

## QIAOXIN N-Channel Enhancement Mode Power MOSFET

### General Description

The VCRR7580 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

### Features

- $V_{DS}=75V$ ;  $I_D=80A@V_{GS}=10V$ ;  
 $R_{DS(ON)}<8m\Omega @V_{GS}=10V$
- Special process technology for high ESD capability
- Special designed for converters and power controls
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

### Application

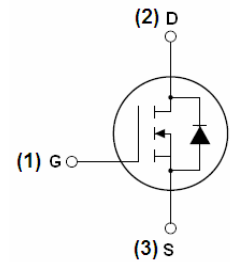
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

### Product Summary

$BV_{DSS}$	typ.	84	V
$R_{DS(ON)}$	typ.	6.5	m $\Omega$
	max.	8.0	m $\Omega$
$I_D$		80	A



TO-220-3L top view



Schematic diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package
VCRR7580		TO-220-3L

Table 1. Absolute Maximum Ratings ( $T_C=25^\circ C$ )

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	75	V
Gate-Source Voltage ( $V_{DS}=0V$ )	$V_{GS}$	$\pm 25$	V
Drain Current (DC) at $T_C=25^\circ C$	$I_{D(DC)}$	80	A
Drain Current (DC) at $T_C=100^\circ C$	$I_{D(DC)}$	60	A
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_{DM(pluse)}$	320	A
Peak diode recovery voltage	$dv/dt$	30	V/ns
Maximum Power Dissipation( $T_C=25^\circ C$ )	$P_D$	170	W
Derating factor		1.13	W/ $^\circ C$
Single pulse avalanche energy (Note 2)	$E_{AS}$	580	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.EAS condition :  $T_J=25^\circ C, V_{DD}=50V, V_G=10V, L=0.3mH, I_D=62A$ ;

**Table 2. Thermal Characteristic**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	0.88	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	63	$^{\circ}C/W$

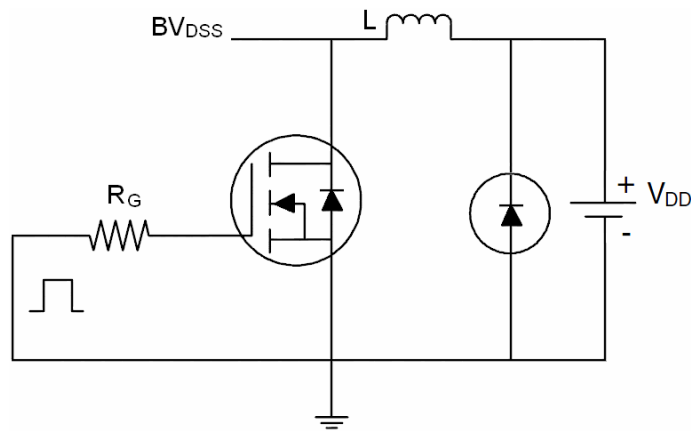
**Table 3. Electrical Characteristics ( $T_C=25^{\circ}C$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/off states</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	75	84		V
Zero Gate Voltage Drain Current( $T_C=25^{\circ}C$ )	$I_{DSS}$	$V_{DS}=75V, V_{GS}=0V$			1	$\mu A$
Zero Gate Voltage Drain Current( $T_C=125^{\circ}C$ )	$I_{DSS}$	$V_{DS}=75V, V_{GS}=0V$			10	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	2.85	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=40A$		6.5	8	m $\Omega$
<b>Dynamic Characteristics</b>						
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=40A$	20	-	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$		4400		PF
Output Capacitance	$C_{oss}$			340		PF
Reverse Transfer Capacitance	$C_{rss}$			260		PF
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=30A,$ $V_{GS}=10V$		100		nC
Gate-Source Charge	$Q_{gs}$			20		nC
Gate-Drain Charge	$Q_{gd}$			30		nC
<b>Switching times</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$		17.8		nS
Turn-on Rise Time	$t_r$			11.8		nS
Turn-Off Delay Time	$t_{d(off)}$			56		nS
Turn-Off Fall Time	$t_f$			14.6		nS
<b>Source- Drain Diode Characteristics</b>						
Source-drain current(Body Diode)	$I_{SD}$				80	A
Pulsed Source-drain current(Body Diode)	$I_{SDM}$				320	A
Forward on voltage <sup>(Note 1)</sup>	$V_{SD}$	$T_j=25^{\circ}C, I_{SD}=40A, V_{GS}=0V$			1.2	V
Reverse Recovery Time <sup>(Note 1)</sup>	$t_{rr}$	$T_j=25^{\circ}C, I_F=75A, di/dt=100A/\mu s$			36	nS
Reverse Recovery Charge <sup>(Note 1)</sup>	$Q_{rr}$				56	nC
Forward Turn-on Time	$t_{on}$	Intrinsic turn-on time is negligible(turn-on is dominated by $L_S+L_D$ )				

