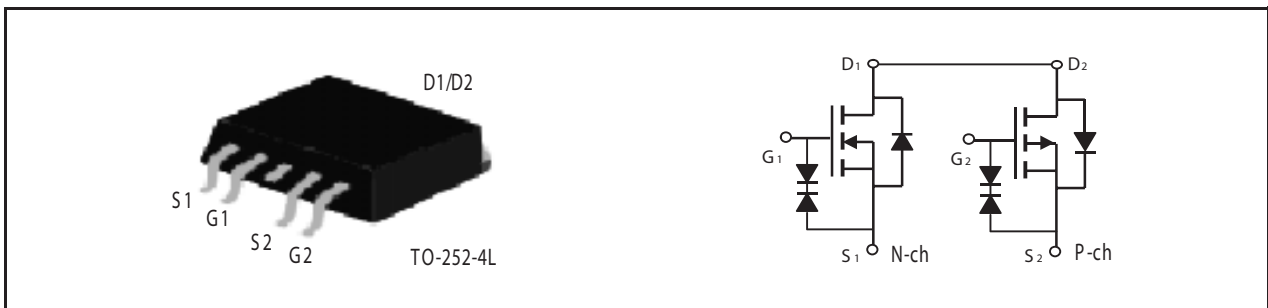




## Dual Enhancement Mode Field Effect Transistor (N and P Channel)

PRODUCT SUMMARY (N-Channel)		
V <sub>DS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (mΩ) Max
30V	16A	28 @ V <sub>GS</sub> =10V
		40 @ V <sub>GS</sub> =4.5V

PRODUCT SUMMARY (P-Channel)		
V <sub>DS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (mΩ) Max
-30V	-14A	34 @ V <sub>GS</sub> =-10V
		55 @ V <sub>GS</sub> =-4.5V



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

Symbol	Parameter	N-Channel	P-Channel	Units	
V <sub>DS</sub>	Drain-Source Voltage	30	-30	V	
V <sub>GS</sub>	Gate-Source Voltage	±20	±20	V	
I <sub>D</sub>	Drain Current-Continuous <sup>a</sup>	T <sub>C</sub> =25°C	16	-14	A
		T <sub>C</sub> =70°C	13	-11	A
I <sub>DM</sub>	-Pulsed <sup>b</sup>	47	-42	A	
E <sub>AS</sub>	Single Pulse Avalanche Energy <sup>d</sup>	16	64	mJ	
P <sub>D</sub>	Maximum Power Dissipation <sup>a</sup>	T <sub>C</sub> =25°C	10.4		W
		T <sub>C</sub> =70°C	6.7		W
T <sub>J</sub> , T <sub>STG</sub>	Operating Junction and Storage Temperature Range	-55 to 150		°C	

### THERMAL CHARACTERISTICS

R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case <sup>a</sup>	12	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient <sup>a</sup>	60	°C/W

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## N-Channel ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V			1	uA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V			±10	uA
<b>ON CHARACTERISTICS</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1	1.9	3	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =16A		22	28	m ohm
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =13.7A		31	40	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =16A		25		S
<b>DYNAMIC CHARACTERISTICS <sup>c</sup></b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V f=1.0MHz		505		pF
C <sub>OSS</sub>	Output Capacitance			105		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			65		pF
<b>SWITCHING CHARACTERISTICS <sup>c</sup></b>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =15V I <sub>D</sub> =1A V <sub>GS</sub> =10V R <sub>GEN</sub> =6 ohm		12		ns
t <sub>r</sub>	Rise Time			11		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			16.6		ns
t <sub>f</sub>	Fall Time			14		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, I <sub>D</sub> =16A, V <sub>GS</sub> =10V		8.8		nC
		V <sub>DS</sub> =15V, I <sub>D</sub> =16A, V <sub>GS</sub> =4.5V		4.3		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =15V, I <sub>D</sub> =16A,		1.5		nC
Q <sub>gd</sub>	Gate-Drain Charge	V <sub>GS</sub> =10V		2.3		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				1.7	A
V <sub>SD</sub>	Diode Forward Voltage <sup>b</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1.7A		0.8	1.2	V

