



## Dual Enhancement Mode Field Effect Transistor ( N and P Channel)

PRODUCT SUMMARY (N-Channel)		
V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> ( mΩ ) Max
55V	4.5A	50 @ V <sub>GS</sub> = 10V
		75 @ V <sub>GS</sub> = 4.5V

PRODUCT SUMMARY (P-Channel)		
V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> ( mΩ ) Max
-55V	-3A	110 @ V <sub>GS</sub> = -10V
		145 @ V <sub>GS</sub> = -4.5V



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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage Rating		V <sub>spike</sub> <sup>d</sup>	60	-60	V
Drain-Source Voltage		V <sub>DS</sub>	55	-55	V
Gate-Source Voltage		V <sub>GS</sub>	±20	±20	V
Drain Current-Continuous <sup>a</sup> @ T <sub>a</sub>	25°C	I <sub>D</sub>	4.5	-3	A
	70°C		3.8	-2.5	A
-Pulsed <sup>b</sup>		I <sub>DM</sub>	20	-15	A
Drain-Source Diode Forward Current <sup>a</sup>		I <sub>S</sub>	1.7	-1.7	A
Maximum Power Dissipation <sup>a</sup>	T <sub>a</sub> =25°C	P <sub>D</sub>	2		W
	T <sub>a</sub> =70°C		1.44		
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to 150		°C

### THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Ambient <sup>a</sup>	R <sub>θJA</sub>	62.5	°C/W
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N-Channel ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	55			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=44V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS<sup>b</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.4	2	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4.5A$		35	50	m ohm
		$V_{GS}=4.5V, I_D=4A$		60	75	m ohm
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=5V, V_{GS}=10V$	15			A
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=4.5A$		9		S
<b>DYNAMIC CHARACTERISTICS<sup>c</sup></b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V$ $f=1.0MHz$		900	1170	pF
Output Capacitance	$C_{OSS}$			80	104	pF
Reverse Transfer Capacitance	$C_{RSS}$			60	78	pF
Gate resistance	$R_g$	$V_{GS}=0V, V_{DS}=0V, f=1.0MHz$		2		ohm
<b>SWITCHING CHARACTERISTICS<sup>c</sup></b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=30V$ $I_D=1A$ $V_{GS}=10V$ $R_{GEN}=6\text{ ohm}$		15	45	ns
Rise Time	$t_r$			5	11	ns
Turn-Off Delay Time	$t_{D(OFF)}$			27	60	ns
Fall Time	$t_f$			10	23	ns
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=4.5A, V_{GS}=10V$		19	25	nC
		$V_{DS}=30V, I_D=4.5A, V_{GS}=4.5V$		9.5	13	nC
Gate-Source Charge	$Q_{gs}$	$V_{DS}=30V, I_D=4.5A$		4	6	nC
Gate-Drain Charge	$Q_{gd}$	$V_{GS}=4.5V$		3.6	5	nC

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P-Channel ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-55			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -44V, V_{GS} = 0V$			-1	$\mu A$
Gate-Body Leakage	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS<sup>b</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.4	-1.6	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -3A$		87	110	m ohm
		$V_{GS} = -4.5V, I_D = -2A$		125	145	m ohm
On-State Drain Current	$I_{D(ON)}$	$V_{DS} = -5V, V_{GS} = -10V$	10			A
Forward Transconductance	$g_{FS}$	$V_{DS} = -5V, I_D = -3A$		8		S
<b>DYNAMIC CHARACTERISTICS<sup>c</sup></b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = -30V, V_{GS} = 0V$ $f = 1.0MHz$		970	1261	pF
Output Capacitance	$C_{OSS}$			60	80	pF
Reverse Transfer Capacitance	$C_{RSS}$			40	60	pF
Gate resistance	$R_g$	$V_{GS} = 0V, V_{DS} = 0V, f = 1.0MHz$		2.5		ohm
<b>SWITCHING CHARACTERISTICS<sup>c</sup></b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = -30V$ $R_L = 15\text{ ohm}$ $V_{GS} = -10V$ $R_{GEN} = 6\text{ ohm}$		20	60	ns
Rise Time	$t_r$			8	17	ns
Turn-Off Delay Time	$t_{D(OFF)}$			95	209	ns
Fall Time	$t_f$			22	50	ns
Total Gate Charge	$Q_g$	$V_{DS} = -30V, I_D = -3A, V_{GS} = -10V$		20	26	nC
		$V_{DS} = -30V, I_D = -3A, V_{GS} = -4.5V$		9	12	nC
Gate-Source Charge	$Q_{gs}$	$V_{DS} = -30V, I_D = -3A$		5	7	nC
Gate-Drain Charge	$Q_{gd}$	$V_{GS} = -4.5V$		3	4	nC

