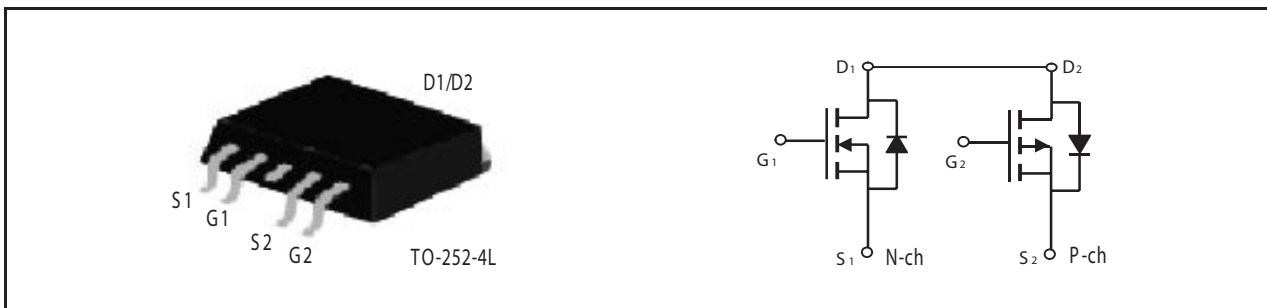


**Dual Enhancement Mode Field Effect Transistor (N and P Channel)**

PRODUCT SUMMARY (N-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
60V	8.6A	76 @ V _{GS} =10V
		90 @ V _{GS} =4.5V

PRODUCT SUMMARY (P-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
-60V	-7.3A	110 @ V _{GS} =-10V
		145 @ 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	60	-60	V	
V _{GS}	Gate-Source Voltage	±20	±20	V	
I _D	Drain Current-Continuous ^a	T _C =25°C	8.6	-7.3	A
		T _C =70°C	6.9	-5.8	A
I _{DM}	-Pulsed ^b	25	-21	A	
E _{AS}	Single Pulse Avalanche Energy ^d	20	30	mJ	
P _D	Maximum Power Dissipation ^a	T _C =25°C	10.5		W
		T _C =70°C	6.7		W
T _J , T _{STG}	Operating Junction and Storage Temperature Range	-55 to 150		°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

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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	60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V			1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V, V _{DS} =0V			±100	nA
ON CHARACTERISTICS						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.0	1.6	3	V
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =8.6A		60	76	m ohm
		V _{GS} =4.5V, I _D =8A		70	90	m ohm
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =8.6A		21		S
DYNAMIC CHARACTERISTICS ^c						
C _{iss}	Input Capacitance	V _{DS} =30V, V _{GS} =0V f=1.0MHz		850		pF
C _{oss}	Output Capacitance			48		pF
C _{rSS}	Reverse Transfer Capacitance			40		pF
SWITCHING CHARACTERISTICS ^c						
t _{D(ON)}	Turn-On Delay Time	V _{DD} =30V I _D =1A		11.5		ns
t _r	Rise Time			11.7		ns
t _{D(OFF)}	Turn-Off Delay Time	V _{GS} =10V R _{GEN} =3.3 ohm		37		ns
t _f	Fall Time			7		ns
Q _g	Total Gate Charge	V _{DS} =30V, I _D =8.6A, V _{GS} =10V		17		nC
		V _{DS} =30V, I _D =8.6A, V _{GS} =4.5V		8.3		nC
Q _{gs}	Gate-Source Charge	V _{DS} =30V, I _D =8.6A, V _{GS} =10V		1.7		nC
Q _{gd}	Gate-Drain Charge			4.7		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 =2A		0.81	1.2	V

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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	-60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-48V, V _{GS} =0V			-1	uA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V, V _{DS} =0V			±100	nA
ON CHARACTERISTICS						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250uA	-1.0	-1.7	-3	V
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-10V, I _D =-7.3A		88	110	m ohm
		V _{GS} =-4.5V, I _D =-6.3A		110	145	m ohm
g _{FS}	Forward Transconductance	V _{DS} =-10V, I _D =-7.3A		12		S
DYNAMIC CHARACTERISTICS ^c						
C _{ISS}	Input Capacitance	V _{DS} =-30V, V _{GS} =0V f=1.0MHz		740		pF
C _{OSS}	Output Capacitance			64		pF
C _{RSS}	Reverse Transfer Capacitance			38		pF
SWITCHING CHARACTERISTICS ^c						
t _{D(ON)}	Turn-On Delay Time	V _{DD} =-30V I _D =-1A		12.5		ns
t _r	Rise Time			12		ns
t _{D(OFF)}	Turn-Off Delay Time	V _{GS} =-10V R _{GEN} =6 ohm		65		ns
t _f	Fall Time			12		ns
Q _g	Total Gate Charge	V _{DS} =-30V, I _D =-7.3A, V _{GS} =-10V		13.5		nC
		V _{DS} =-30V, I _D =-7.3A, V _{GS} =-4.5V		6		nC
Q _{gs}	Gate-Source Charge	V _{DS} =-30V, I _D =-7.3A, V _{GS} =-10V		1.6		nC
Q _{gd}	Gate-Drain Charge			3.6		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I _S	Maximum Continuous Drain-Source Diode Forward Current				-1.6	A
V _{SD}	Diode Forward Voltage ^b	V _{GS} =0V, I _S =-1.6A		-0.8	-1.2	V