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## P-Channel ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V			-1	uA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V			±10	uA
<b>ON CHARACTERISTICS</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA	-1	-1.8	-3	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-14A		26	34	m ohm
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-11A		41	55	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-14A		17		S
<b>DYNAMIC CHARACTERISTICS <sup>c</sup></b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V f=1.0MHz		815		pF
C <sub>OSS</sub>	Output Capacitance			215		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			125		pF
<b>SWITCHING CHARACTERISTICS <sup>c</sup></b>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-15V I <sub>D</sub> =-1A V <sub>GS</sub> =-10V R <sub>GEN</sub> =6 ohm		13		ns
t <sub>r</sub>	Rise Time			15		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			62		ns
t <sub>f</sub>	Fall Time			13		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-15V, I <sub>D</sub> =-14A, V <sub>GS</sub> =-10V		15.5		nC
		V <sub>DS</sub> =-15V, I <sub>D</sub> =-14A, V <sub>GS</sub> =-4.5V		7.3		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-15V, I <sub>D</sub> =-14A, V <sub>GS</sub> =-10V		1.7		nC
Q <sub>gd</sub>	Gate-Drain Charge			4.7		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				-1.7	A
V <sub>SD</sub>	Diode Forward Voltage <sup>b</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1.7A		-0.77	-1.3	V
<b>Notes</b> a.Surface Mounted on FR4 Board, t ≤ 10sec. b.Pulse Test:Pulse Width ≤ 300us, Duty Cycle ≤ 2%. c.Guaranteed by design, not subject to production testing. d.Starting T <sub>J</sub> =25°C, L=0.5mH, V <sub>DD</sub> = 20V, V <sub>GS</sub> =10V.(See Figure13)						

