

## MS4541C

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

#### Features

- Low  $r_{DS(on)}$  trench technology
- Low thermal impedance
- Fast switching speed

#### Typical Applications:

- White LED boost converters
- Automotive Systems
- Industrial DC/DC Conversion Circuits

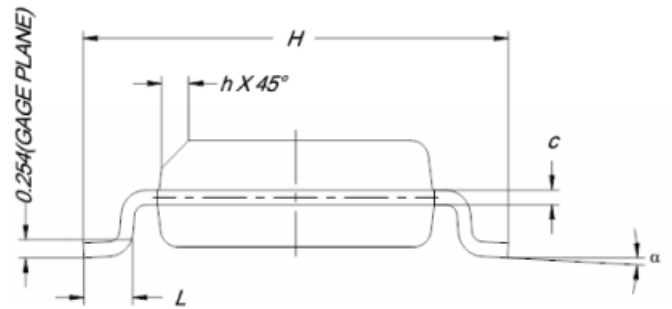
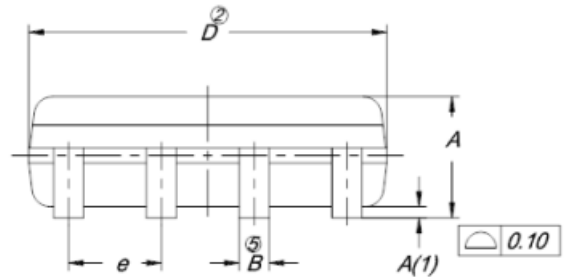
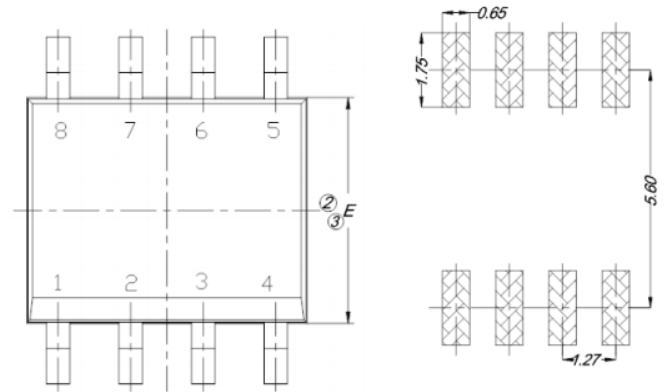
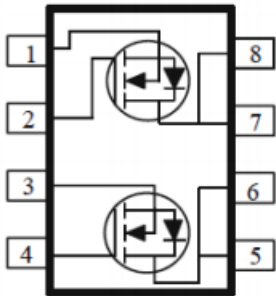
#### Packing & Order Information

3,000/Reel



**RoHS**  
COMPLIANT

#### Graphic symbol



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.35	1.55	1.75
A(1)	0.10	0.18	0.25
B	0.38	0.45	0.51
C	0.19	0.22	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
e	1.27 BSC		
H	5.80	6.00	6.20
L	0.50	0.72	0.93
$\alpha$	0°	4°	8°
h	0.25	0.38	0.50

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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current <sup>a</sup> ( $T_A=25^\circ\text{C}$ )	5.8	A
	Continuous Drain Current <sup>a</sup> ( $T_A=70^\circ\text{C}$ )	4.5	A
$I_{DM}$	Pulsed Drain Current <sup>b</sup>	20	A
$I_S$	Continuous Source Current (Diode Conduction) <sup>a</sup>	2.6	A
$P_D$	Power Dissipation <sup>a</sup> ( $T_A=25^\circ\text{C}$ )	2.1	W
	Power Dissipation <sup>a</sup> ( $T_A=70^\circ\text{C}$ )	1.3	W
$T_J/T_{STG}$	Operating Junction and Storage Temperature	-55 to 150	$^\circ\text{C}$

##### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient <sup>a</sup> ( $t \leq 10$ sec)	62.5	$^\circ\text{C/W}$
	Maximum Junction-to-Ambient <sup>a</sup> (Steady-State)	110	

##### Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

##### Static

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$ (N-ch) $V_{DS} = V_{GS}$ , $I_D = -250\mu\text{A}$ (P-ch)	1 -1			V
$I_{GSS}$	Gate-Body Leakage	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			$\pm 100$	nA
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32$ V, $V_{GS} = 0$ V (N-ch) $V_{DS} = -32$ V, $V_{GS} = 0$ V (P-ch)			1 -1	$\mu\text{A}$
$I_{D(on)}$	On-State Drain Current	$V_{DS} = 5$ V, $V_{GS} = 10$ V (N-ch) $V_{DS} = -5$ V, $V_{GS} = -10$ V (P-ch)	10 -10			A
$r_{DS(on)}$	Drain-Source On-Resistance	$V_{GS} = 10$ V, $I_D = 5.3$ A (N-ch) $V_{GS} = 4.5$ V, $I_D = 4.4$ A (N-ch) $V_{GS} = -10$ V, $I_D = -3.6$ A (N-ch) $V_{GS} = -4.5$ V, $I_D = -2.6$ A (N-ch)			42 60 90 125	m $\Omega$
$g_{fs}$	Forward Transconductance	$V_{GS} = 15$ V, $I_D = 5.3$ A (N-ch) $V_{GS} = -15$ V, $I_D = -3.6$ A (P-ch)		13 11		S
$V_{SD}$	Diode Forward Voltage	$I_S = 1.3$ A, $V_{GS} = 0$ V (N-ch) $I_S = -1.2$ A, $V_{GS} = 0$ V (P-ch)		0.77 -0.81		V

