

## WCM2070

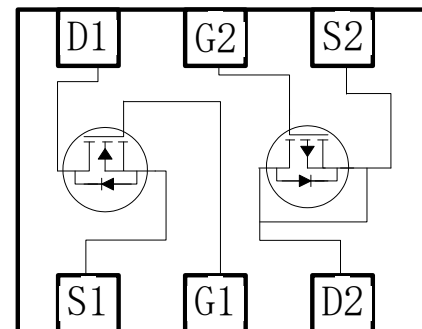
N- and P-Channel Complementary, 12V,MOSFET

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

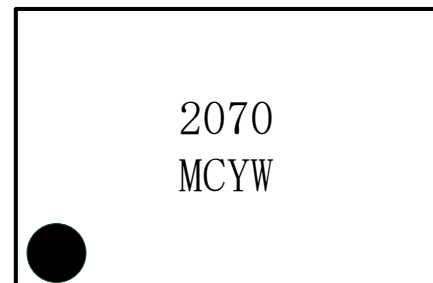
	V <sub>DS</sub> (V)	Typical R <sub>DS(on)</sub> (Ω)
N-Channel	12	0.028 @ V <sub>GS</sub> =4.5V
		0.035 @ V <sub>GS</sub> =2.5V
		0.046 @ V <sub>GS</sub> =1.8V
P-Channel	-12	0.057 @ V <sub>GS</sub> = - 4.5V
		0.087 @ V <sub>GS</sub> = -2.5V
		0.140 @ V <sub>GS</sub> = -1.8V



DFN2\*2-6L



Pin configuration (Top View)



2070 = Device Code  
 MC = Special Code  
 YW = Date Code  
**Marking**

### Descriptions

The WCM2070 is the N-Channel 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<sub>DS(ON)</sub> with low gate charge. Standard Product WCM2070 is Pb-free and Halogen-free..

### Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Small package DFN2\*2-6L

### Applications

- Power supply converters circuit
- Load/Power Switching for portable device

### Order Information

Device	Package	Shipping
WCM2070-6/TR	DFN2*2-6L	3000/Tape&Reel

**Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	N-Channel	P-Channel	Unit		
$V_{DSS}$	Drain-to-Source Voltage	12	-12	V		
$V_{GSS}$	Gate-to-Source Voltage	$\pm 8$	$\pm 8$	V		
$I_D$	Continuous Drain Current <sup>a d</sup>	$t \leq 10 \text{ s}$	$T_A=25^\circ\text{C}$	5.1	-4.0	A
			$T_A=70^\circ\text{C}$	4.0	-3.2	
		Steady State	$T_A=25^\circ\text{C}$	4.4	-3.4	
			$T_A=70^\circ\text{C}$	3.5	-2.7	
$I_{DM}$	Pulsed Drain Current <sup>c</sup>	17.6	-13.6	A		
$P_D$	Power Dissipation <sup>a d</sup>	$t \leq 10 \text{ s}$	$T_A=25^\circ\text{C}$	1.8		W
			$T_A=70^\circ\text{C}$	1.15		
		Steady State	$T_A=25^\circ\text{C}$	1.37		
			$T_A=70^\circ\text{C}$	0.87		
$T_J$	Operation junction temperature	-55~150		$^\circ\text{C}$		
$T_{stg}$	Storage temperature range	-55~150		$^\circ\text{C}$		

**Thermal Resistance Ratings ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

Parameter	Symbol	Typical	Maximum	Unit	
Junction-to-Ambient Thermal Resistance <sup>a</sup>	$R_{\theta JA}$	$t \leq 10 \text{ s}$	55	69	$^\circ\text{C/W}$
		Steady State	70	91	
Junction-to-Ambient Thermal Resistance <sup>b</sup>	$R_{\theta JA}$	$t \leq 10 \text{ s}$	88	115	
		Steady State	125	179	
Junction-to-Case Thermal Resistance	$R_{\theta JC}$	34	44		