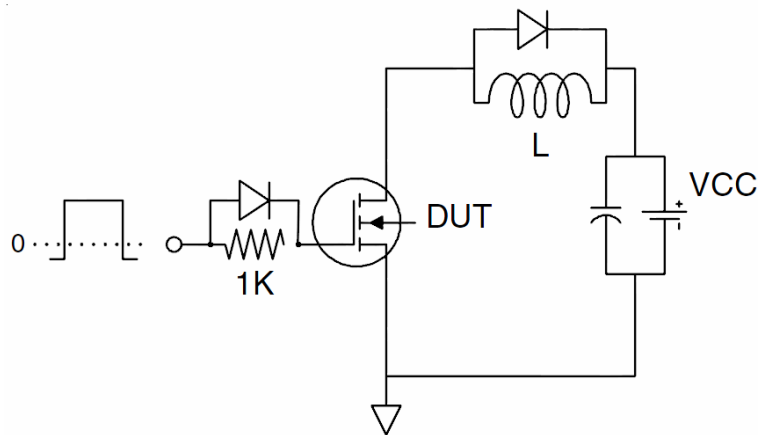
Notes 1. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 1.5\%$ ,  $R_G=25\Omega$ , Starting  $T_j=25^{\circ}C$

## Test Circuit

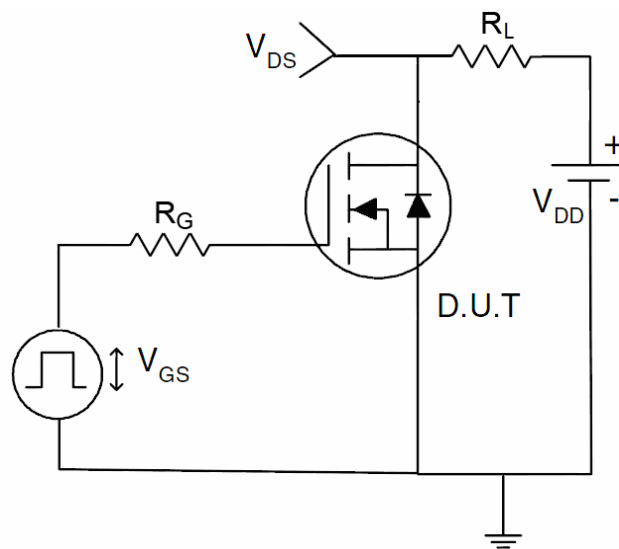
### 1) $E_{AS}$ Test Circuit



### 2) Gate Charge Test Circuit

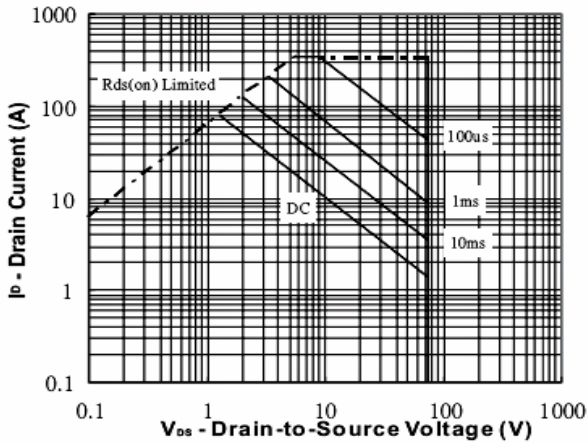


### 3) Switch Time Test Circuit

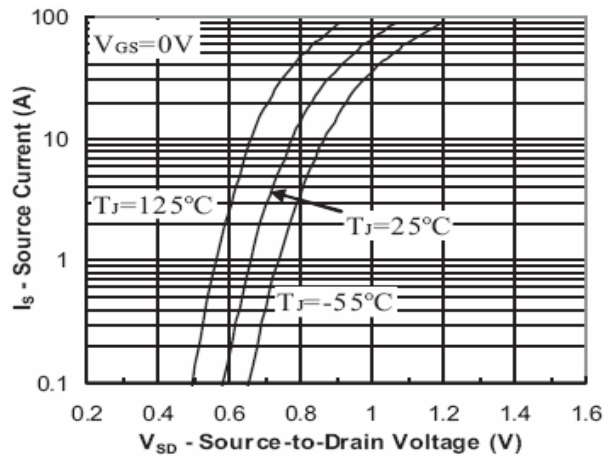


**Typical Electrical and Thermal Characteristics (curves)**

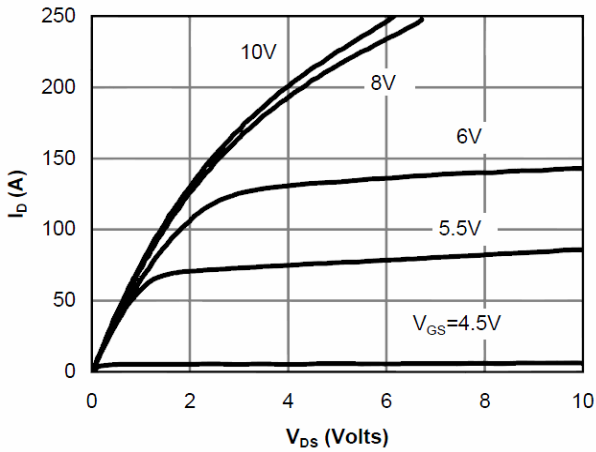
**Figure1. Safe operating area**



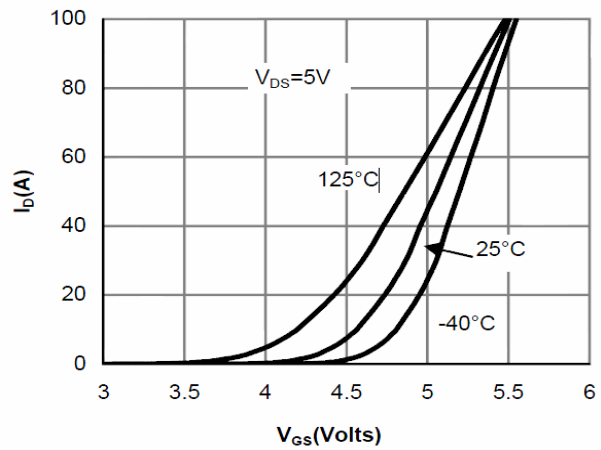
**Figure2. Source-Drain Diode Forward Voltage**