Notes

- Surface Mounted on FR4 Board, t ≤ 10sec.
- Pulse Test: Pulse Width ≤ 300us, Duty Cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Starting T_J=25°C, L=0.5mH, V_{DD} = 30V, V_{GS}=10V. (See Figure13)

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N-Channel

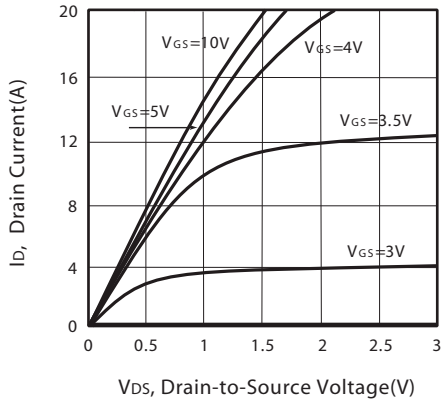


Figure 1. Output Characteristics

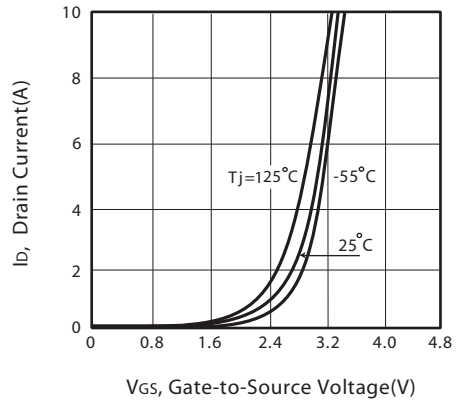


Figure 2. Transfer Characteristics

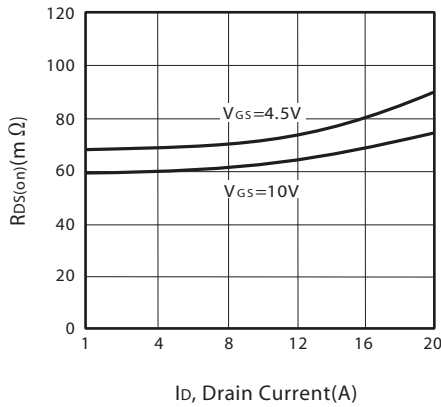


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

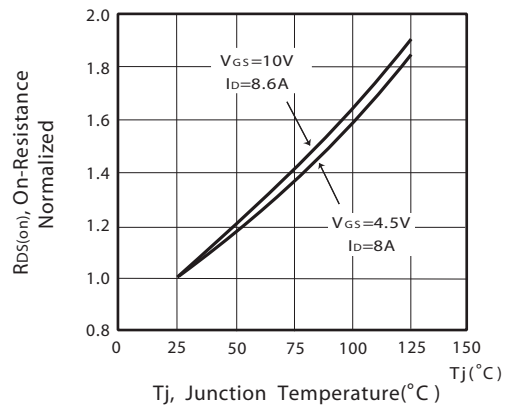


Figure 4. On-Resistance Variation with Drain Current and Temperature

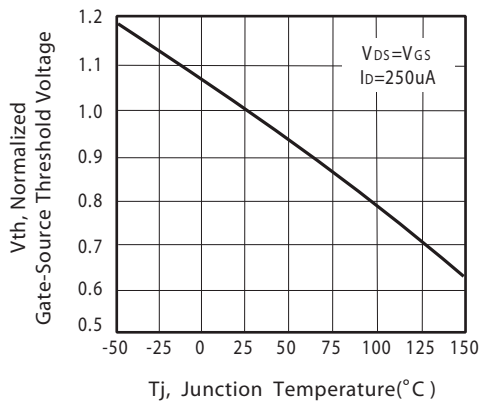