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

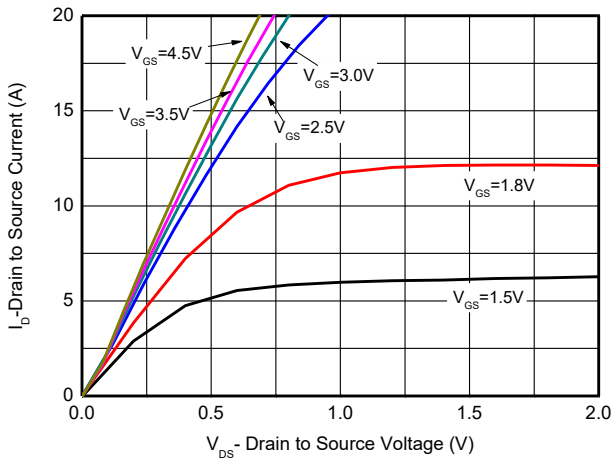
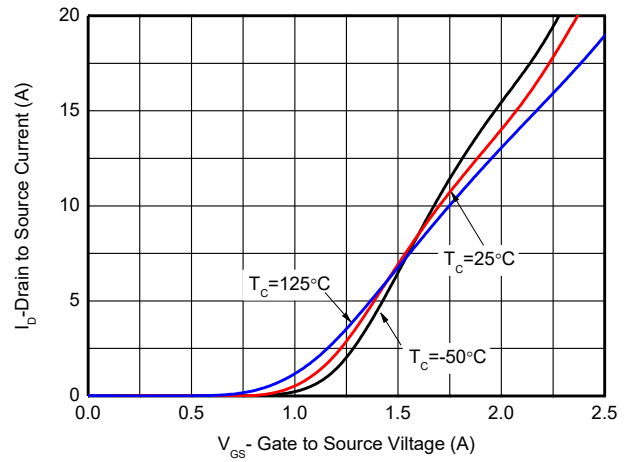
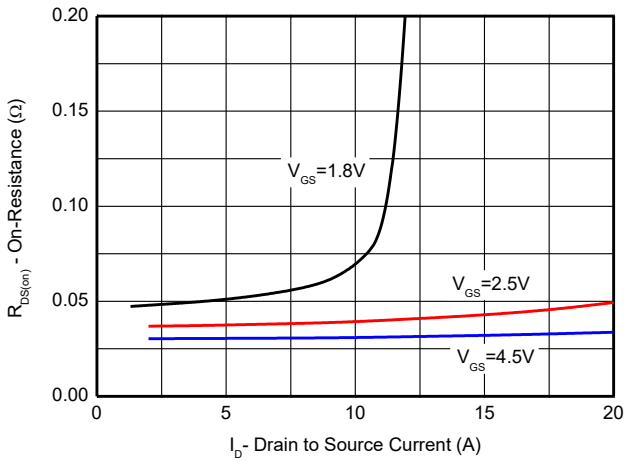
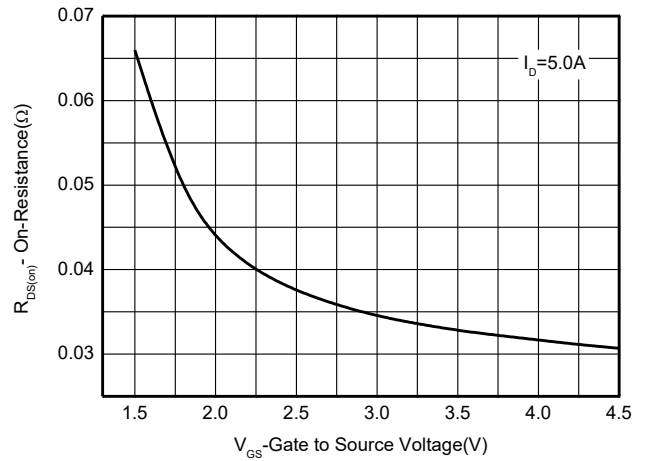
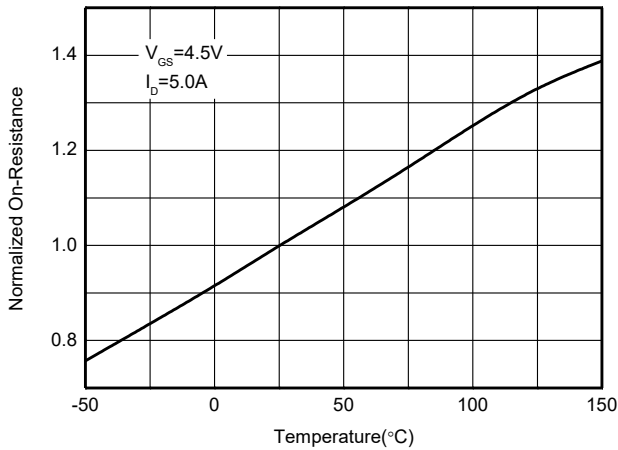
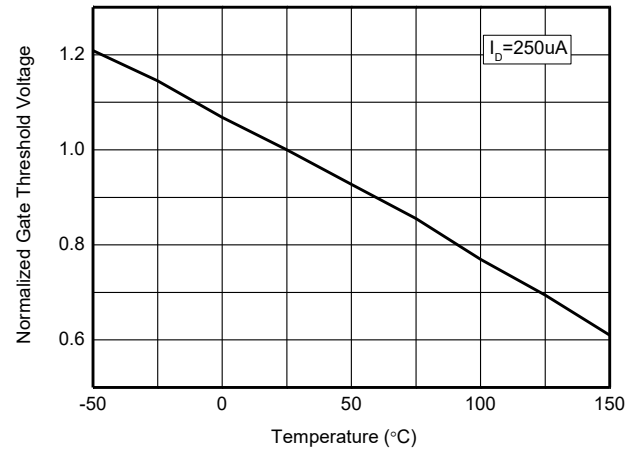
c Pulse width<380 $\mu\text{s}$ , Duty Cycle<2%