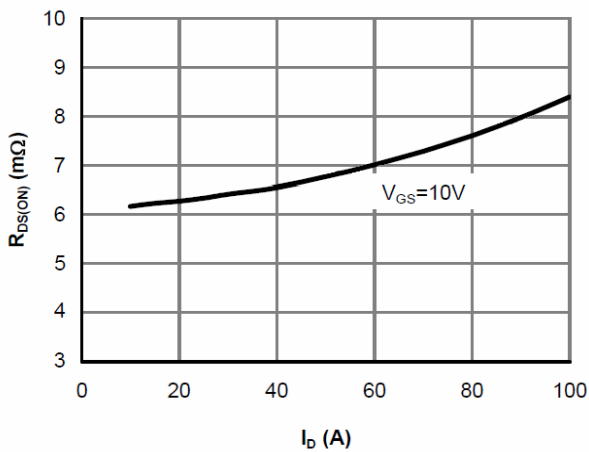
**Figure3. Output characteristics**



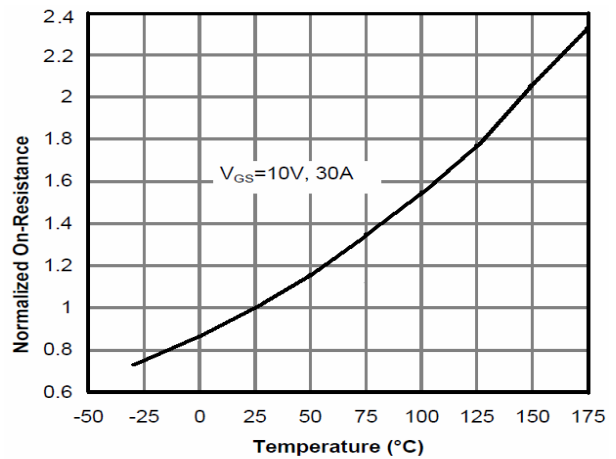
**Figure4. Transfer characteristics**



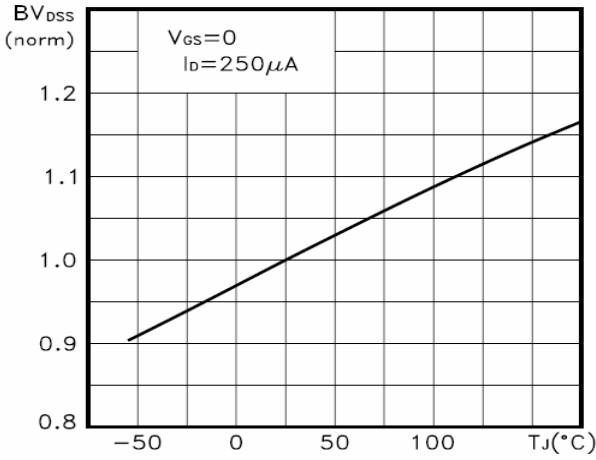
**Figure5. Static drain-source on resistance**



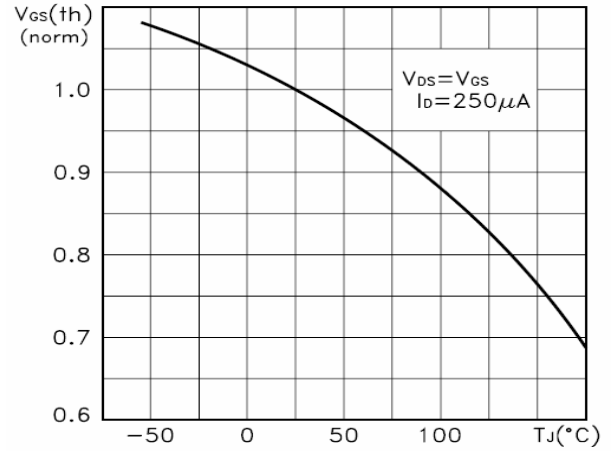