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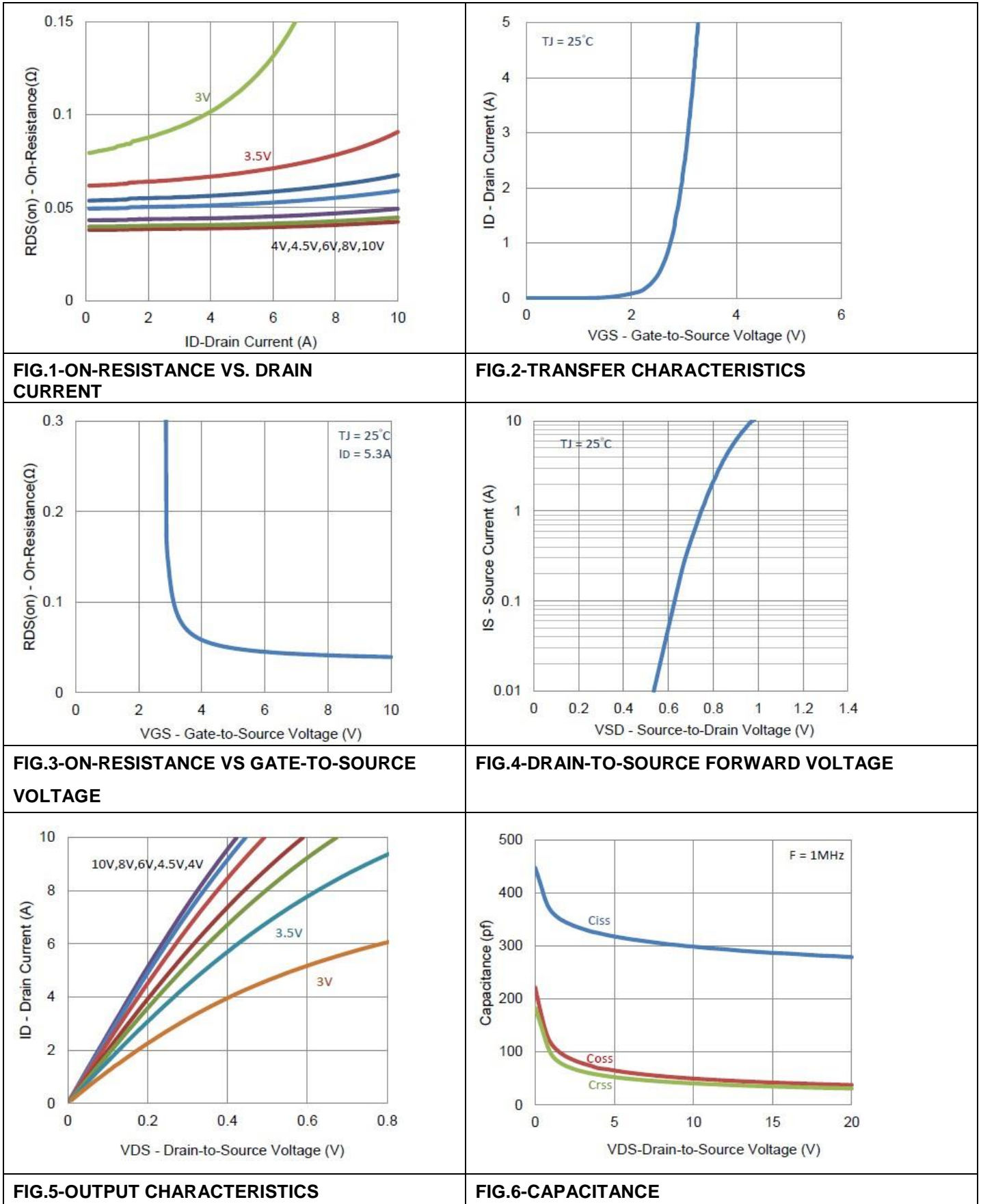
Dynamic <sup>b</sup>						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	Total Gate Charge	N-Channel $V_{DS} = 20\text{ V}$ , $I_D = 5.3\text{ A}$ , $V_{GS} = 10\text{ V}$	--	3.6	--	nC
$Q_{gs}$	Gate-Source Charge		--	1.3	--	nC
$Q_{gd}$	Gate-Drain Charge		--	1.4	--	nC
$t_{d(on)}$	Turn-On Delay Time	N-Channel $I_D = 5.3\text{ A}$ , $R_L = 3.5\ \Omega$ , $V_{GEN} = 10\text{ V}$ , $R_{GEN} = 6\ \Omega$ , $V_{DD} = 20\text{ V}$	--	2	--	ns
$t_r$	Rise Time		--	18	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	16	--	ns
$t_f$	Fall Time		--	5	--	ns
$C_{ISS}$	Input Capacitance	N-Channel $V_{DS} = 15\text{ V}$ $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	--	287	--	pF
$C_{OSS}$	Output Capacitance		--	42	--	pF
$C_{RSS}$	Reverse Transfer Capacitance		--	34	--	pF
$Q_g$	Total Gate Charge	P-Channel $V_{DS} = -20\text{ V}$ , $I_D = -3.6\text{ A}$ , $V_{GS} = -10\text{ V}$	--	5.8	--	nC
$Q_{gs}$	Gate-Source Charge		--	1.6	--	nC
$Q_{gd}$	Gate-Drain Charge		--	2.3	--	nC

Dynamic <sup>b</sup>						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	P-Channel $I_D = -3.6\text{ A}$ , $R_L = 5.5\ \Omega$ , $V_{GEN} = -10\text{ V}$ , $R_{GEN} = 6\ \Omega$ , $V_{DD} = -20\text{ V}$	--	4	--	ns
$t_r$	Rise Time		--	5	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	17	--	ns
$t_f$	Fall Time		--	7	--	ns
$C_{ISS}$	Input Capacitance	P-Channel $V_{DS} = -15\text{ V}$ $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	--	384	--	pF
$C_{OSS}$	Output Capacitance		--	36	--	pF
$C_{RSS}$	Reverse Transfer Capacitance		--	36	--	pF

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#### Typical Electrical Characteristics - N-channel