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## N-Channel

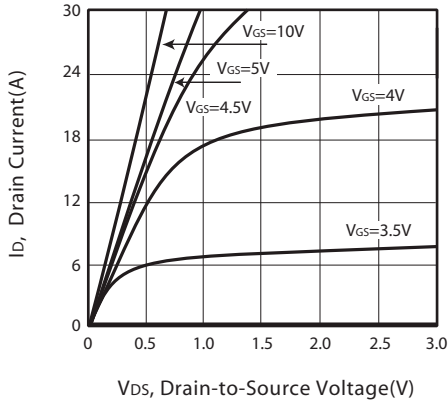


Figure 1. Output Characteristics

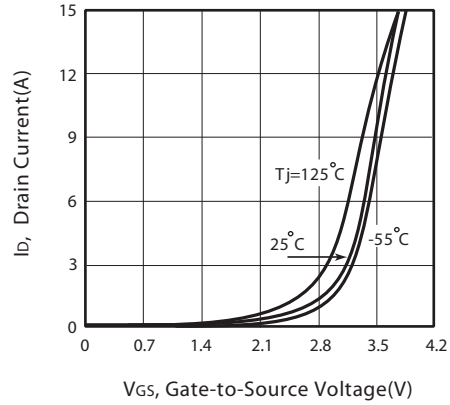


Figure 2. Transfer Characteristics

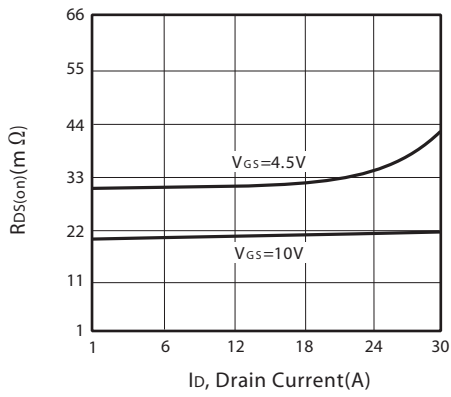


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

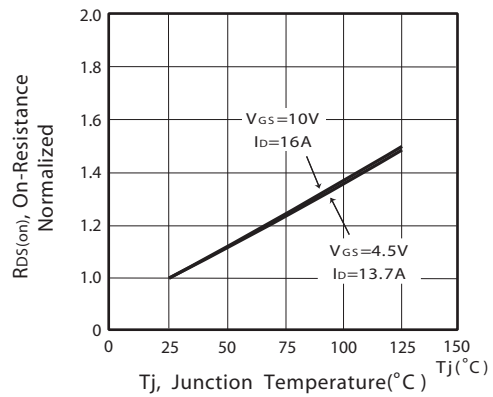


Figure 4. On-Resistance Variation with Drain Current and Temperature

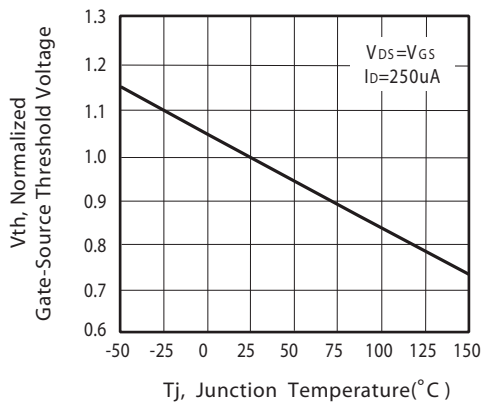


Figure 5. Gate Threshold Variation with Temperature

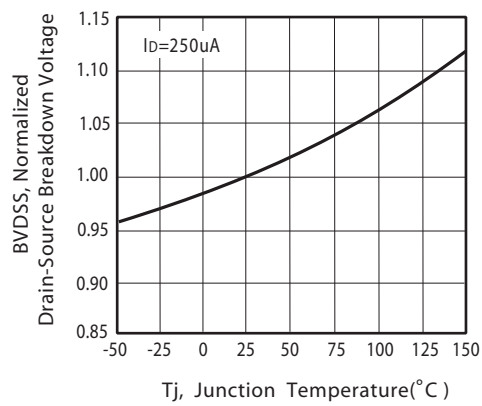


