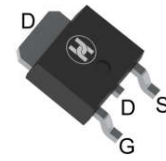
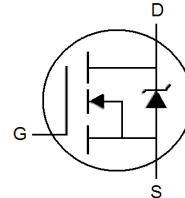


**N-CHANNEL Power MOSFET**
**FEATURES**

- $V_{DS}$ : 40V Max.,  $I_D$ : 120A Max.
- $R_{DS(ON)}$ : 2.3m $\Omega$ (max.)@ $V_{GS}=10V, I_D=20A$
- $R_{DS(ON)}$ : 3.5m $\Omega$ (max.)@ $V_{GS}=4.5V, I_D=20A$
- High density cell design for ultra low on-resistance
- Fully characterized avalanche voltage and current


**TO-252**

**EQUIVALENT CIRCUIT**
**MECHANICAL DATA**

- Case: TO-252
- Case material: Molded Plastic. UL flammability 94V-0
- Weight: 0.33grams(approximate)
- Marking: D120N04

**MAXIMUM RATINGS** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	40	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current	$I_D$	120	A
Pulsed drain current (Note 1)	$I_{DM}$	360	A
Power dissipation	$P_D$	110	W
Thermal resistance from junction to ambient	$R_{\theta JA}$	20	$^\circ\text{C/W}$
Operating junction and storage temperature	$T_J, T_{STG}$	-55~+150	$^\circ\text{C}$
Single Pulsed Avalanche Energy (note 1)	$E_{AS}$	70	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10s)	$T_L$	260	$^\circ\text{C}$

Note: 1.  $E_{AS}$  condition:  $V_{DD}=20V, L=0.5mH, R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

**N-CHANNEL Power MOSFET**
**ELECTRICAL CHARACTERISTICS** (TA=25°C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
<b>Off characteristics</b>						
Drain-Source breakdown voltage	$V_{(BR)DS}$	40			V	$V_{GS}=0V, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$			1	$\mu A$	$V_{DS}=40V, V_{GS}=0V$
Gate-body leakage current	$I_{GSS}$			$\pm 100$	nA	$V_{DS}=0V, V_{GS}=\pm 20V$
<b>On characteristics (note1)</b>						
Gate-threshold voltage	$V_{GS(th)}$	1.2	1.7	2.4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Drain-source on-resistance	$R_{DS(on)}$		1.55	2.3	m $\Omega$	$V_{GS}=10V, I_D=20A$
			2.35	3.5		$V_{GS}=4.5V, I_D=20A$
Forward transconductance	$g_{FS}$		10		S	$V_{DS}=5V, I_D=50A$
<b>Dynamic characteristics</b> (Guaranteed by design, not subject to production)						
Input capacitance	$C_{iss}$		4620		pF	$V_{GS}=0V$ $V_{DS}=20V$ $f=1.0MHz$
Output capacitance	$C_{oss}$		430		pF	
Reverse transfer capacitance	$C_{rss}$		360		pF	
<b>Switching characteristics</b> (Guaranteed by design, not subject to production)						
Turn-on delay time	$t_{d(on)}$		15		ns	$V_{DD}=20V$ $I_D=20A$ $R_G=3\Omega$ $V_{GS}=10V$
Turn-on rise time	$t_r$		55		ns	
Turn-off delay time	$t_{d(off)}$		120		ns	
Turn-off fall time	$t_f$		80		ns	
Total gate charge	$Q_g$		100		nC	$V_{DS}=10V, V_{GS}=10V,$ $I_D=20A$
Gate-source charge	$Q_{gs}$		16		nC	
Gate-drain charge	$Q_{gd}$		22		nC	
<b>Drain-source diode characteristics</b>						
Diode forward voltage	$V_{SD}$			1.2	V	$I_S=15A, V_{GS}=0V$
Max. forward current	$I_S$			20	A	
Pulsed drain-source diode forward current	$I_{SM}$			120	A	

 Notes: 1. Pulse Test: Pulse Width $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .

