

## N- and P-Channel 40 V (D-S) MOSFET

### PRODUCT SUMMARY

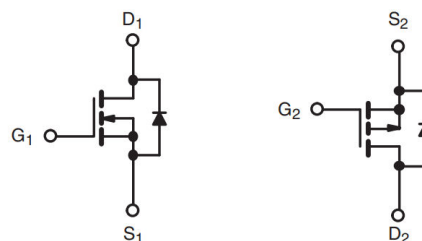
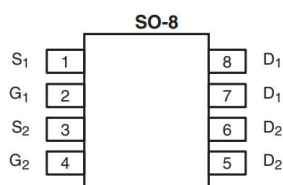
	V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (mΩ)(Typ.)	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)
N-Channel	40	16 at V <sub>GS</sub> = 10 V	6.7	19.5 nC
		24 at V <sub>GS</sub> = 4.5 V		
P-Channel	- 40	32 at V <sub>GS</sub> = - 10 V	- 6.1	21 nC
		52 at V <sub>GS</sub> = - 4.5 V		

### FEATURES

- DT-Trench Power MOSFET
- 100 % Rgand UIS Tested

### APPLICATIONS

- Backlight Inverter for LCD Display
- Full Bridge Converter


**RoHS**  
 COMPLIANT


### ABSOLUTE MAXIMUM RATINGS T<sub>A</sub> = 25 °C, unless otherwise noted

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V <sub>DS</sub>	40	- 40	V
Gate-Source Voltage		V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	6.7	- 6.1	A
	T <sub>C</sub> = 70 °C		5.4	- 4.7	
	T <sub>A</sub> = 25 °C		5.6 <sup>b, c</sup>	- 4.7 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		4.4 <sup>b, c</sup>	- 3.7 <sup>b, c</sup>	
Pulsed Drain Current		I <sub>DM</sub>	20	- 20	
Single Pulse Avalanche Energy		E <sub>AS</sub>	2.45	5	mJ
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	3.0	3.1	W
	T <sub>C</sub> = 70 °C		1.92	1.98	
	T <sub>A</sub> = 25 °C		2.0 <sup>b, c</sup>	2.0 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		1.28 <sup>b, c</sup>	1.28 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150		°C

### THERMAL RESISTANCE RATINGS

Parameter		Symbol	N-Channel		P-Channel		Unit
			Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	35	41.6	34	40.3	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJC</sub>	55	62.5	55	62.5	

Notes:

 a. Based on T<sub>C</sub> = 25 °C.

b. Surface Mounted on 1" x 1" FR4 board.

c. t = 10 s.

d. Maximum under Steady State conditions is 120 °C/W.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted							
Parameter	Symbol	Test Conditions		Min.	Typ. <sup>a</sup>	Max.	Unit
Static							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	N-Ch	40			V
		$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	P-Ch	-40			
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	N-Ch	1.4		3	V
		$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	P-Ch	-1.2		-2.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	N-Ch P-Ch			100 -100	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	N-Ch			1	$\mu\text{A}$
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$	P-Ch			-1	
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$	N-Ch			10	
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$	P-Ch			-10	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	N-Ch	10			A
		$V_{DS} = -5\text{ V}, V_{GS} = -10\text{ V}$	P-Ch	-10			
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 3\text{ A}$	N-Ch		16	19	m $\Omega$
		$V_{GS} = -10\text{ V}, I_D = -2\text{ A}$	P-Ch		32	39	
		$V_{GS} = 4.5\text{ V}, I_D = 3\text{ A}$	N-Ch		24	28	
		$V_{GS} = -4.5\text{ V}, I_D = -2\text{ A}$	P-Ch		52	58	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 3\text{ A}$	N-Ch		18		S
		$V_{DS} = -15\text{ V}, I_D = -2\text{ A}$	P-Ch		12		
Dynamic <sup>a</sup>							
Input Capacitance	$C_{iss}$	N-Channel $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	N-Ch P-Ch		980 1320		pF
Output Capacitance	$C_{oss}$		N-Ch P-Ch		73 105		
Reverse Transfer Capacitance	$C_{rss}$	P-Channel $V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	N-Ch P-Ch		64 94		
Total Gate Charge	$Q_g$	N-Channel $V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 3\text{ A}$	N-Ch P-Ch		19.5 21		nC
Gate-Source Charge	$Q_{gs}$		N-Ch P-Ch		1.8 2.2		
Gate-Drain Charge	$Q_{gd}$	P-Channel $V_{DS} = -20\text{ V}, V_{GS} = 10\text{ V}, I_D = -2\text{ A}$	N-Ch P-Ch		3.1 3.5		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	N-Ch P-Ch		3.5 6.5		$\Omega$