Figure 5. Gate Threshold Variation with Temperature

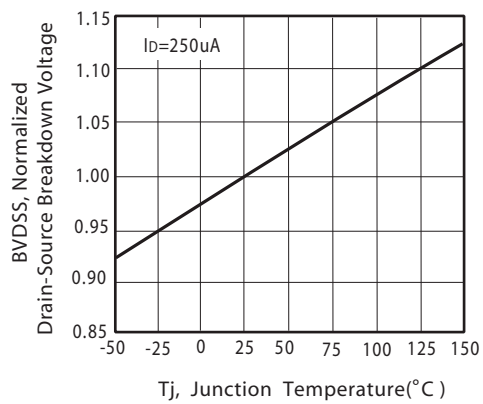


Figure 6. Breakdown Voltage Variation with Temperature

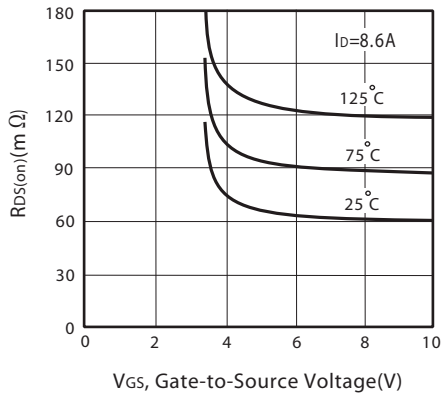


Figure 7. On-Resistance vs. Gate-Source Voltage

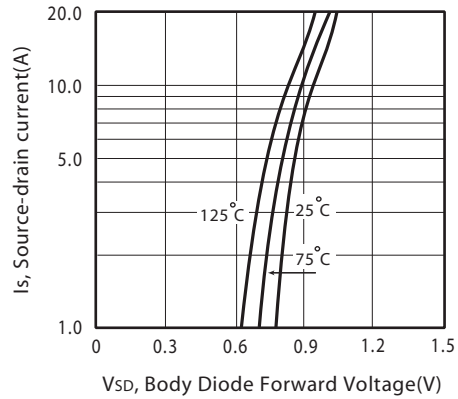


Figure 8. Body Diode Forward Voltage Variation with Source Current

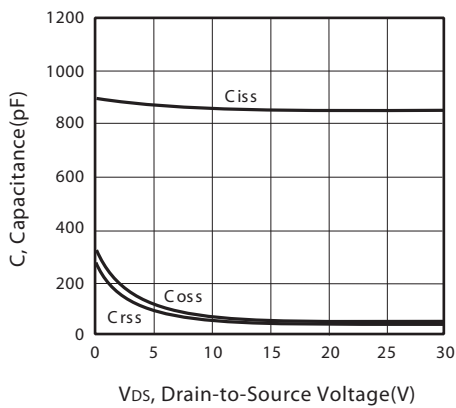


Figure 9. Capacitance

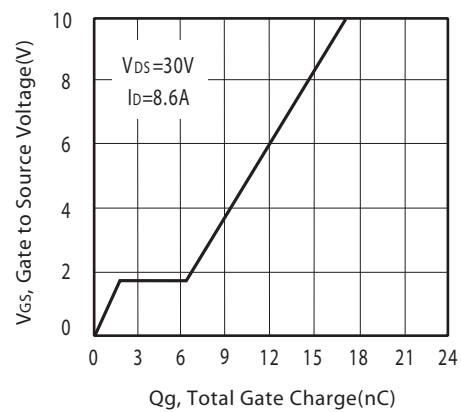


Figure 10. Gate Charge

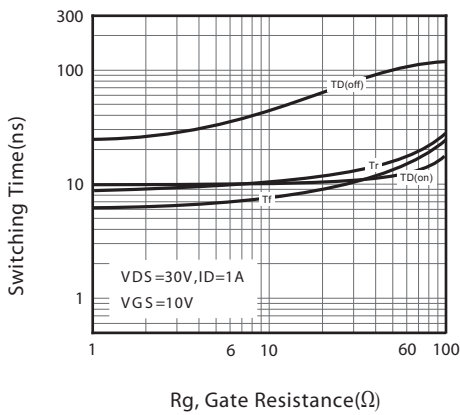


Figure 11. switching characteristics

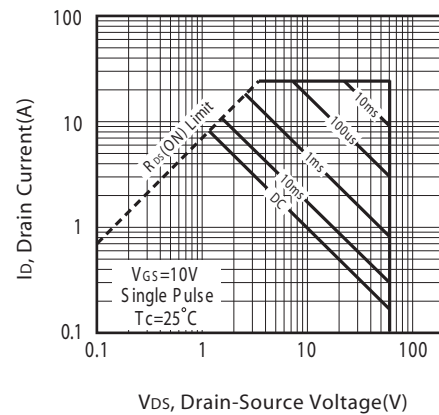
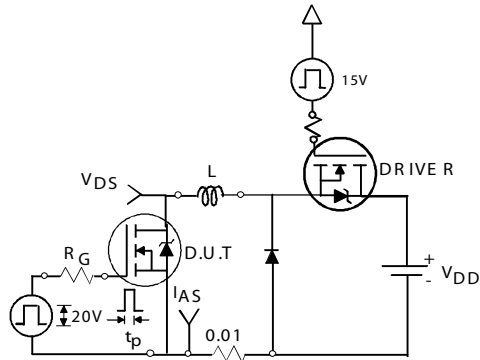
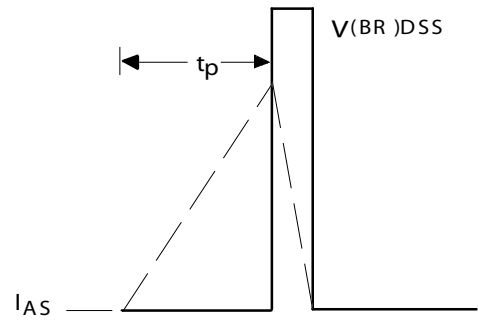