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## ELECTRICAL CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS<sup>b</sup></b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{V}, I_s = 1.7\text{A}$	N-Ch	0.82	1.2	V
		$V_{GS} = 0\text{V}, I_s = -1.7\text{A}$	P-Ch	-0.84	-1.2	

### Notes

- a. Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .
- b. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- c. Guaranteed by design, not subject to production testing.
- d. Guaranteed when external  $R_g = 6 \text{ ohm}$  and  $t_f < t_f \text{ max}$

### N-Channel

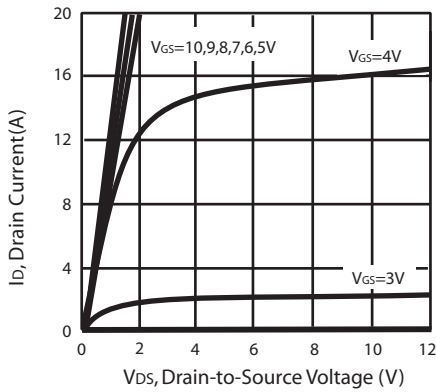


Figure 1. Output Characteristics

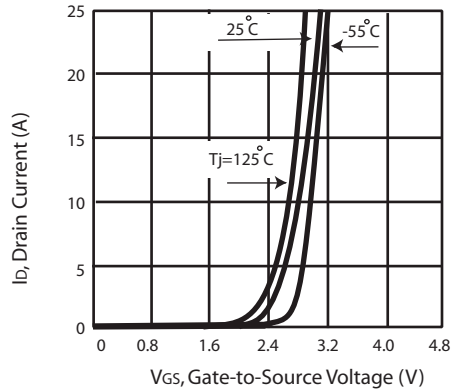


Figure 2. Transfer Characteristics

