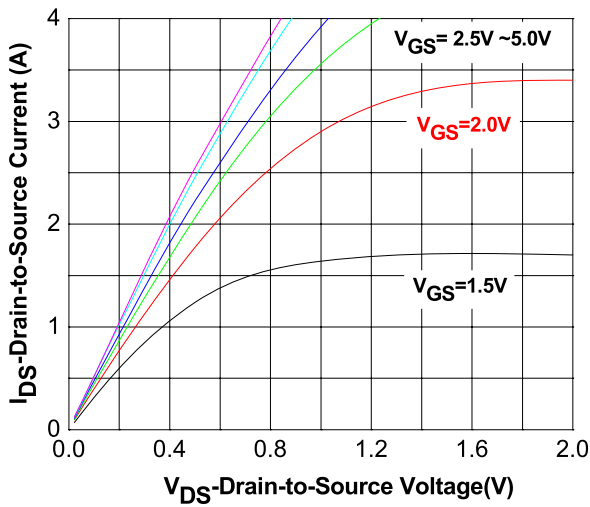
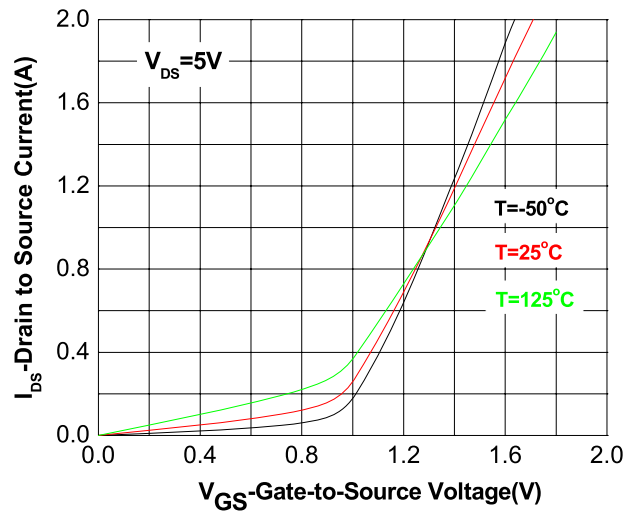
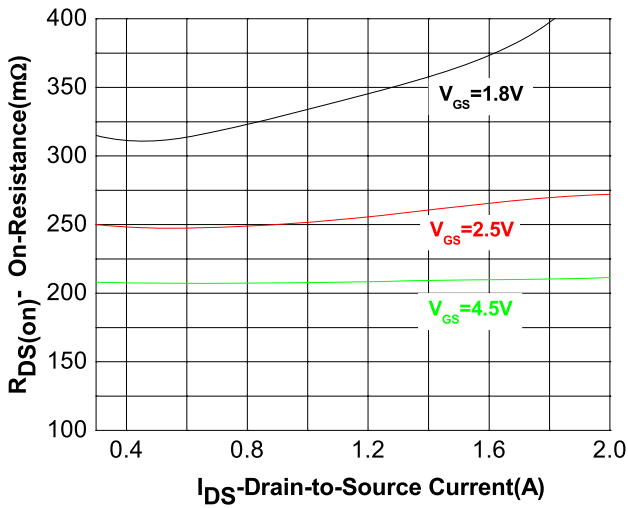
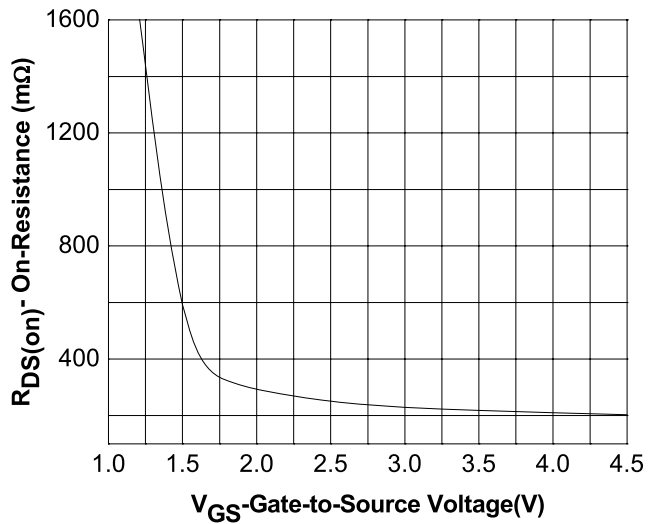
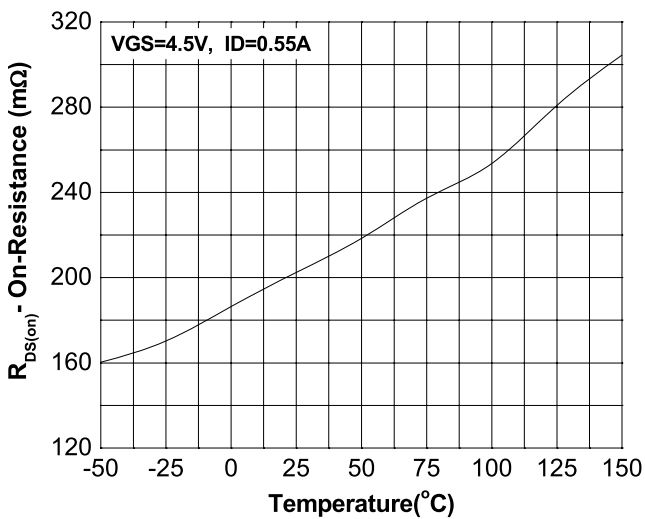
