



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

PRODUCT SUMMARY (N-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
40V	15A	32 @ V _{GS} =10V
		42 @ V _{GS} =4.5V

PRODUCT SUMMARY (P-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
-40V	-12A	48 @ V _{GS} =-10V
		68 @ V _{GS} =-4.5V



ABSOLUTE MAXIMUM RATINGS (T_C=25°C unless otherwise noted)

Symbol	Parameter	N-Channel	P-Channel	Units	
V _{DS}	Drain-Source Voltage	40	-40	V	
V _{GS}	Gate-Source Voltage	±20	±20	V	
I _D	Drain Current-Continuous ^a	T _C =25°C	15	-12	A
		T _C =70°C	12	-10	A
I _{DM}	-Pulsed ^b	43	-36	A	
E _{AS}	Single Pulse Avalanche Energy ^d	8	15	mJ	
P _D	Maximum Power Dissipation ^a	T _C =25°C	11	W	
		T _C =70°C	6.7	W	
T _J , T _{STG}	Operating Junction and Storage Temperature Range	-55 to 175		°C	

THERMAL CHARACTERISTICS

R _{θJC}	Thermal Resistance, Junction-to-Case ^a	12	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient ^a	60	°C/W

STU411D

Ver 1.1

N-Channel ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =32V, V _{GS} =0V			1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V, V _{DS} =0V			±10	μA
ON CHARACTERISTICS						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.5	1.8	3	V
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =15A		25	32	m ohm
		V _{GS} =4.5V, I _D =13A		32	42	m ohm
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =15A		17		S
DYNAMIC CHARACTERISTICS ^c						
C _{ISS}	Input Capacitance	V _{DS} =20V, V _{GS} =0V f=1.0MHz		623		pF
C _{OSS}	Output Capacitance			95		pF
C _{RSS}	Reverse Transfer Capacitance			56		pF
SWITCHING CHARACTERISTICS ^c						
t _{D(ON)}	Turn-On Delay Time	V _{DD} =20V I _D =1A V _{GS} =10V R _{GEN} =3.3 ohm		10.5		ns
t _r	Rise Time			10.6		ns
t _{D(OFF)}	Turn-Off Delay Time			39		ns
t _f	Fall Time			9.6		ns
Q _g	Total Gate Charge	V _{DS} =20V, I _D =15A, V _{GS} =10V		9.5		nC
		V _{DS} =20V, I _D =15A, V _{GS} =4.5V		4.5		nC
Q _{gs}	Gate-Source Charge	V _{DS} =20V, I _D =15A,		1.6		nC
Q _{gd}	Gate-Drain Charge	V _{GS} =10V		2.3		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I _S	Maximum Continuous Drain-Source Diode Forward Current				2.2	A
V _{SD}	Diode Forward Voltage ^b	V _{GS} =0V, I _S =2.2A		0.78	1.2	V

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Ver 1.1

P-Channel ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
OFF CHARACTERISTICS							
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =-250uA	-40			V	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-32V , V _{GS} =0V			-1	uA	
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V , V _{DS} =0V			±10	uA	
ON CHARACTERISTICS							
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250uA	-1.25	-1.6	-3	V	
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-10V , I _D =-12A		38	48	m ohm	
		V _{GS} =-4.5V , I _D =-10A		52	68	m ohm	
g _{FS}	Forward Transconductance	V _{DS} =-5V , I _D =-12A		9		S	
DYNAMIC CHARACTERISTICS ^c							
C _{ISS}	Input Capacitance	V _{DS} =-20V, V _{GS} =0V f=1.0MHz		895		pF	
C _{OSS}	Output Capacitance				138		pF
C _{RSS}	Reverse Transfer Capacitance				67		pF
SWITCHING CHARACTERISTICS ^c							
t _{D(ON)}	Turn-On Delay Time	V _{DD} =-20V I _D =-1A V _{GS} =-10V R _{GEN} =3 ohm		14		ns	
t _r	Rise Time				14		ns
t _{D(OFF)}	Turn-Off Delay Time				54		ns
t _f	Fall Time				10		ns
Q _g	Total Gate Charge	V _{DS} =-20V, I _D =-12A, V _{GS} =-10V		14.5		nC	
		V _{DS} =-20V, I _D =-12A, V _{GS} =-4.5V		7		nC	
Q _{gs}	Gate-Source Charge	V _{DS} =-20V, I _D =-12A,		2.1		nC	
Q _{gd}	Gate-Drain Charge	V _{GS} =-10V		3.4		nC	
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
I _S	Maximum Continuous Drain-Source Diode Forward Current				-2.0	A	
V _{SD}	Diode Forward Voltage ^b	V _{GS} =0V, I _S =-2.0A		-0.77	-1.2	V	
Notes 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 _J =25°C, L=0.5mH, V _{DD} = 20V, V _{GS} =10V.(See Figure13)							