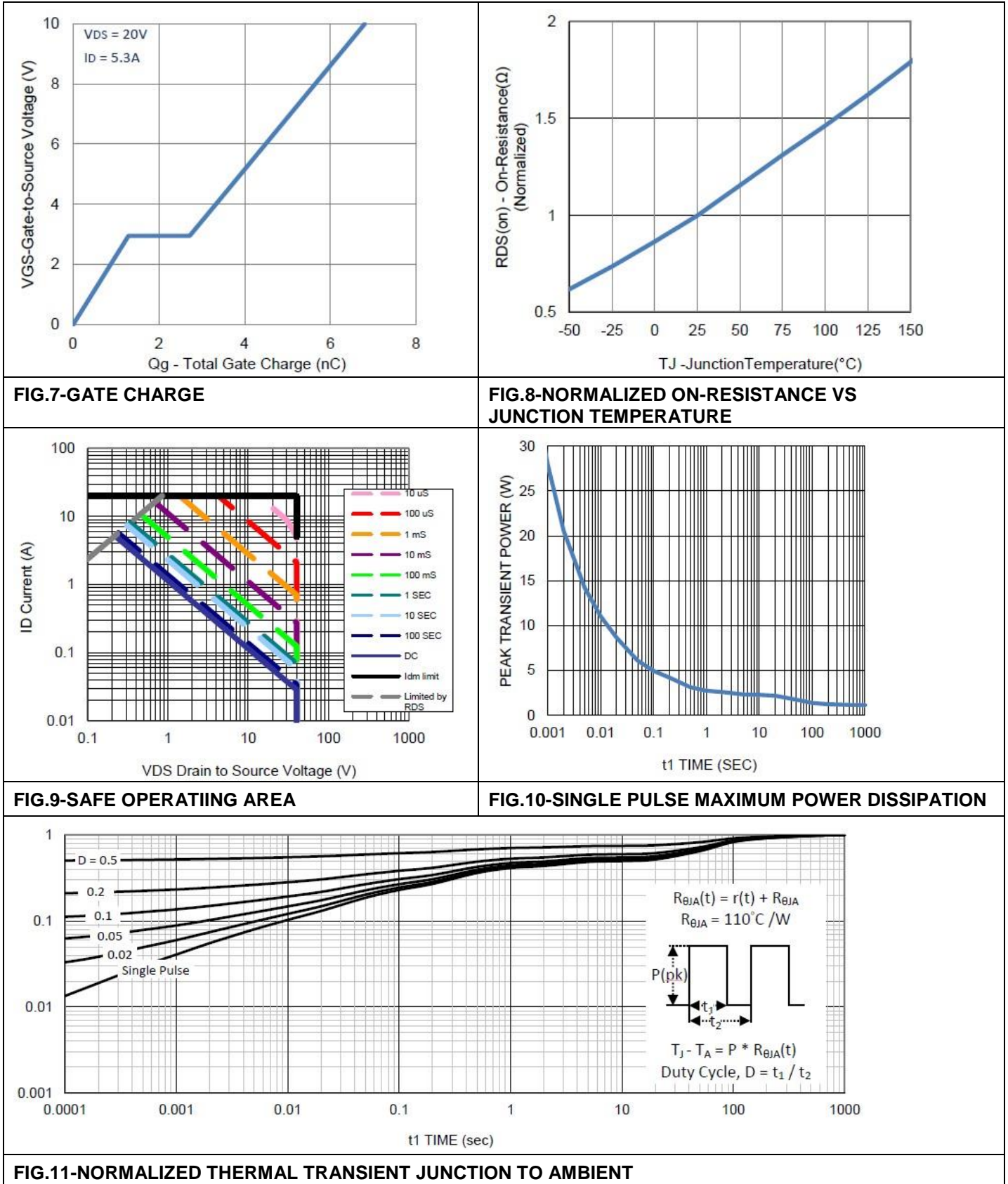
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