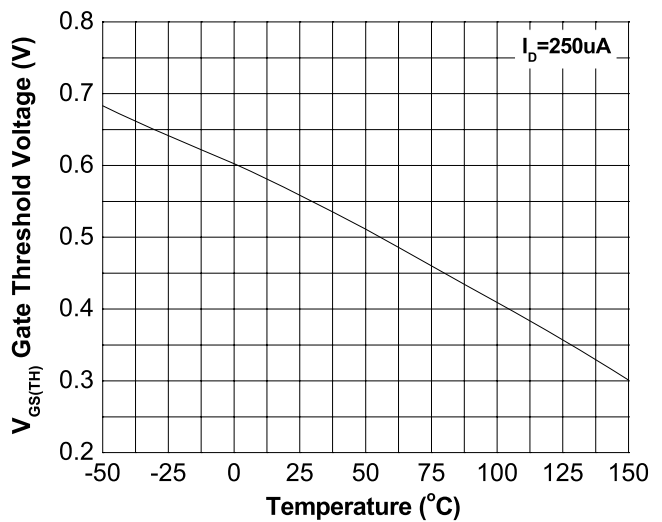
c Repetitive rating, pulse width limited by junction temperature, t_p=10μs, Duty Cycle=1%

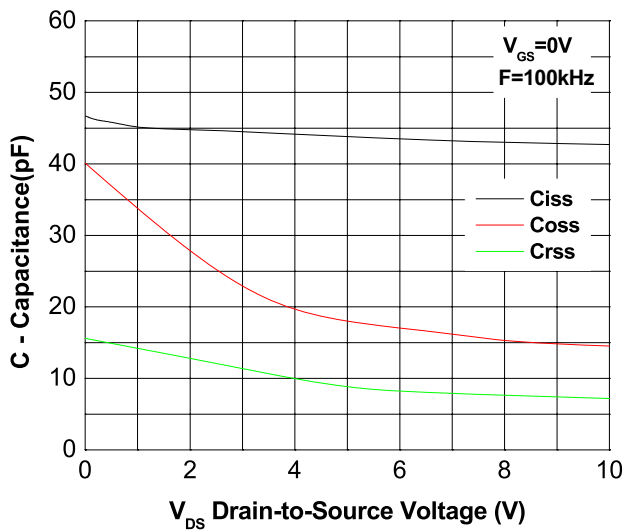