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N-Channel

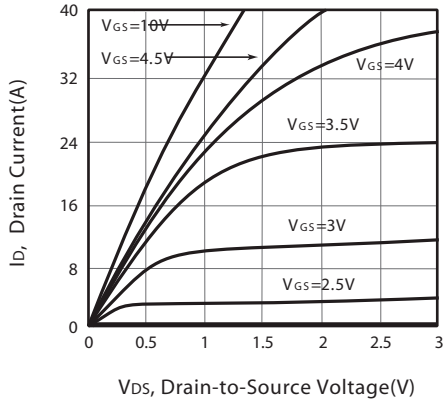


Figure 1. Output Characteristics

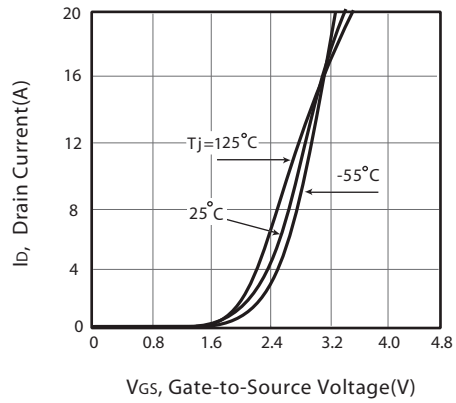


Figure 2. Transfer Characteristics

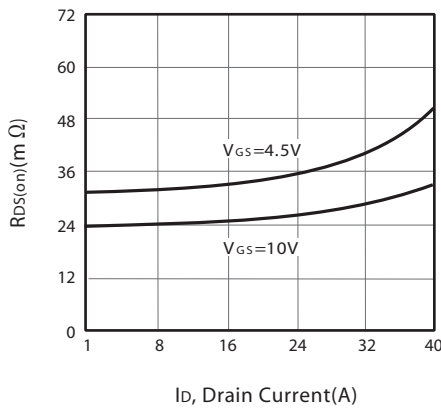


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

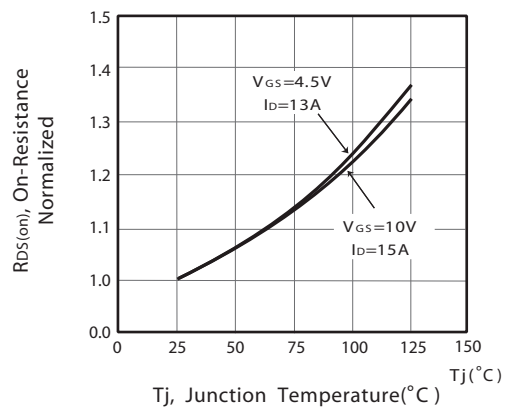


Figure 4. On-Resistance Variation with Drain Current and Temperature

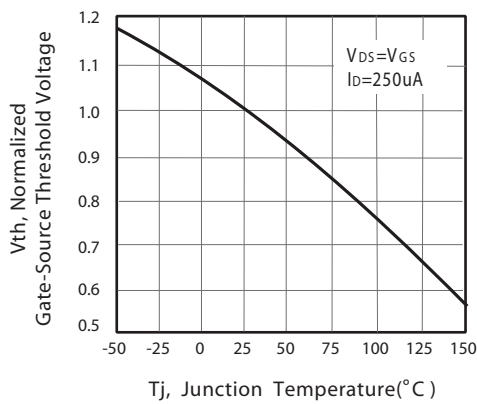


Figure 5. Gate Threshold Variation with Temperature

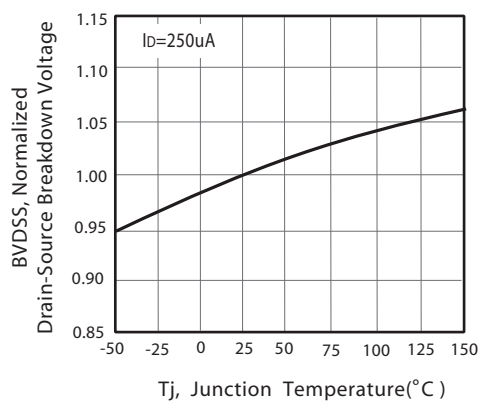