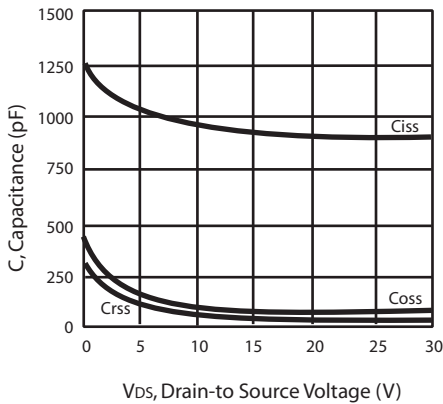


Figure 3. Capacitance

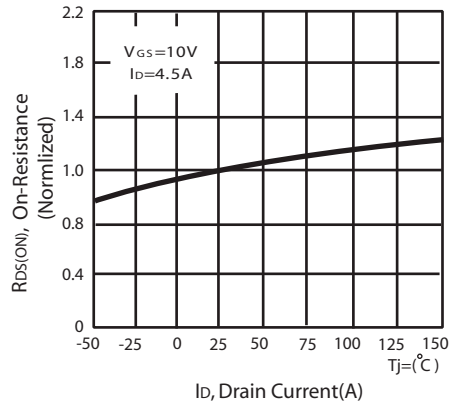


Figure 4. On-Resistance Variation with Drain Current and Temperature

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## N-Channel

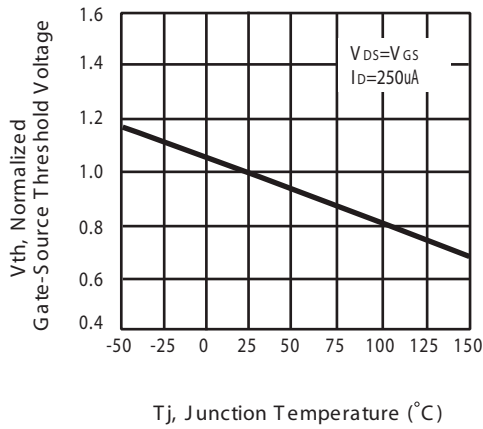


Figure 5. Gate Threshold Variation with Temperature

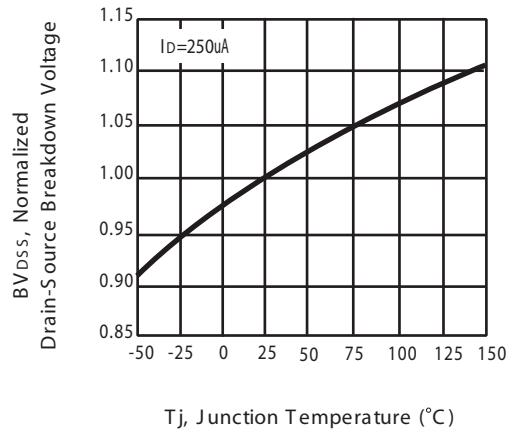


Figure 6. Breakdown Voltage Variation with Temperature

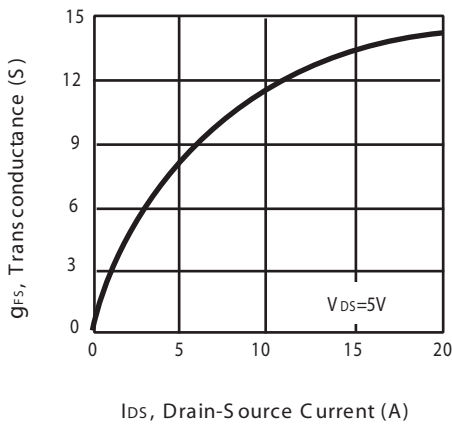


Figure 7. Transconductance Variation with Drain Current

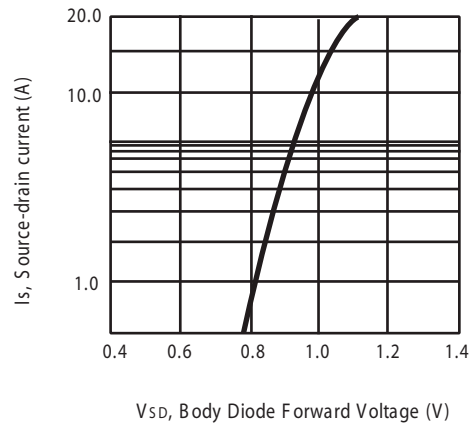


Figure 8. Body Diode Forward Voltage Variation with Source Current

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## P-Channel

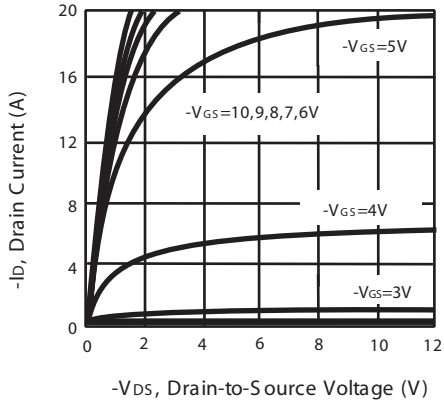