**N-CHANNEL Power MOSFET**

**TYPICAL CHARACTERISTICS**

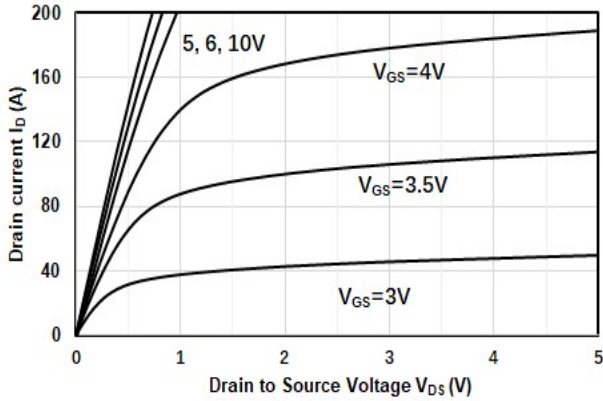


Figure1. Output Characteristics

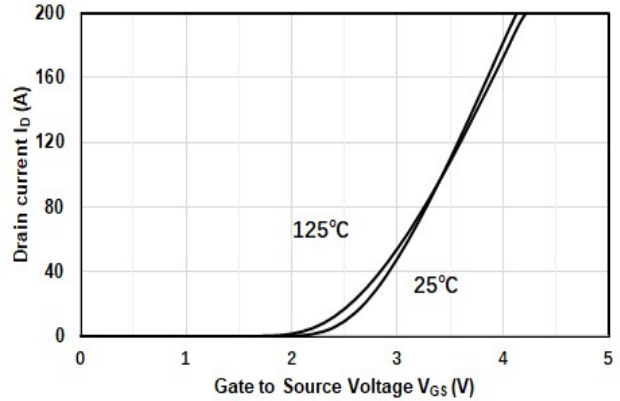


Figure2. Transfer Characteristics

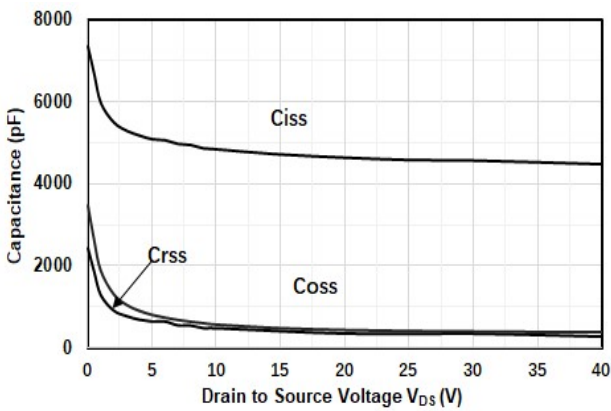


Figure3. Capacitance Characteristics

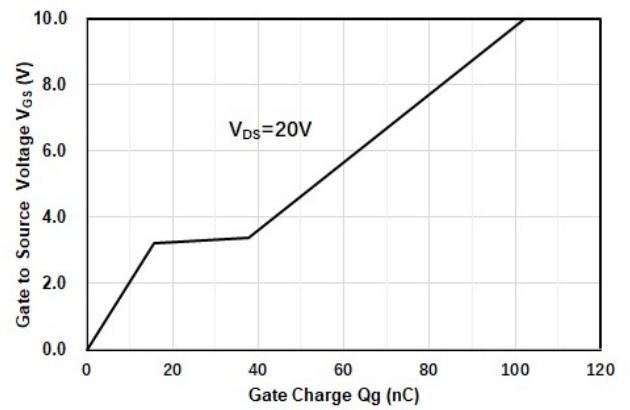


Figure4. Gate Charge

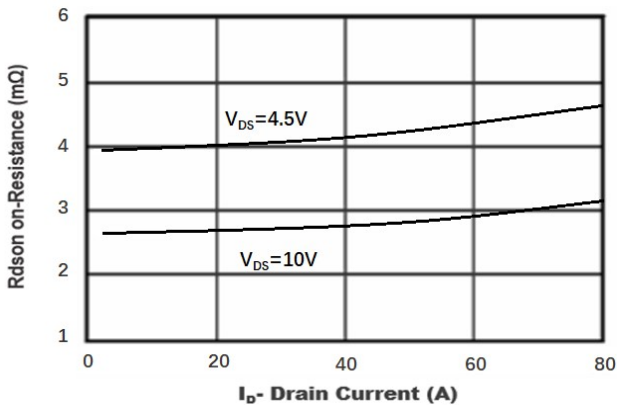


Figure5. Drain-Source on Resistance

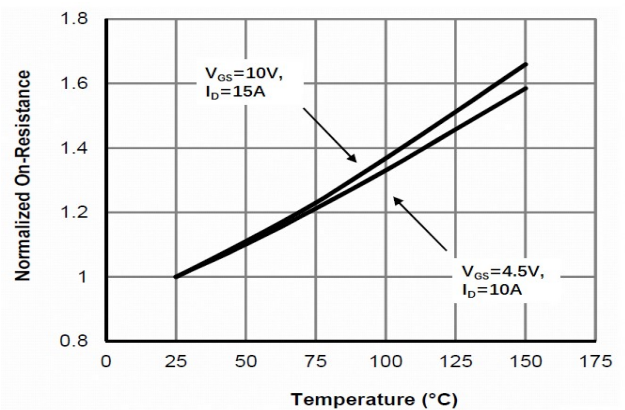