Figure 6. Breakdown Voltage Variation with Temperature

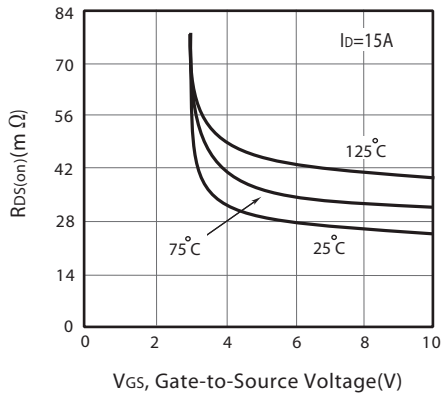


Figure 7. On-Resistance vs. Gate-Source Voltage

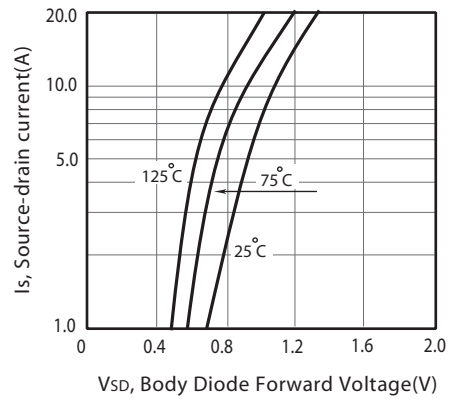


Figure 8. Body Diode Forward Voltage Variation with Source Current

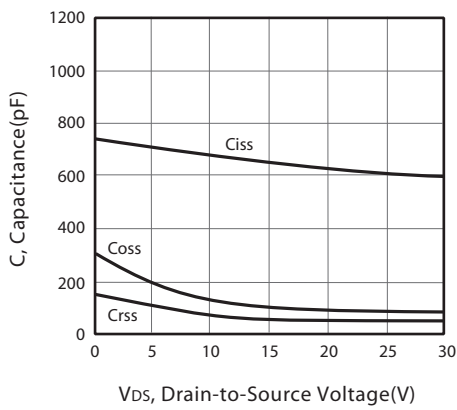


Figure 9. Capacitance

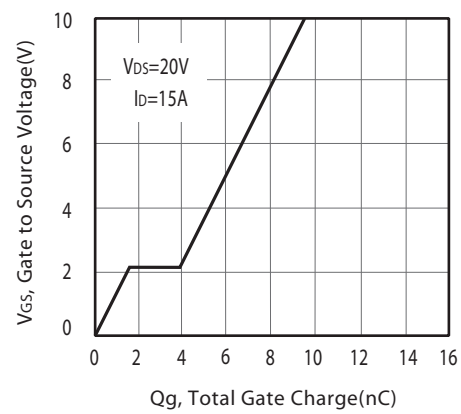


Figure 10. Gate Charge

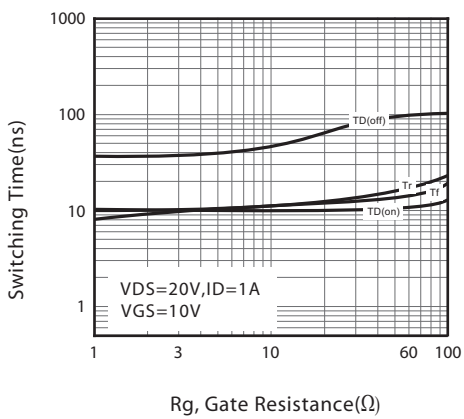


Figure 11. switching characteristics

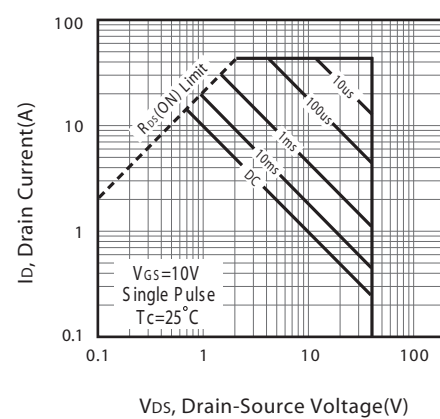
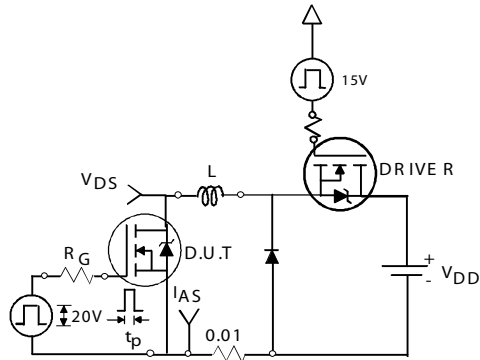
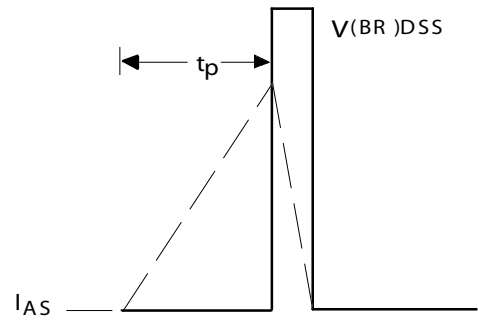