Figure 12. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

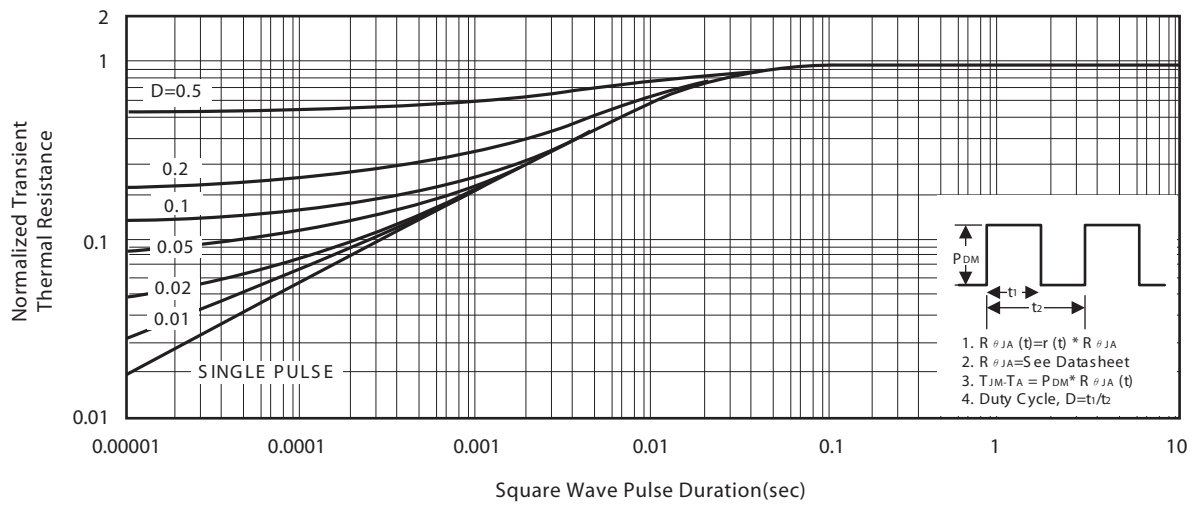


Figure 14. Normalized Thermal Transient Impedance Curve

P-Channel

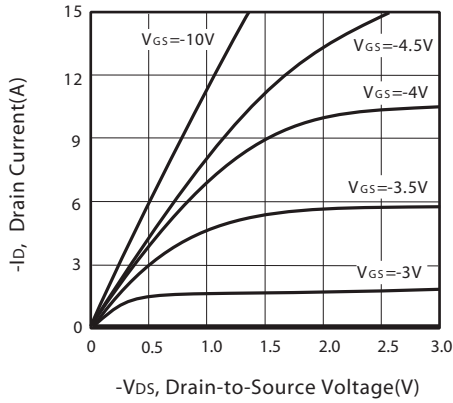


Figure 1. Output Characteristics

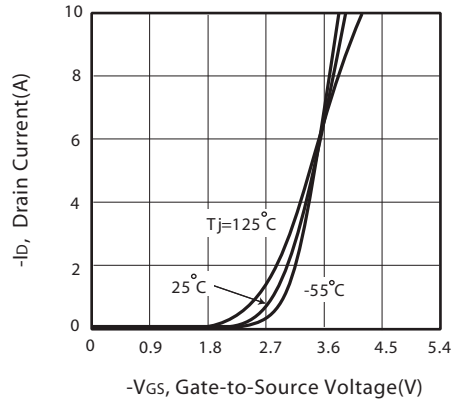


Figure 2. Transfer Characteristics

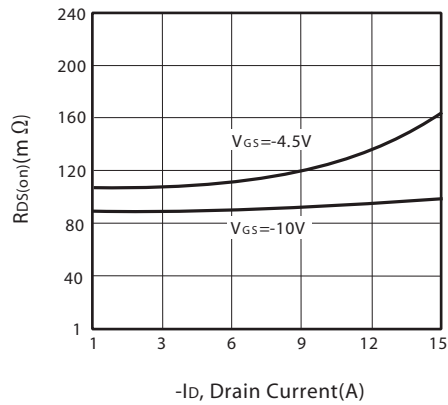


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

