



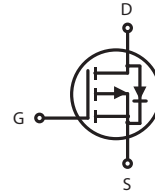
## P-Channel Enhancement Mode Field Effect Transistor

## PRODUCT SUMMARY

V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (m $\Omega$ ) Max
-55V	-24	42 @ V <sub>GS</sub> = -10V
		55 @ V <sub>GS</sub> = -4.5V

## FEATURES

- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- TO-252 and TO-251 Package.

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage Rating	V <sub>spike</sub> <sup>c</sup>	-60	V
Drain-Source Voltage	V <sub>DS</sub>	-55	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Drain Current-Continuous @ T <sub>C</sub> =25°C -Pulsed <sup>a</sup>	I <sub>D</sub>	-24	A
	I <sub>DM</sub>	-72	A
Drain-Source Diode Forward Current	I <sub>S</sub>	-20	A
Maximum Power Dissipation @ T <sub>C</sub> =25°C	P <sub>D</sub>	50	W
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 175	°C

## THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Case	R $\theta$ JC	3	°C/W
Thermal Resistance, Junction-to-Ambient	R $\theta$ JA	50	°C/W

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ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-55			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-44V, V <sub>GS</sub> =0V			-1	uA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA
<b>ON CHARACTERISTICS<sup>a</sup></b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA	-1	-1.7	-3	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A		33	42	m ohm
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-6A		42	55	m ohm
On-State Drain Current	I <sub>D(ON)</sub>	V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V	-24			A
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-10V, I <sub>D</sub> =-10A		16		S
<b>DYNAMIC CHARACTERISTICS<sup>b</sup></b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V f=1.0MHz		1730		pF
Output Capacitance	C <sub>OSS</sub>			185		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			125		pF
Gate resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz		1.7		ohm
<b>SWITCHING CHARACTERISTICS<sup>b</sup></b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =-30V I <sub>D</sub> =-1 A V <sub>GS</sub> =-10V R <sub>GEN</sub> =6 ohm		21		ns
Rise Time	t <sub>r</sub>			25		ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			127		ns
Fall Time	t <sub>f</sub>			35		ns
Total Gate Charge (10V)	Q <sub>g</sub>	V <sub>DS</sub> =-30V, I <sub>D</sub> =-10A V <sub>GS</sub> =-10V		31		nC
Total Gate Charge (4.5V)				13.5		nC
Gate-Source Charge	Q <sub>gs</sub>			3.5		nC
Gate-Drain Charge	Q <sub>gd</sub>			7		nC

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS <sup>a</sup></b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0V, I_s = -10A$		-0.92	-1.3	V

### Notes

- a. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.
- c. Guaranteed when external  $R_g=6\text{ ohm}$  and  $t_f < t_{f\text{ max}}$

