



Product Specification

产品规格手册

20N06-Q

20A, 60V N-CHANNEL POWER MOSFET

20A-60V N沟道功率MOS管

20A, 60V N-CHANNEL POWER MOSFET

■ DESCRIPTION

The **20N06-Q** is an N-channel enhancement mode power MOSFET using NSD's advanced technology to provide customers with a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The **20N06-Q** is universally applied in low voltage, such as automotive, high efficiency switching for DC/DC converters and DC motor control.

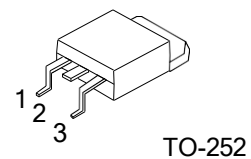
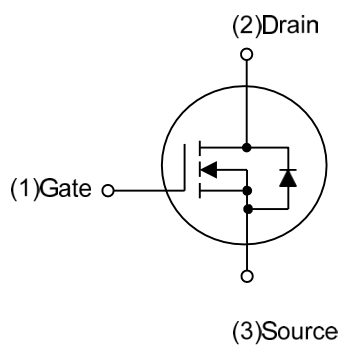
■ FEATURES

* $R_{DS(ON)} \leq 50 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=5.0\text{A}$

$R_{DS(ON)} \leq 65 \text{ m}\Omega$ @ $V_{GS}=4.5\text{V}$, $I_D=5.0\text{A}$

* High switching speed

■ SYMBOL



1: Gate 2: Drain 3: Source

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current	Continuous	I_D	20	A
	Pulsed	I_{DM}	40	A
Power Dissipation	TO-220/TO-263	P_D	89	W
	TO-251/TO-252		50	W
	SOP-8		5.2	W
	PDFN5×6		30	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

■ THERMAL DATA

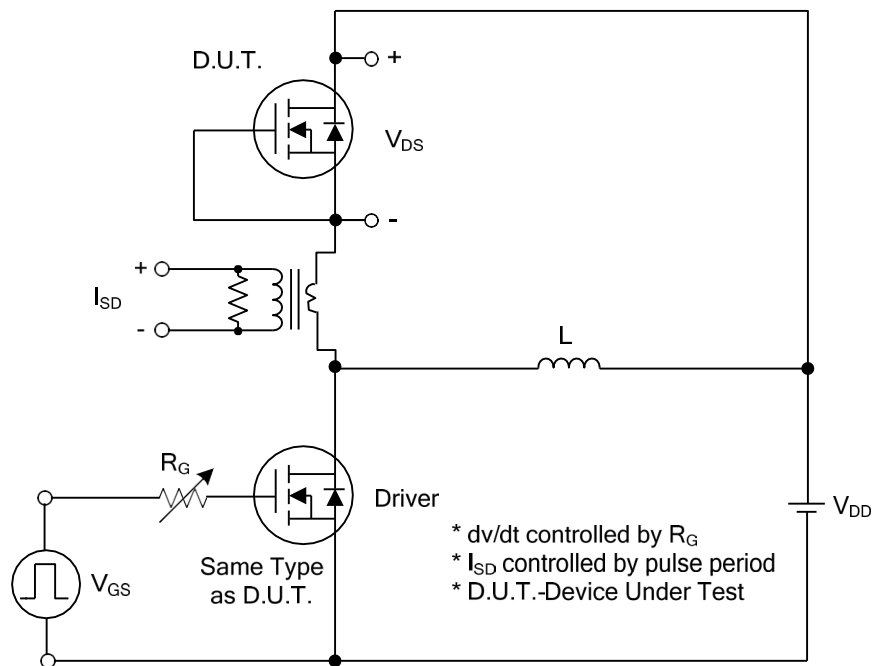
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-263	θ_{JA}	62	°C/W
	TO-251/TO-252		110	°C/W
	SOP-8		100 (Note)	°C/W
	PDFN5×6		35 (Note)	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	1.4	°C/W
	TO-251/TO-252		2.5 (Note)	°C/W
	SOP-8		24 (Note)	°C/W
	PDFN5×6		4.16 (Note)	°C/W