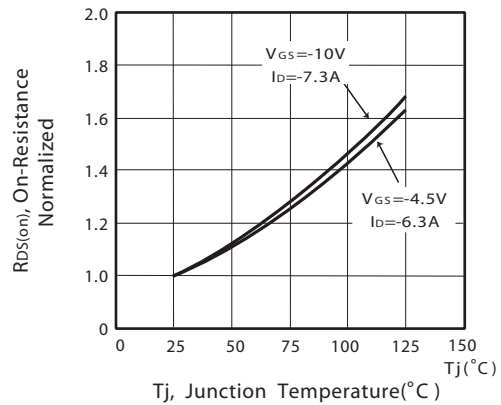


Figure 4. On-Resistance Variation with Drain Current and Temperature

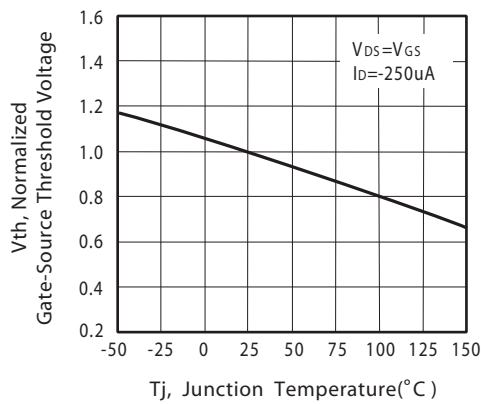


Figure 5. Gate Threshold Variation with Temperature

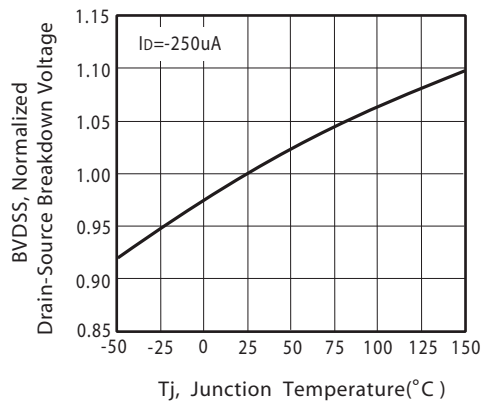


Figure 6. Breakdown Voltage Variation with Temperature

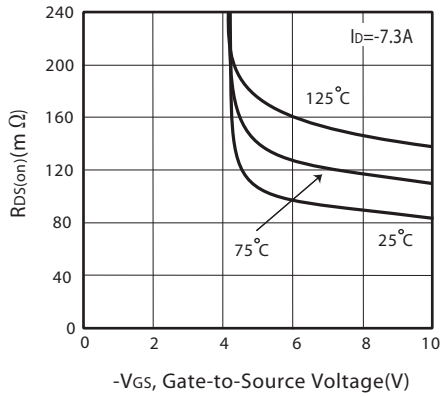


Figure 7. On-Resistance vs. Gate-Source Voltage

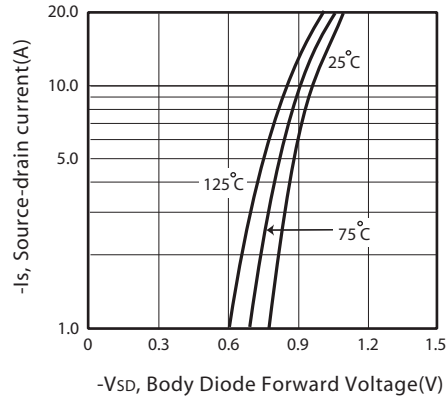