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted							
Parameter	Symbol	Test Conditions		Min.	Typ. <sup>a</sup>	Max.	Unit
Dynamic <sup>a</sup>							
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 20\text{ V}$ , $R_L = 4\text{ }\Omega$ $I_D \cong 5\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 1\text{ }\Omega$	N-Ch		7		ns
			P-Ch		7		
Rise Time	$t_r$		N-Ch		10		
			P-Ch		12		
Turn-Off Delay Time	$t_{d(off)}$	P-Channel $V_{DD} = -20\text{ V}$ , $R_L = 4\text{ }\Omega$ $I_D \cong -5\text{ A}$ , $V_{GEN} = -10\text{ V}$ , $R_g = 1\text{ }\Omega$	N-Ch		15		
			P-Ch		30		
Fall Time	$t_f$		N-Ch		9		
			P-Ch		9		
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 20\text{ V}$ , $R_L = 4\text{ }\Omega$ $I_D \cong 5\text{ A}$ , $V_{GEN} = 4.5\text{ V}$ , $R_g = 1\text{ }\Omega$	N-Ch		16		
			P-Ch		44		
Rise Time	$t_r$		N-Ch		17		
			P-Ch		33		
Turn-Off Delay Time	$t_{d(off)}$	P-Channel $V_{DD} = -20\text{ V}$ , $R_L = 4\text{ }\Omega$ $I_D \cong -5\text{ A}$ , $V_{GEN} = -4.5\text{ V}$ , $R_g = 1\text{ }\Omega$	N-Ch		16		
			P-Ch		28		
Fall Time	$t_f$		N-Ch		10		
			P-Ch		13		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^{\circ}\text{C}$	N-Ch			6.7	A
			P-Ch			- 6.1	
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$	$T_C = 25\text{ }^{\circ}\text{C}$	N-Ch			20	
			P-Ch			- 20	
Body Diode Voltage	$V_{SD}$	$I_S = 1\text{ A}$	N-Ch			1.2	V
		$I_S = -1\text{ A}$	P-Ch			- 1.2	
Body Diode Reverse Recovery Time	$t_{rr}$	N-Channel $I_F = 3\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^{\circ}\text{C}$	N-Ch		20	30	ns
			P-Ch		26	50	
Body Diode Reverse Recovery Charge	$Q_{rr}$		N-Ch		15	25	nC
			P-Ch		18.5	35	
Reverse Recovery Fall Time	$t_a$	P-Channel $I_F = -2\text{ A}$ , $di/dt = -100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^{\circ}\text{C}$	N-Ch		14		ns
			P-Ch		12.5		
Reverse Recovery Rise Time	$t_b$		N-Ch		7		
			P-Ch		13.5		

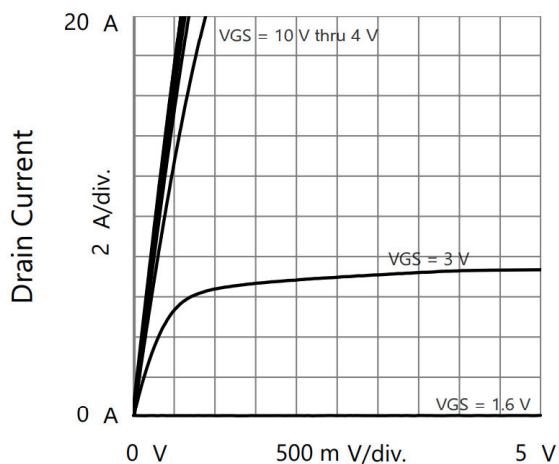
Notes:

a. Guaranteed by design, not subject to production testing.