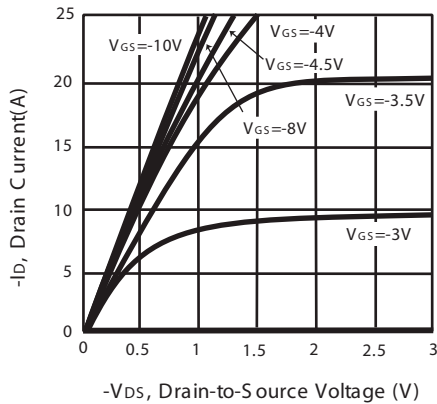


Figure 1. Output Characteristics

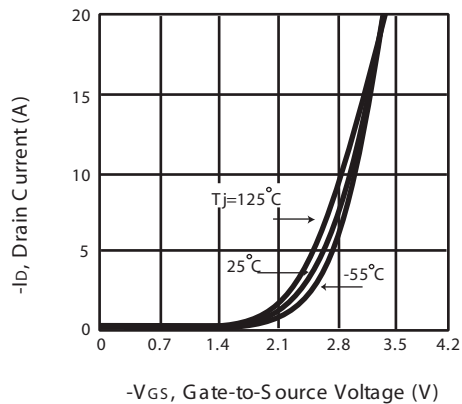


Figure 2. Transfer Characteristics

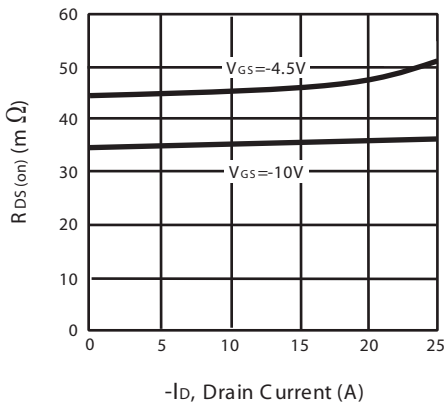


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

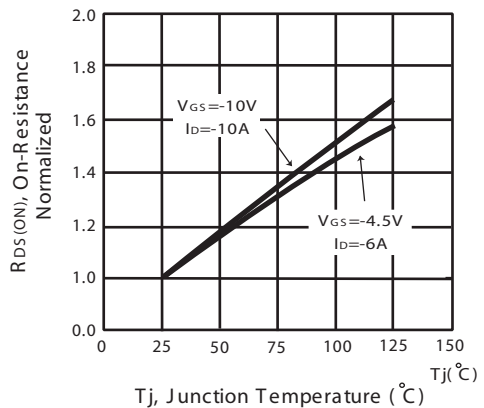


Figure 4. On-Resistance Variation with Drain Current and Temperature

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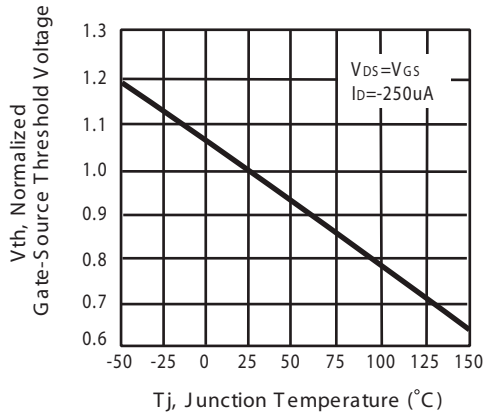


Figure 5. Gate Threshold Variation with Temperature

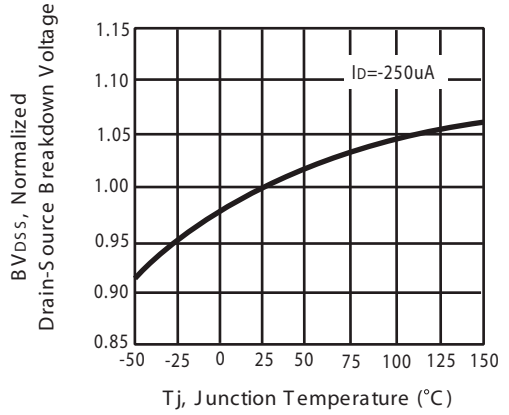


Figure 6. Breakdown Voltage Variation with Temperature

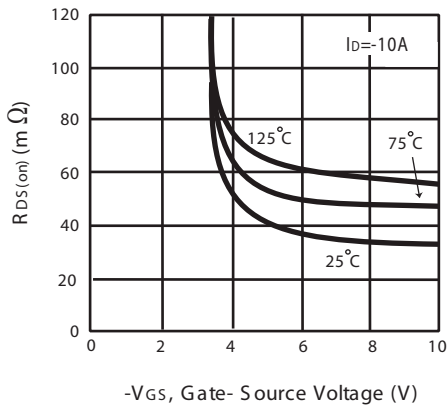


Figure 7. On-Resistance vs. Gate-Source Voltage

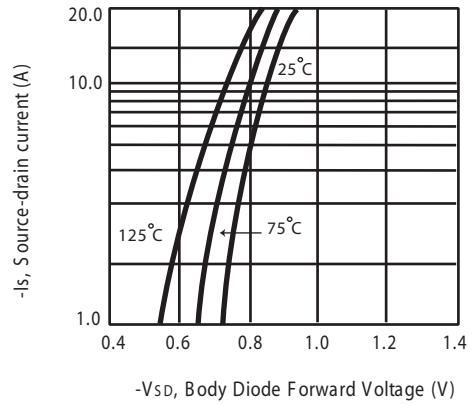


Figure 8. Body Diode Forward Voltage Variation with Source Current

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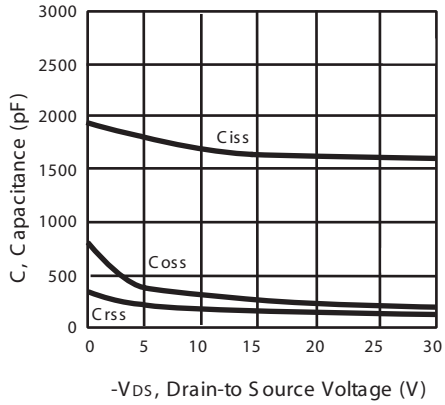