Figure 6. Breakdown Voltage Variation with Temperature

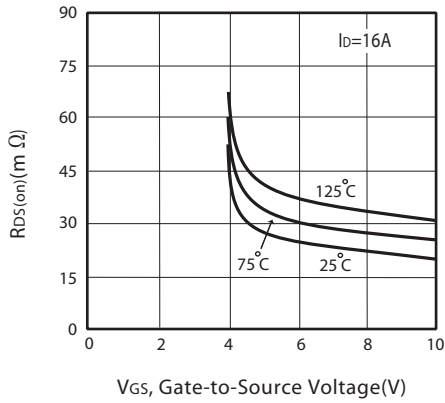


Figure 7. On-Resistance vs. Gate-Source Voltage

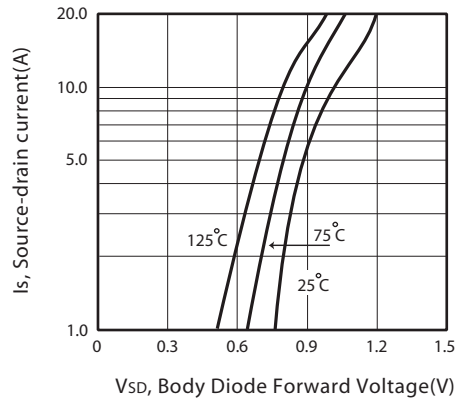


Figure 8. Body Diode Forward Voltage Variation with Source Current

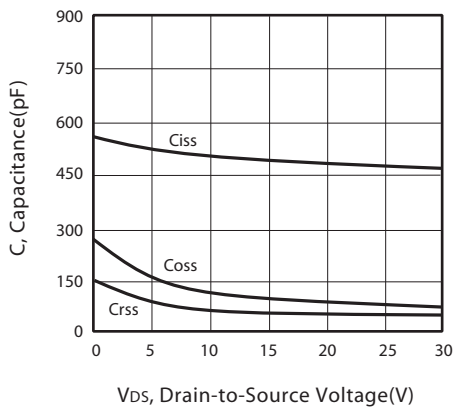


Figure 9. Capacitance

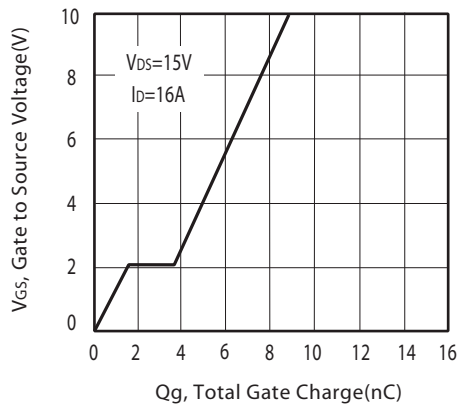


Figure 10. Gate Charge

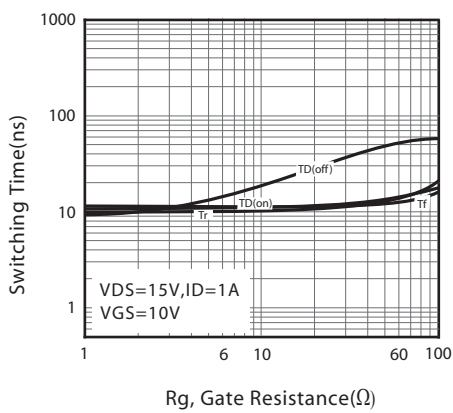


Figure 11. switching characteristics

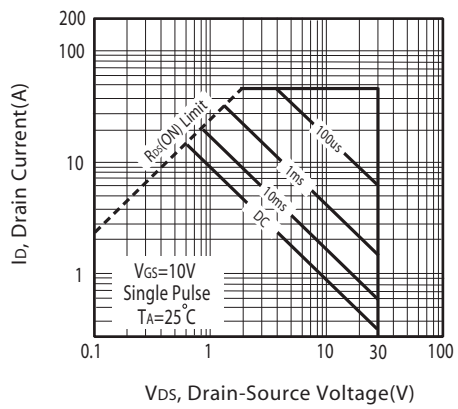
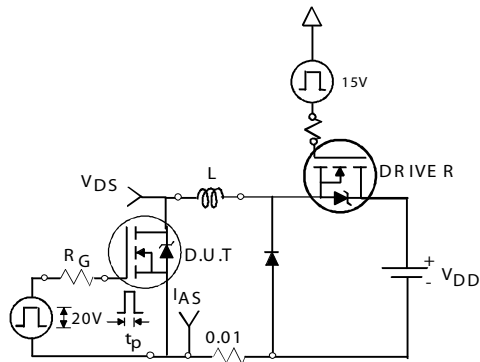
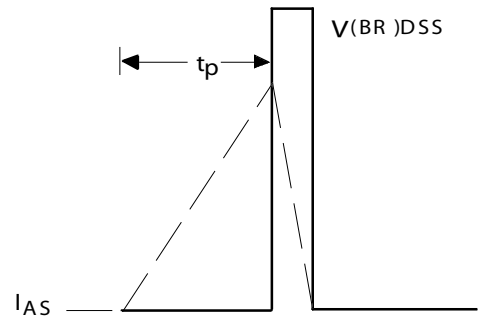