Figure 8. Body Diode Forward Voltage Variation with Source Current

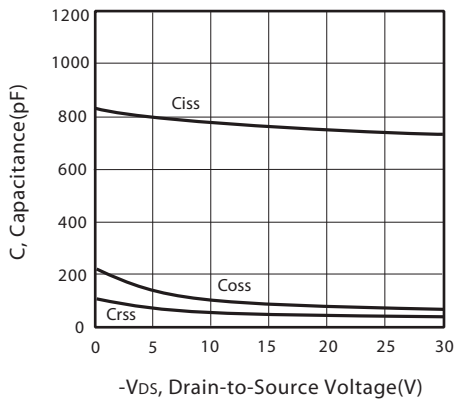


Figure 9. Capacitance

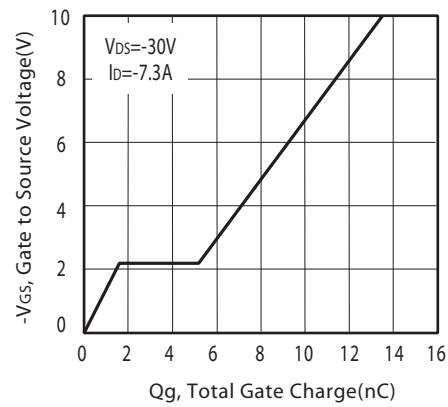


Figure 10. Gate Charge

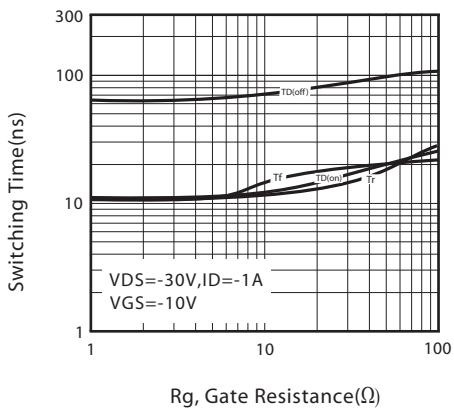


Figure 11. switching characteristics

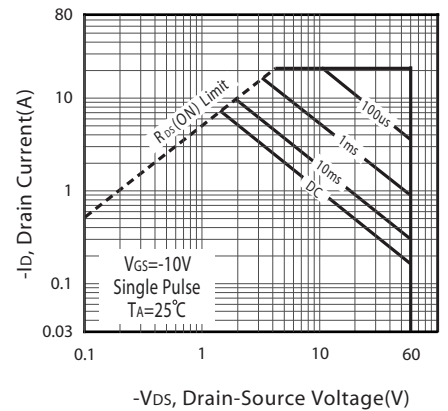
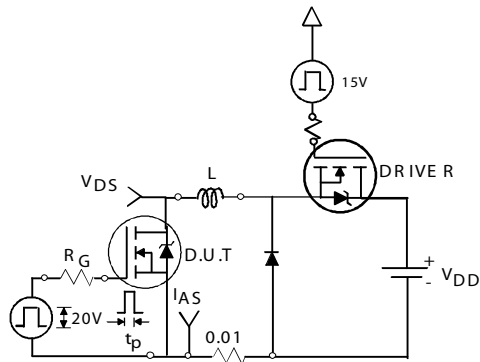
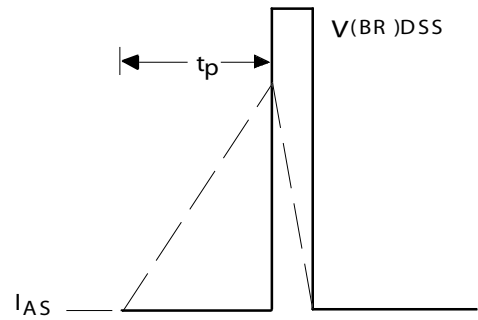