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

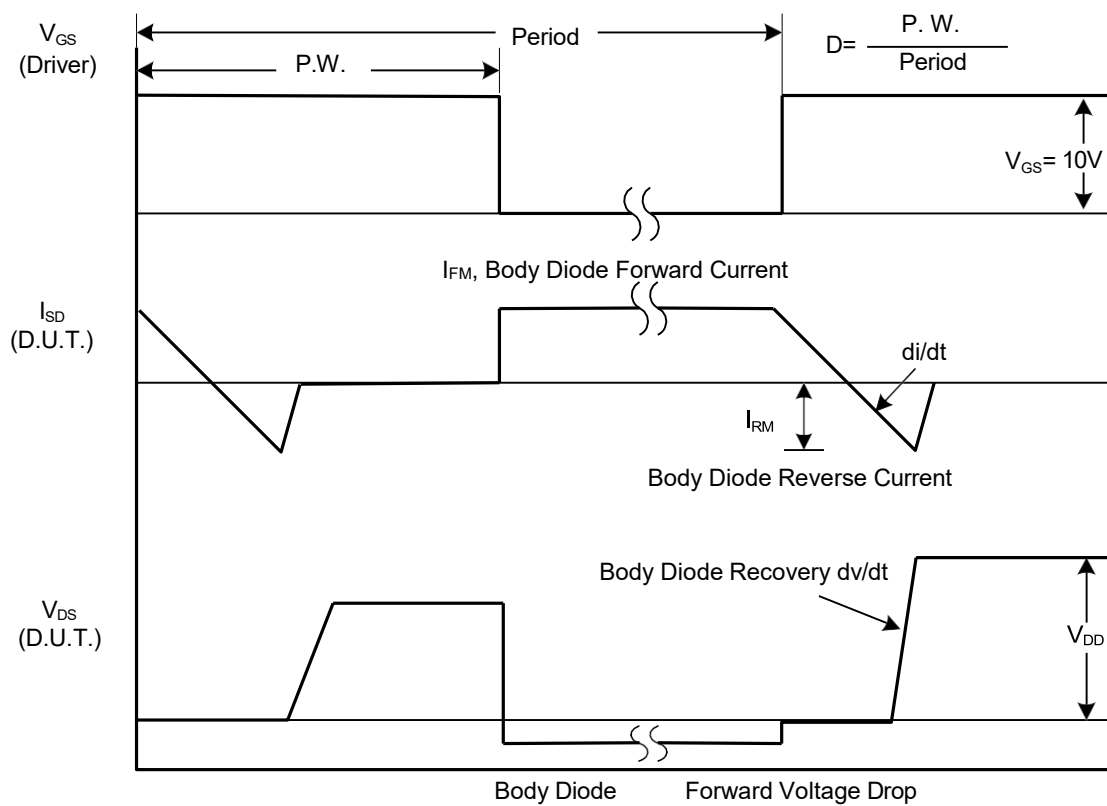
ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	60			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =60V, V _{GS} =0V			1	μA
			V _{DS} =48V, V _{GS} =0V, T _C =125°C			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+16V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-16V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	1.0		3.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =5.0A			50	mΩ
			V _{GS} =4.5V, I _D =5.0A			65	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		676		pF
Output Capacitance		C _{OSS}			70		pF
Reverse Transfer Capacitance		C _{RSS}			51		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =48V, V _{GS} =10V, I _D =20A (Note 1, 2)		22		nC
Gate to Source Charge		Q _{GS}			5		nC
Gate to Drain Charge		Q _{GD}			4.5		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} =30V, V _{GS} =10V, I _D =20A, R _G =3.3Ω (Note 1, 2)		3.2		ns
Rise Time		t _R			17		ns
Turn-OFF Delay Time		t _{D(OFF)}			13		ns
Fall-Time		t _F			19		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				20	A
Maximum Body-Diode Pulsed Current		I _{SM}				40	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =20A, V _{GS} =0V			1.2	V
Reverse Recovery Time		t _{rr}	I _S =20A, V _{GS} =0V,		30		nS
Reverse Recovery Charge		Q _{rr}	dl/dt=100A/μs		12		nC

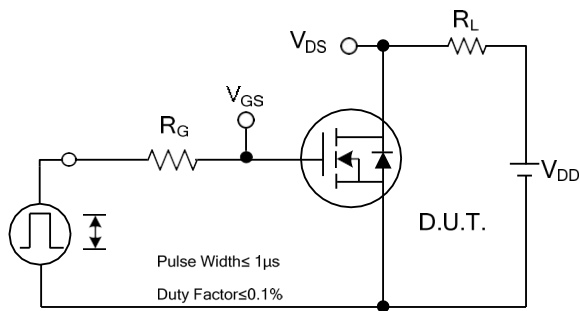
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.