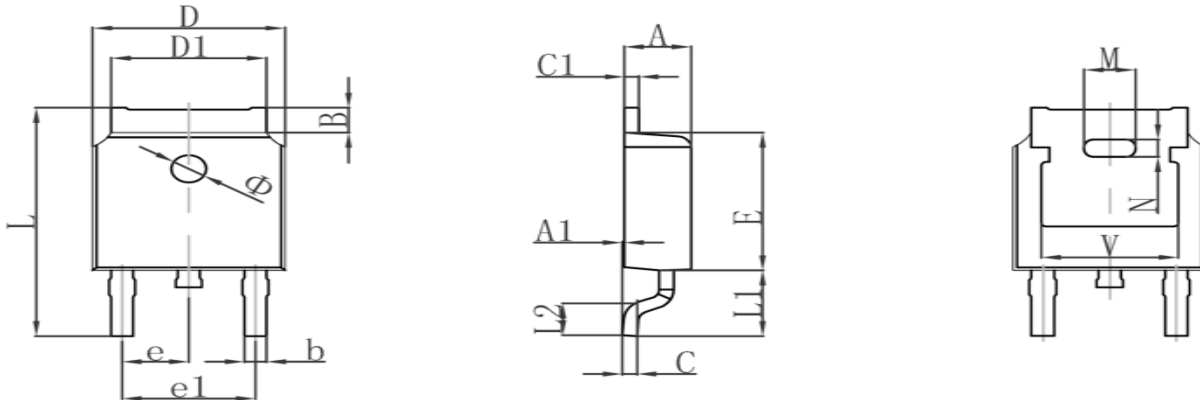
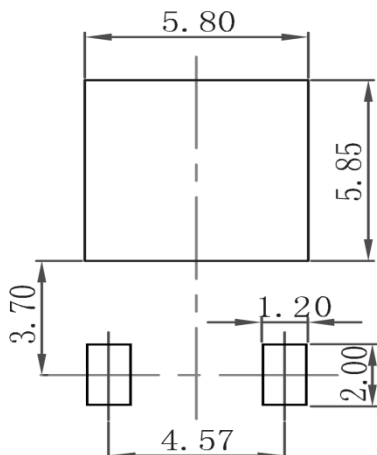


Figure6. Drain-Source on Resistance

**N-CHANNEL Power MOSFET**
**TO-252 PACKAGE OUTLINE DIMENSIONS**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	0.236	0.244
e	2.286TYP		0.090TYP	
e1	4.327	4.727	0.170	0.186
M	1.778REF		0.070REF	
N	0.762REF		0.018REF	
L	9.800	10.400	0.386	0.409
L1	2.9REF		0.114REF	
L2	1.400	1.700	0.055	0.067
V	4.830REF		0.190REF	
Φ	1.100	1.300	0.043	0.051