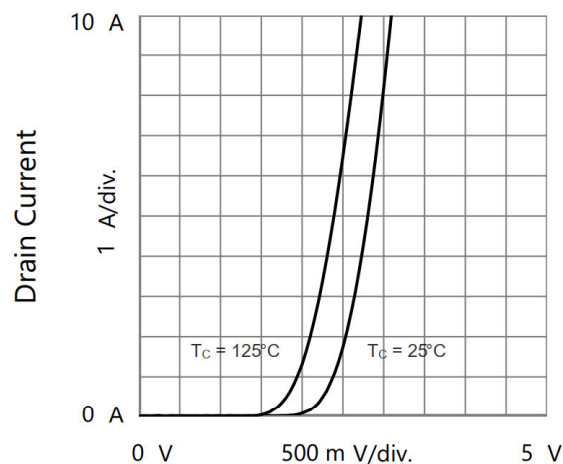
 b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

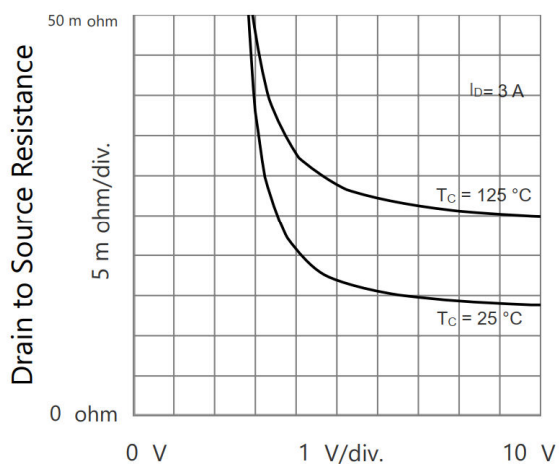
**N-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



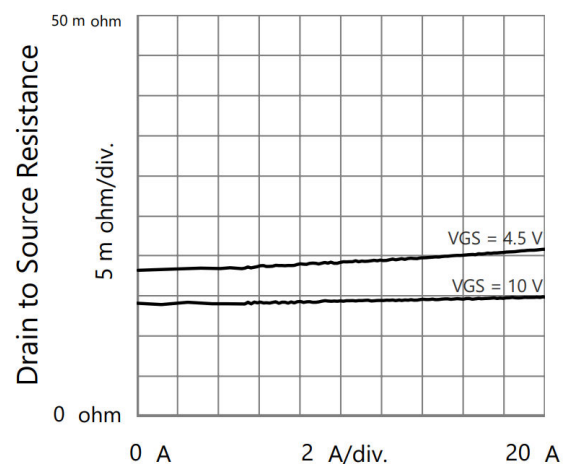
Drain to Source Voltage  
Output Characteristics



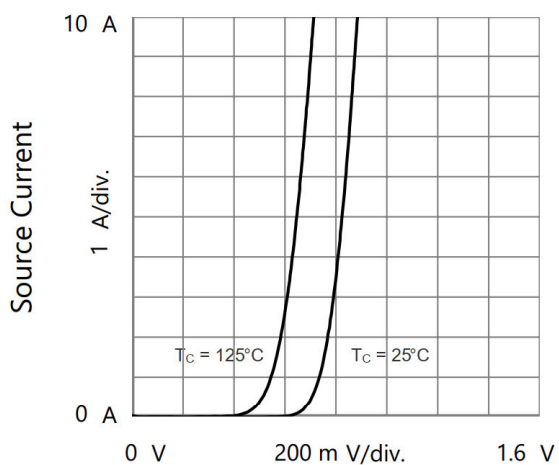
Gate to Source Voltage  
Transfer Characteristics