Figure 9. Capacitance

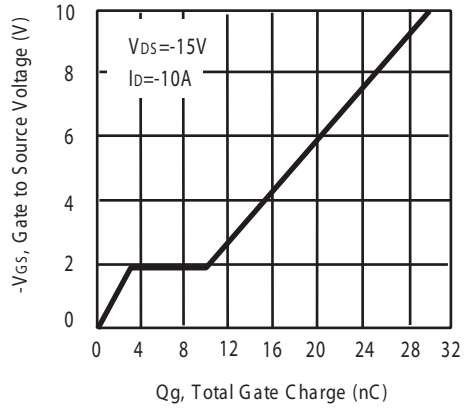


Figure 10. Gate Charge

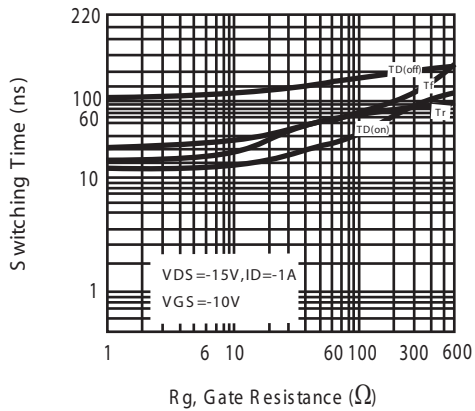


Figure 11. switching characteristics

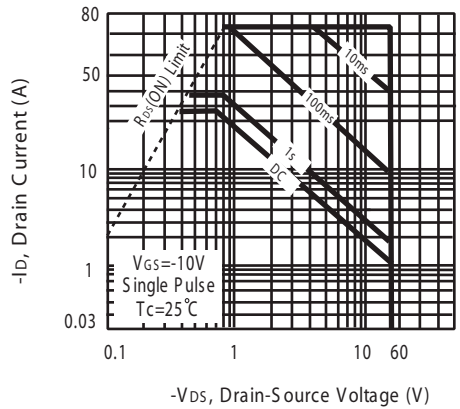


Figure 10. Maximum Safe Operating Area

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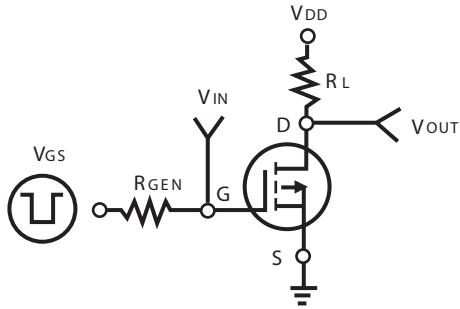