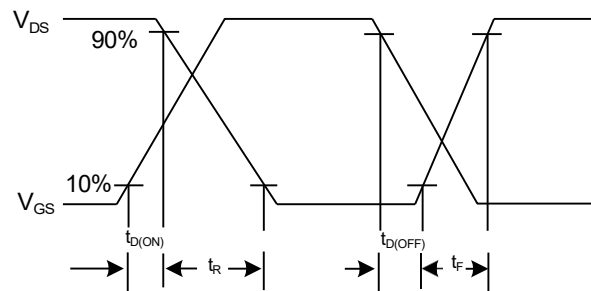
Peak Diode Recovery dv/dt Test Circuit



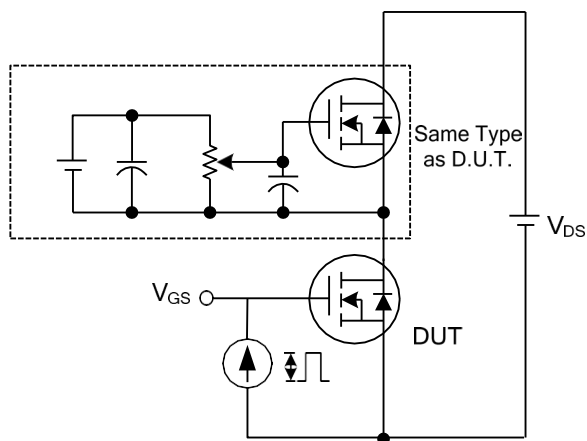
Peak Diode Recovery dv/dt Waveforms



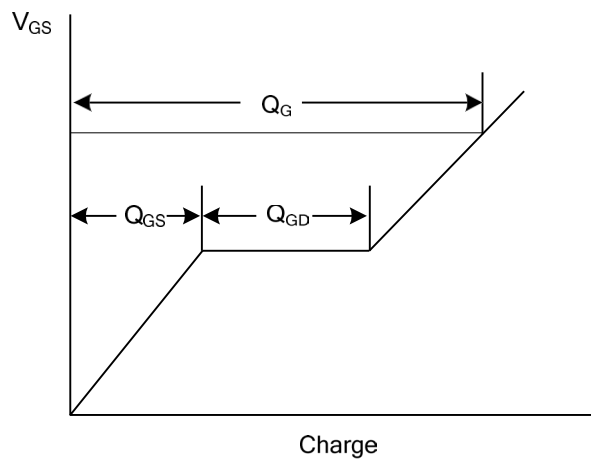
Switching Test Circuit



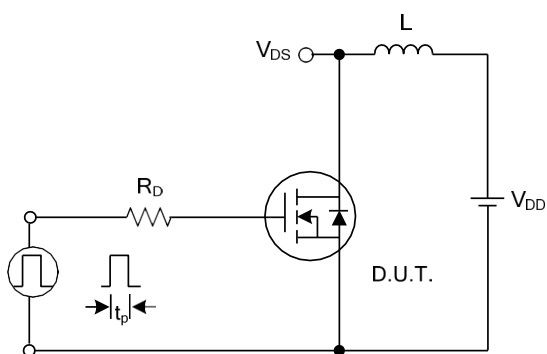
Switching Waveforms



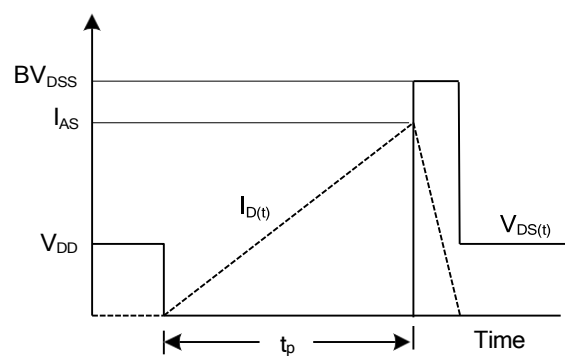