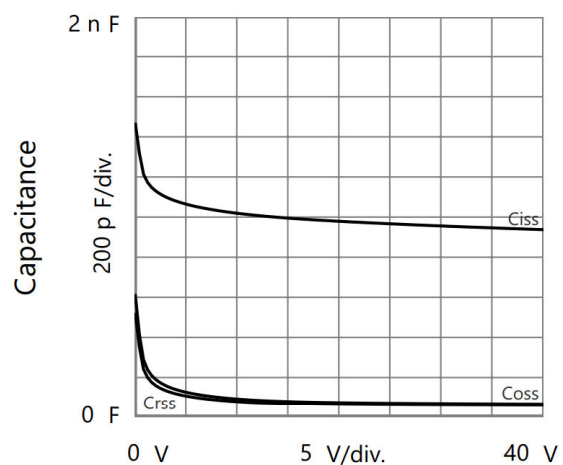
Gate to Source Voltage  
Drain to Source Resistance vs. Gate to Source Voltage



Drain Current  
Drain to Source Resistance vs. Drain Current

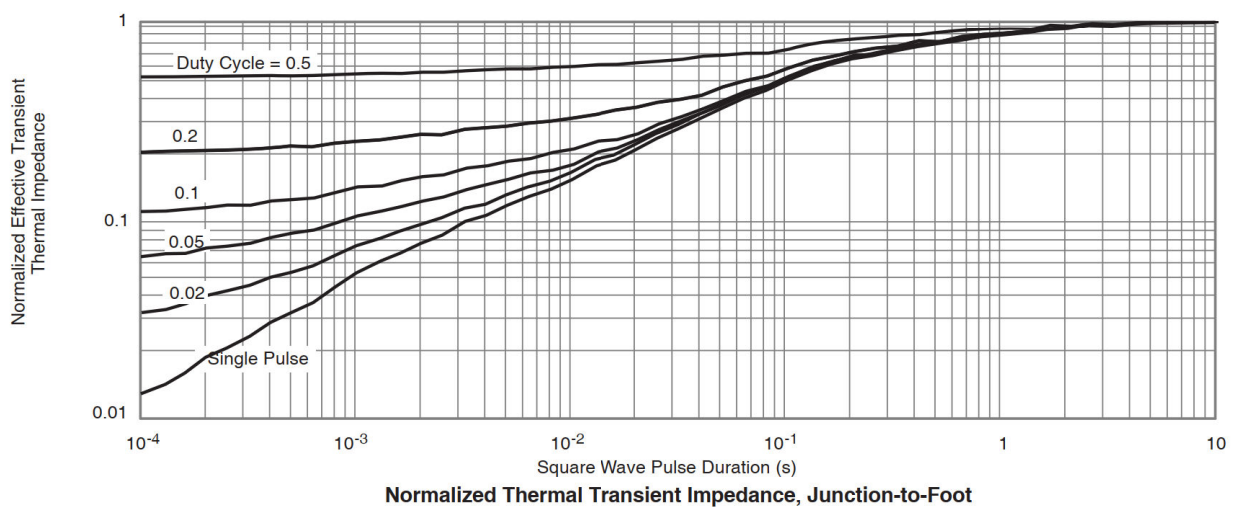
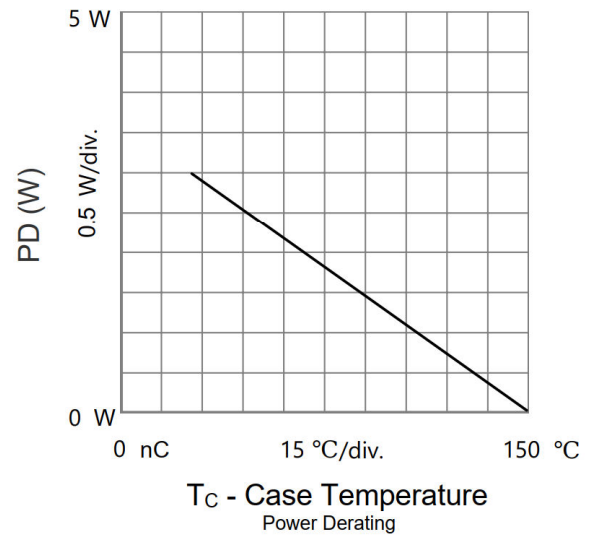
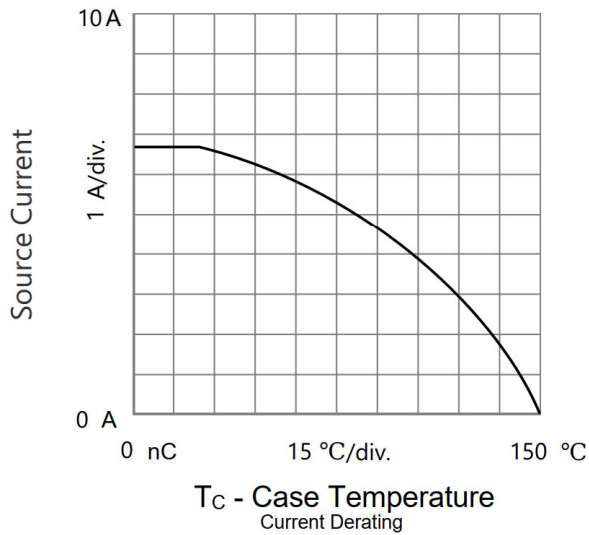
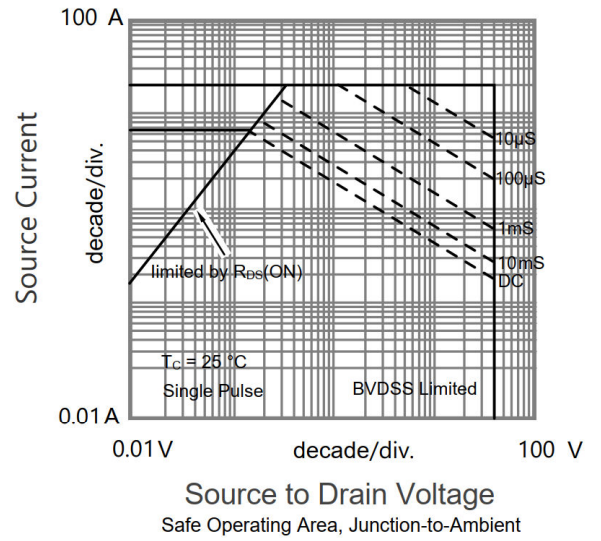
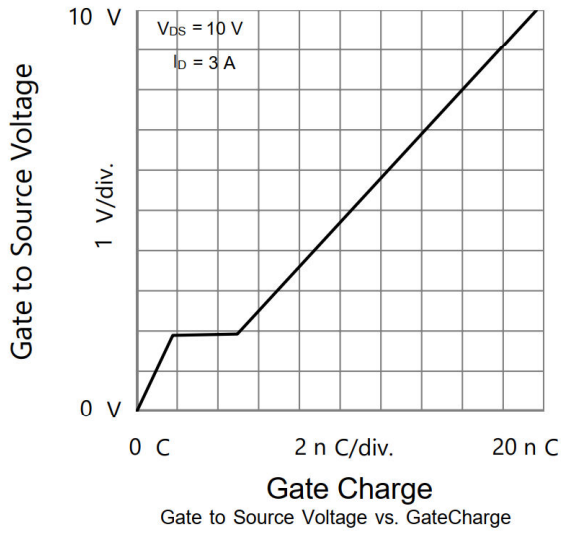