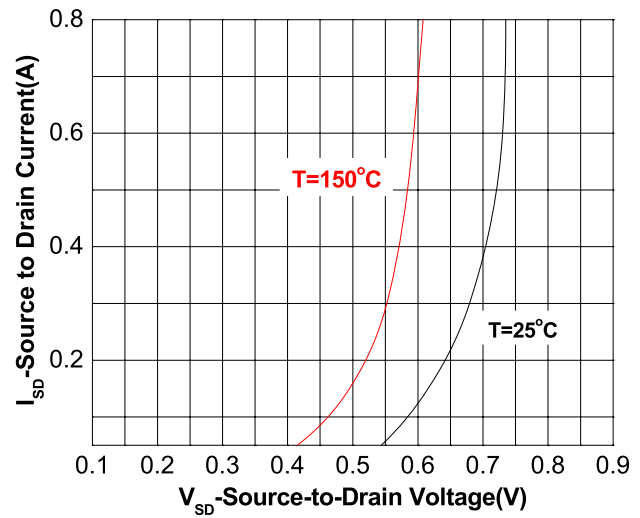
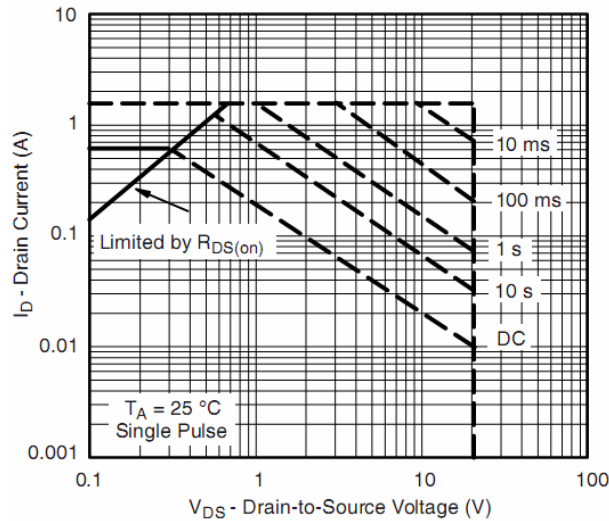
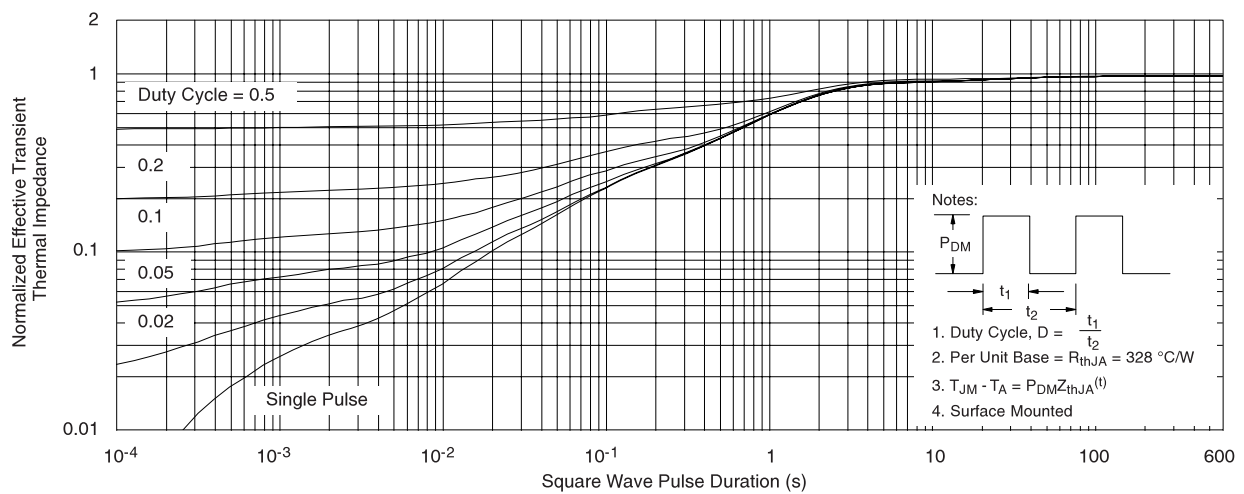
d Repetitive rating, pulse width limited by junction temperature T_J=150°C.