Figure 1. Output Characteristics

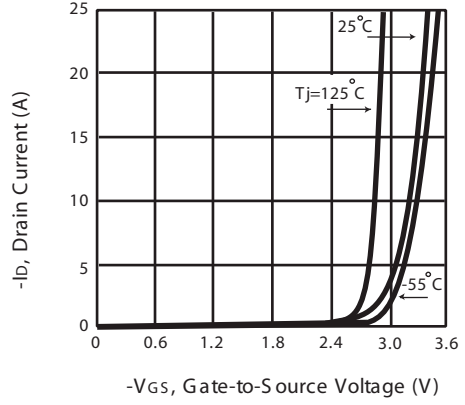


Figure 2. Transfer Characteristics

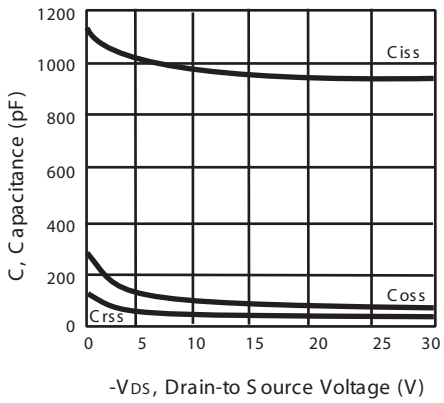


Figure 3. Capacitance

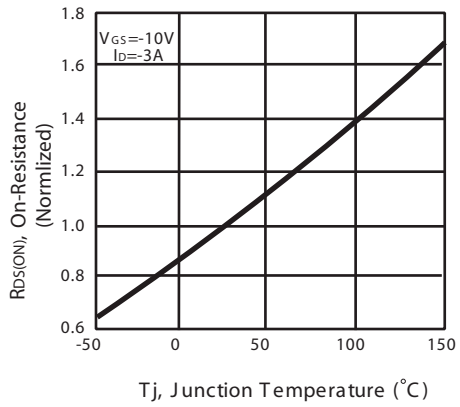


Figure 4. On-Resistance Variation with Temperature

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## P-Channel

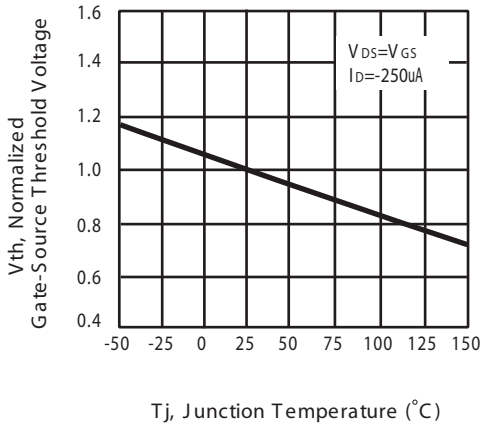


Figure 5. Gate Threshold Variation with Temperature

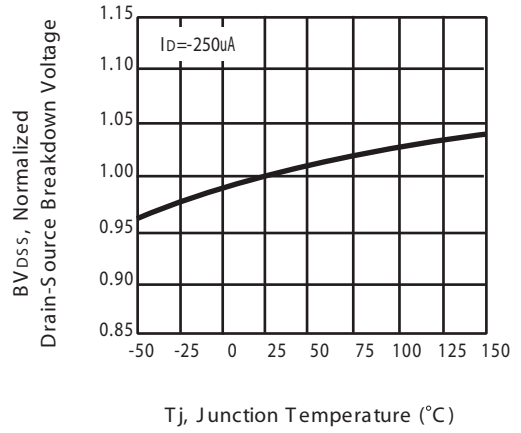


Figure 6. Breakdown Voltage Variation with Temperature

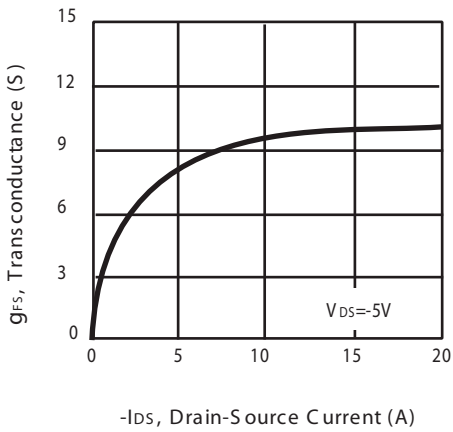


Figure 7. Transconductance Variation with Drain Current

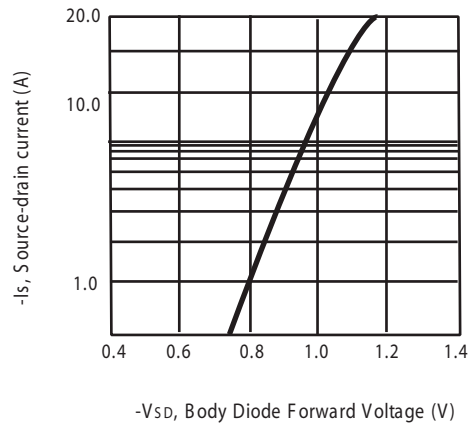
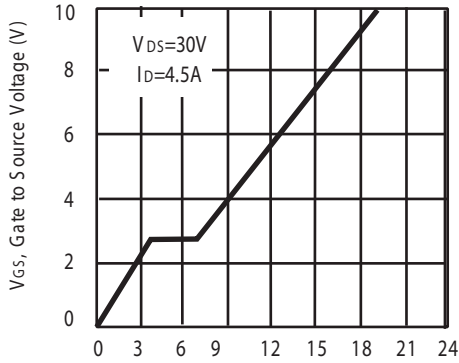