Figure 11. Switching Test Circuit

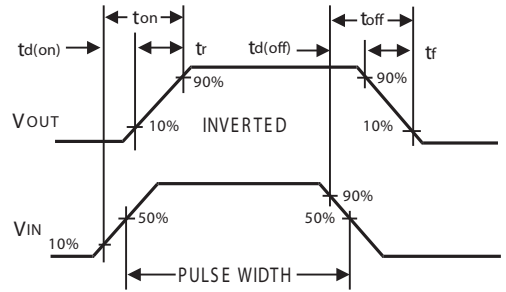


Figure 12. Switching Waveforms

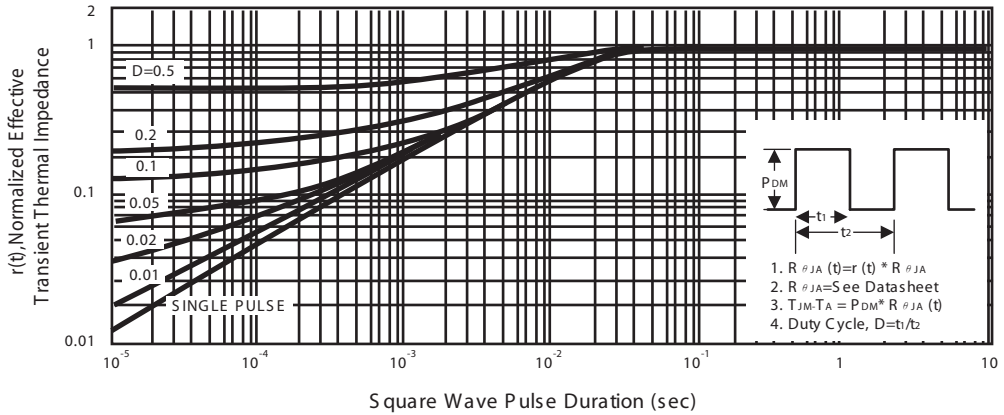
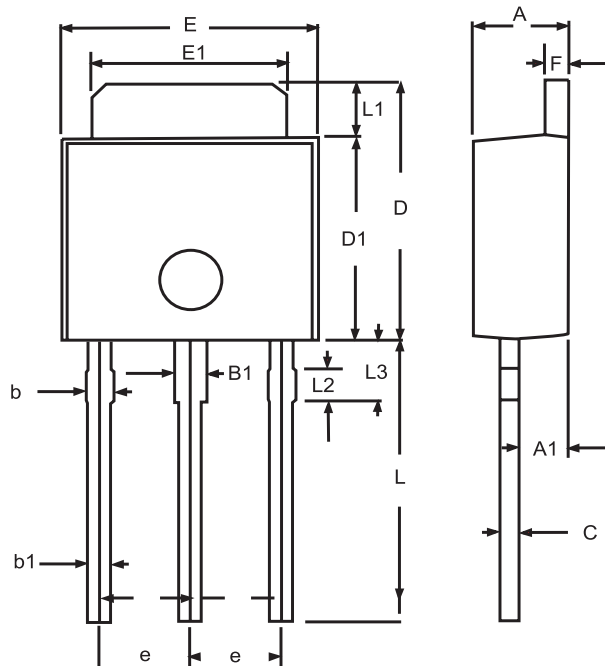


Figure 13. Normalized Thermal Transient Impedance Curve

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## PACKAGE OUTLINE DIMENSIONS

TO-251

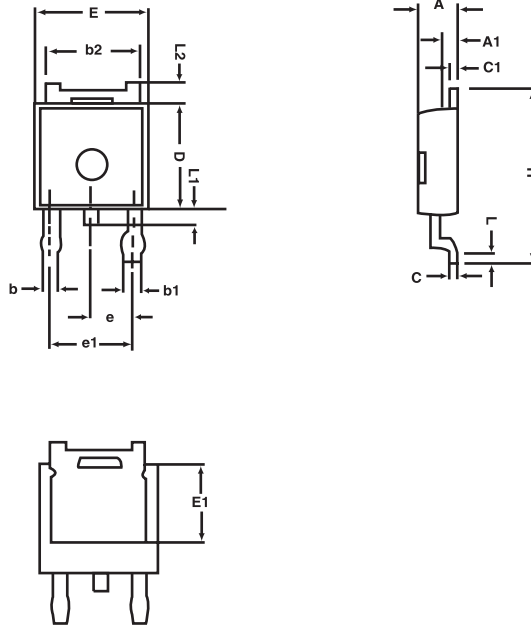


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.095
A1	1.100	1.300	0.043	0.051
B1	0.650	1.050	0.026	0.041
b	0.500	0.900	0.020	0.035
b1	0.400	0.800	0.016	0.32
C	0.400	0.600	0.016	0.024
D	6.700	7.300	0.264	0.287
D1	5.400	5.650	0.213	0.222
E	6.40	6.650	0.252	0.262
e	2.100	2.500	0.083	0.098
F	0.400	0.600	0.016	0.024
L	7.000	8.000	0.276	0.315
L1	1.300	1.700	0.051	0.067
L2	0.700	0.900	0.028	0.035
L3	1.400	1.800	0.055	0.071