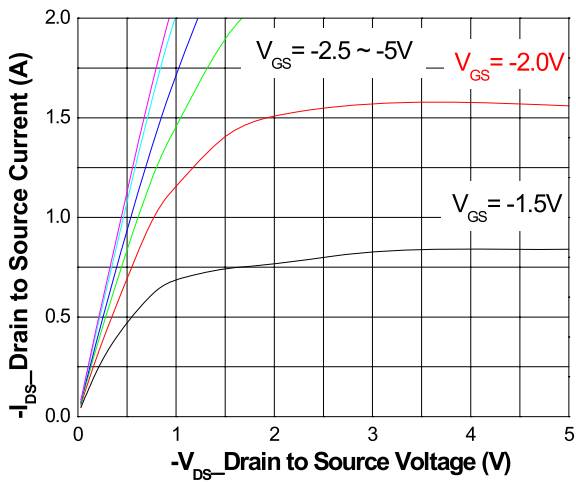
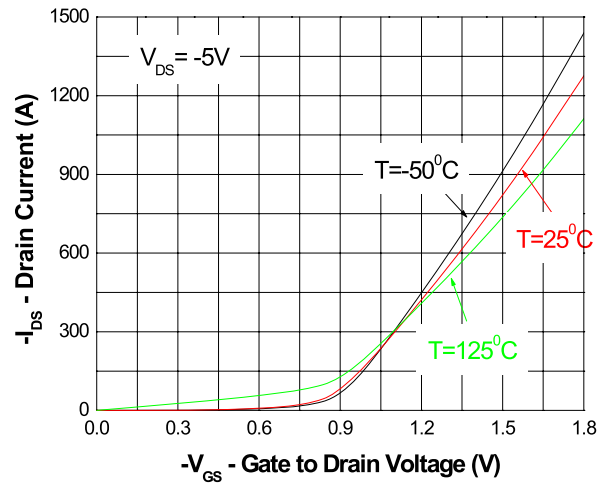
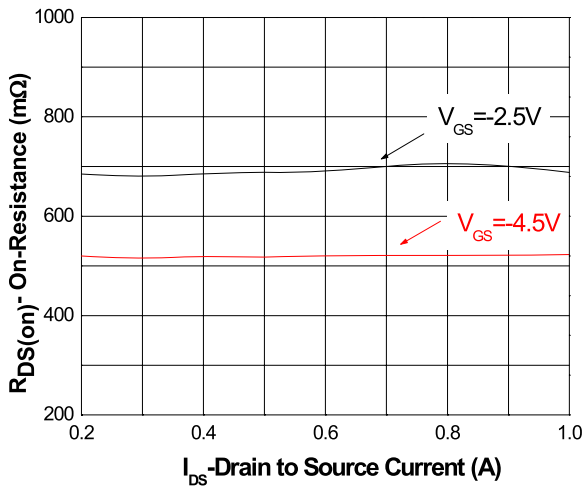
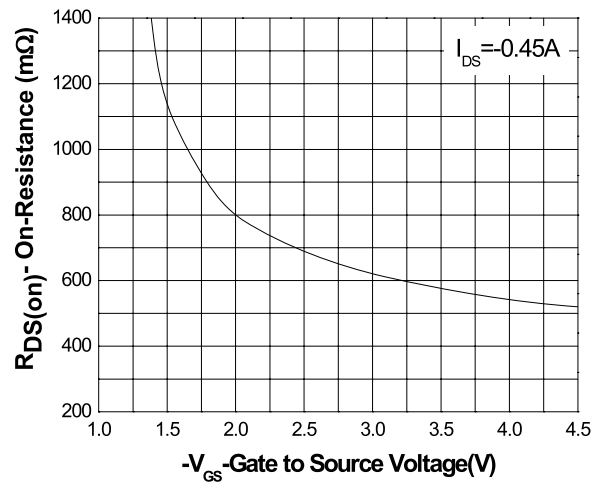
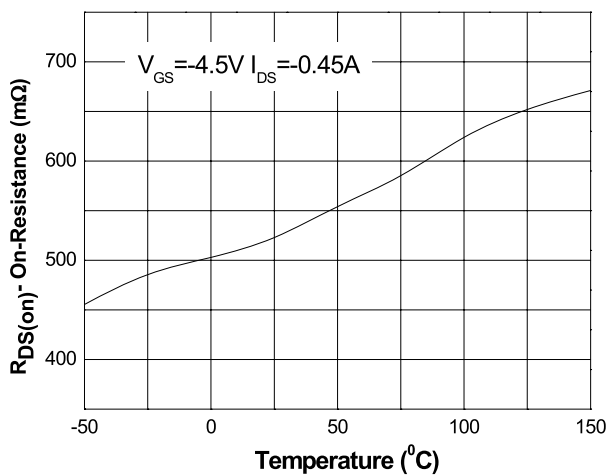
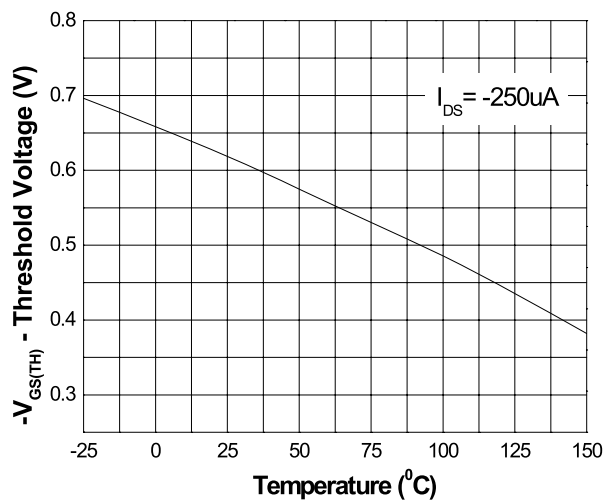
Electronics Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

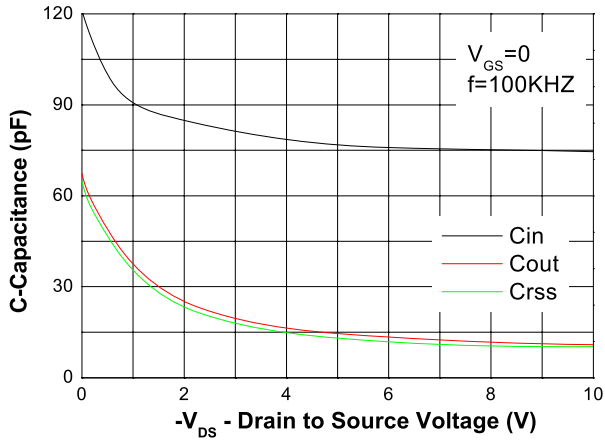
Symbol	Parameter	Test Condition	Min	Typ.	Max	Unit	
Off Characteristics							
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	N-Ch	20		V	
		$V_{GS}=0\text{V}, I_D=-250\mu\text{A}$	P-Ch	-20			
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=16\text{V}, V_{GS}=0\text{V}$	N-Ch		1	uA	
		$V_{DS}=-16\text{V}, V_{GS}=0\text{V}$	P-Ch		-1		
I_{GSS}	Gate –Source leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 5\text{V}$	N-Ch		± 5	uA	