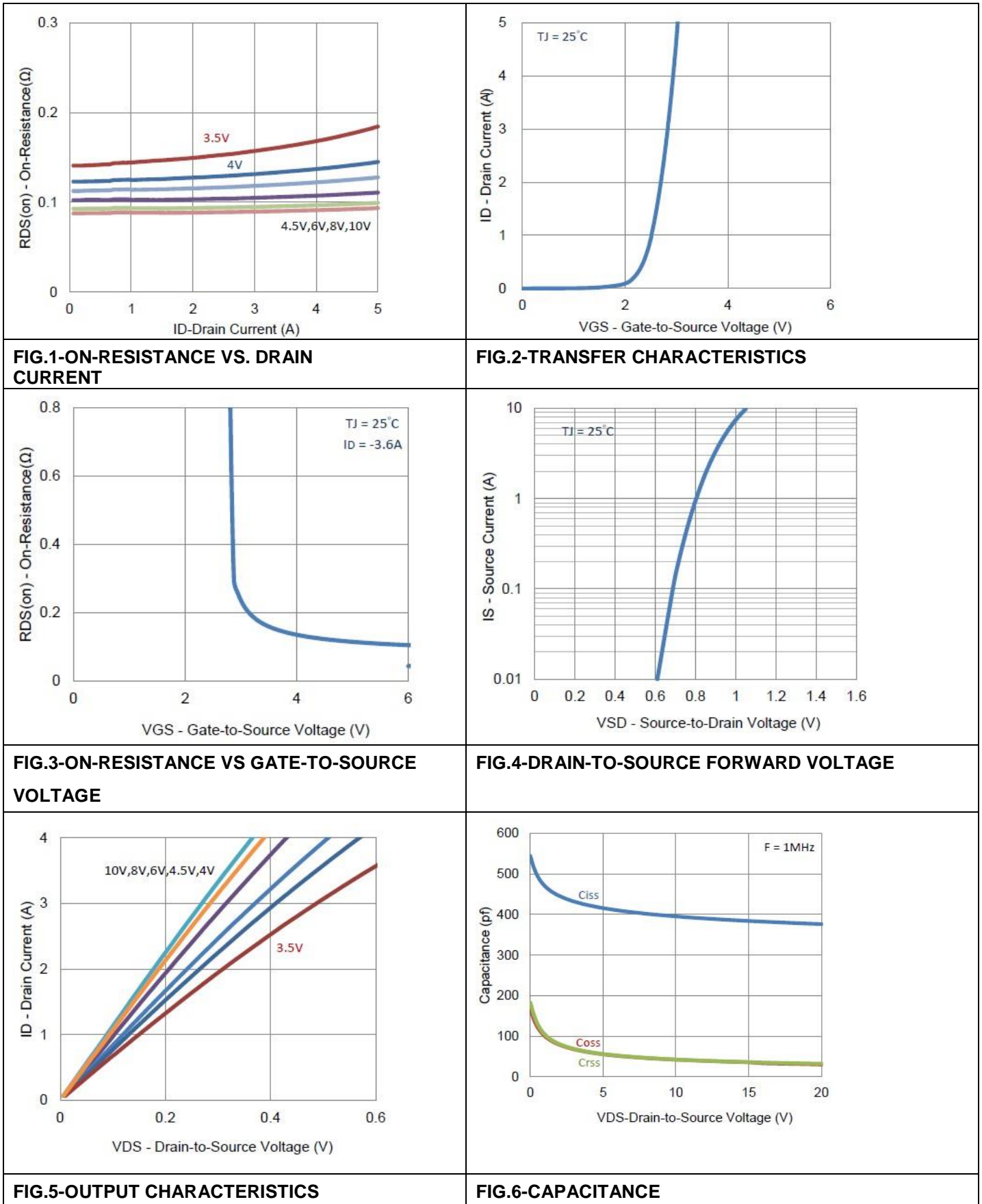
#### ■ Typical Electrical Characteristics - N-channel