Gate Charge Test Circuit



Gate Charge Waveform



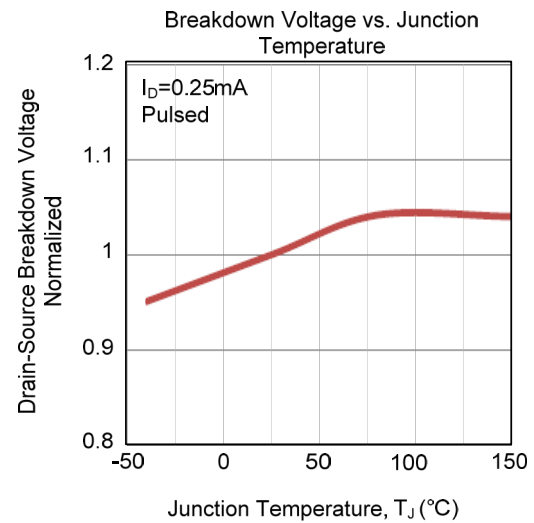
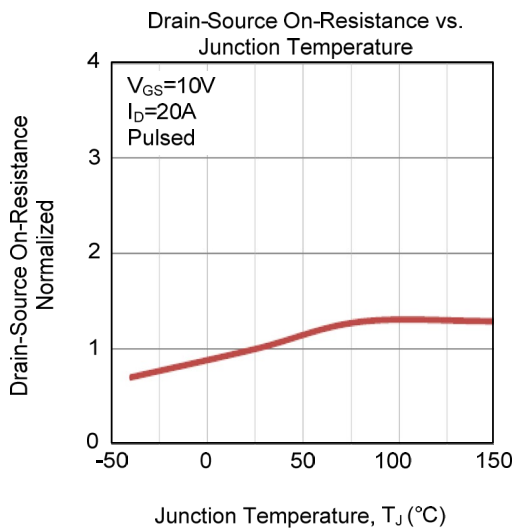
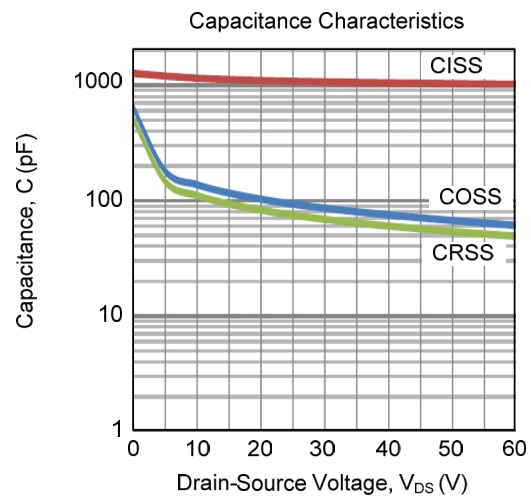
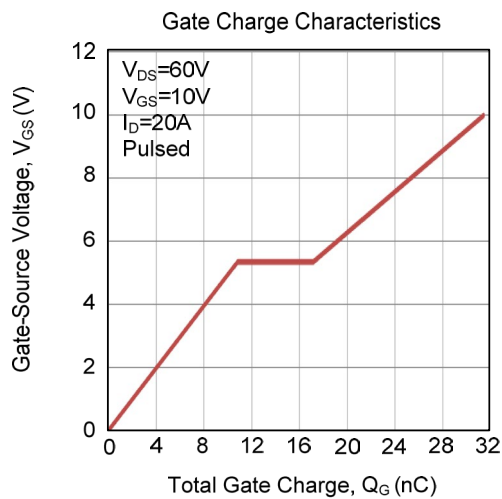
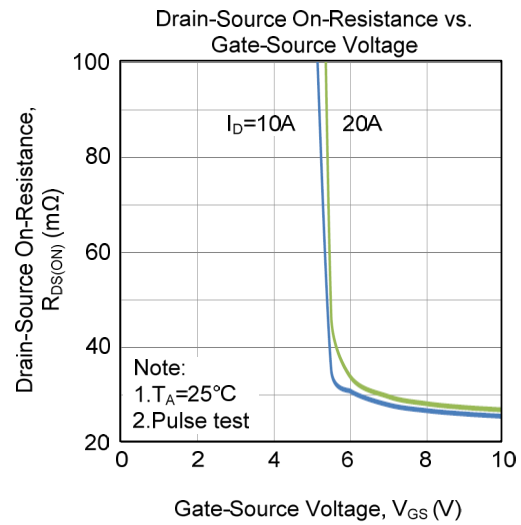
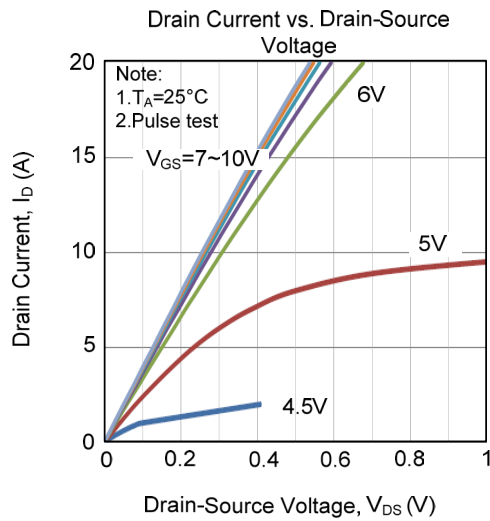
Unclamped Inductive Switching Test Circuit