Figure 12. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

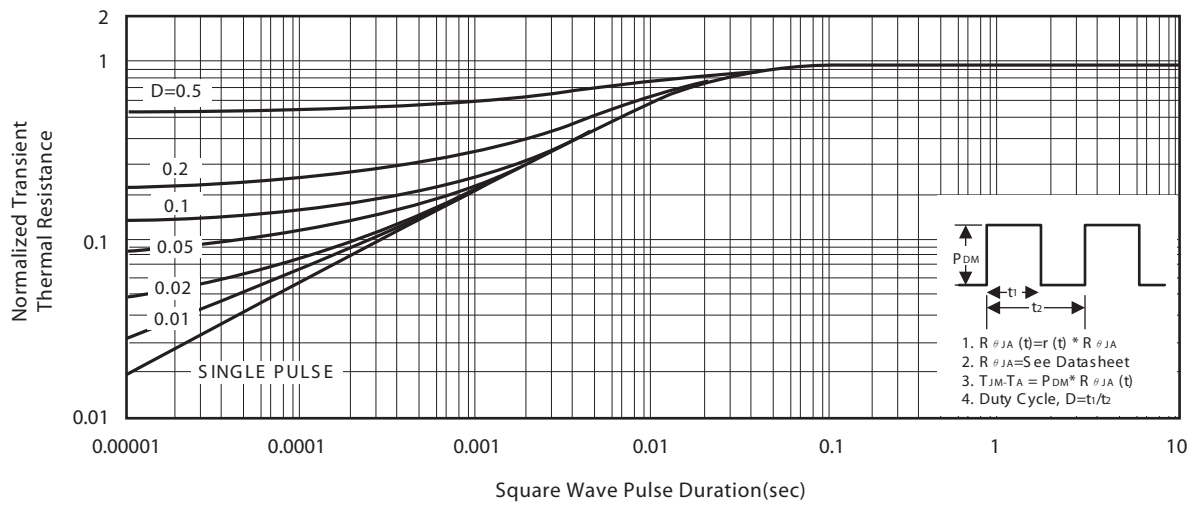


Figure 14. Normalized Thermal Transient Impedance Curve

P-Channel

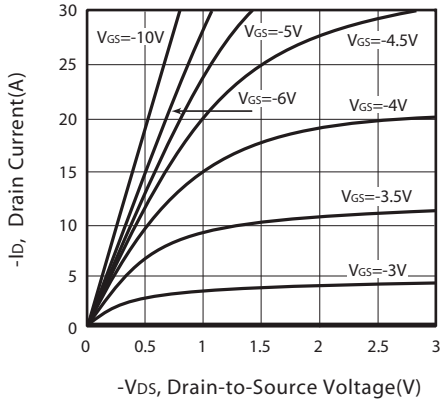


Figure 1. Output Characteristics

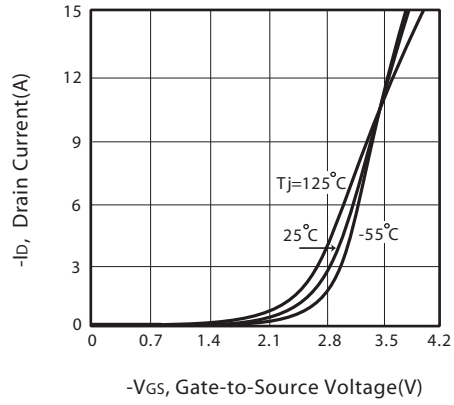


Figure 2. Transfer Characteristics

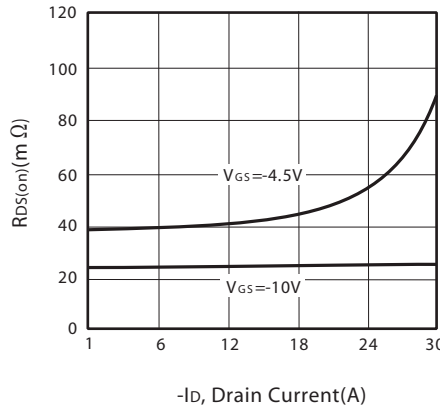


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

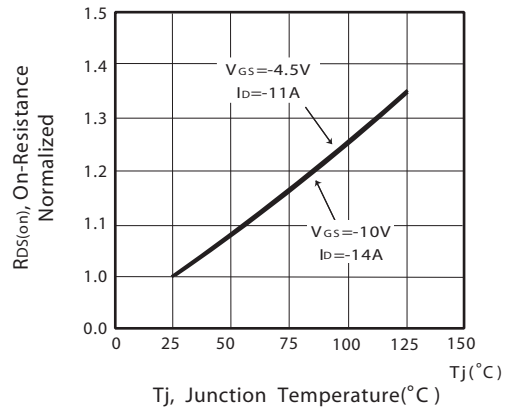


Figure 4. On-Resistance Variation with Drain Current and Temperature

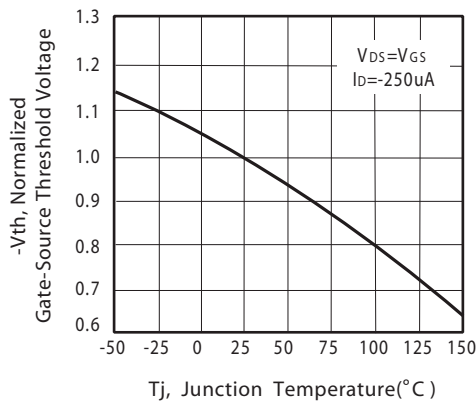


Figure 5. Gate Threshold Variation with Temperature