Figure 12. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

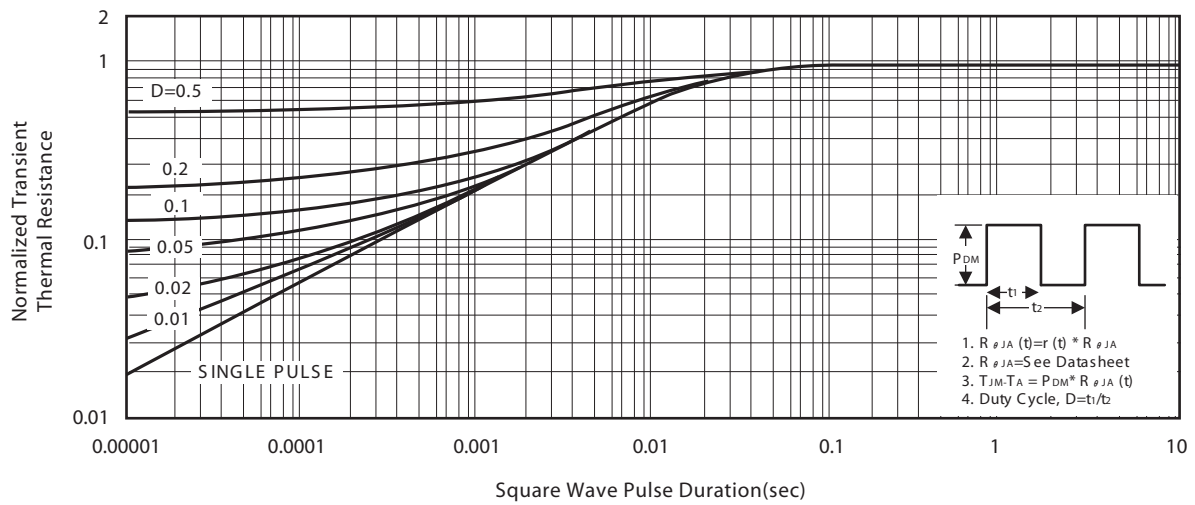


Figure 14. Normalized Thermal Transient Impedance Curve

P-Channel

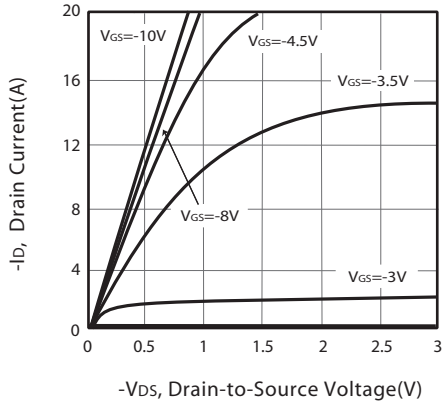


Figure 1. Output Characteristics

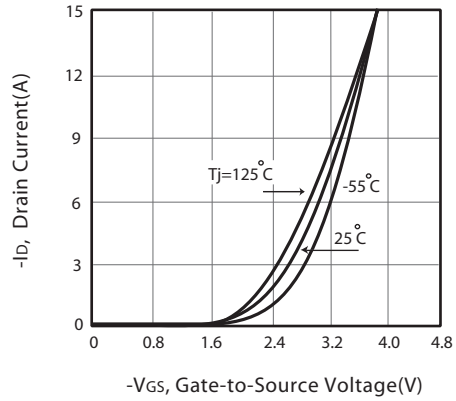


Figure 2. Transfer Characteristics

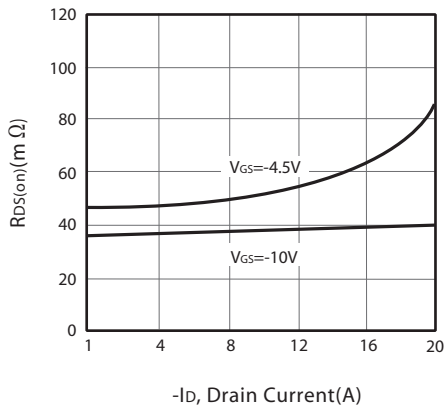


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