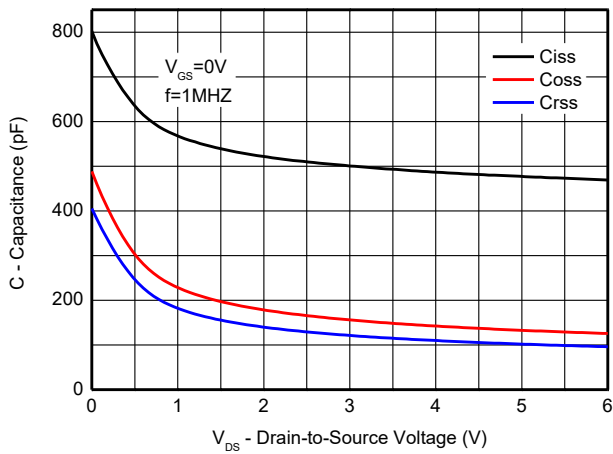
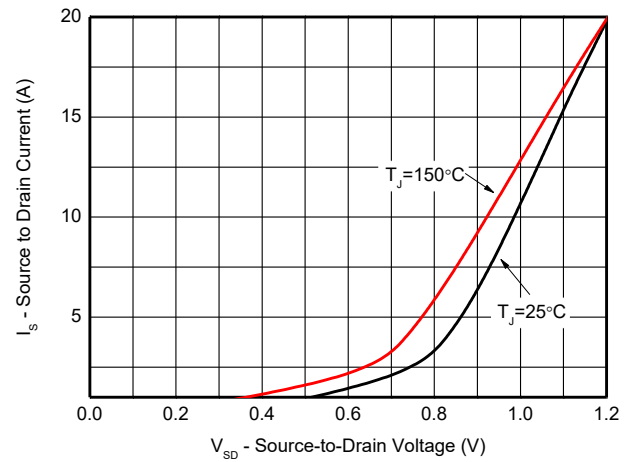
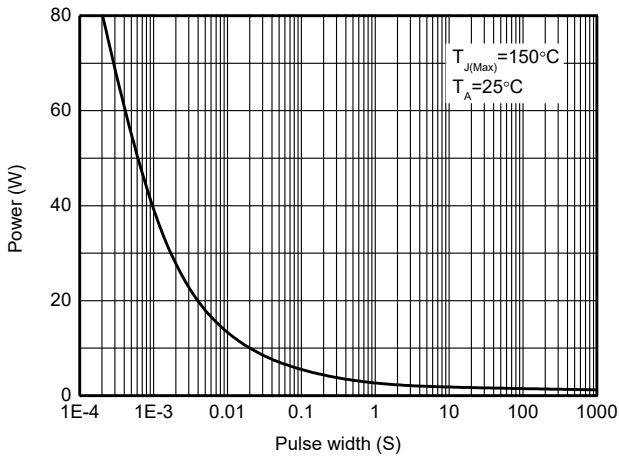
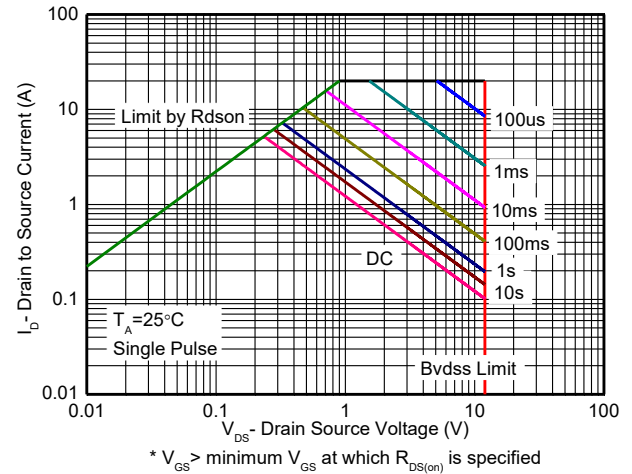
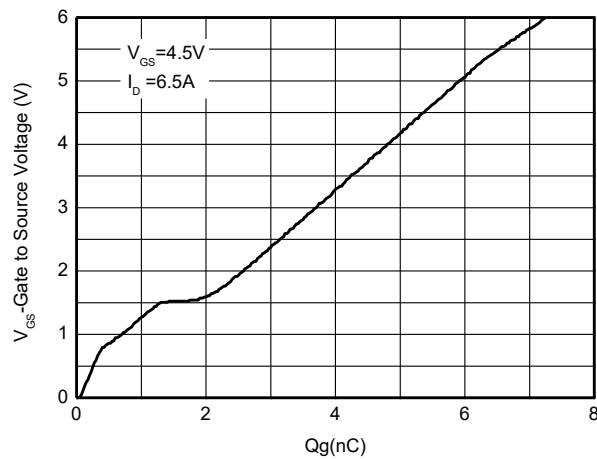
d Maximum junction temperature  $T_J=150^\circ\text{C}$ .