Source to Drain Voltage  
Body Diode Forward Characteristics



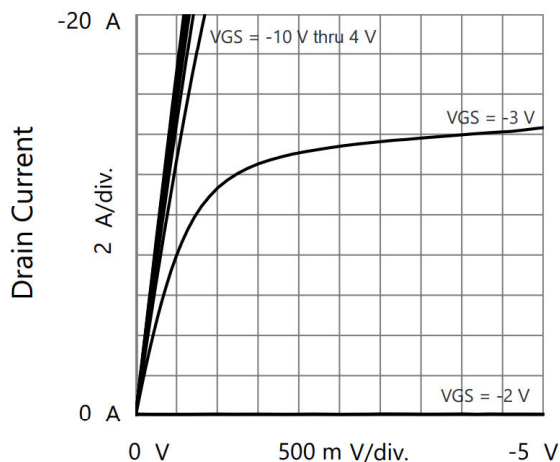
Drain to Source Voltage  
Capacitances

**N-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

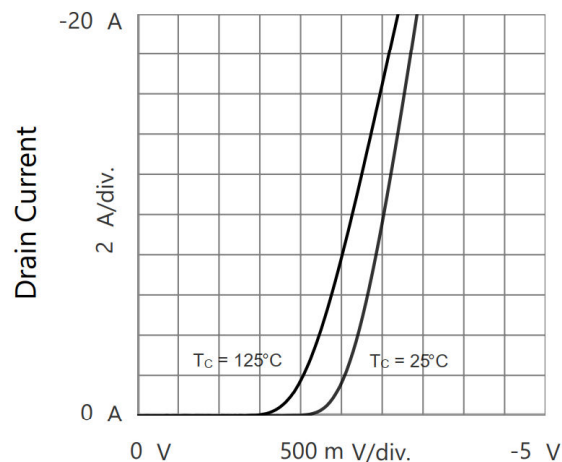




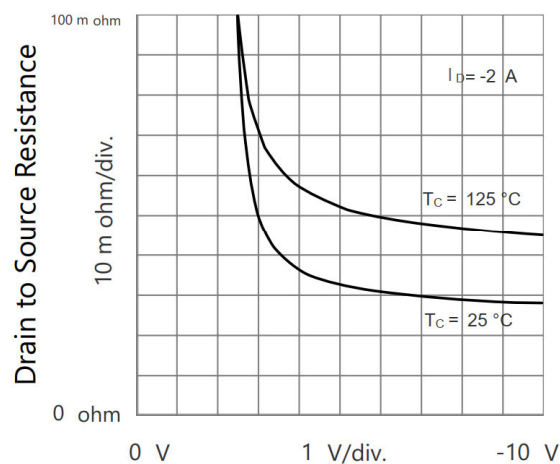
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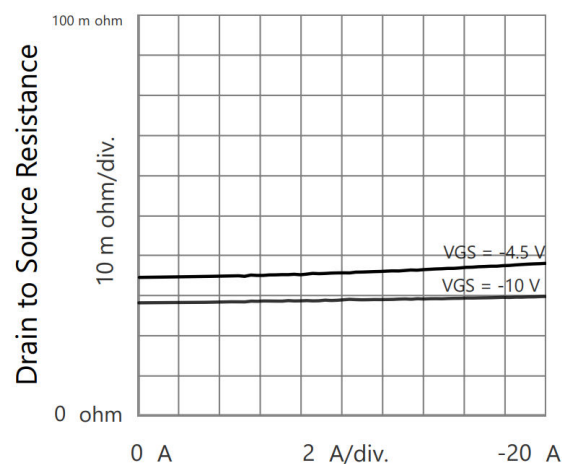
Drain to Source Voltage  
Output Characteristics



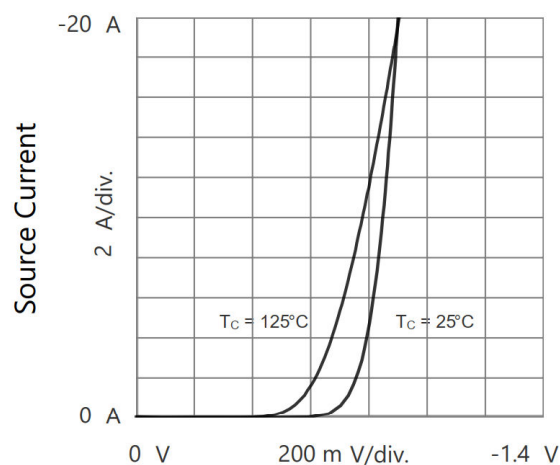
Gate to Source Voltage  
Transfer Characteristics