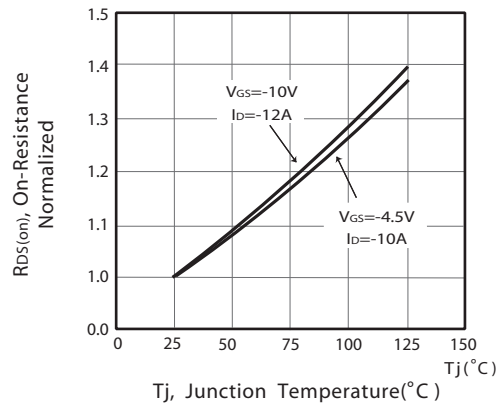


Figure 4. On-Resistance Variation with Drain Current and Temperature

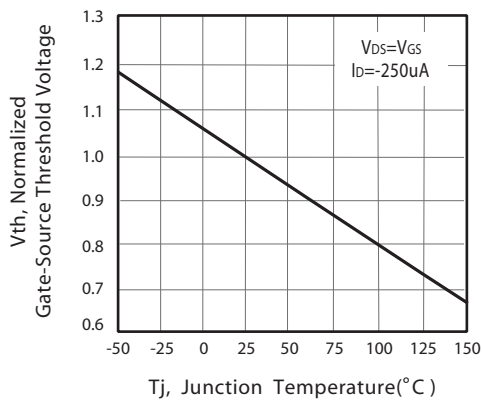


Figure 5. Gate Threshold Variation with Temperature

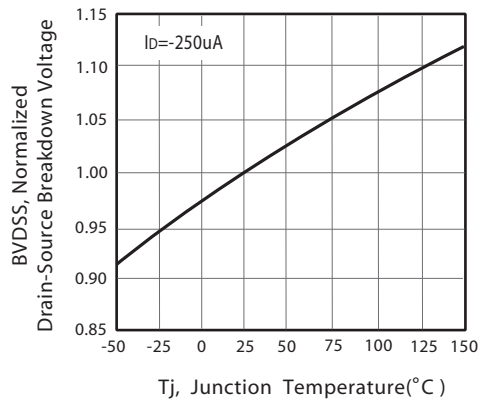


Figure 6. Breakdown Voltage Variation with Temperature

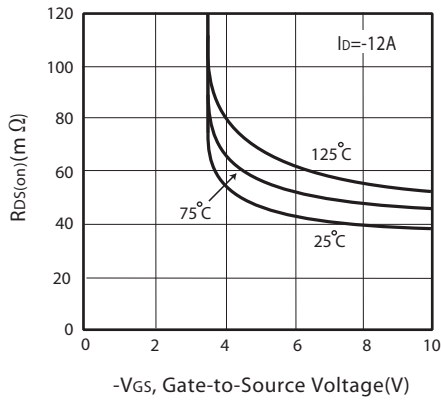


Figure 7. On-Resistance vs. Gate-Source Voltage

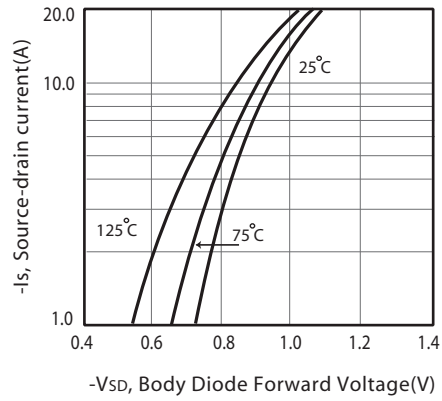