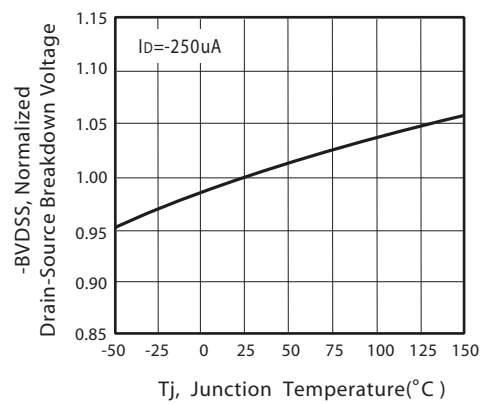


Figure 6. Breakdown Voltage Variation with Temperature

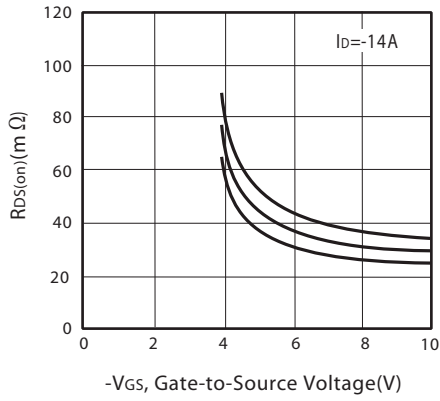


Figure 7. On-Resistance vs. Gate-Source Voltage

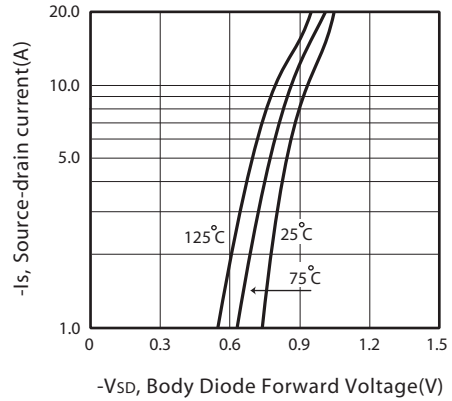


Figure 8. Body Diode Forward Voltage Variation with Source Current

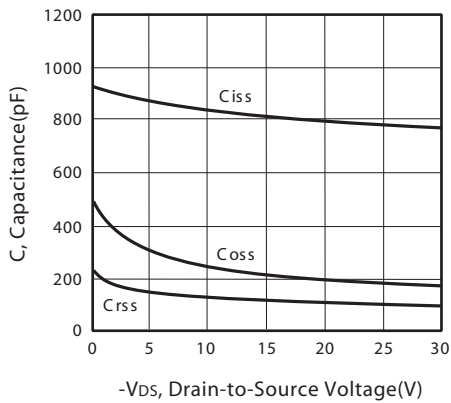


Figure 9. Capacitance

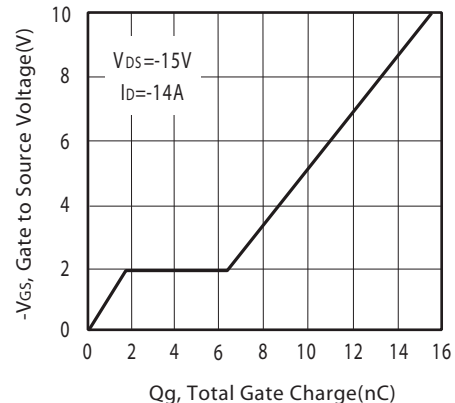


Figure 10. Gate Charge

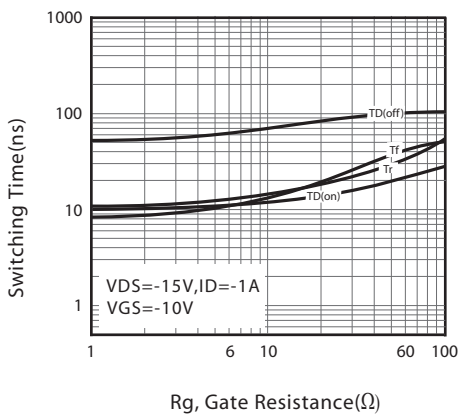


Figure 11. switching characteristics

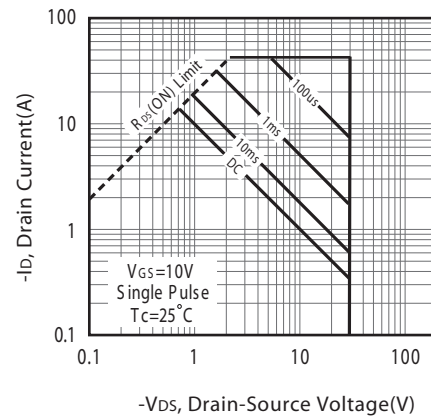
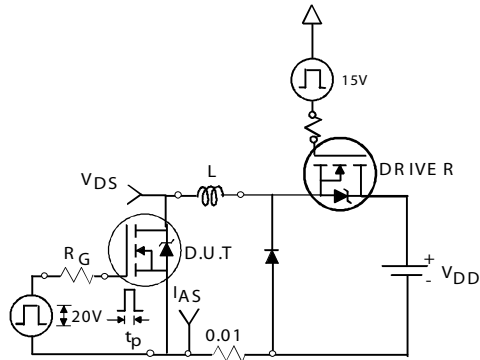