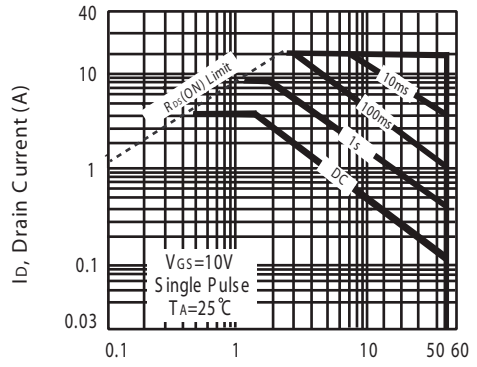
Figure 8. Body Diode Forward Voltage Variation with Source Current

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## N-Channel

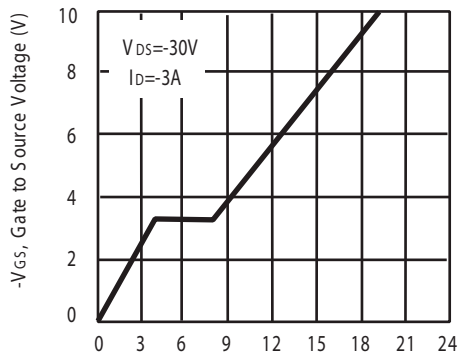


Qg, Total Gate Charge (nC)  
Figure 9. Gate Charge

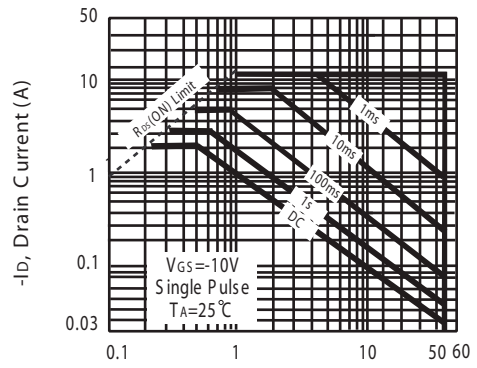


VDs, Drain-Source Voltage (V)  
Figure 10. Maximum Safe Operating Area

## P-Channel



Qg, Total Gate Charge (nC)  
Figure 9. Gate Charge



-VDs, Body Diode Forward Voltage (V)  
Figure 10. Maximum Safe Operating Area



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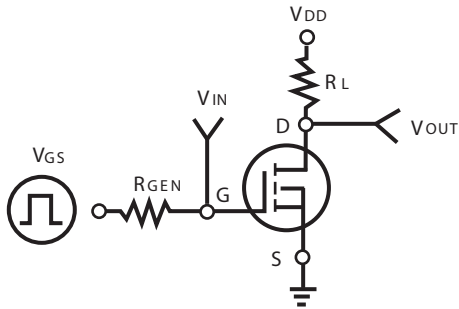