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## PACKAGE OUTLINE DIMENSIONS

### TO-252



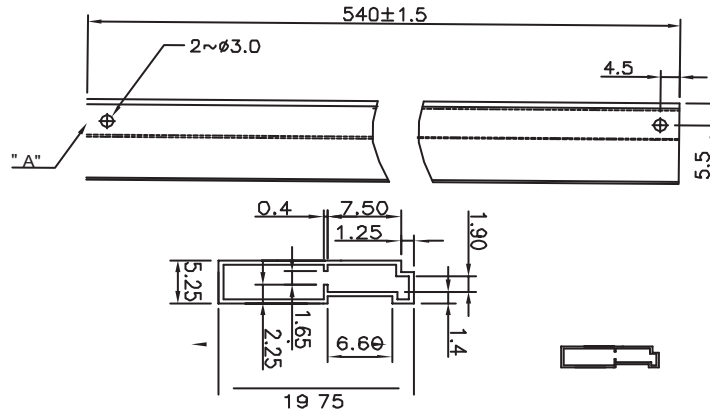
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.25	2.35	0.089	0.093
A1	0.95	1.05	0.037	0.041
b	0.77	0.85	0.030	0.033
b1	0.84	0.94	0.033	0.037
b2	5.30	5.45	0.209	0.215
C	0.49	0.53	0.019	0.021
D	6.00	6.20	0.236	0.244
E	6.40	6.60	0.252	0.260
E1	3.18	3.67	0.125	0.145
e	2.29	BSC	0.090	BSC
H	9.70	10.10	0.382	0.398
L	1.425	1.625	0.056	0.064
L1	0.650	0.850	0.026	0.033
L2	0.600	REF.	0.024	REF.



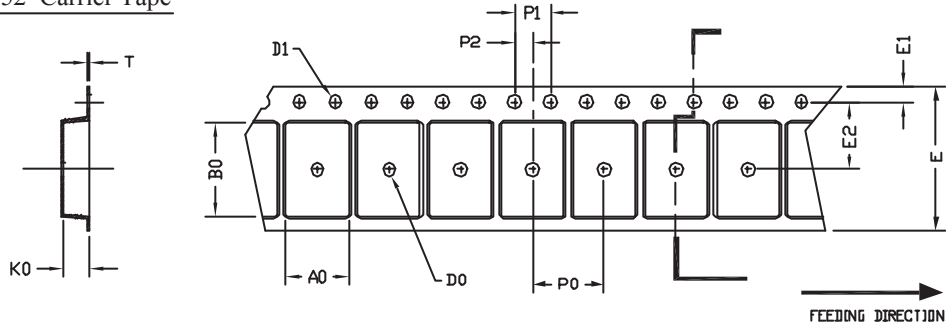
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## TO251 Tube/TO-252 Tape and Reel Data

### TO-251 Tube



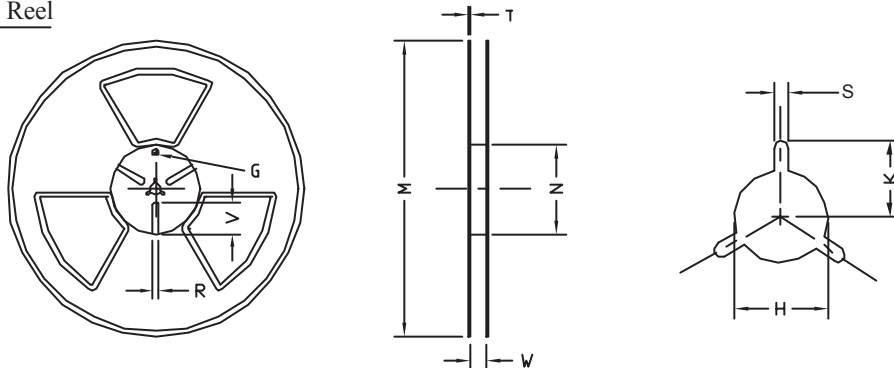
### TO-252 Carrier Tape



UNIT:mm

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
TO-252 (16 mm)	6.80 ±0.1	10.3 ±0.1	2.50 ±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 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	---	---	---