			P-Ch		± 5		
ON Characteristics							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	N-Ch	0.4	0.55	0.9	V
		$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	P-Ch	-0.4	0.62	-0.9	
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS}=4.5\text{V}, I_D=0.55\text{A}$	N-Ch		230	310	m Ω
		$V_{GS}=-4.5\text{V}, I_D=-0.45\text{A}$	P-Ch		520	810	
		$V_{GS}=2.5\text{V}, I_D=0.45\text{A}$	N-Ch		275	360	
		$V_{GS}=-2.5\text{V}, I_D=-0.35\text{A}$	P-Ch		685	1050	
		$V_{GS}=1.8\text{V}, I_D=0.35\text{A}$	N-Ch		330	460	
		$V_{GS}=-1.8\text{V}, I_D=-0.25\text{A}$	P-Ch		890	1300	
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=0.55\text{A}$	N-Ch		2.0	S	
		$V_{DS}=-5\text{V}, I_D=-0.45\text{A}$	P-Ch		1.25		
Dynamic Characteristics							
C_{iss}	Input Capacitance	NMOS: $V_{DS}=10\text{V}, V_{GS}=0\text{V}, F=100\text{KHz}$ PMOS: $V_{DS}=-10\text{V}, V_{GS}=0\text{V}, F=100\text{KHz}$	N-Ch		50	pF	
			P-Ch		74.5		
C_{oss}	Output Capacitance		N-Ch		13		
			P-Ch		10.8		
C_{rss}	Reverse Transfer Capacitance		N-Ch		8		
			P-Ch		10.2		
$Q_{G(TOT)}$	Total Gate Charge	NMOS: $V_{DS}=10\text{V}, V_{GS}=4.5\text{V}, I_D=0.55\text{A}$ PMOS: $V_{DS}=-10\text{V}, V_{GS}=-4.5\text{V}, I_D=-0.45\text{A}$	N-Ch		1.15	nC	
$Q_{G(TH)}$	Threshold gate charge		P-Ch		1.8		
			N-Ch		0.06		
Q_{GS}	Gate-Source Charge		P-Ch		0.12		
			N-Ch		0.15		
Q_{GD}	Gate-Drain Charge		P-Ch		0.18		
		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: $V_{DD}=10V$, $V_{GEN}=4.5V$, $R_G=6\Omega$ $I_D=0.55A$	