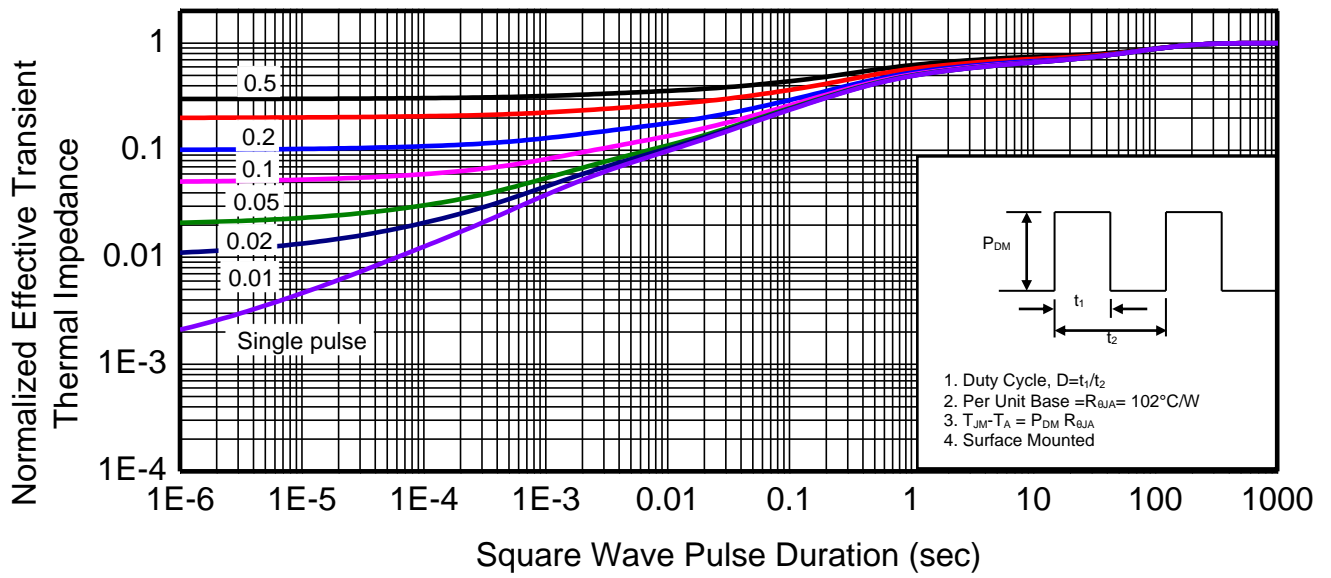
**Electronics Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Test Condition	Min	Typ.	Max	Unit		
<b>Off Characteristics</b>								
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	N-Ch	12		V		
		$V_{GS}=0V, I_D=-250\mu A$	P-Ch	-12				
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=10V, V_{GS}=0V$	N-Ch		1	uA		
		$V_{DS}=-10V, V_{GS}=0V$	P-Ch		-1			
$I_{GSS}$	Gate –Source leakage current	$V_{DS}=0V, V_{GS}=\pm 8V$	N-Ch		$\pm 1$	uA		
			P-Ch		$\pm 1$			
<b>ON Characteristics</b>								
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	N-Ch		0.70	1.2	V	
		$V_{DS}=V_{GS}, I_D=-250\mu A$	P-Ch		-0.80	-1.2		
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS}=4.5V, I_D=5.0A$	N-Ch		28	46	m $\Omega$	
		$V_{GS}=-4.5V, I_D=-3.6A$	P-Ch		57	75		
		$V_{GS}=2.5V, I_D=4.6A$	N-Ch		35	66		
		$V_{GS}=-2.5V, I_D=-3.2A$	P-Ch		87	110		
		$V_{GS}=1.8V, I_D=4.1A$	N-Ch		46	80		
		$V_{GS}=-1.8V, I_D=-1.0A$	P-Ch		140	171		
<b>Dynamic Characteristics</b>								
$C_{iss}$	Input Capacitance	Nmos: $V_{DS}=6V, V_{GS}=0V,$ $f=1MHz$ Pmos: $V_{DS}=-6V, V_{GS}=0V,$ $f=1MHz$	N-Ch		469	pF		
			P-Ch		673			
$C_{oss}$	Output Capacitance		N-Ch		125			
			P-Ch		175			
$C_{rss}$	Reverse Transfer Capacitance		N-Ch		95			
			P-Ch		162			
$Q_{G(TOT)}$	Total Gate Charge	Nmos: $V_{DD}=10V, V_{GS}=4.5V,$ $I_D=6.5A$ Pmos: $V_{DD}=-10V, V_{GS}=-4.5V$ $I_D=-4.3A$	N-Ch		5.38	nC		
			P-Ch		6.56			
$Q_{G(TH)}$	Threshold gate charge		N-Ch		0.72			
			P-Ch		0.81			
$Q_{GS}$	Gate-Source Charge		N-Ch		1.3			
			P-Ch		1.2			
$Q_{GD}$	Gate-Drain Charge		N-Ch		0.76			
			P-Ch		2.1			
$t_{d(on)}$	Turn-On Delay Time		Nmos: $V_{DD}=6V, V_{GS}=4.5V,$ $I_D=5.2A, R_G=1\Omega$ Pmos: $V_{DD}=-6V, I_D=-3.8A,$ $V_{GS}=-4.5V, R_G=1\Omega$	N-Ch			20	ns
				P-Ch			30	
$t_r$	Turn-On Rise Time			N-Ch			22	
				P-Ch			32	
$t_{d(off)}$	Turn-Off Delay Time	N-Ch			48			
		P-Ch			62			
$t_f$	Turn-Off Fall Time	N-Ch			15			
		P-Ch			18			