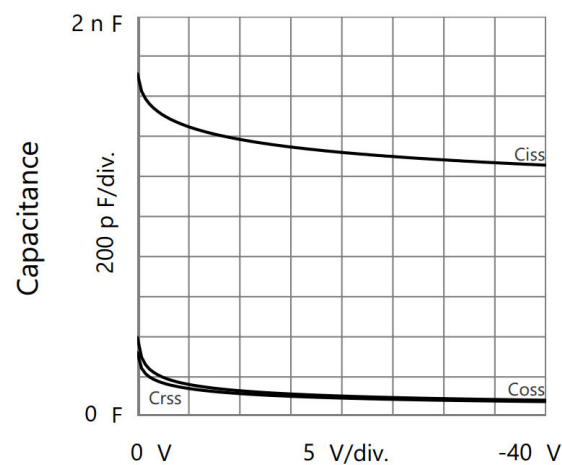
Gate to Source Voltage  
Drain to Source Resistance vs. Gate to Source Voltage



Drain Current  
Drain to Source Resistance vs. Drain Current

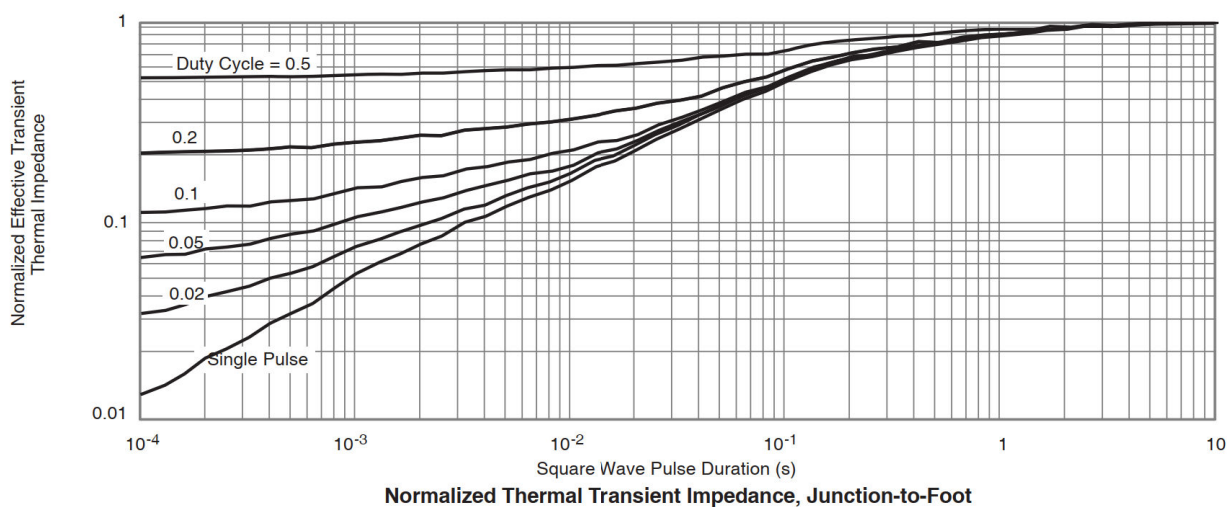
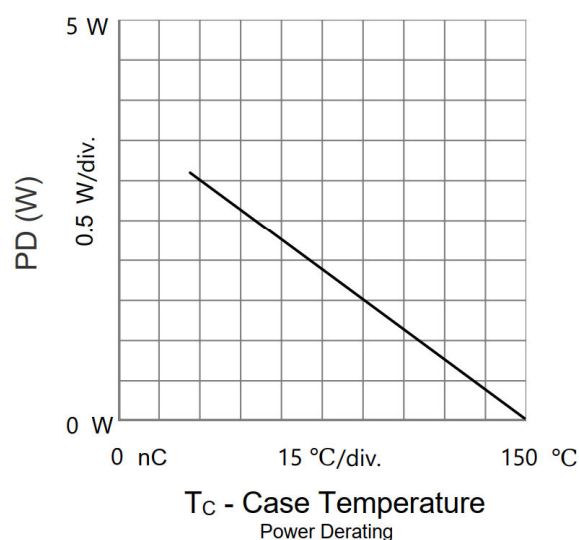
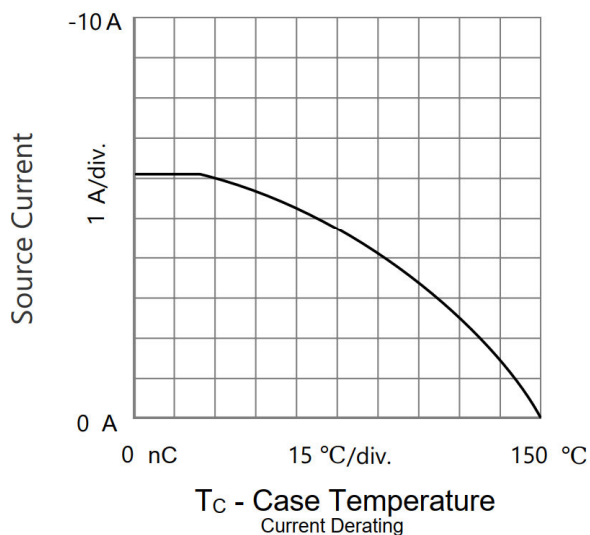