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: $V_{DD}=-10V$, $V_{GEN}=-4.5V$, $R_G=6\Omega$ $I_D=-0.45A$	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	

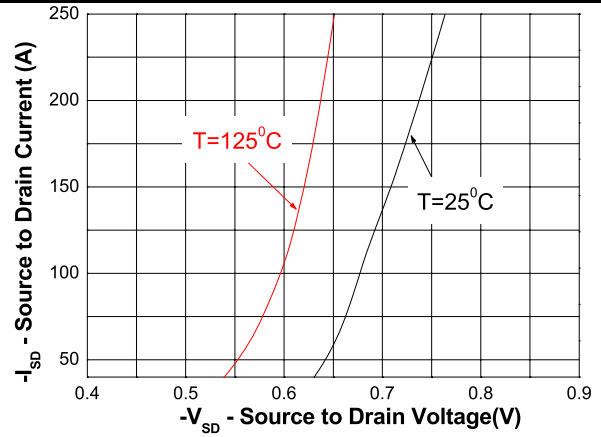
NMOS Typical Characteristics (Ta=25°C, unless otherwise noted)

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)

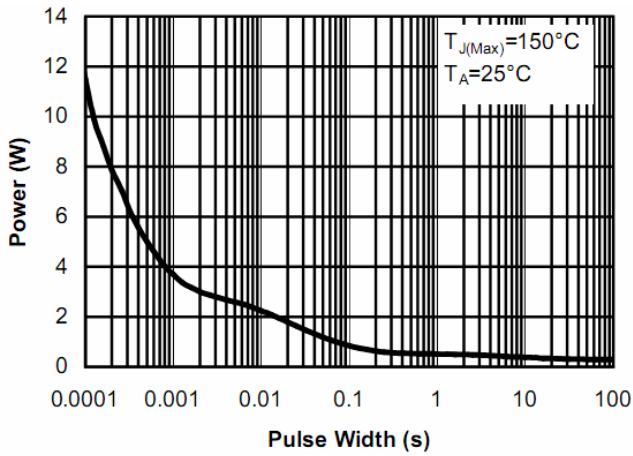
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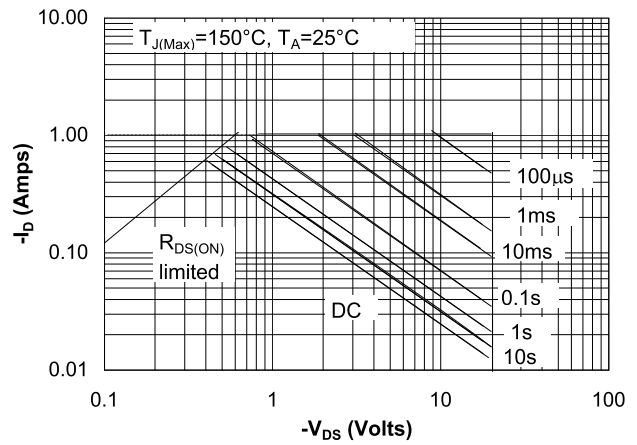
Capacitance



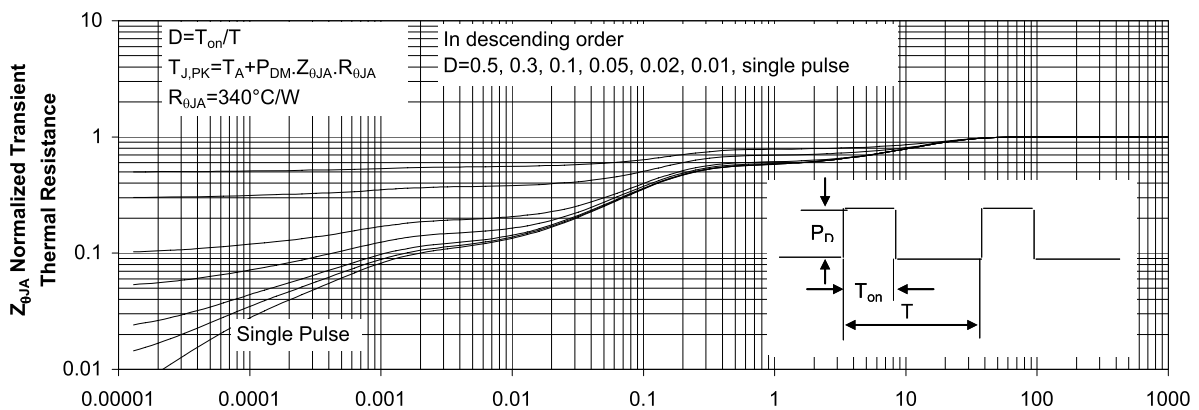
Body diode forward voltage



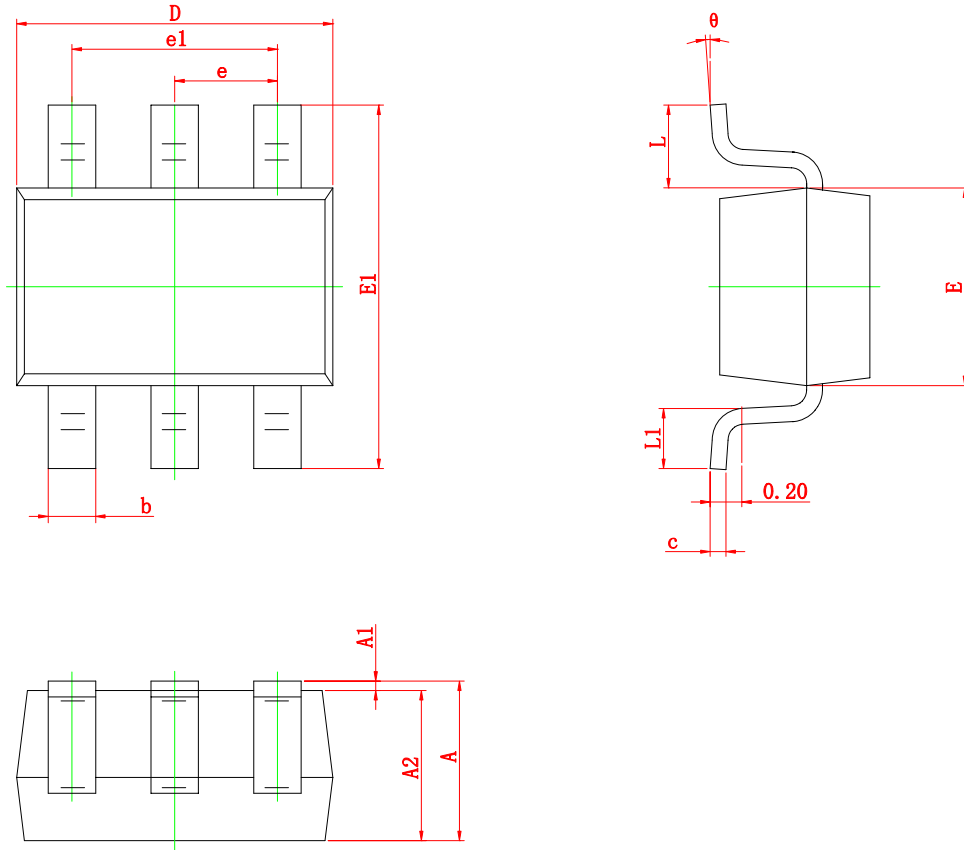
Single pulse power



Safe operating power



Transient thermal response (Junction-to-Ambient)

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°

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