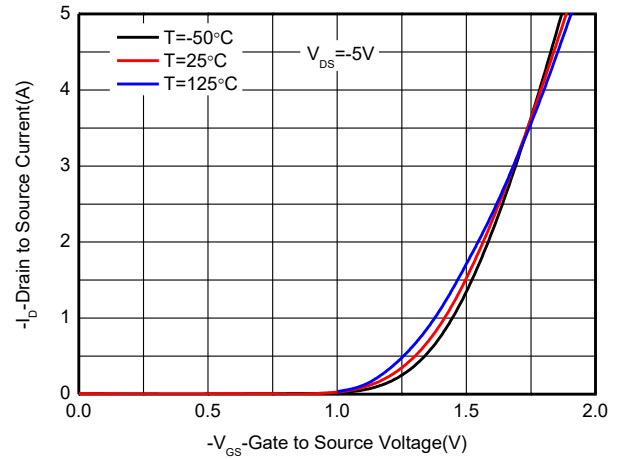
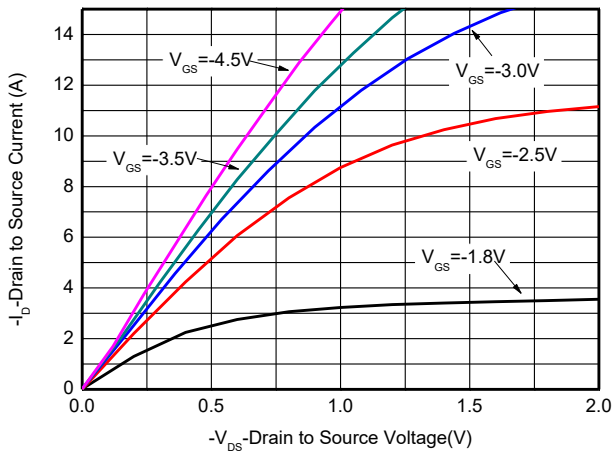
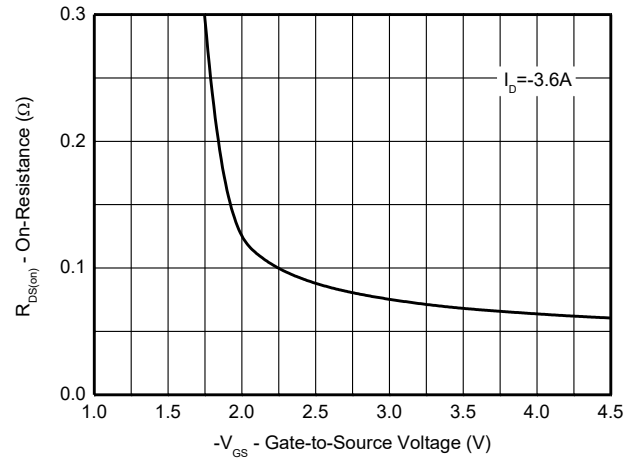
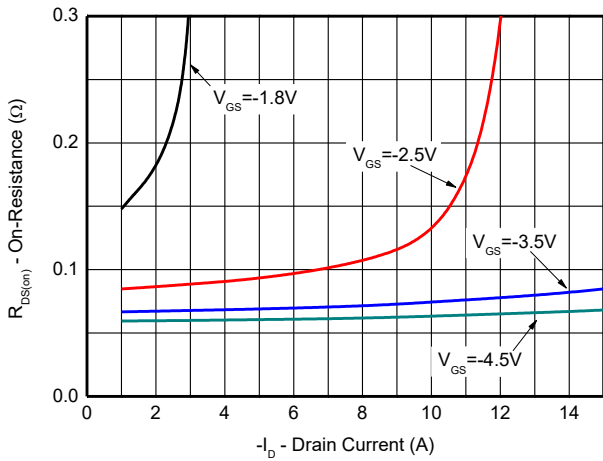
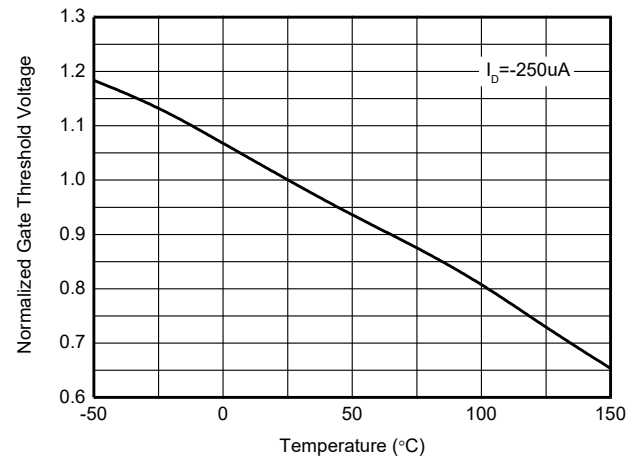
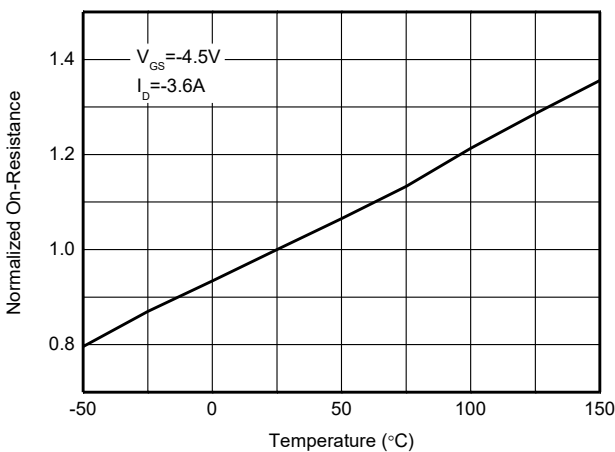
BODY DIODE CHARACTERISTICS							
Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 5.2\text{ A}$	N-Ch		0.7	1.5	V
		$V_{GS} = 0\text{ V}, I_S = -3.4\text{ A}$	P-Ch		-0.8	-1.5	
Body-Diode Continuous Current	$I_S$		N-Ch			5.3	A
			P-Ch			-4.1	
Body-Diode Pulsed Current	$I_{SM}$		N-Ch			20	A
			P-Ch			-15	
Body Diode Reverse Recovery Time	$T_{rr}$	Nmos: $I_F=5.2\text{ A}, dI/dt=100\text{ A/us}$ $V_{GS}=0\text{ V (NOTE C)}$	N-Ch		18	50	nS
			P-Ch		27	65	
Body Diode Reverse Recovery Charge	$Q_{rr}$	Pmos: $I_F=-3.8\text{ A}, dI/dt=-100\text{ A/us}$ $V_{GS}=0\text{ V (NOTE C)}$	N-Ch		4.5	10	uC
			P-Ch		11	25	
Reverse Recovery Fall Time	$t_a$		N-Ch		7		nS
			P-Ch		15		
Reverse Recovery Rise Time	$t_b$		N-Ch		11		nS
			P-Ch		12		