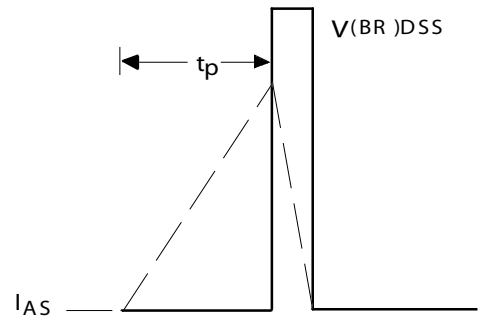
Figure 12. Maximum Safe Operating Area





Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

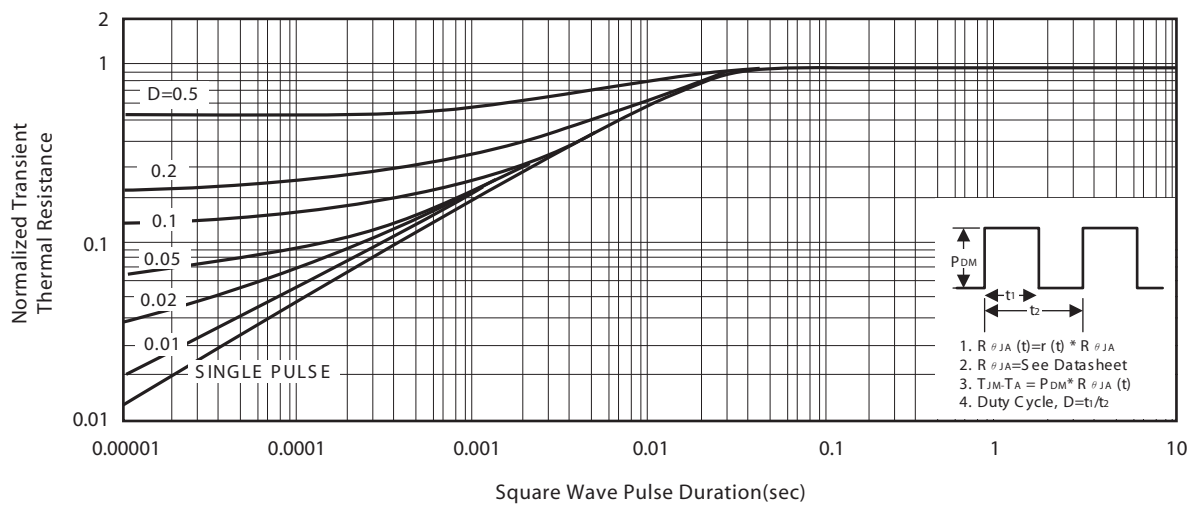
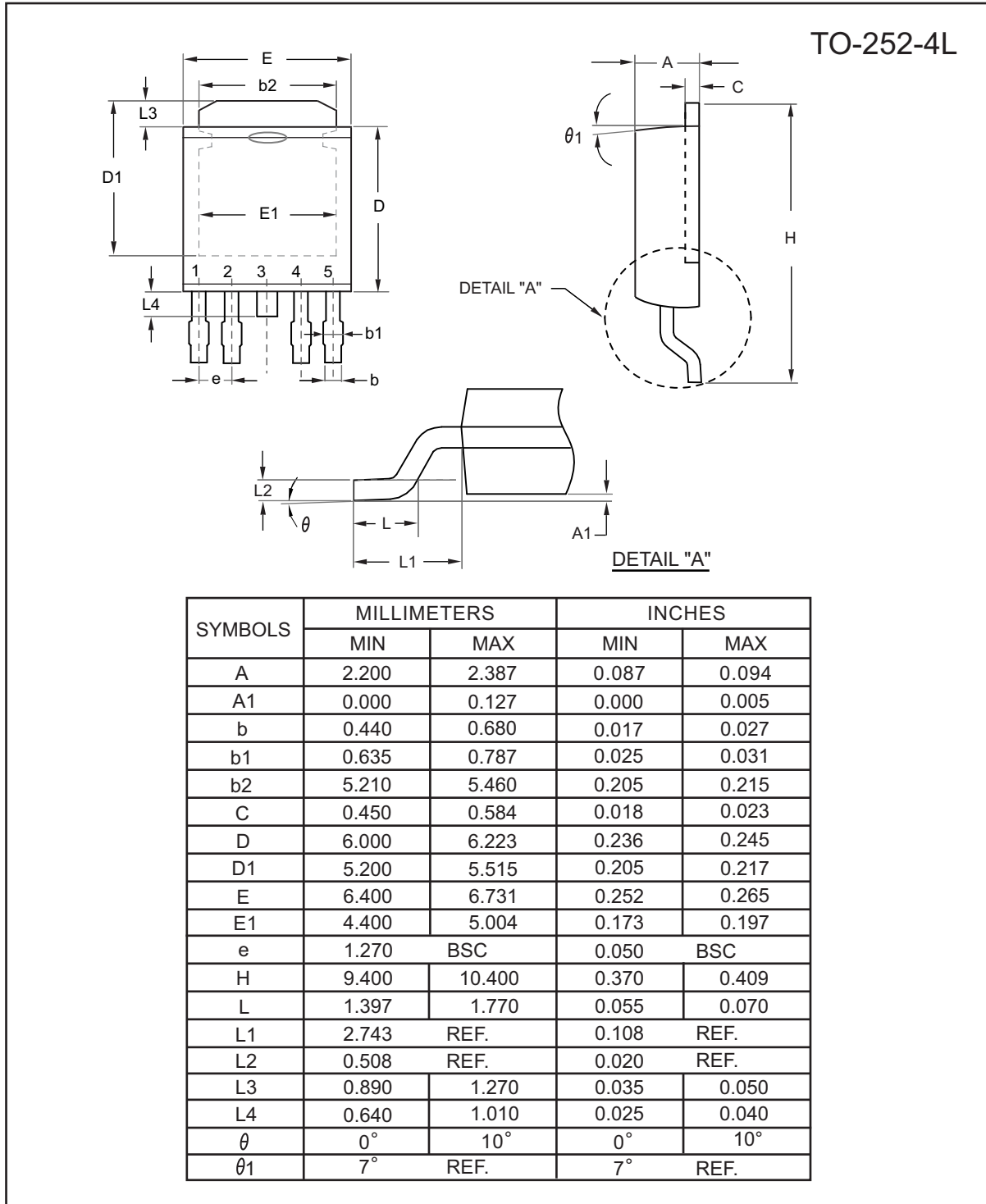