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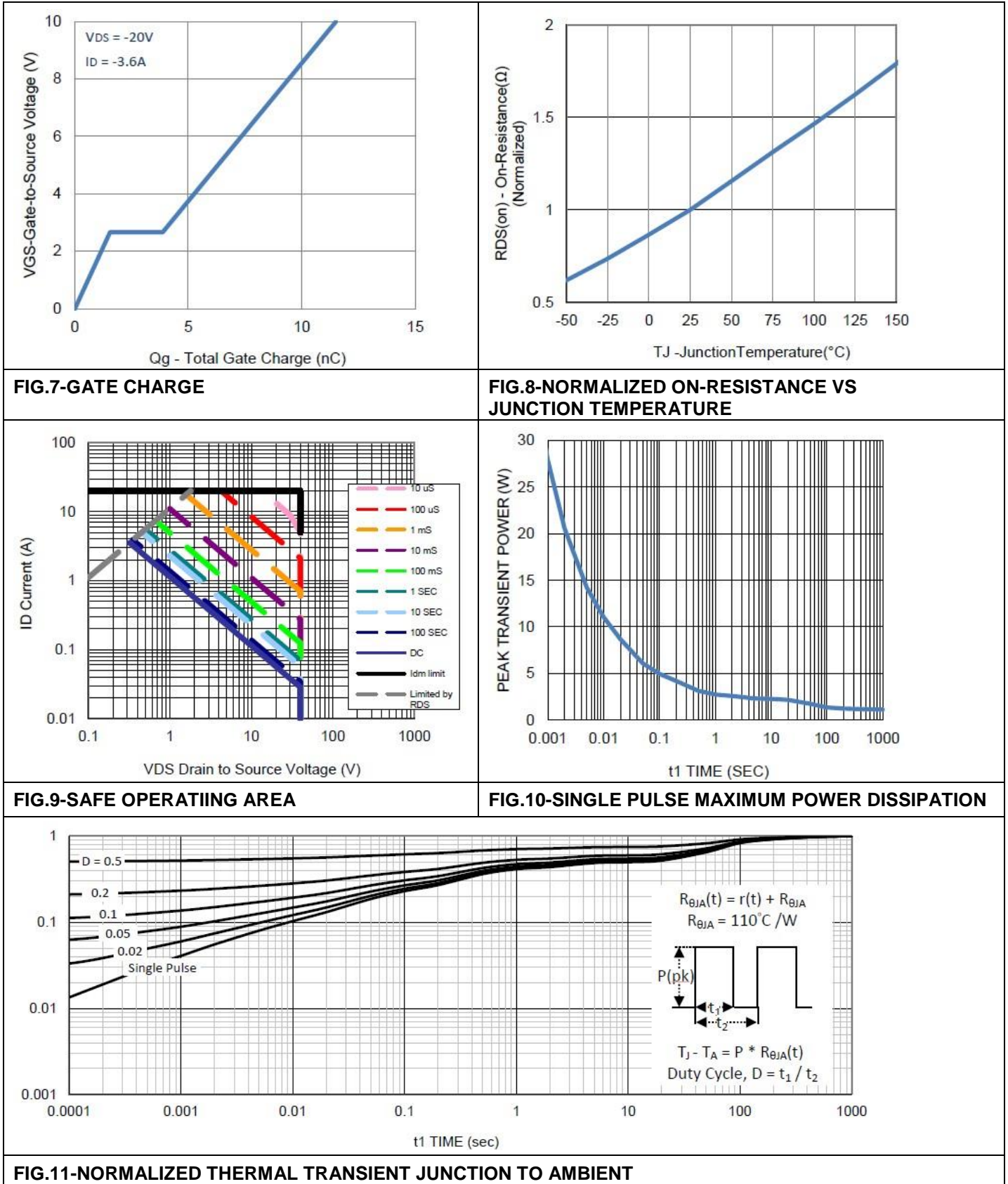
#### Typical Electrical Characteristics - P-channel



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#### ■ Typical Electrical Characteristics - P-channel





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