Figure 8. Body Diode Forward Voltage Variation with Source Current

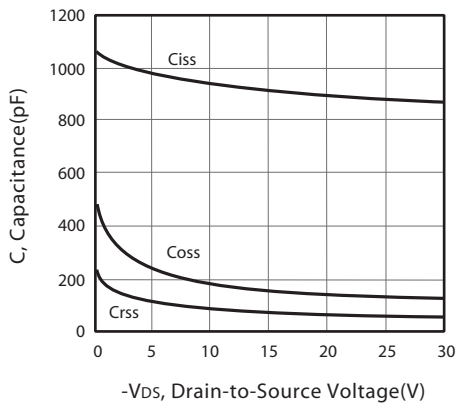


Figure 9. Capacitance

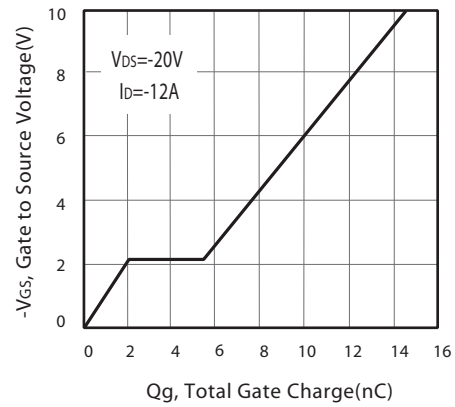


Figure 10. Gate Charge

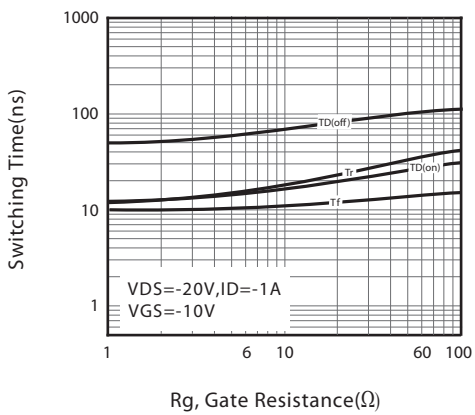


Figure 11. switching characteristics

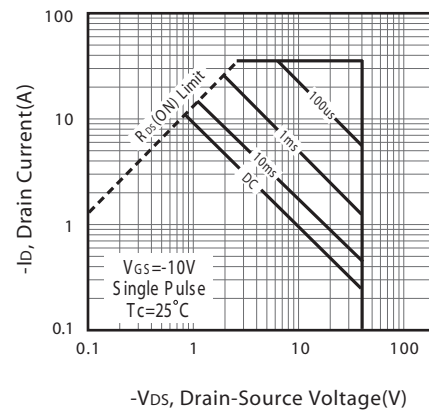
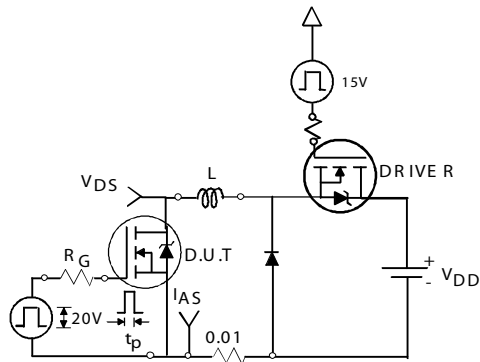
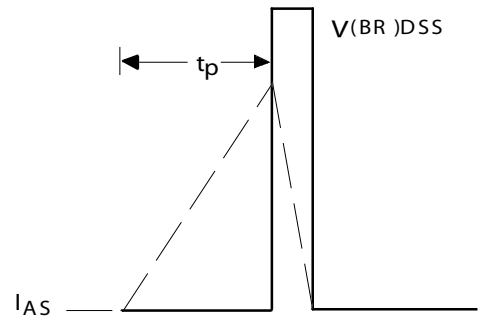