Figure 12. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

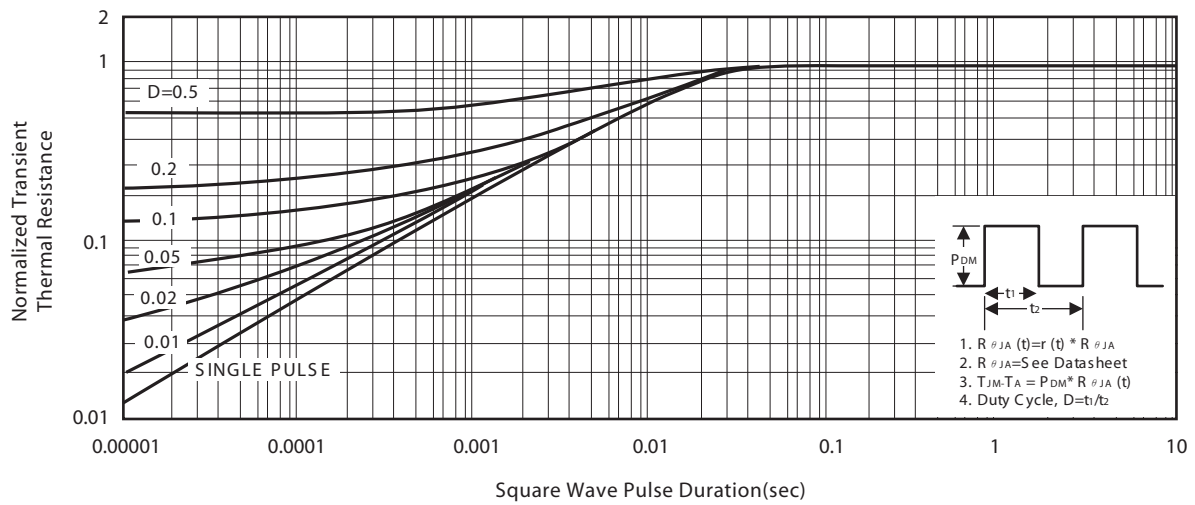
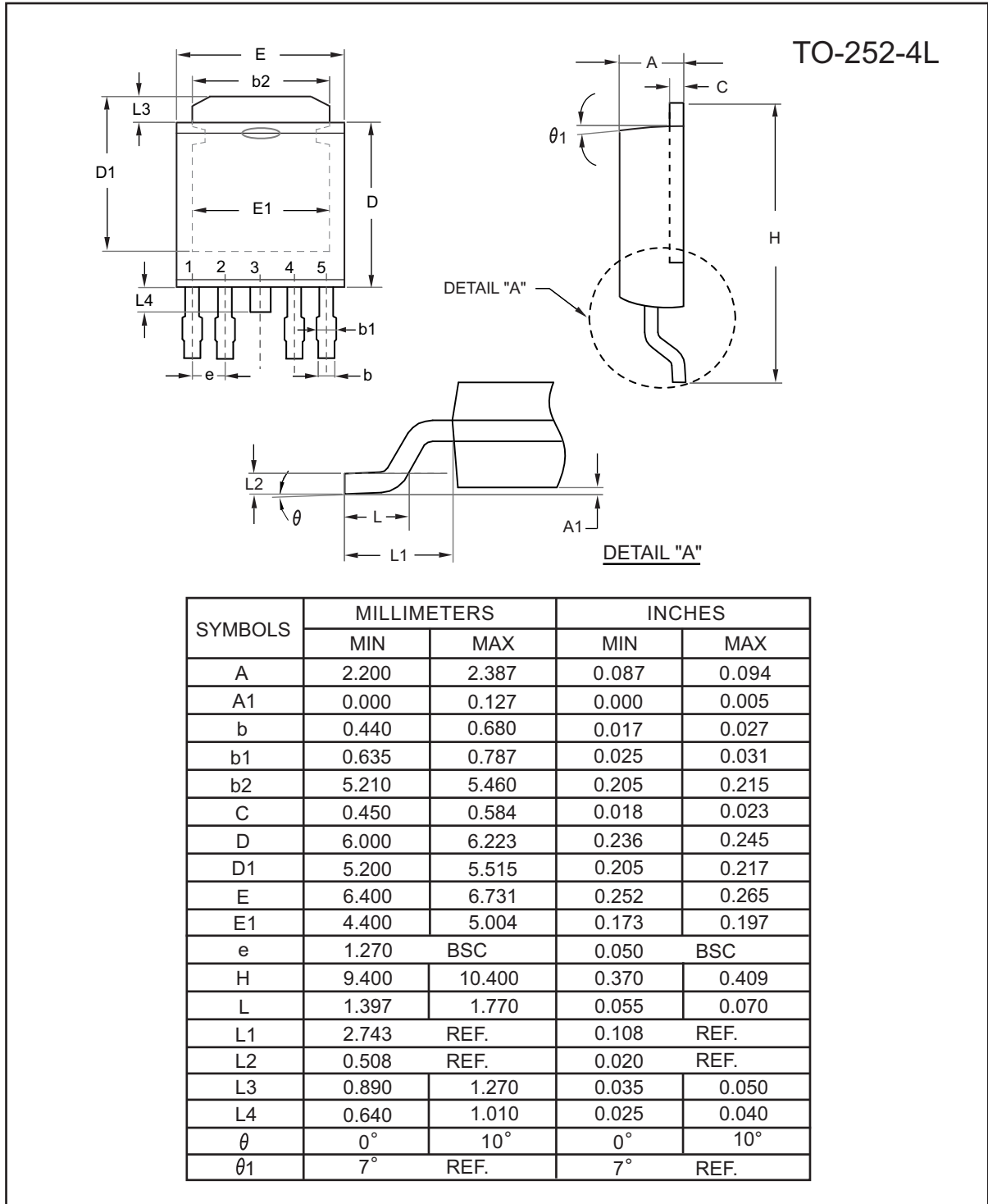