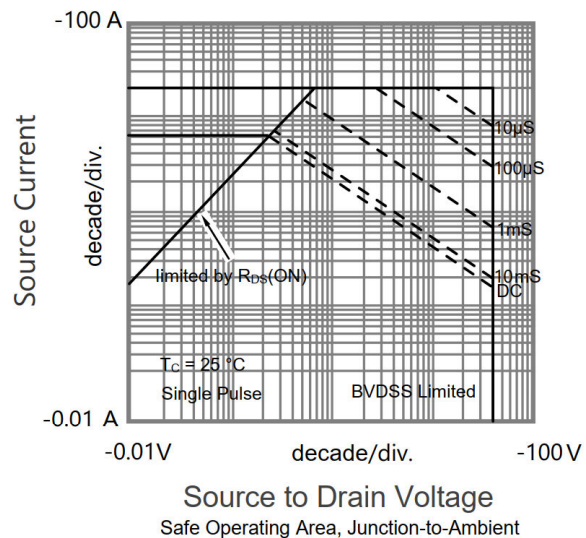
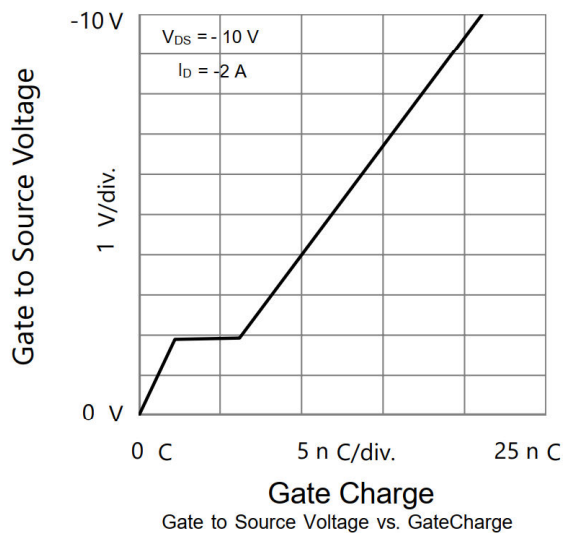


Source to Drain Voltage  
Body Diode Forward Characteristics



Drain to Source Voltage  
Capacitances

**P-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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