**Figure6.  $R_{DS(ON)}$  vs Junction Temperature**



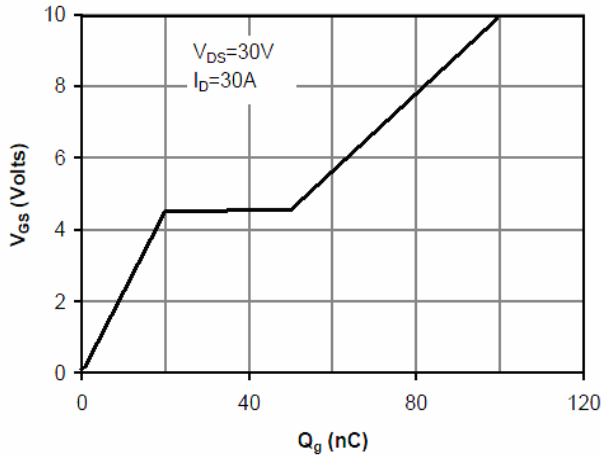
**Figure7.  $BV_{DSS}$  vs Junction Temperature**



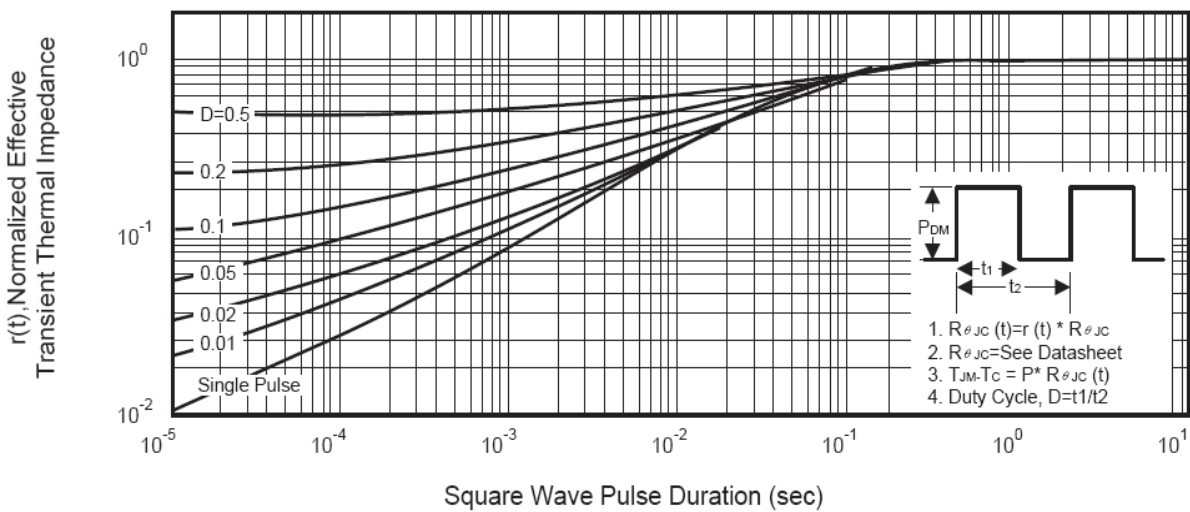
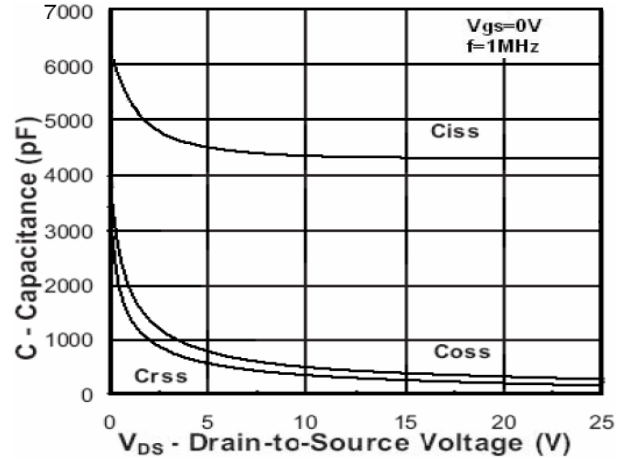
**Figure8.  $V_{GS(th)}$  vs Junction Temperature**