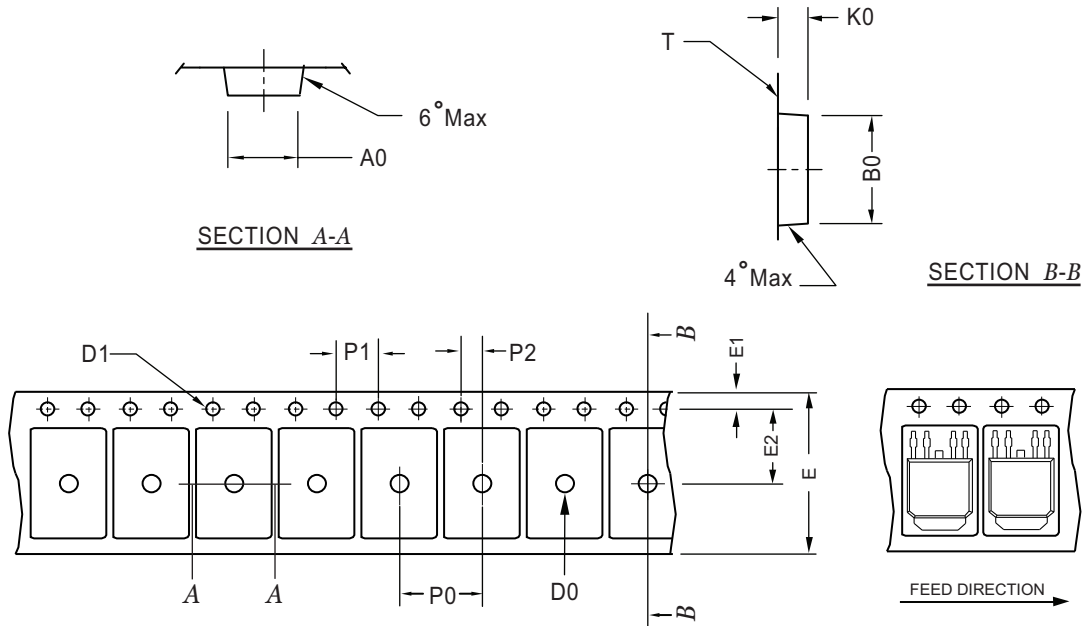
Figure 14. Normalized Thermal Transient Impedance Curve

PACKAGE OUTLINE DIMENSIONS



TO-252-4L Tape and Reel Data

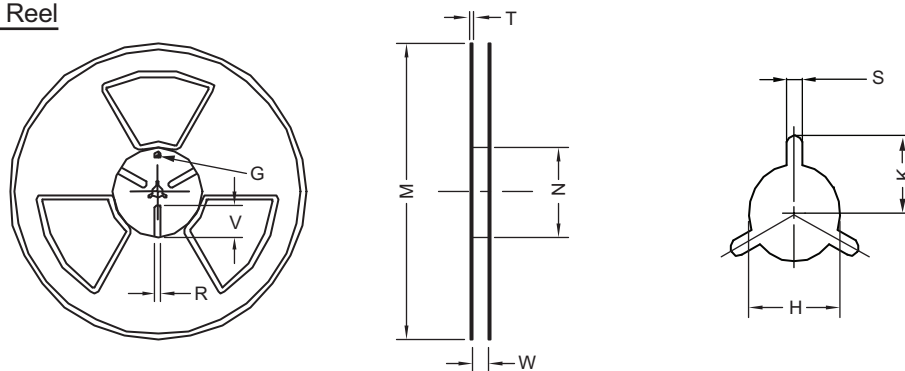
TO-252-4L Carrier Tape



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	---	---	---