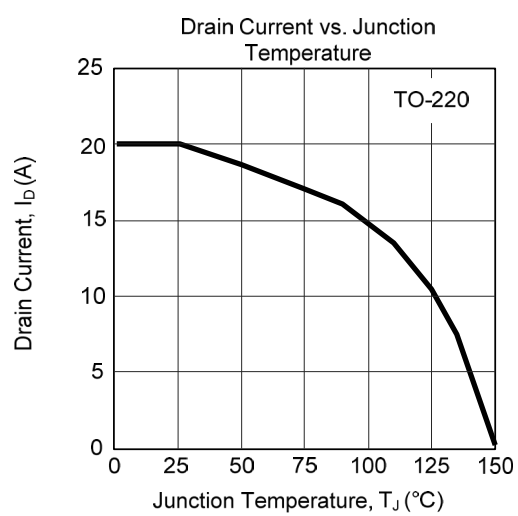
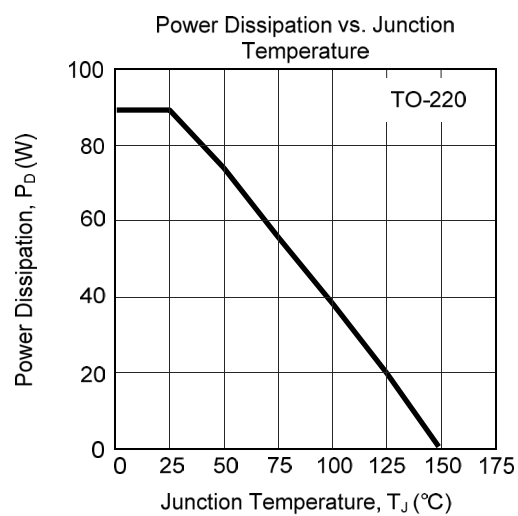
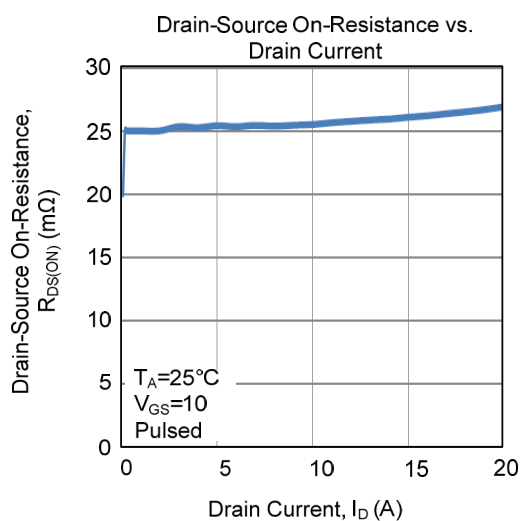
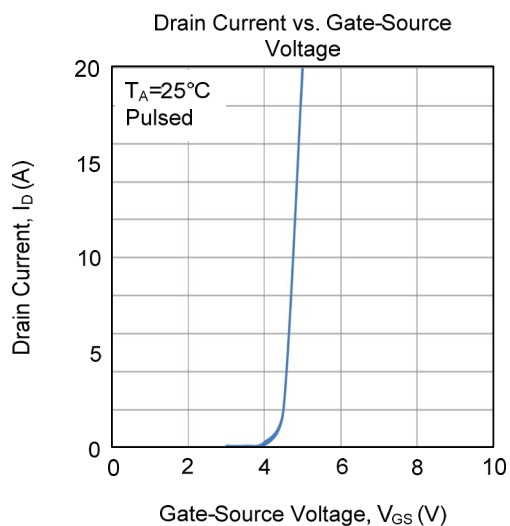
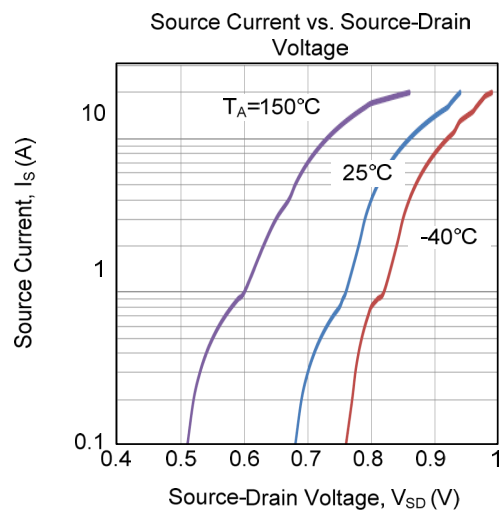
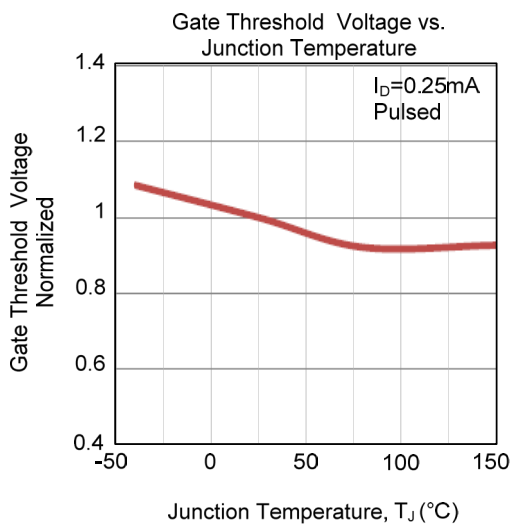
Unclamped Inductive Switching Waveforms