**Typical Characteristics (N-Channel)**
 **$T_A=25^{\circ}\text{C}$ , 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**

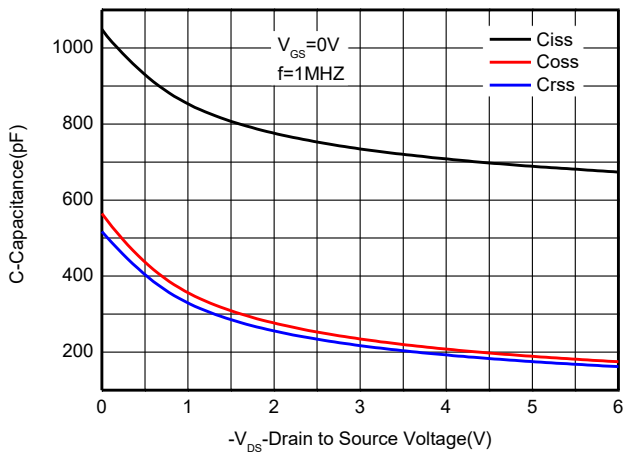
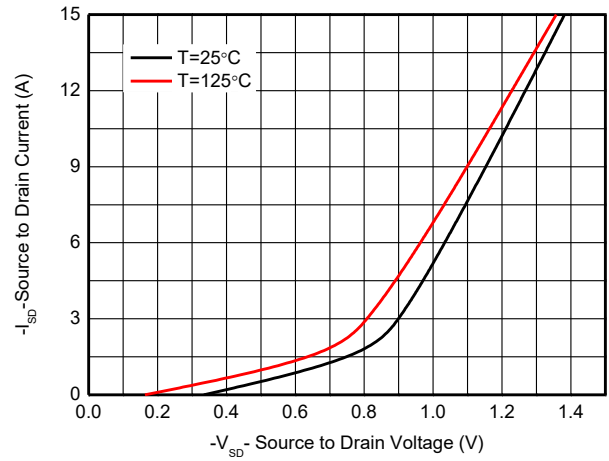
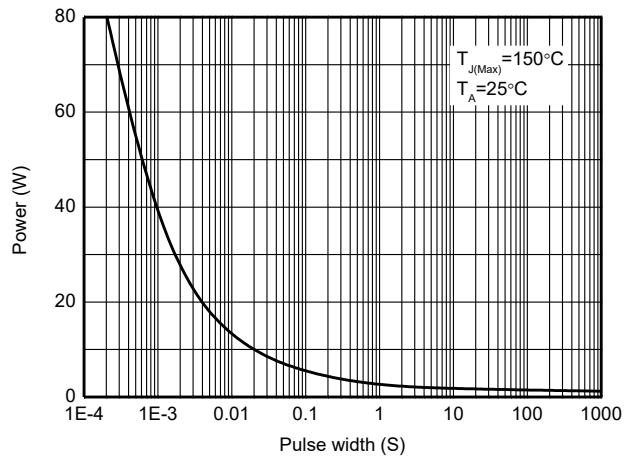
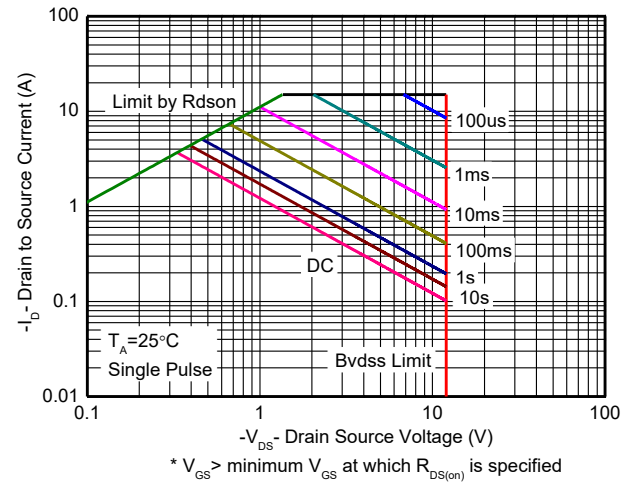
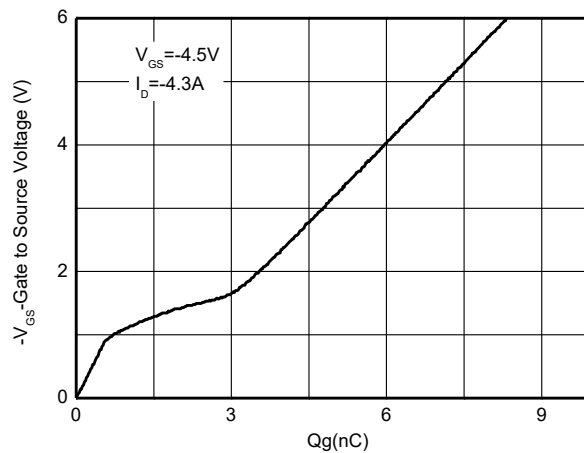