Figure 11. Switching Test Circuit

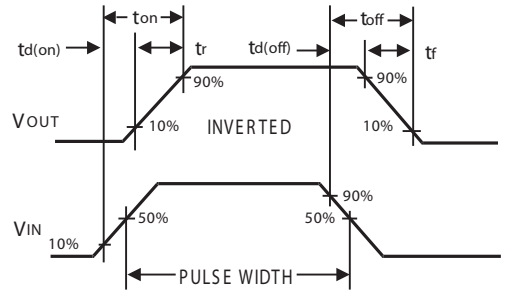
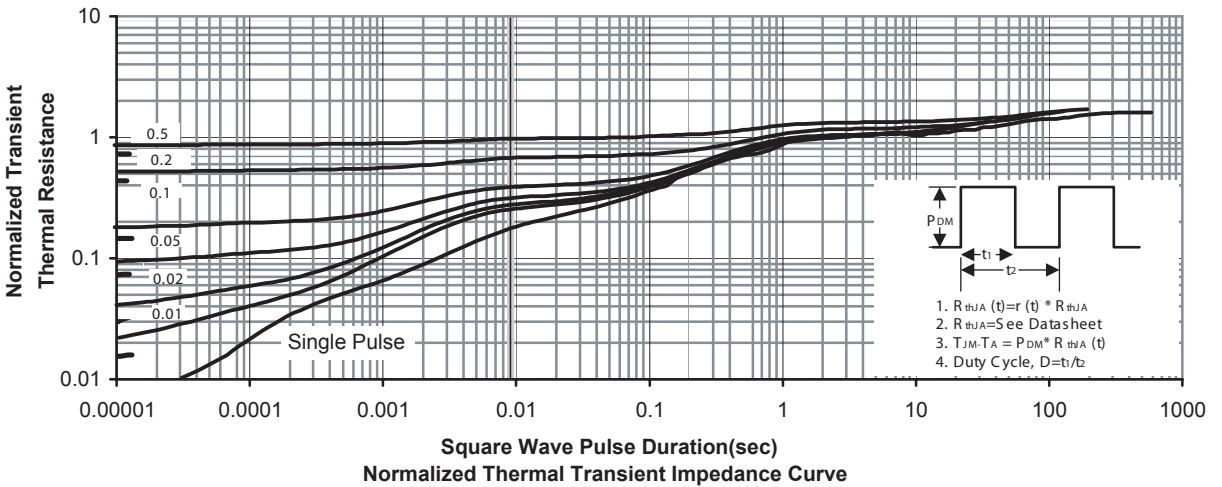
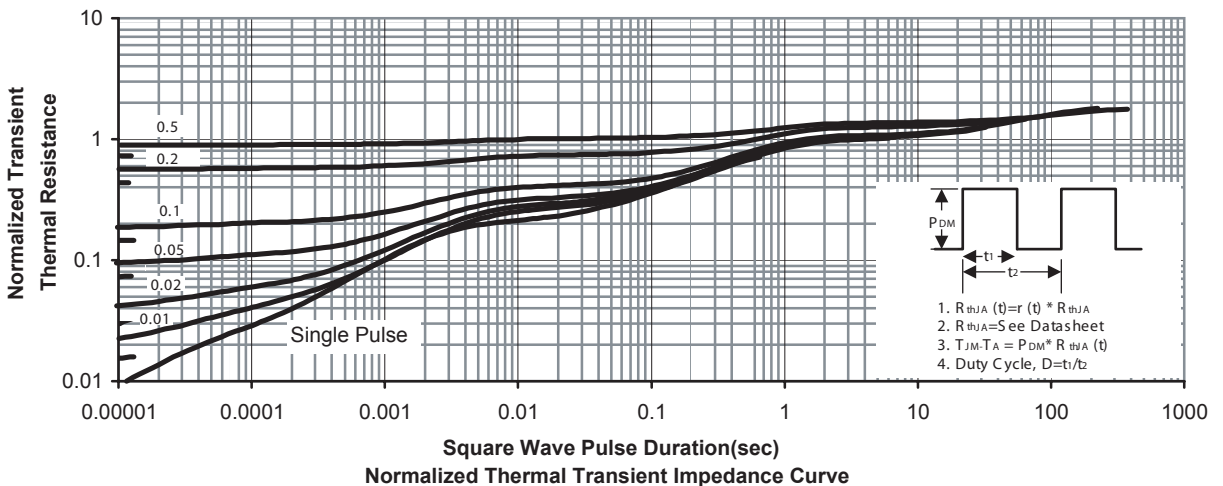