Figure 14. Normalized Thermal Transient Impedance Curve

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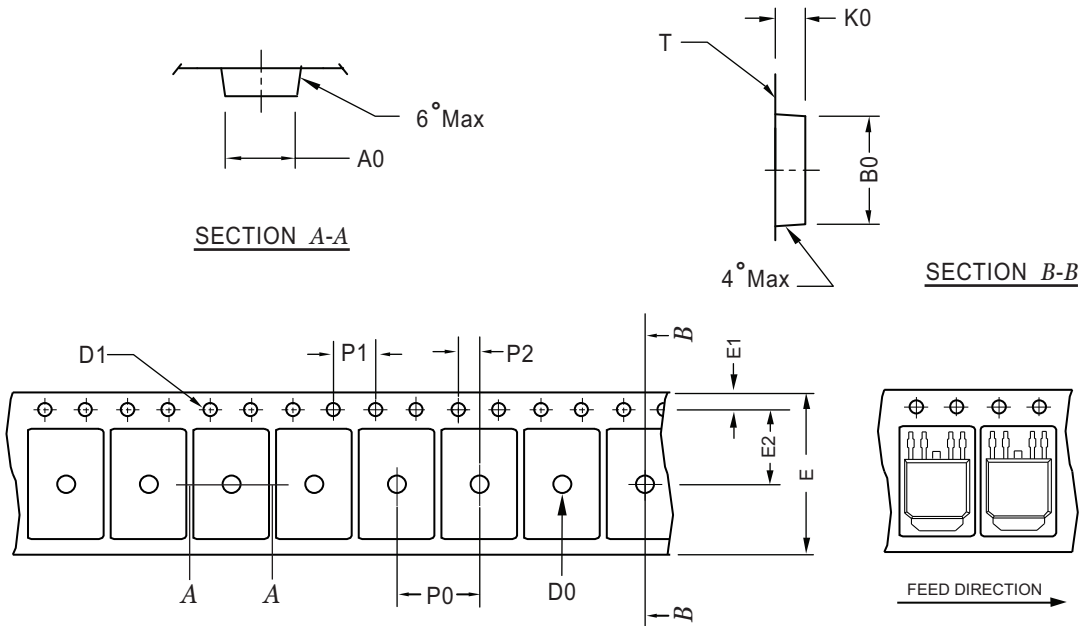
## PACKAGE OUTLINE DIMENSIONS



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## TO-252-4L Tape and Reel Data

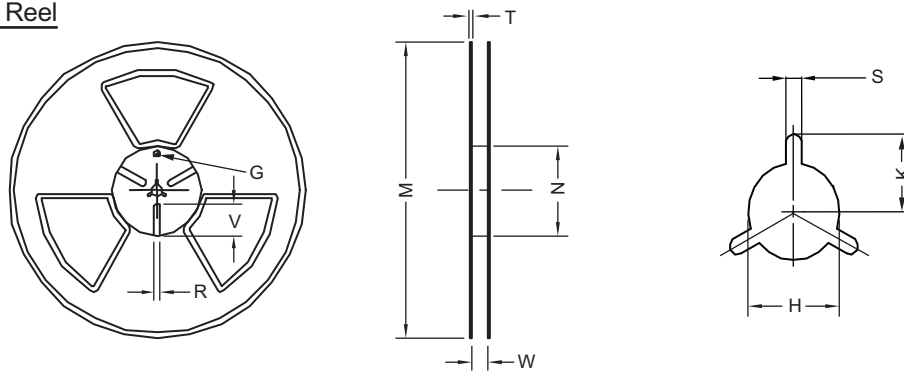
### TO-252-4L Carrier Tape



UNIT:mm

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
TO-252 (16 mm)	6.96 ±0.1	10.49 ±0.1	2.79 ±0.1	φ2	φ1.5 +0.1 -0	16.0 ±0.3	1.75 ±0.1	7.5 ±0.15	8.0 ±0.1	4.0 ±0.1	2.0 ±0.15	0.3 ±0.05

### TO-252-4L Reel



UNIT:mm

TAPE SIZE	REEL SIZE	M	N	W	T	H	K	S	G	R	V
16 mm	φ 330	φ 330 ± 0.5	φ 97 ± 1.0	17.0 + 1.5 - 0	2.2	φ 13.0 + 0.5 - 0.2	10.6	2.0 ±0.5	---	---	---