**Capacitance**

**Body Diode Forward Voltage**

**Single pulse power**

**Safe operating power**

**Gate charge Characteristics**

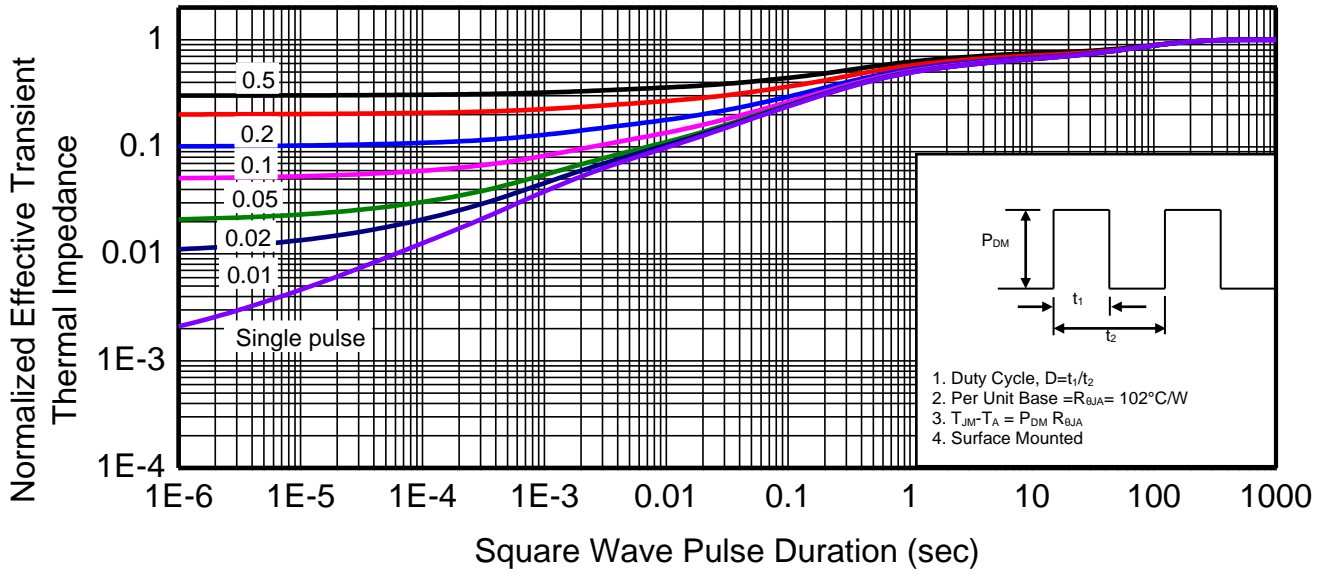


**Transient thermal response (Junction-to-Ambient)**

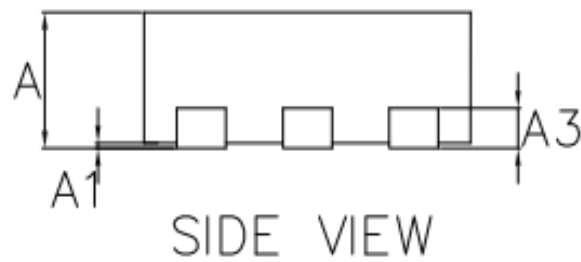
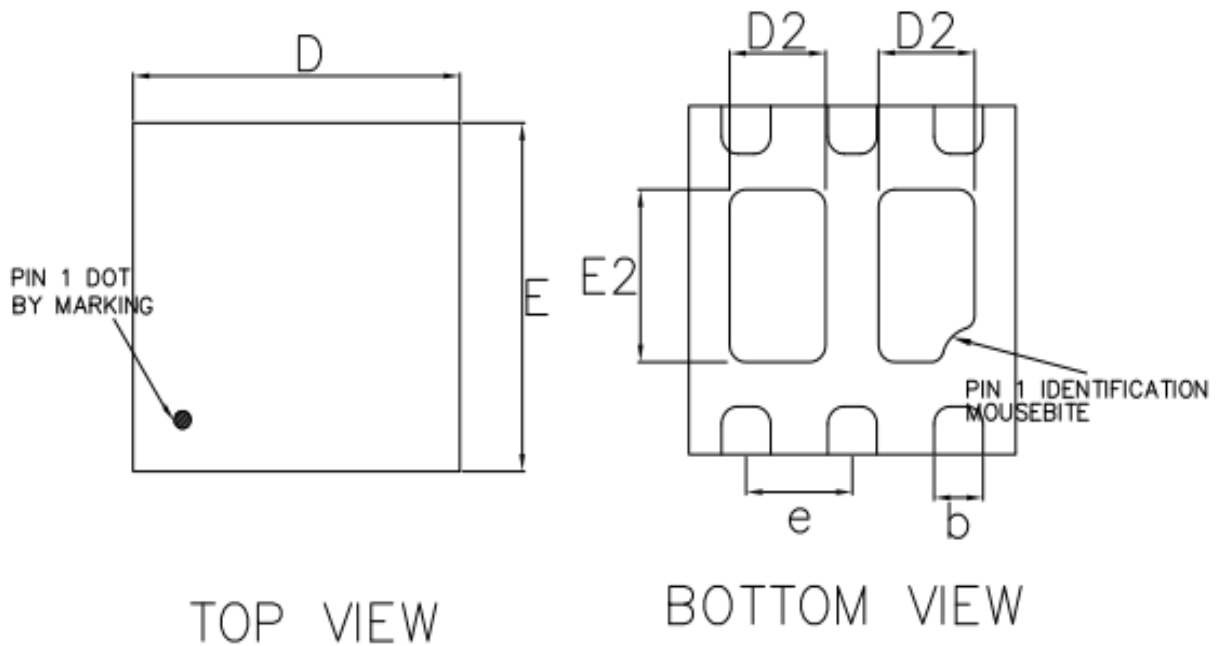
**Typical Characteristics (P-Channel)**
 **$T_A=25^{\circ}\text{C}$ , unless otherwise noted)**

**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**




**Capacitor**

**Body diode forward voltage**

**Single pulse power (Junction-to-ambient)**

**Safe operating power**

**Gate charge Characteristics**



### Transient thermal response (Junction-to-Ambient)

**Package Outline Dimension**
**DFN2\*2-6L**


COMMON DIMENSIONS(MM)			
PKG. REF.	W: VERY VERY THIN		
	MIN.	NOM.	MAX
A	0.70	0.75	0.80
A1	0.00	-	0.05
A3	0.20 REF.		
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	0.44	0.59	0.69
E2	0.84	0.99	1.09
b	0.25	0.30	0.35
L	0.175	0.275	0.375
e	0.65 BSC		