Figure 12. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

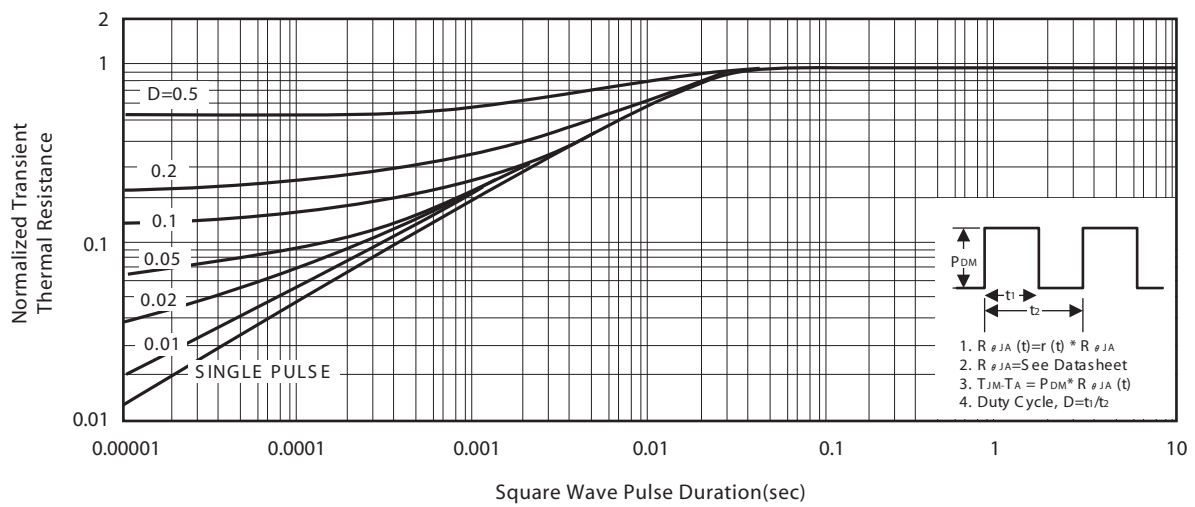
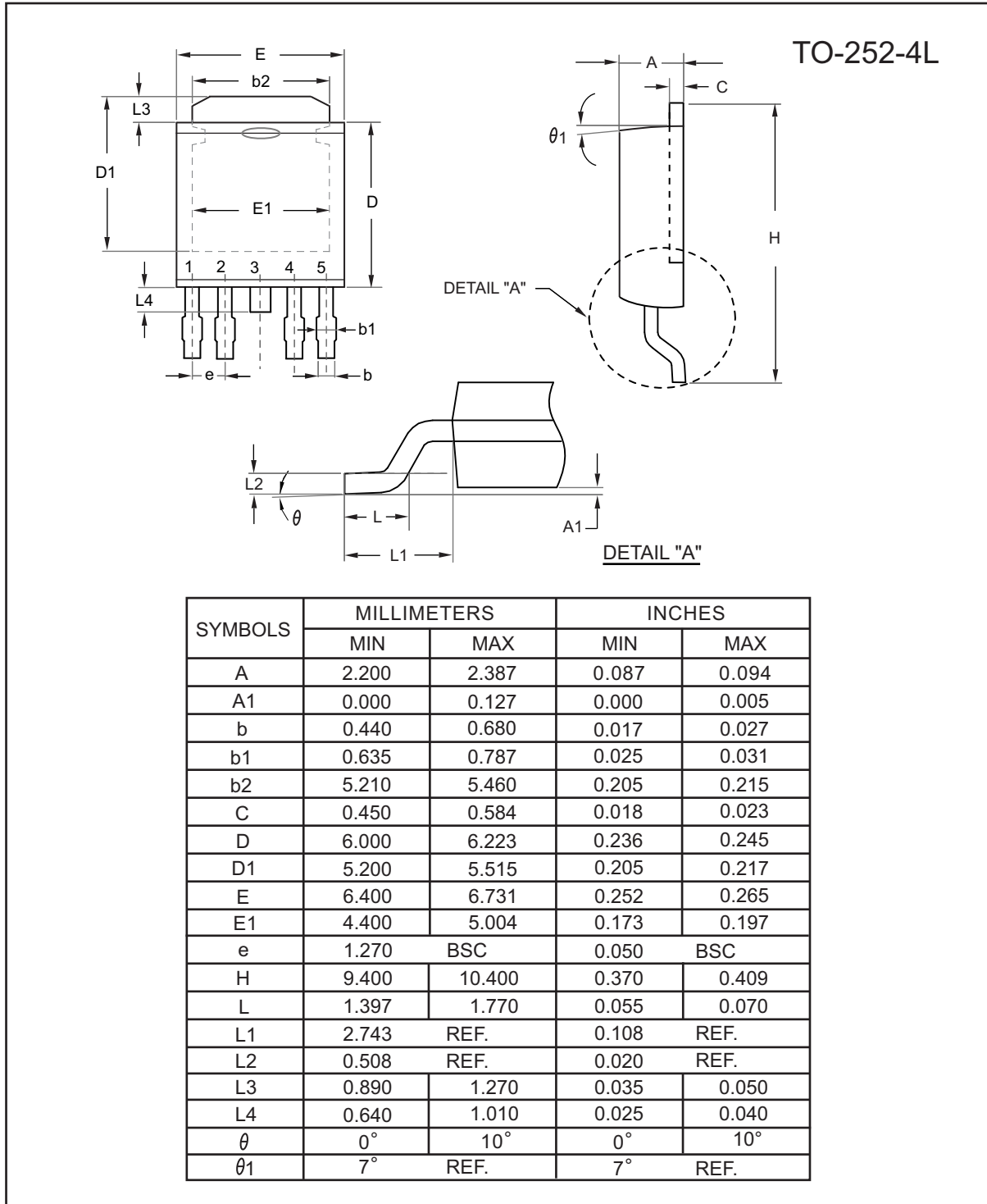