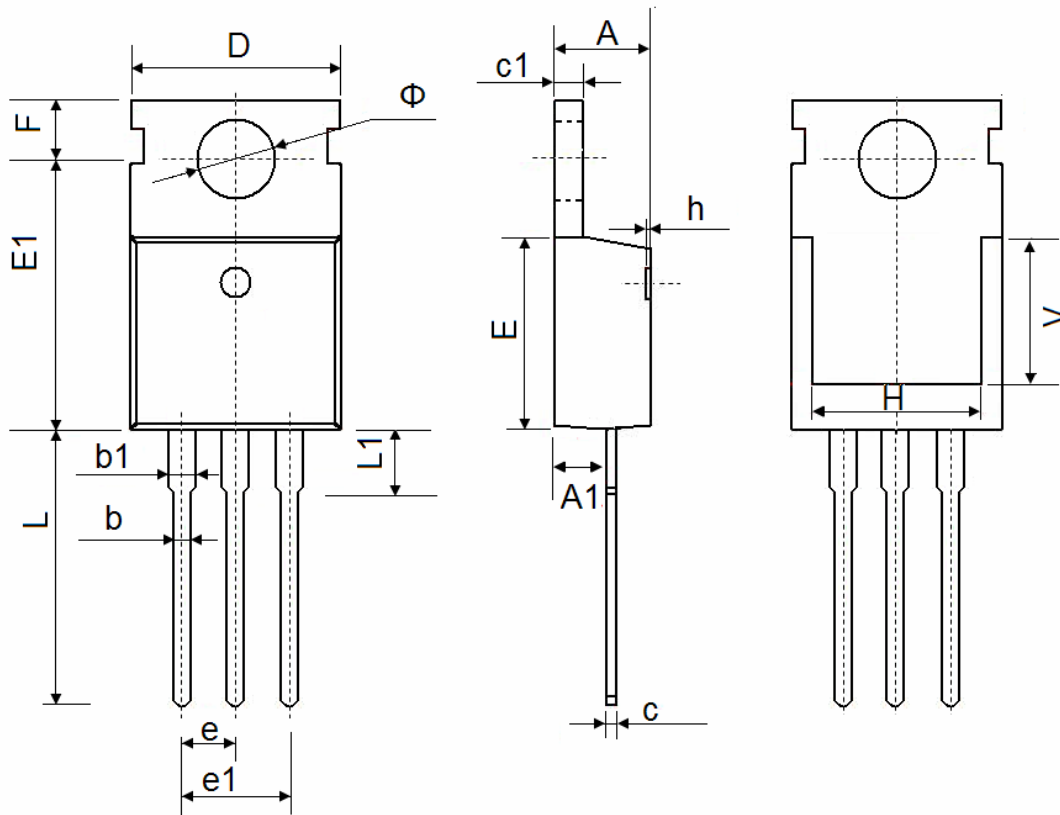
**Figure9. Gate charge waveforms**



**Figure10. Capacitance**



**TO-220-3L Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
$\Phi$	3.400	3.800	0.134	0.150

### **Attention**

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