Figure 12. Switching Waveforms

## N-Channel



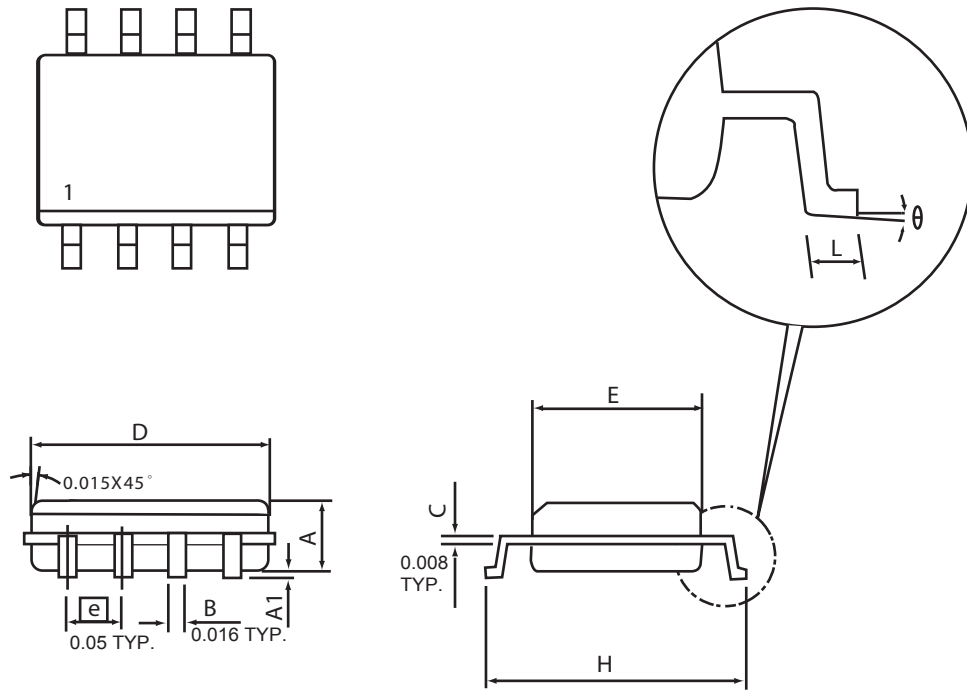
## P-Channel



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## PACKAGE OUTLINE DIMENSIONS

SO-8

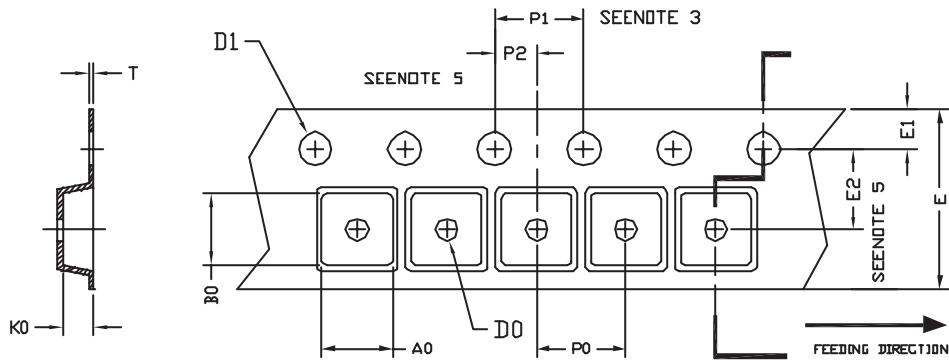


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	4.98	0.189	0.196
E	3.81	3.99	0.150	0.157
H	5.79	6.20	0.228	0.244
L	0.41	1.27	0.016	0.050
$\theta$	0°	8°	0°	8°

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## SO-8 Tape and Reel Data

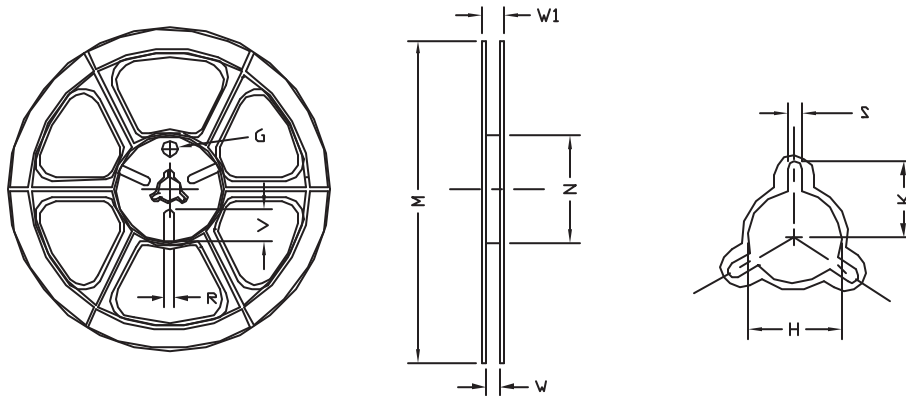
### SO-8 Carrier Tape



unit:mm

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SOP 8N 150mil	6.40	5.20	2.10	$\phi$ 1.5 (MIN)	$\phi$ 1.5 + 0.1 - 0.0	12.0 $\pm$ 0.3	1.75	5.5 $\pm$ 0.05	8.0	4.0	2.0 $\pm$ 0.05	0.3 $\pm$ 0.05

### SO-8 Reel



UNIT:mm

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
12 mm	$\phi$ 330	330 $\pm$ 1	62 $\pm$ 1.5	12.4 + 0.2	16.8 - 0.4	$\phi$ 12.75 + 0.15	---	2.0 $\pm$ 0.15	---	---	---