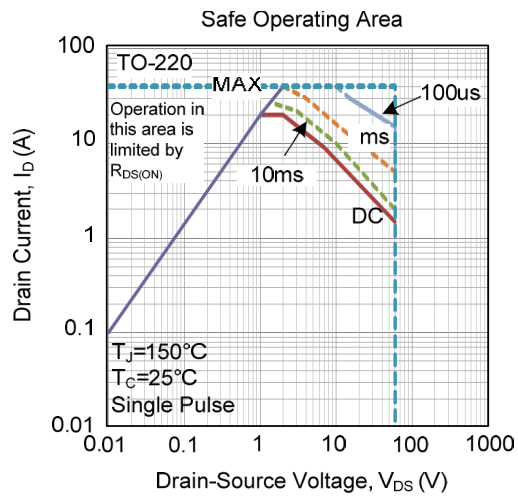
TYPICAL CHARACTERISTICS

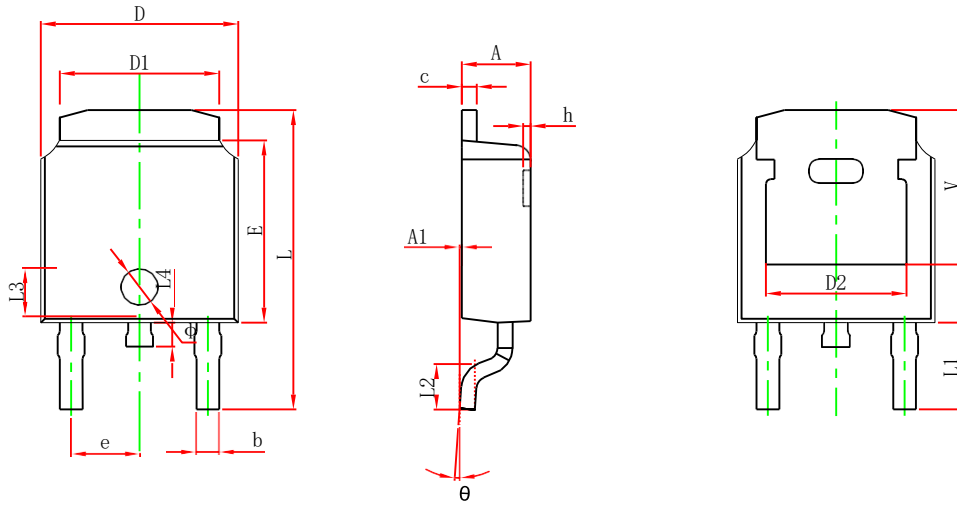


■ **TYPICAL**

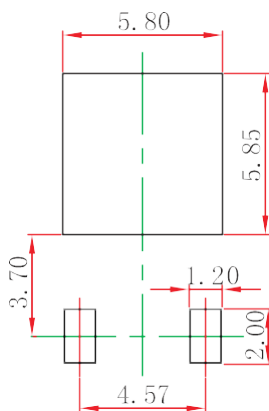


■ **TYPICAL**



Mechanical Information
TO-252-2L Mechanical Information
TO-252-2L Outline Dimensions


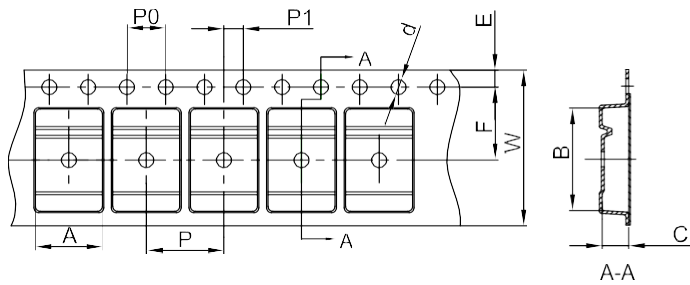
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

TO-252-2L Suggest 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.

TO-252 Tape and Reel

TO-252 Embossed Carrier Tape



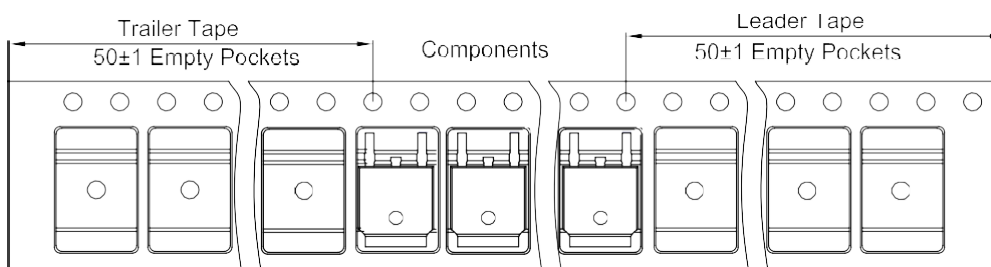
Packaging Description:

TO-252 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 25,00 units per 13" or 33.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

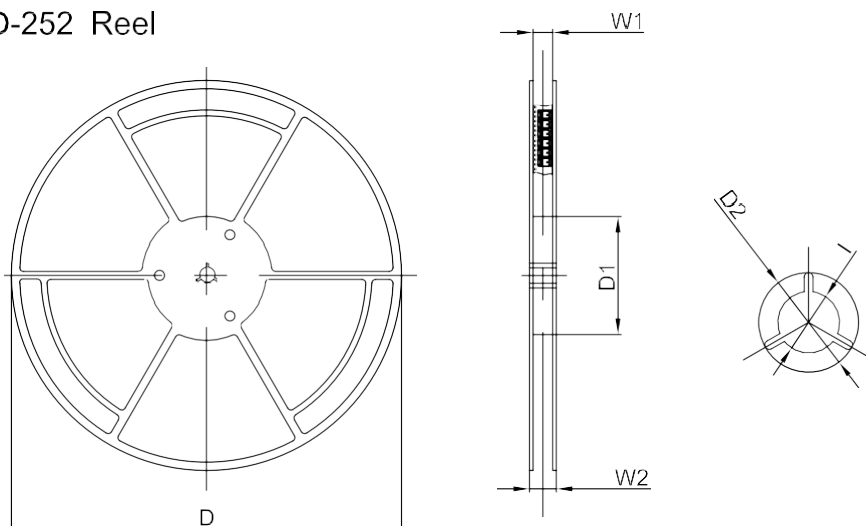
Dimensions are in millimeter

Pkg 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

TO-252 Tape Leader and Trailer



TO-252 Reel



Dimensions are in millimeter

Reel Option	D	D1	D2	W1	W2	I
13"Dia	330.00	100.00	Ø21.00	16.40	21.00	Ø13.00

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
2,500 pcs	13inch	2,500 pcs	340×336×29	25,000 pcs	353×346×365	