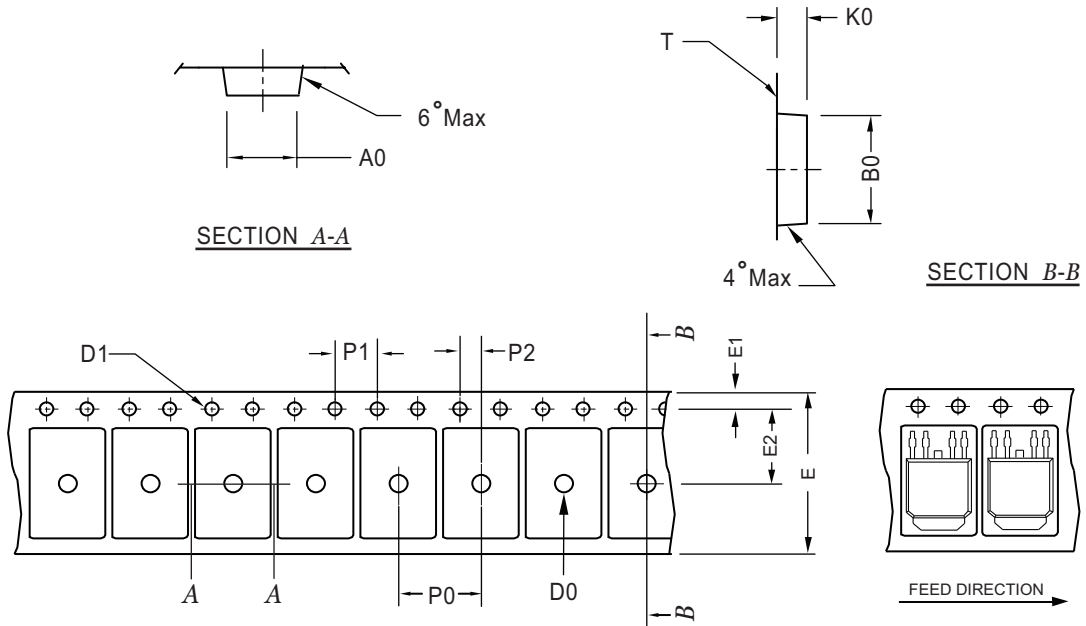
Figure 14. Normalized Thermal Transient Impedance Curve

PACKAGE OUTLINE DIMENSIONS



TO-252-4L Tape and Reel Data

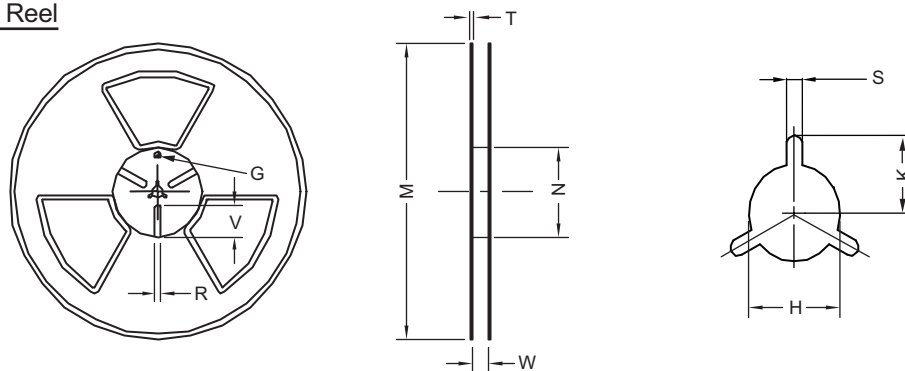
TO-252-4L Carrier Tape



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	φ 2	φ 1.5 +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	---	---	---