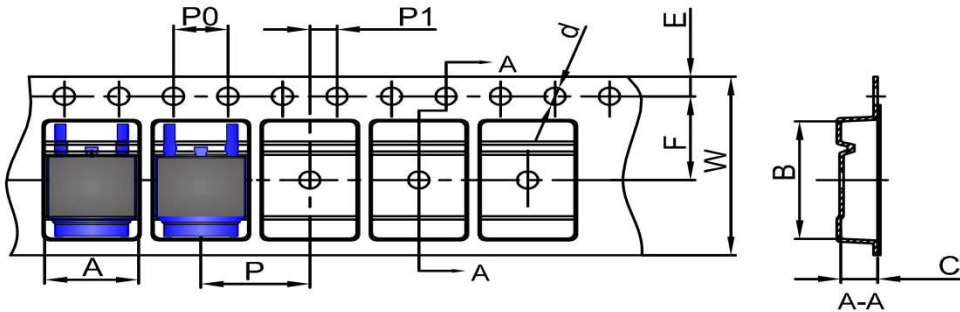
**TO-252 SUGGESTED PAD LAYOUT**

**Note:**

1. Controlling dimension: in millimeters
2. General tolerance:  $\pm 0.05\text{mm}$
3. The pad layout is for reference purposes only

**N-CHANNEL Power MOSFET**

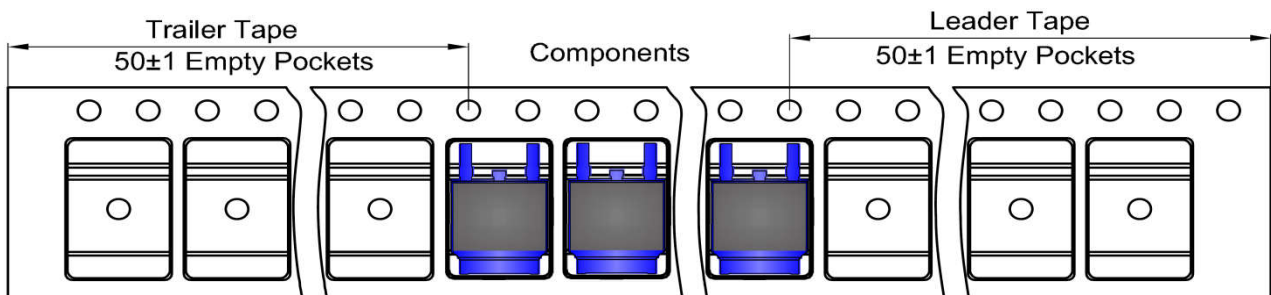
**TO-252 TAPE AND REEL**

**TO-252 Embossed Carrier Tape**

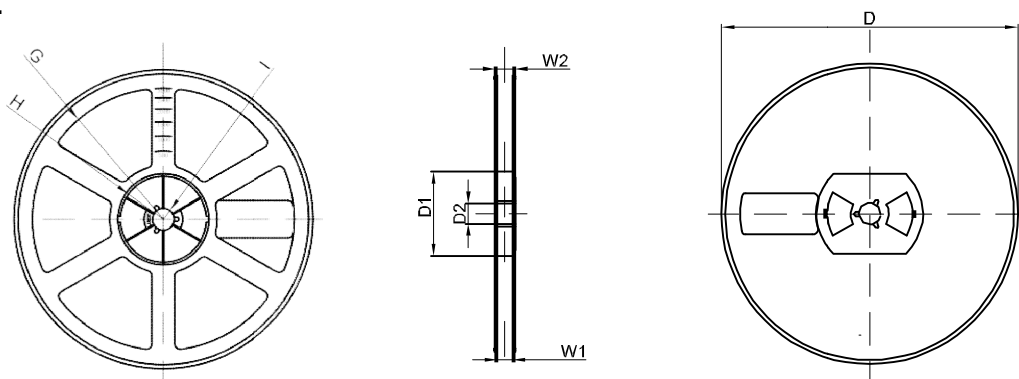


DIMENSIONS ARE IN MILLIMETER										
TYPE	A	B	C	d	E	F	P0	P	P1	W
TO-252	6.90	10.50	2.70	Ø1.55	1.75	7.50	4.00	8.00	2.00	16.00
TOLERANCE	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1

**TO-252 Tape Leader and Trailer**



**TO-252 REEL**



DIMENSIONS ARE IN MILLIMETER								
REEL OPTION	D	D1	D2	G	H	I	W1	W2
13" DIA	Ø330.00	100.00	Φ21.00	R151.00	R56.00	R6.50	16.40	21.00
TOLERANCE	±2	±1	±1	±1	±1	±1	±1	±1